United States
Department of
Agriculture

Forest
Service

May 2013

Draft Environmental Impact Statement

Beaver Creek Project

Coeur d'Alene River Ranger District, Idaho Panhandle National Forests
Shoshone County, Idaho

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TTY). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW., Washington, DC 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TTY). USDA is an equal opportunity provider and employer.

Beaver Creek
Draft Environmental Impact Statement
Shoshone County, Idaho]

Lead Agency:	**US Forest Service**
Cooperating Agencies:	**None**
Responsible Official:	**Mary Farnsworth, Forest Supervisor** **3815 Schreiber Way** **Coeur d'Alene, ID 83814**
For Information Contact:	**Lauren Goschke, Project Leader** **Coeur d'Alene River Ranger District** **2502 E. Sherman Avenue** **Coeur d'Alene, ID 83814** **(208) 769-3046**

Abstract: The environmental impact statement (EIS) addresses the need to maintain existing and recruit additional long-lived early seral species to facilitate greater forest health and increased resiliency to disturbance. It also addresses the need to manage the landscape arrangement of forest structure and age class within the Beaver Creek watershed to ensure diverse and sustainable forest stands. Dead and dying trees throughout the project area are increasing fuel loading throughout the watershed. Treatment is needed to reduce the risk of hazardous fuels which could threaten wildland urban interface areas. Lastly, it addresses the need to restore water quality and aquatic habitats in the Beaver Creek watershed to meet State water quality standards, improve the abundance of fisheries and other aquatic organisms, and improve the longevity of road conditions by reducing maintenance costs and providing for long term public access.

The project area encompasses approximately 28,200 acres. The major issues identified during scoping include effects of road construction, aggregated retention, and impacts to wildlife. Alternatives considered include:

Alternative 1: No proposed activities. Alternative 1 would maintain the existing level of management including fire suppression, road maintenance, recreation use, and previously authorized projects.

Activities Common to Action Alternatives: Implementation of all design feature criteria. Silvicultural prescriptions, including shelterwood, seed tree, commercial thinning, and improvement cuts, logging systems including ground based, skyline, cable, and Escaliner swing. Reforestation of all regeneration harvest acres after timber harvest; including pocket gopher control. Underburning and fuel treatments associated with timber harvesting. Prescribed ecosystem burning on 2,080 acres, and fuel break development on 6 acres. Decommissioning 66 miles of road; reconditioning 51 miles of road; reconstructing over 20 miles of roads, and improving aquatic organism passage barriers.

Alternative 2: Includes activities common to action alternatives and timber harvest and associated fuels treatment on approximately 1,973 acres. Silvicultural prescriptions include 917 acres of shelterwood, 263 acres of seed tree, 300 acres of commercial thins, and 493 acres of improvement cuts. Logging systems include 230 acres of ground-based, 1,495 acres of skyline, 10 acres of cable, and 238 acres of Escaliner swing. This alternative contains 1.2 miles of proposed new permanent road and 1.5 miles of temporary road construction, recommends 66 miles of road decommissioning, 19 miles of road storage, and the improvement of 8 aquatic organism passage barriers. It proposes the installation of 1 gate to enforce restricted access along the Pony Gulch road.

Alternative 3: Includes activities common to action alternatives and timber harvest and associated fuel treatments on approximately 1,662 acres, which includes aggregate retention silvicultural treatments. Silvicultural prescriptions would be the same as those for Alternative 2, with the addition of aggregated retention in some selected seed tree and shelterwood harvest units. Silvicultural prescriptions include 498 acres of shelterwood, 121 acres of seed tree, 253 acres of commercial thin, 430 acres of improvement cuts, and 360 acres of aggregate retention. Logging systems include 212 acres of ground based, 1,197 acres of skyline, 36 acres of cable, and 217 acres of Escaliner swing. This alternative contains no proposed new permanent or temporary road construction, and recommends 104 miles of road decommissioning and the improvement of 12 aquatic organism passage barriers.

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

Send comments to:	**Beaver Creek Project Leader** **Coeur d'Alene River Ranger District** **2502 E. Sherman Avenue** **Coeur d'Alene, ID 83814** **FAX: (208) 769-3062**
Submit electronic comments to:	comments-northern-idpanhandle-coeur-dalene@fs.fed.us

Electronic comments must be submitted in a format that is readable with optical character recognition software and be searchable, such as MS Word. The subject line must contain "Beaver Creek Project."

Date comments must be received:	**45 days following publication of the Notice of Availability in the Federal Register**

Summary

Introduction

The Coeur d'Alene River Ranger District of the Idaho Panhandle National Forests (IPNF) is proposing the Beaver Creek Project. The project is designed to respond to the goals and objectives outlined in the IPNF Forest Plan, USDA Forest Service Strategic Plan for Fiscal years 2007-2012, Interior Columbia Basin Strategy, Coeur d'Alene Geographic Assessment, Shoshone County Wildland Urban Interface Fire Mitigation Plan and the National Cohesive Wildland Fire Management Strategy. Existing conditions in the resource area deviate from the desired future conditions defined by the Forest Plan, particularly conditions regarding forest resiliency, hazardous fuel loading and watershed health.

The 28,200-acre Beaver Creek Resource Area is located entirely within Shoshone County, Idaho, approximately 15 miles northwest of Wallace, Idaho (T50N R4E, sections 31-35, T49N R3E sections 1, 12, 13, and 24, T49N R4E sections 1-36, T49N R5E sections 7, 17-21, and 28-32, T48N R5E section 6, and T48N R4E sections 1-4, and 9-11, Boise Meridian). The Resource Area includes National Forest System lands in the drainages of White Creek, Carpenter Gulch, Rock Gulch, Missouri Gulch, Scott Gulch, Alder Creek, Kid Gulch, Deer Creek, Moore Gulch, Dudley Creek, Ferguson Creek, Carbon Creek, Prospect Gulch, Unknown Gulch, Pony Gulch, Cleveland Gulch, and Potosi Gulch, all of which drain into Beaver Creek, then into the Coeur d'Alene River, and eventually into Lake Coeur d'Alene. National Forest System lands in the area are managed by the Coeur d'Alene River Ranger District of the IPNF. There are no proposals for future timber management in the Beaver Creek Resource Area for another 25-30 years.

Purpose and Need for Action

Based on the comparison between the desired and existing conditions, as determined through the regulatory framework direction described above, the following objectives were identified by the project interdisciplinary team (see Appendix G –Preparers and Contributors) to develop the original proposed action:

- Objective 1 – Develop resilient forest conditions by improving the resiliency of the landscape to insects, disease, fire, and drought through maintaining existing long lived early seral species and increasing their overall representation across the landscape.
- Objective 2 –Reduce hazardous fuels in the wildland-urban interface and within the resource area to improve public and firefighter safety, as well as make communities, infrastructure and natural resource values less vulnerable to impacts from wildfire.
- Objective 3 – Improve water quality and aquatic habitats by restoring water quality and watershed conditions to meet water quality standards and bring aquatic habitats towards an enhanced condition.

Objective 1: Develop Resilient Forest Conditions

A primary goal of this project is to maintain and increase long-lived early seral species across the landscape, including ponderosa pine, western larch, and white pine. Increasing the abundance of these species will contribute increased resiliency to disturbances such as fire, insects, and disease. This action is needed because although all three species currently exist in the Beaver Creek watershed, they occur in lower quantities than they did historically due to selective harvesting, fire suppression and white pine blister rust. To meet these needs, as well as the goals and objectives of the Forest Plan, stands should trend from the current composition of species more vulnerable to disturbance (grand fir, Douglas-fir, lodgepole pine) towards long-lived early seral species (ponderosa pine, western larch, and western white pine), which are more resistant to disturbances.

There is also a need to manage the landscape arrangement of forest structure and age class within the Beaver Creek watershed. Currently, the average patch size for the seedling/sapling size classes is below the desired condition; primarily because of the lack of stand replacement fire over the past century and the average size and pattern of contemporary regeneration harvests. Increasing the average patch size for the seedling/sapling classes is important to regenerate the early seral species (ponderosa pine, western larch, and western white pine), which are more resistant to disturbances. Additionally, because the last major fire event occurred over 100 years ago, there is a need to manage for the arrangement of potential future old growth while considering the arrangement and condition of the existing old growth.

Objective 2: Hazardous Fuels Reduction

Approximately two-thirds of the Beaver Creek Resource area is designated as wildland-urban interface (WUI) in the Shoshone County Community Wildfire Protection Plan. Private land, homes, heavy summertime recreational use, and the Bonneville Power Administration (BPA) transmission line are major factors influencing the WUI designation. The communities of Prichard and Murray are not within the Beaver Creek Resource Area, but could be affected by a large fire in the area. Due to the existing fuel conditions, it is possible that a large fire could potentially threaten the resource area in the near future.

There is a need for hazardous fuel reduction in the Beaver Creek Resource Area because the increase in hazardous fuels in the project area increases the potential of wildfire to threaten life, property, resource values and infrastructure. The objectives of fire management in the Beaver Creek area are to alter fuel profiles so that public and firefighter safety is improved; communities, infrastructure, and other values-at-risk are less vulnerable to impacts from wildfire; to restore natural ecological processes; and to achieve desired conditions and attain management objectives from the Forest Plan. Based on the area's high fuel levels and its proximity to private development, there is a need to reduce hazardous fuels in the Beaver Creek Resource Area to reduce the risk of fire.

Additionally, the absence of fire has also affected species composition and landscape structure, especially on the dry sites in the resource area. Dry site habitats that are dependent on fire to maintain their species composition and structure are now in a condition where a wildfire could result in complete mortality of the stands.

Objective 3: Improved Water Quality and Aquatic Habitats

There is a need to restore water quality and aquatic habitats in the Beaver Creek watershed to meet State water quality standards, improve the abundance of fisheries and other aquatic organisms, and improve the longevity of road conditions by reducing maintenance costs while providing for long-term public access. This action is needed partly because streams within the Beaver Creek resource area are considered impaired and do not fully support beneficial uses of the State of Idaho (including cold water aquatic life and salmonid spawning) due to high sediment loads, elevated metals, and altered stream flow, habitat, and temperature regimes. In the Beaver Creek Resource Area, poorly designed forest roads contribute to the impaired water quality status as defined by the Idaho Department of Environmental Quality and the Environmental Protection Agency.

This action responds to several standards, goals and objectives of the Idaho Panhandle Forest Plan (1987) and Inland Native Fish Strategy (1995), including maintaining or reducing sediment levels within State standards, not significantly impairing the long-term productivity of water resources, and maintaining the physical integrity of streams. Substantial efforts at restoring water quality conditions in Beaver Creek have occurred recently, including reclamation of the historic Idora Mine and Mill site, numerous road improvements and decommissioning projects in environmentally sensitive areas, and several culvert improvements to improve fish passage. This project would further capitalize on those actions and continue to improve water quality by reducing the effects of roads on streams and aquatic organisms.

Public Involvement

Public involvement for the Beaver Creek project began in the fall of 2012. Scoping was used to help the Forest Service develop the original proposed action. Site-specific public comments were requested through a letter and open-house meeting. Input was received on how interested parties viewed the management proposal for the area as described in the scoping notice. Questions about road decommissioning and access management were the predominate conversation.

During the formal scoping period this project was identified as being conducted as an environmental assessment (EA). After reviewing the comments, gauging the amount of public interest in the project, along with the large size and scope of the project, the Forest Service decided to move forward with analysis through preparation of an environmental impact statement rather than an environmental assessment. The Forest Service sent a letter to all interested parties informing them of the change, and explained how they could continue to stay involved in the project through the new assessment process. A Notice of Intent (NOI) to prepare an environmental impact statement was published in the Federal Register on January 22, 2013.

The project interdisciplinary team worked closely with the Shoshone County Forest Health Collaborative, a group of individuals and organizations representing diverse interests in Shoshone County, to develop the project proposal and alternatives and help facilitate public involvement. The team also worked with the North Fork Watershed Advisory Group, which is comprised of both agency representatives and landowners who are interested in management of the North Fork of the Coeur d'Alene River. Additionally, the project wildlife biologist met with three representatives from the Idaho Department of Fish and Game to discuss big-game habitat and other wildlife in the Beaver Creek Resource Area.

Issues Identified

Using the comments from letters mailed in, comments received during the public meeting, and frequent interactions with the public, other agencies, and local groups such as the Shoshone County Collaborative and the North Fork Watershed Advisory Group, along with resource condition information, the project interdisciplinary team developed a list of issues needing addressed.

The issues were separated into three categories: key issues, analysis issues and issues addressed but not analyzed in detail. Issues that were included in the analysis (key issues and analysis issues) were defined as those directly or indirectly affected by implementing the action alternatives.

Key Issues

Key issues are those issues within the scope of the project and of sufficient concern to drive the development of the action alternatives. Key issues were used to develop the focus and specific activities of the action alternatives, sharply define effects of the proposed action alternatives against each other and the no-action alternative. These key issues were also used to help define the scope of the environmental analysis and documentation. These issues are specific to this geographic area and proposal.

Table S-1. Key issues associated with the Beaver Creek Project.

Key Issue/Sub-Issue	Analysis Measures
Forest Vegetation: Openings in excess of 40 acres	Number of openings that would be greater than 40 acres in size and, of those over 40 acres, how many openings are in each size class (including adjacent stands)
Forest Vegetation: Representation of early seral species (forest cover) across the landscape	Acres and proportion of forest cover types
Forest Vegetation: Stand level forest structure	Acres and proportion of each structure class
Forest Vegetation: Vertical Structure	Number and proportion of canopy layers
Forest Vegetation: Existing and/or potential future old growth	Proportion and acres of Beaver Creek watershed allocated as old growth per Green et al (2011) definitions; and proportion and acres of the affected old growth management units allocated as old growth per Green et al (2011) definitions. A patch size assessment of allocated old growth patches will be completed for the affected OGMUs.
Forest Vegetation: Future access for vegetation management (as related to road decommissioning)	Estimated acres with no road access for vegetation management
Fire/Fuels: Fuel loading at the stand scale over time	Surface fuels will be measured with surface flame lengths; ladder fuels will be measured with the probability of torching; crown fuels will be measured with the crowning index.
Fire/Fuels: Fire behavior at the resource area or landscape scale	The Minimum Travel Time indicator from the FlamMap model will be used to display changes in landscape-level fire behavior, specifically rate of spread.

Key Issue/Sub-Issue	Analysis Measures
Fire/Fuels: Species composition and forest structure within the resource area that, in the past, was heavily influenced by the historic fire regime.	Acres changed in Fire Regime Condition Class
Hydrology – Water Quality: Soil erosion and sedimentation to streams	Changes in sediment delivery to streams; length of road contributing sediment to streams
Hydrology – Water Quantity: Peak flow, including altered runoff timing, a shortened peak flow duration combined with a concurrent increased peak flow volume.	Relative change in amount of annual water yield and peak flow runoff.
Fisheries: Project-related activities may affect fish distribution.	Additional miles of stream made available to fish.
Wildlife: Project-related activities may affect distribution of forage and thermal cover in elk winter range (MA-4); of particular concern are the Kings Pass (Compartment 189) and Pony Gulch (Compartment 191) areas.	Distribution of cover and forage in winter range within Compartments 189 and 191; and the resulting overall elk habitat potential for Elk Habitat Unit 5.
Economics: The amount of timber harvested under the proposal will affect revenues and the local economy.	Total Present Net Value of the timber sale; number of jobs created

Analysis Issues

Analysis issues were not essential in developing action alternatives, but were important to measure, because the analysis of these issues may show effects of each alternative on different forest resources. These issues are briefly discussed in the Chapter 3 description of existing conditions as needed to set context, with more detail provided in specialist reports in the project file. These issues include:

- **Fisheries (Sensitive and Management Indicator Species)**– Effects of fish passage barrier removal on fish habitat, effects on sensitive and management indicator species (MIS) of fish (westslope cutthroat trout), and effects on pool quality, spawning and rearing habitat, cover and water temperature.
- **Soils** – Effects on soil resources
- **Wildlife (Sensitive, MIS, and species hunted or trapped)**- Effects on sensitive species (flammulated owls, pygmy nuthatch, black-backed woodpecker, fringed myotis, fisher, western toad, and gray wolf), and management indicator species (migratory birds, northern goshawk, pileated woodpecker,) and other wildlife species commonly hunted, fished or trapped (American marten).
- **Sensitive Plants**– Effects on sensitive plant habitat (moist forest, wet forest, and dry forest plant guilds) and Forest Species of Concern (FSOC) (bank monkeyflower, short-spored jelly lichen, Hall's lungwort, pine broomrape, and round-leaved rein orchid)
- **Recreation -** Effects on recreational access (both motorized and nonmotorized activities), specifically access for the Disabled Hunt Program, snowmobile access (due to snowplowing on routes groomed for snowmobiles), and OHV access.
- **Visuals** – Effects on visual characteristics

Issues Addressed but not Analyzed in Detail

Issues that were addressed but not analyzed in detail were those that were: 1) outside the scope of the proposed actions; 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. The Council on Environmental Quality (CEQ) regulations handbook for implementing the National Environmental Policy Act (NEPA) explained this delineation in Sec. 1501.7, which requires agencies to "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" These issues include:

- **Specific Rare Plants -** Effects on Threatened and Endangered plants (water howellia and Spaulding's catchfly), Sensitive plant habitat guilds (grassland, subalpine, deciduous riparian, aquatic, and peatland plant guilds) and Forest Species of Concern not present in the resource area.
- **Specific Fish-** Effects on Threatened, Endangered, Sensitive, and Management Indicator Species not present in the resource area (bull trout, Kootenai River white sturgeon, redband trout, burbot, and western pearlshell mussel).
- **Specific Wildlife –** Effects on Threatened and Endangered species (Canada lynx, grizzly bear, woodland caribou), and Sensitive species (bald eagle, common loon, harlequin duck, northern bog lemming, peregrine falcon, black swift, Coeur d'Alene salamander, Townsend's big-eared bat, and North American wolverine) either not affected by the project or not present (no habitat) in the resource area.
- **Air Quality** – Effects of burning on air quality
- **Climate Change** – Carbon cycling and storage
- **Cultural** – Effects on archeological and other historical resources
- **Minerals** – Effects on minerals management and access to mining operations
- **Noxious Weeds –** Effects on noxious weed populations
- **General Motorized Access –** Effects to the district transportation system

For more detail on the reasons these issues were not analyzed in detail, see Appendix B.

Alternatives Considered in Detail

The project team developed the Proposed Action Alternatives to respond specifically to the Purpose and Need for Action. These alternatives would implement activities that contribute to moving the resources in the resource area toward their desired future conditions.

Development of Alternative 1

The National Environmental Policy Act (NEPA) requires that an environmental impact statement include a "no-action" alternative to serve as a baseline to compare action alternatives. The No-Action Alternative is based on the premise that ecosystems continue to change in the absence of active management.

For this project, analysis of the No-Action Alternative (identified as Alternative 1) represents the effects of *not* implementing the proposed activities in response to the purpose and need, while taking into account the effects of past, ongoing, and reasonably foreseeable activities.

This alternative proposes to maintain an existing level of management within the Beaver Creek Resource area. Current management plans would continue to guide management of the resource area. Fire suppression, road maintenance, recreation use, transmission line maintenance, and previously authorized projects would continue.

No vegetation management, fuels management, road management, or watershed management activities would be implemented to accomplish project goals in the Beaver Creek Resource Area. The No-Action Alternative is the baseline for comparative analysis of the effects of the action alternatives.

Development of Alternative 2 (Action Alternative)

Alternative 2 reflects the agency's original action proposed in scoping, with modifications as described herein. Alternative 2 proposes management activities in the Beaver Creek Resource Area to establish healthy and resilient forests, to reduce hazardous fuels, and improve watershed health. The proposal was based on Forest Plan goals and objectives, other applicable direction, and the best available resource condition information.

Activities were proposed based on how well they would meet the purpose and need for the project. Following preliminary assessments and collaborative discussions, activities were modified if the risk to resources was greater than the benefit as it related to the purpose and need. The resulting proposal was presented during public scoping and identified as the Proposed-Action Alternative.

Following scoping, the project team revised the proposed action based on further field reconnaissance, logging system modifications, and further refinement of data used for the Transportation Analysis Process (TAPs). Alternative 2 incorporates public comments received through scoping and the public meeting. Some roads that are proposed for full decommissioning under Alternative 3 were left partially open in Alternative 2 to respond to public comments that called for maintaining existing and future access in these areas for mining needs. These changes have all been incorporated into a refined action alternative, which is henceforth identified as Alternative 2.

Development of Alternative 3 (Action Alternative)

This alternative was developed in response to: comments received during public scoping; further collaboration with interested stakeholders through a combination of meetings and field trips; and internal concerns related to snow interception in elk winter range. Most of the concerns voiced about the proposed action (as scoped) were tied to the amount of new permanent and temporary road construction, density of the existing road system, and timber harvest proposed in the context of existing resource conditions. There were concerns that past timber harvest on USFS managed lands along with timber harvest and development on private lands, in conjunction with the proposed activities as scoped, would lead to unacceptable impacts on water quality and wildlife.

Alternative 3 eliminates all proposed new road construction (permanent and temporary), increases the miles of road decommissioning, and reduces the total acres of commercial timber harvest. Higher-risk units and roads were eliminated in developing the original proposed action; therefore, the reduction in relative risk comes from an overall reduction in total harvest and road-related activities. Alternative 3 also proposes upgrading or replacing aquatic organism passage (AOP) culverts located underneath the main paved road that goes through the Beaver Creek Resource Area (Road 456).

Alternative 3 also incorporates some of the concepts of variable retention harvest suggested by Idaho Conservation League on a percentage of two groups of units proposed for regeneration harvest (shelterwood and seed tree treatments).

Alternative 3 responds to concerns about new road construction and existing road densities in the area with a strong focus on the effects of the existing transportation system on aquatic resources. Some roads that are kept in Alternative 2 for access for long term vegetation management are proposed for decommissioning in Alternative 3 to further protect aquatic resources.

Comparison of the Action Alternatives

Both action alternatives (Alternatives 2 and 3) propose, to varying degrees, the following types of activities:

- **Vegetation management activities** (commercial timber harvest and reforestation)
- **Fuel management activities** (site preparation, ecosystem burning, fuelbreaks**)**
- **Watershed improvement activities** (AOP upgrades, road decommissioning and storage)
- **Road management activities** (temporary and permanent road construction, road reconstruction and maintenance, road reconditioning and gate installation)

Table S-2. Comparison of activities, by action alternative.

Proposed vegetation management activities	Alt. 2	Alt. 3
Commercial harvest		
Shelterwood (acres)	917	498
Seed tree (acres)	263	121
Commercial thin (acres)	300	253
Improvement cut (acres)	493	430
Aggregate retention (acres)	0	360
Total commercial harvest (acres)	1,973	1,662
Logging systems		
Ground based (acres)	230	212
Skyline (acres)	1,495	1,197
Cable (acres)	10	36
Escaliner swing (acres)	238	217
Total logging systems (acres)	1,973	1,662
Reforestation (acres)	1,180	871
Proposed Fuels Management Activities		
Fuel treatments associated with timber harvest		
Prescribed burning – underburning (acres)	1,825	1,528
Jackpot burning (acres)	36	22
Mastication (acres)	18	18
Grapple piling (acres)	52	52
Yarding tops without burning (acres)	42	42
Total fuel treatments associated w/commercial harvest (acres)	1,973	1,662
Fuel treatments not associated with timber harvest		
Fuel breaks (acres)	6	6
Prescribed burning – ecosystem burning (acres)	2,080	2,080
Total prescribed burning not associated with harvest (acres)	2,086	2,086
Proposed watershed improvement activities		
Aquatic Organism Passage repair (number of culverts)	8	12
Road storage (miles)	19	0.5
Road decommissioning (miles)	66	104
Proposed road management activities		
Road reconditioning (miles)	51	51
Road reconstruction (miles)	29	25
Construction of permanent (system) road (miles)	1.2	0
Construction of temporary (nonsystem) road (miles)	1.5	0
Gate Installation (number of gates)	1	0

Alternatives Considered but Eliminated from Detailed Study

Many of the public comments received through the scoping process were related to the analysis process or concerns that have been addressed in the effects analysis and disclosure. Other comments suggested alternatives but lacked sufficient detail to consider them further or did not demonstrate a clear tie to potential impacts or to achieving the purpose and need for the project.

Maximum Fuelbreak Treatment Including Mastication

One alternative to the proposed action (as scoped) which was considered but eliminated is an alternative that would have maximized fuelbreak construction in addition to the treatments already included in the action alternatives. This alternative would create more fuelbreaks (mainly on ridgetops in the resource area) and would implement ground-based treatments such as mastication (using equipment that chews or grinds fuels). Different methods could be used to treat fuels, including commercial harvesting to thin canopy fuels, with surface and ladder fuels treated through a combination of slashing, grapple piling and/or mastication.

There are several reasons why this alternative was eliminated. First, the proposed action alternatives treat many, if not all, of the strategic areas within the resource area that have not already been treated with past activities. Although there are many other ridgetops that could be treated, many are not strategically important, and some are too steep to use ground-based equipment. The efficiency of narrow ridge-top fuelbreaks that are not adjacent to larger landscape treatments would likely be minimal. A large network of fuelbreaks created with mechanized equipment is probably not economically feasible under current budgets, or within the economic constraints of the Beaver Creek project. The proposed fuel activities, when considered with past fuel reduction activities, treat most of the areas within the resource area that are strategic, and economically and ecologically feasible. The addition of more mechanized fuelbreaks would likely add little effectiveness in terms of landscape fuel reduction, and would likely be too expensive to implement.

Maximum Harvest Treatment

Another suggested alternative to the proposed action which was considered but eliminated would have maximized harvest treatments, in addition to the treatments already in the proposed action (as scoped), and/or maximized harvest treatments within proposed units (utilizing a clearcut harvest treatment). This alternative would create more openings, potentially larger openings, and, if more intensive harvest treatments were used, more early-seral structure across the landscape. This would create a larger supply of timber and would therefore generate more revenue from the sale, would aid in treating forest health issues, could provide additional foraging areas for wildlife and would provide greater economic return to the local communities.

Despite the benefits, there are several reasons why this alternative was eliminated. First, the action proposed in scoping was developed to treat many of the areas within the resource area that have not already been treated with past activities. These areas are in need of active management. Although there are other stands that could be treated, many are inaccessible without building many miles of road to access them, or using alternative methods of harvest, such as helicopter harvest. These options face both economic and resource barriers.

Secondly, this proposed alternative would have impacts on other resource concerns, such as watershed restoration, wildlife habitat and elk security. Maximization of some resources at the expense of other resources does not fit the purpose and need of this project. Mitigating the effects of miles of new roads and more aggressive harvest treatments may not be economically feasible.

The action proposed in scoping was developed to treat as much area as necessary without creating undue ecological burdens on the landscape or economic burdens on project implementation. The addition of larger harvest areas or more intensive harvest treatments across the resource area would likely result in tradeoffs that would not meet the purpose and need of this project.

Less than 40-acre Openings

Although there was not a direct suggestion to develop an alternative to address this issue, some scoping comments expressed concern regarding openings greater than 40 acres (PF Doc. PI-059). In response to the expressed concerns, the interdisciplinary team did consider an alternative that would eliminate creating openings greater than 40 acres; however, this alternative was eliminated because it would not trend the area toward desired future conditions and it would restrict treatment activities from meeting the purpose and need for the project.

The **desired condition** for the Beaver Creek Resource Area strives for a broad range of patch sizes in all age classes (emulating the patterns that would have been produced by natural disturbance regimes). The historic patch sizes of fires, historic extent of white pine and western larch dominated stands and recent and ongoing insect and disease caused mortality within the resource area all occur or did occur with patch sizes in the 1,000's – 10,000's of acres.

In order to meet the **purpose and need** of the Beaver Creek project to reduce fuels and improve species composition and stand/landscape structure, activities need to be designed based on on-the ground conditions in the resource area, which are contiguous to many stands, and are larger than 40 acres in many cases.

There is a need to reduce fuels and create a pattern of fuel treatments across the landscape that is effective in modifying potential fire behavior and able to produce a safer environment in which to conduct suppression activities. Fire research results show that larger treatment blocks are more effective than scattered smaller treatment blocks at altering fire spread rates and severities within a given treatment block. Research also shows that strategic placement of treatment blocks is important in altering fire spread rates and severities across a given landscape. It is important to match the scale of treatments to the scale of the insect and disease-driven fuels accumulations and to the scale of historic ecological processes within the resource area. Limiting opening sizes to less than 40 acres would limit their effectiveness at slowing the spread of large fires and limit their effectiveness at reducing fire severity. Smaller fuel treatment areas may not have as much significant beneficial effects on the spread, intensity and severity of large fires, especially if placed randomly on the landscape.

There is also a need to trend the landscape towards a more desirable pattern of forest structure and patch sizes. The scale of treatments should be matched to the scale of the widespread and increasing root disease and bark beetle (Douglas-fir beetle, fir engraver beetle, and mountain pine beetle) mortality in order to restore resilient tree species. The large majority of the resource area is classified as mature forest (i.e. mature forest is the matrix). Previous regeneration harvesting created the majority of the existing openings within the resource area

but left untreated, mature forested stands between and around the openings. Extensive areas of mature forest in the resource area have been severely affected by western white pine blister rust, mountain pine beetle and Douglas-fir beetle and are now badly infected with root diseases.

Within the resource area there is currently very little diversity in patch sizes within the young structure class. Creating openings in excess of 40 acres would increase the diversity of patch sizes within the young structure class and eventually in the medium structure class as the young stands grow. This increased diversity in patch sizes would also translate to the western larch, western white pine and ponderosa pine forest cover types because most of these forest cover types are directly associated with regeneration harvests in the resource area. Developing large patches of resilient forest now may eventually lead to development of large patches of future old growth that have greater representation of resilient species.

Limiting openings to less than 40 acres would maintain or reduce the average patch size of the young structural stage within the resource area, which is already less variable than would have been expected from natural disturbance regimes. Large patches of young structure may, through growth and natural successional processes over time, become large patches of medium and/or mature structure that includes substantial quantities of long-lived, early-seral conifer species. Establishing large patches of resilient, potentially long-lived tree species would reflect the historic extent of western white pine, ponderosa pine and western larch within the resource area.

Decisions to be Made

The Responsible Official for this project is the IPNF Forest Supervisor. The Forest Supervisor will make the following decisions and document them in a Record of Decision after completion of the final environmental impact statement (FEIS).

- Which action alternative (Alternative 2 or 3) to implement
- What monitoring requirements, if any, are needed to evaluate implementation of the project

Table of Contents

Summary i
Introduction i
Purpose and Need for Action i
Public Involvement iii
Issues Identified iv
Alternatives Considered in Detail vi
Comparison of the Action Alternatives viii
Alternatives Considered but Eliminated from Detailed Study x
Decisions to be Made xii
Chapter 1 - Purpose of and Need for Action 1
1.1. Introduction 1
1.2. Background 2
1.3. Purpose and Need for Action 4
1.3.1. Develop Resilient Forest Conditions 4
1.3.2. Hazardous Fuels Reduction 6
1.3.3. Improved Water Quality and Aquatic Habitats 7
1.4. Proposed Action Alternatives 8
1.5. Decision Framework 9
1.6. Collaboration and Public Involvement 9
1.6.1. Scoping 9
1.6.2. Collaboration 10
1.7. Potentially-Required Permits 11
1.8. Issues 11
1.8.1. Issue Identification 11
1.8.2. Key Issues 11
1.8.3. Analysis Issues 13
1.8.4. Issues Addressed but not Analyzed in Detail 13
Chapter 2 - Alternatives 15
2.1. Introduction 15
2.2. Development of the Alternatives 15
2.2.1. Development of Alternative 1 15
2.2.2. Development of Alternative 2 16
2.2.3. Development of Alternative 3 16
2.3. Range of Alternatives 17
2.4. Alternatives Considered but Eliminated from Detailed Study 17
2.4.1. Maximum Fuelbreak Treatment Including Mastication 18
2.4.2. Maximum Harvest Treatment 18
2.4.3. Less than 40-acre Openings 19
2.5. Activities Proposed Under the Action Alternatives 20
2.5.1. Summary of Proposed Activities 20
2.5.2. Vegetation Management Activities 22
2.5.3. Fuel Management Activities 27
2.5.4. Watershed Improvement Activities 29
2.5.5. Road Management Activities 30
2.6. Design Features of the Action Alternatives 32
2.7. Mitigation Measures 32

2.8. Monitoring Activities 33
2.8.1. Forest Plan Monitoring 33
2.8.2. Project-specific Hydrology Monitoring 33
2.8.3. Project-specific Fisheries Monitoring 34
2.8.4. Project-specific Wildlife Monitoring 34
2.8.5. Project-specific Visuals Monitoring 34
2.9. Past, Ongoing and Reasonably Foreseeable Activities 34
2.10. Summary Comparison of Effects by Key Issue 36
2.10.1. Summary of Effects to Forest Vegetation 37
2.10.2. Summary of Effects to Fire/Fuels 38
2.10.3. Summary of Effects to Hydrology/Fisheries 39
2.10.4. Summary of Effects to Wildlife 39
2.10.5. Summary of Financial Effects 39
Chapter 3 - Affected Environment and Environmental Consequences 40
3.1. Forest Vegetation 40
3.1.1. Introduction 40
3.1.2. Affected Environment and Existing Conditions 41
3.1.3. Management Framework 54
3.1.4. Environmental Consequences 60
3.1.5. Effects Summary 90
3.1.6. Forest Vegetation References 91
3.2. Fire/Fuels 95
3.2.1. Introduction 95
3.2.2. Methodology 98
3.2.3. Spatial and Temporal Context for Effects Analysis 99
3.2.4. Existing Conditions 101
3.2.5. Management Framework 107
3.2.6. Environmental Consequences 109
3.2.7. Effects Summary 126
3.2.8. Fire/Fuel References 128
3.3. Hydrology 135
3.3.1. Introduction 135
3.3.2. Existing Conditions 136
3.3.3. Management Framework 142
3.3.4. Environmental Consequences 143
3.3.5. Effects Summary 173
3.3.6. Hydrology References 175
3.4. Fisheries 177
3.4.1. Introduction 177
3.4.2. Affected Environment and Existing Conditions 178
3.4.3. Management Framework 187
3.4.4. Environmental Consequences 188
3.4.5. Effects Summary 197
3.4.6. Fisheries References 198
3.5. Soils 200
3.5.1. Introduction 200
3.5.2. Affected Environment and Existing Conditions 201
3.5.3. Management Framework for Soils 210
3.5.4. Environmental Consequences to Soils 211
3.5.5. Soils References 238

3.6. Wildlife....245
3.6.1. Introduction....245
3.6.2. Affected Environment....245
3.6.3. Characterization of Habitats....245
3.6.4. Organization....246
3.6.5. Management Framework....247
3.6.6. Environmental Consequences....250
3.6.7. Wildlife References....316
3.7. Threatened, Endangered and Sensitive Plants....327
3.7.1. Introduction....327
3.7.2. Affected Environment and Existing Conditions....327
3.7.3. Management Framework....335
3.7.4. Environmental Consequences....335
3.7.5. Effects Summary....343
3.7.6. TES Plants References....344
3.8. Recreation....346
3.8.1. Introduction....346
3.8.2. Existing Conditions....347
3.8.3. Management Framework....352
3.8.4. Environmental Consequences....353
3.8.5. Recreation References....362
3.9. Visuals....362
3.9.1. Introduction....362
3.9.2. Affected Environment or Existing Conditions....363
3.9.3. Management Framework....366
3.9.4. Environmental Consequences....367
3.9.5. Effects Summary....373
3.9.6. Visuals References....373
3.10. Financial Analysis....374
3.10.1. Introduction....374
3.10.2. Affected Environment....374
3.10.3. Management Framework....378
3.10.4. Environmental Consequences....379
3.10.5. Financial References....387
Chapter 4 - Required Disclosures....388
4.1. Short-term Uses and Long-term Productivity....388
4.2. Adverse Environmental Effects Which Cannot Be Avoided....389
4.3. Irreversible and Irretrievable Commitments of Resources....391
4.4. Other Required Disclosures....392
4.5. Possible Conflicts with Other Agency or Government Policies, Plans or Regulations....393
4.6. Incomplete or Unavailable Information....393

List of Appendices

Appendix A – Past, Ongoing and Reasonably Foreseeable Activities

Appendix B – Concerns Addressed but Not Analyzed in Detail

Appendix C – Public Involvement and Collaboration

Appendix D – Specific Activity Information

Appendix E – Design Features

Appendix F – Application of Soil and Water Conservation Practices

Appendix G – Preparers and Contributors

Appendix H – Management Indicator Species Considerations for the IPNF

Appendix I – Distribution of the DEIS

List of Tables

Table 1. Key issues associated with the Beaver Creek Project. 12
Table 2. Comparison of activities proposed during scoping and those under Alternative 2. 16
Table 3. Summary of proposed activities under Alternatives 2 and 3.....21
Table 4. Summary comparison of vegetation management activities under the action alternatives. 22
Table 5. Summary comparison of fuel management treatments under the action alternatives. 27
Table 6. Summary comparison of watershed improvement activities under the action alternatives.....29
Table 7. Summary comparison of road management activities under the action alternatives.....30
Table 8. Synopsis of past, ongoing and reasonably foreseeable activities. 35
Table 9. Summary comparison effects of alternatives on key Forest Vegetation issues.....37
Table 10. Summary comparison effects of alternatives on key Fire/Fuels issues. 38
Table 11. Summary comparison effects of alternatives on key Hydrology/Fisheries issues. 39
Table 12. Summary comparison effects of alternatives on key Wildlife issue 39
Table 13. Summary comparison effects of alternatives on key Finance issue 39
Table 14. National Forest System acres that are potentially capable of supporting old-growth forest in each of the OGMUs affected by the proposed Beaver Creek action alternatives.....42
Table 15. Acres of past timber harvest activities on NFS lands in the Beaver Creek Resource Area prior to 2010, by decade (source of harvest acres is the FACTS database). 46
Table 16. Forest Cover Types in the Beaver Creek Resource Area (PF Doc. VEG-07). 47
Table 17. Landscape metrics for existing forest cover types on National Forest System lands in the Beaver Creek Resource Area. 49
Table 18. Historic fire acreages in the Beaver Creek Drainage. 50
Table 19. Landscape metrics for existing structure classes on all ownerships in the Beaver Creek Resource Area. 52
Table 20. Old Growth Allocation in Beaver Creek Resource Area and Old Growth Management Units (OGMU's) before and after the allocated old growth review.....53
Table 21. Changes to special use code (SUC) designations resulting from the recent review for OGMUs 115, 116 and 122. 54
Table 22. Minimum Maximum and Mean patch sizes of allocated old growth in each of the affected OGMUs. 54
Table 23. Disclosure of criteria to meet Forest Plan Standard 10(f), by Old Growth Management Unit. .56
Table 24. Projected changes in forest cover type over an 80-year simulation on 11,041 acres of NFS lands in the Beaver Creek Resource Area.[1] 62
Table 25. Synopsis of past, ongoing and reasonably foreseeable activities that are incorporated into the existing condition for Forest Vegetation. 68
Table 26. Changes in mean patch size (acres) in the Beaver Creek Resource Area. 70
Table 27. Changes in structure class proportion (%) in the Beaver Creek Resource Area. 70
Table 28. Potential openings created and/or affected by regeneration harvests under Alternative 2. 71
Table 29. Potential openings created and/or affected by regeneration harvests under Alternative 3. 73
Table 30. Differences in forest cover types on NFS lands in the Beaver Creek Resource Area relative to the existing condition for Alternatives 2 and 3.1.....78
Table 31. Existing and projected number of patches by forest cover type.....79
Table 32. Existing and projected maximum patch size by forest cover type. 79
Table 33. Existing and projected mean, maximum and minimum patch size, by structure class. 85
Table 34. Summary comparison effects of alternatives on key Forest Vegetation issues.....90
Table 35. Fire Regime Condition Class (FRCC) within the Beaver Creek Resource Area, by alternative and in comparison to Alternative 1 (existing condition). 120
Table 36. Issues and analysis indicators for the analysis of the effects of the proposed actions on hydrologic conditions in the Beaver Creek watershed. 136

Table 37. Existing condition of the estimated percent of each subwatershed in an effectively harvested condition. 139
Table 38. Existing conditions of roads by subwatershed and their relative contributions of sediment in the Beaver Creek watershed..... 141
Table 39. Percent of each subwatershed area effectively harvested, and the percent increase from existing conditions, used in the peak flow analysis for each alternative. 156
Table 40. Estimated percent equivalent clearcut area (ECA) of each subwatershed as a result of proposed activities under Alternative 2. 156
Table 41. Effects on sediment contributions and water quality in streams as a result of proposed road reconstruction and maintenance activities in Alternative 2. 158
Table 42. Effects on sediment contributions and water quality in streams as a result of proposed administrative decommissioning activities in Alternative 2. 158
Table 43. Effects on sediment contributions and water quality in streams as a result of proposed ground-disturbing decommissioning activities in Alternative 2. 159
Table 44. Summary of effects on sediment contributions and water quality in streams as a result of proposed of road reconstruction and decommissioning activities in Alternative 2. 160
Table 45. Road densities in the subwatersheds of Beaver Creek as a result of proposed actions in Alternative 2. 162
Table 46. Estimated percent equivalent clearcut area (ECA) of each subwatershed as a result of proposed activities under Alternative 3. 164
Table 47. Effects on sediment contributions and water quality in streams as a result of proposed reconstruction and maintenance activities in Alternative 3. 165
Table 48. Effects on sediment contributions and water quality in streams as a result of proposed administrative decommissioning activities in Alternative 3. 166
Table 49. Effects on sediment contributions and water quality in streams as a result of proposed ground-disturbing decommissioning activities in Alternative 3. 166
Table 50. Summary of effects on sediment contributions and water quality in streams as a result of proposed of road reconstruction and decommissioning activities in Alternative 3. 167
Table 51. Road densities in subwatersheds of Beaver Creek as a result of proposed actions in Alt. 3 ... 168
Table 52. Length of road connected to streams in each subwatershed, by alternative. 174
Table 53. Relative amount of sediment delivered to streams by roads in each subwatershed..... 174
Table 54. Rationale of appropriate fisheries analysis for Threatened, Endangered, Sensitive, and Management Indicator Species (MIS). 179
Table 55. Abundance of fish found in the State of Idaho Department of Environmental Quality Beneficial Use Reconnaissance Program (MacFarland et al 2013). 181
Table 56. Relative density of westslope cutthroat trout (WCT) and brook trout by juvenile (70-150mm) and adult (>150mm) size classes (fish per mile)..... 183
Table 57. Proposed culvert replacement (Aquatic Organism Passage or AOP) projects to improve fish habitat distribution in Beaver Creek. 184
Table 58. Key fish habitat parameters for subsampled fish-bearing streams in the Resource Area. [1] 186
Table 59. Percent of stream length in each RASCAL survey category. 186
Table 60. Mass Failure Potential for harvest and burn-only areas under Alternatives 2 and 3. 204
Table 61. Sediment Delivery Potential for harvest and burn-only areas under Alternatives 2 and 3. 205
Table 62. Soil productivity potential for harvest and burn-only areas under Alternatives 2 and 3. 205
Table 63. Surface Erosion Potential for harvest and burn-only areas under Alternatives 2 and 3..... 206
Table 64. Subsurface Erosion Potential for harvest and burn-only areas under Alternatives 2 and 3. 206
Table 65. Landtype sensitivity for harvest and burn-only areas under Alternatives 2 and 3. 207
Table 66. Potential detrimental disturbance coefficients used for various logging and prescribed fire scenarios..... 212
Table 67. Comparison of Proposed Activities, by Alternative. 216
Table 68. Existing conditions and potential impacts of management activities under Alternative 2. 221

Table 69. Existing conditions and potential impacts of management activities under Alternative 3. 224
Table 70. Recommended coarse woody debris retention.[1] 231
Table 71. Summary comparison of land not in the productive land base under Alternatives 2 and 3. 236
Table 72. Past, present and reasonably foreseeable actions cumulatively affecting wildlife. 251
Table 73. Wildlife species not analyzed in detail. 253
Table 74. Wildlife species analyzed in detail. 254
Table 75. Issue indicators used to measure effects. 255
Table 76. Miles of road proposed for decommissioning and miles of road proposed for construction (permanent and temporary) under all alternatives. 256
Table 77. Wildlife analysis scales used for analyzing direct, indirect and/or cumulative effects. 257
Table 78. Amount of potentially suitable summer fisher habitat remaining after each alternative and percent of loss from existing. 260
Table 79. Proposed activities occurring in flammulated owl suitable nesting habitat. 268
Table 80. Calculated Elk Habitat Potential (EHP) for Wallace Elk Habitat Unit (WEHU) 5 during and after completion of activities.[1] 277
Table 81. Security for National Forest System lands in Wallace Elk Habitat Unit (WEHU) 5.[1] 278
Table 82. Vegetation structural stage (VSS) percentages within the Beaver Creek Project's Northern Goshawk Analysis Area. 289
Table 83. Vegetation structural stage (VSS) percentages within the Alder Creek Northern Goshawk post-fledgling area (PFA) for the Beaver Creek Project. 289
Table 84. Vegetation structural stage (VSS) percentages within the Rock Gulch Northern Goshawk post-fledgling area (PFA) for the Beaver Creek Project. 289
Table 85. Calculated Elk Habitat Potential (EHP) for WEHU 5.[1] 305
Table 86. Elk security for National Forest System (NFS) lands in WEHU 5.[1] 305
Table 87. Changes to suitable marten habitat in the Beaver Creek Resource Area for each alternative (PF Doc. WL-R181, WL-78, and WL-86). 311
Table 88. Threatened Plants on the District, by Rare Plant Habitat Guild 328
Table 89. Sensitive Plants on the District, by Rare Plant Habitat Guild 329
Table 90. Forest Species of Concern Plants on the District, by Rare Plant Habitat Guild 330
Table 91. Sensitive Plant and Forest Species of Concern Occurrences in the Resource Area 331
Table 92. Potential risk of adverse impacts to TES Plants and Forest Species of Concern as a result of proposed activities in highly suitable habitat, by plant guild. 336
Table 93. Summary of determination of effects on Sensitive plant species, for each alternative. 343
Table 94. Miles of Motorized Designated Routes within the Beaver Creek Resource Area. 347
Table 95. Summary of the two separate OHV trail systems within Beaver Creek Resource Area 355
Table 96. Sensitive level and visual quality objective for viewpoints/viewing corridors in the Beaver Creek Resource Area. 367
Table 97. Project Feasibility and Financial Efficiency Summary (2012 dollars) 382
Table 98. Activity expenditures (not included in appraisal), by alternative. 382
Table 99. Proportion of timber harvest by product type. 384
Table 100. Economic impacts (employment and labor income), total and annual ($2010). 385
Table 101. Project feasibility and financial efficiency summary (2012 dollars). 387

List of Figures

Figure 1. Beaver Creek Vicinity map. 2
Figure 2. Forest Plan Management Area Designation of NFS Lands in the Beaver Creek Resource Area. 3
Figure 3. Tree mortality in the Beaver Creek Resource Area. 5
Figure 4. Hazardous fuel loading in the Beaver Creek Resource Area. 6
Figure 5. Culvert failure on the Kings Pass Road in the Beaver Creek Resource Area. 8
Figure 6. Post-harvest shelterwood unit (Unit 55 in the Blue Alder Project) prior to underburn on the Coeur d'Alene River Ranger District. 23
Figure 7. Post-harvest seed tree unit prior to underburning on the Coeur d'Alene River Ranger District. 24
Figure 8. Post-harvest commercial thinning unit on the Coeur d'Alene River Ranger District. 26
Figure 9. Post-harvest improvement cut unit on the Coeur d'Alene River Ranger District. 27
Figure 10. *Armillaria sp.* Infection in a Douglas-fir tree in proposed Unit 69. 44
Figure 11. Very heavy fuel loading in proposed Unit 84 as a result of mortality caused by mountain pine beetle in lodgepole pine and excessive stand density. 45
Figure 12. Current and Historic Forest Cover Types on National Forest System lands in the Coeur d'Alene River Basin (PF Doc. VEG-10). 47
Figure 13. Existing Beaver Creek Resource Area and historic Coeur d'Alene River Basin forest structure class proportions (PF Doc. VEG-10). 50
Figure 14. Comparison of Forest Cover Types on NFS lands in the Beaver Creek Resource Area. 61
Figure 15. Conceptual design for aggregate retention patches in proposed Unit 10. 75
Figure 16. Existing and projected mean patch sizes for NFS lands in the Beaver Creek Resource Area. . 80
Figure 17. Comparison of changes in structure classes in the Beaver Creek Resource Area 81
Figure 18. Visual comparison of aggregated retention and dispersed retention in regeneration harvests that retain equal proportions of the original overstory (from Franklin et al. 1997). 83
Figure 19. Passive crown fire behavior (torching). 96
Figure 20. Active crown fire behavior. 97
Figure 21. Cumulative Effects Area used for the Fire/Fuels analysis. 100
Figure 22. A structure directly adjacent to NFS lands in the Beaver Creek Resource Area. 101
Figure 23. An example of heavy fuels in the Beaver Creek Resource Area. 102
Figure 24. A dry site in the Beaver Creek Resource Area; these dry sites make up less than 20% of the resource area, and are dependent on frequent fire to maintain their structure and resilience. 104
Figure 25. Recorded fire history of the Red Beauty Resource Area 1905 – present. 106
Figure 26. Minimum Travel Time Analysis for Alternative 2. 114
Figure 27. Minimum Travel Time analysis for Alternative 3. 116
Figure 28. Flame length over time in two stands with different treatments. 118
Figure 29. Probability of torching in a representative stand. 119
Figure 30. Crowning Index in representative stands. 120
Figure 31. Acres in each Fire Regime Condition Class, by alternative. 127
Figure 32. Estimated and predicted relative change in water yield in the Beaver Creek watershed. 137
Figure 33. Locations where road segments are known to contribute sediment to streams. 140
Figure 34. From Grant et al 2008, representing peak flow response to harvest in the transient snow hydrologic zone. 145
Figure 35. Hydrologic recovery curves used for each forest habitat type; definitions of each habitat type can be found in USDA 2005, PF Doc. AQ-27 and AQ-R26. 147
Figure 36. Subwatersheds of Beaver Creek surveyed for instream conditions using the modified RASCAL method. 149
Figure 37. Percent of effectively harvested area, by subwatershed in the Beaver Creek Resource Area. 150
Figure 38. Estimated relative amount of effectively harvested area as a result of proposed activities in the Beaver Creek Resource Area, by alternative. 152

Figure 39. Estimated relative increase in water yield as a result of proposed activities in the Beaver Creek Resource Area, by alternative....152
Figure 40. Length of road included in the analysis of peak flows in each subwatershed, by alternative.153
Figure 41. Percent of subwatershed areas in an effectively harvested condition immediately following proposed harvest, by alternative....154
Figure 42. Effectively harvested areas potentially affecting peak flows in the Prospect Creek subwatershed, where harvest and road decommissioning is proposed....155
Figure 43. Effectively harvested areas potentially affecting peak flows in the Unknown Creek subwatershed, where harvest and road decommissioning is proposed....155
Figure 44. Relative abundance of fish species found in the Beaver Creek Watershed, 2005-2011....181
Figure 45. Population estimates for westslope cutthroat trout and brook trout in Beaver Creek and select tributaries (Forest Service data 2005-2012)....182
Figure 46. Map showing the location of aquatic organism passage (AOP) culverts proposed for replacement under Alternative 2....190
Figure 47. Map showing the location of aquatic organism passage (AOP) culverts proposed for replacement under Alternative 3....192
Figure 48. Geologic Composition of the Beaver Creek Resource Area....201
Figure 49. Satellite photo of Mt. Mazama, now known as Crater Lake, in Oregon....202
Figure 50. Fire-induced soil hydrophobicity....218
Figure 51. Roundleaved rein Orchid (*Platanthera orbiculata*)....334
Figure 52. Designated Motorized Routes within the Beaver Creek Resource Area as authorized by the Motor Vehicle Use Map....348
Figure 53. Groomed Snowmobile Trails in or near the Beaver Creek Resource Area....350
Figure 54. Disabled Hunting Program Route in Potosi Gulch....351
Figure 55. Kings Pass/Potosi Gulch (Eastside) OHV Trails....356
Figure 56. Jackass Ridge (Westside) OHV Trails....357
Figure 57. Groomed snowmobile routes and timber haul routes in the Beaver Creek Resource Area; (routes highlighted in yellow indicate potential plowing on a snowmobile trail)....359
Figure 58. Potosi Gulch disabled hunting routes in relation to proposed harvest units....360
Figure 59. View of Beaver Creek Resource Are from Forest Road 456 near Dobson Pass....363
Figure 60. Google Earth image of Beaver Creek Resource Area showing past harvest units....364
Figure 61. Harvest area adjacent to Road 605 near Kings Pass....365
Figure 62. Evidence of insect and disease activity is found throughout the analysis area....366
Figure 63. Google Earth simulation of harvest units from Forest Road 456 near Dobson Pass....371
Figure 64. Google Earth Simulation of a harvest unit location near a residential development near Forest Road 456....372
Figure 65. Land Ownership, by percent of land area (source: U.S. Geological Survey, Gap Analysis Program. 2012)....375
Figure 66. Change in population, 2000-2011 (source: US Department of Commerce 2012)....376

List of Acronyms

AOP	Aquatic organism passage
ATV	All-terrain vehicle
BBER	Bureau of Business and Economic Research
BLM	Bureau of Land Management
BMP	Best Management Practices
BPA	Bonneville Power Administration
CCF	Cunit (hundred cubic feet)
CDA	Coeur d'Alene
CFR	Code of Federal Regulations
COR	Contractor's Officer Representative
CWPP	Community Wildfire Protection Plan
dbh	Diameter at breast height
DEIS	Draft Environmental Impact Statement
DEQ	Department of Environmental Quality
DF	Douglas-fir
EA	Environmental Assessment
ECA	Equivalent Clearcut Acres
EHA	Equivalent Harvest Acres
EHP	Elk habitat potential
EHU	Elk habitat unit
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPS-HDT	Economic Profile System – Human Dimension Toolkit
ESA	Endangered Species Act
FACTS	Forest Service Activity Tracking System
FEIS	Final Environmental Impact Statement
FFE	Fire and Fuels Extension
FIA	Forest Inventory and Analysis
FPA	Forest Practices Act
FRCC	Fire Regime Condition Class
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
FSOC	Forest Species of Concern (plants)
FSVeg	Field Sampled Vegetation Database
FTE	Full-time equivalent
FVS	Forest Vegetation Simulator
GA	Geographic Assessment
GF	Grand fir
GMU	Game management unit
GRAIP	Geomorphic Roads Analysis and Inventory
ICDC	Idaho Conservation Data Center
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDT	Interdisciplinary Team
IFPA	Idaho Forest Practices Act
IFTNP	Intermountain Forest Tree Nutrition Cooperative
IMPLAN	Impact analysis for planning
INFRA	Infrastructure application
INFS	Inland Native Fish Strategy
IPNF	Idaho Panhandle National Forests
LP	Lodgepole pine
LRMP	Land and Resource Management Plan
LWD	Large woody debris
MA	Management area
MIS	Management indicator species
MMBF	Million board feet
MOU	Memorandum of Understanding
mph	miles per hour
MTT	Minimum Travel Time (fire)
MUSYA	Multiple Use Sustainable Yield Act
MVUM	Motor Vehicle Use Map
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NPDES	National Pollution Discharge Elimination System
NRIS	Natural Resource Information System
NRMEP	North Rocky Mountain Ecological Province
OGMU	Old Growth Management Unit
OHV	Off-highway vehicle
OSHA	Occupational Safety & Health Administration
PF	Project file
PFA	Post-fledgling area
PNV	Present net value
PP	Ponderosa pine
R1	Region 1 - Forest Service Northern Region
RASCAL	Rapid Assessment of Stream Conditions Along Length
RD	Ranger District
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management Objective
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SAF	Subalpine fir
SCC	Shoshone County (Forest Health) Collaborative
SOPA	Schedule of Proposed Actions
SVAP	Stream Visual Assessment Protocol
SWCD	Soil and Water Conservation District
SWCP	Soil and Water Conservation Practices
TAP	Transportation Analysis Process
TES	Threatened, Endangered and Sensitive (species)
TMDL	Total Maximum Daily Load
TSC	Timber Sale Contract
TSI	Timber Stand Inventory
TSMRS	Timber Stand Management Record System
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFS	Unites States Forest Service
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
VQO	Visual quality objective
VSS	Vegetation structural stages
WAG	(North Fork) Watershed Advisory Group
WCT	Westslope cutthroat trout
WEHU	Wallace Elk Habitat Unit
WH	Western hemlock
WL	Western larch
WP	White pine
WPM	Western pearlshell mussel
WRC	Western redcedar
WUI	Wildland Urban Interface

1. Chapter 1 - Purpose of and Need for Action

1.1. Introduction

The Beaver Creek Environmental Impact Statement (EIS) is a site-specific effects analysis of management activities proposed in the Beaver Creek Resource area. The Forest Service has prepared this EIS in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action alternatives.

The document is organized into four chapters:

- *Chapter 1. Purpose and Need for Action*: The chapter includes introductory information on the background and history of Beaver Creek Resource Area, the purpose of and need for management in the Beaver Creek area, and the agency's proposal(s) for achieving that purpose and need. This section also details the decision framework for this project, how the Forest Service involved the public in development of the proposal, and issues that emerged regarding the proposed action (as scoped).
- *Chapter 2. Alternatives*: This chapter provides a detailed description of the alternatives methods developed for achieving the stated purpose and need of the project. These alternatives were developed based on significant issues raised by the public, other agencies, and the interdisciplinary team. This discussion also includes design features and mitigation measures. This section provides a summary of the past, present, and reasonably foreseeable activities in the resource area. Finally, this section contains a table comparing key elements of the alternatives and concludes with a summary table of selected environmental effects associated with the alternatives
- *Chapter 3. Affected Environment and Environmental Consequences:* This chapter describes the environmental effects of implementing the No-Action alternative and the Action Alternatives. This analysis is organized by environmental component.
- *Chapter 4.* Required Disclosures: This chapter describes, as applicable, short-term uses and long-term productivity, unavoidable adverse effects, irreversible and irretrievable commitments of resources, incomplete or unavailable information and any other required disclosures.
- *Appendices*: The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

Additional documentation, including more detailed analyses of the resources in the area, is found in the project files, located at the Coeur d'Alene River Ranger District – Fernan Office, 2902 E. Sherman Avenue, Coeur d'Alene, Idaho 83814. Throughout this EIS, specific documents are cited by their assigned project file document (PF Doc.) number. Project file documents are available for review by contacting the project leader (contact information for the project leader is provided in the abstract of this document).

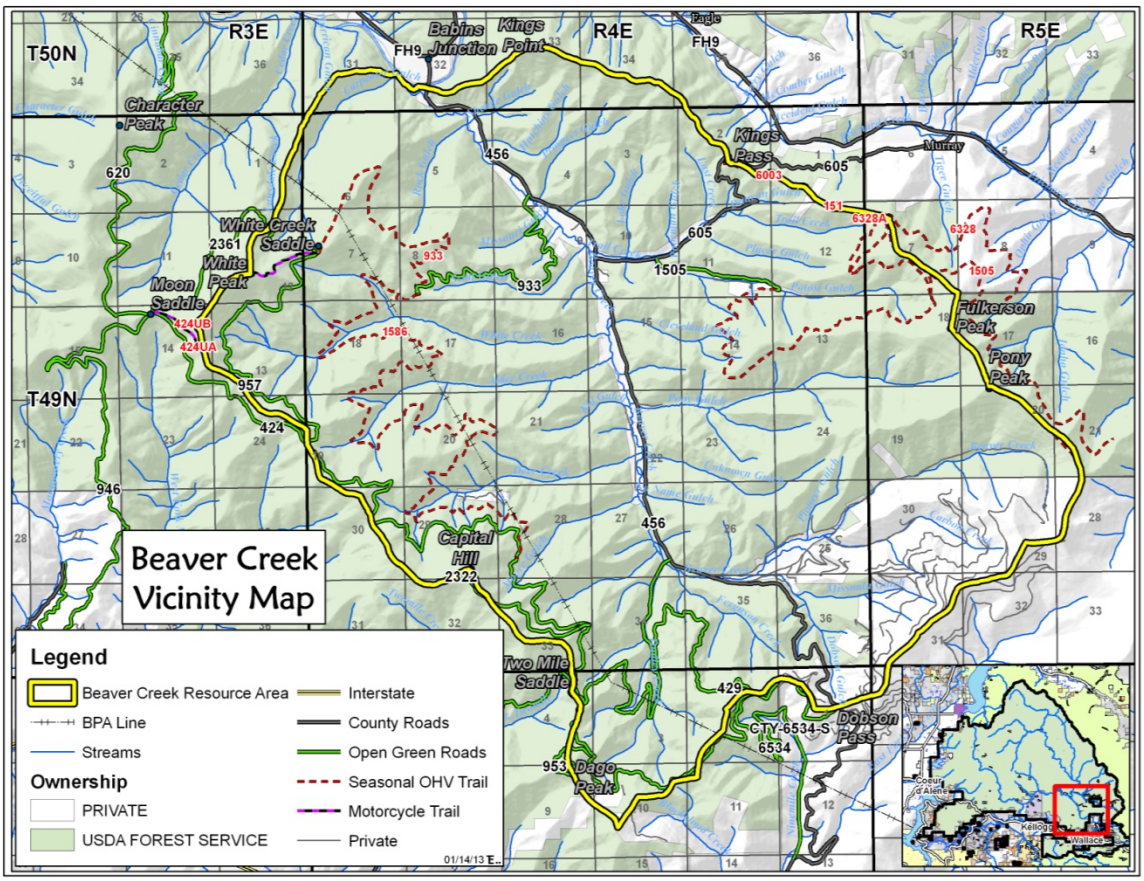


Figure 1. Beaver Creek Vicinity map.

1.2. Background

The 28,200-acre Beaver Creek Resource Area (Figure 1) is located entirely within Shoshone County, Idaho, approximately 15 miles northwest of Wallace, Idaho (T50N R4E, sections 31-35, T49N R3E sections 1, 12, 13, and 24, T49N R4E sections 1-36, T49N R5E sections 7, 17-21, and 28-32, T48N R5E section 6, and T48N R4E sections 1-4, and 9-11, Boise Meridian). The Resource Area includes National Forest System (NFS) lands in the drainages of White Creek, Carpenter Gulch, Rock Gulch, Missouri Gulch, Scott Gulch, Alder Creek, Kid Gulch, Deer Creek, Moore Gulch, Dudley Creek, Ferguson Creek, Carbon Creek, Prospect Gulch, Unknown Gulch, Pony Gulch, Cleveland Gulch, and Potosi Gulch, all of which drain into Beaver Creek, then into the Coeur d'Alene River, and eventually into Lake Coeur d'Alene. National Forest System lands in the area are managed by the Coeur d'Alene River Ranger District of the Idaho Panhandle National Forests (IPNF).

Direction for this project comes from the IPNF Land and Resource Management Plan (LRMP; PF Doc. CR-002), which sets the direction for managing the resources of the Forest. For clarity, that document is referred to simply as the "Forest Plan." The Forest Plan divides NFS lands into management areas (MAs), each with different management goals, resource potential and limitations.

All of the following MA's are found in the Beaver Creek resource area:

- MA-1, lands that are designated for timber production
- MA-4, lands that are designated for timber production while managing big-game winter range
- MA-6, lands that are designated for timber production while managing elk summer range habitats
- MA-9, lands that are designated as 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)

A full description of management area direction is in the Forest Plan (PF Doc. CR-002).

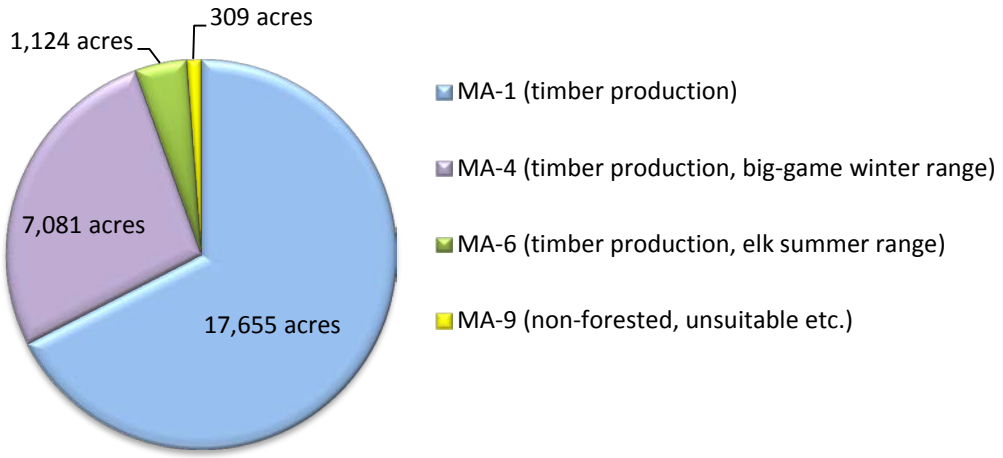


Figure 2. Forest Plan Management Area Designation of NFS Lands in the Beaver Creek Resource Area.

The Forest Plan is one of several documents that provided guidance and contributed to the development of this project. Others include:

- USDA Forest Service Strategic Plan for Fiscal Years 2007-2012 (PF Doc. CR-030)
- Interior Columbia Basin Strategy (PF Doc. CR-035)
- Coeur d'Alene Geographic Assessment (PF Doc. CR-025)
- Shoshone County Wildland Urban Interface Fire Mitigation Plan (PF Doc. CR-020)
- National Cohesive Wildland Fire Management Strategy (PF Doc. FF-REF-24)
- Beaver Creek Watershed Assessment (McFarland et al., 2013 PF Doc. AQ-R15)

These documents led to development of the purpose and need objectives described below.

1.3. Purpose and Need for Action

The Beaver Creek project is proposed at this time to respond to the goals and objectives of the guiding documents listed above. The actions proposed through the Beaver Creek project are designed to respond to the goals and objectives outlined in the Forest Plan, and are intended to help move the resource area towards the desired conditions described in that plan (LRMP; PF Doc. CR-002). Management direction defined in the Forest Plan sets the general direction for managing all of the resources for the Forest's resources. It provides both Forest-wide and area-specific goals, standards, and guidelines. This EIS documents the analysis of effects of the proposed activities on the Beaver Creek Resource area.

The actions proposed through the Beaver Creek project are needed because existing conditions in the resource area deviate from the desired future conditions as defined by the Forest Plan (PF Doc. CR-002). The differences exist in a variety of resource areas, but are most pronounced in the areas of forest resiliency, hazardous fuel loading, and watershed health. These conditions and the consequences of these conditions are summarized below and will be addressed in detail in Chapter 3.

The project interdisciplinary team (IDT; see Appendix G) developed the following three objectives for the Beaver Creek resource area based on a comparison of existing conditions with desired future conditions:

- **Objective 1 – Develop resilient forest conditions** by improving the resiliency of the landscape to insects, disease, fire, and drought through maintaining existing long-lived early seral species and increasing their overall representation across the landscape
- **Objective 2 –Reduce hazardous fuels** in the wildland-urban interface and within the resource area to improve public and firefighter safety, as well as make communities, infrastructure and natural resource values less vulnerable to impacts from wildfire
- **Objective 3 – Improve water quality and aquatic habitats** by restoring water quality and watershed conditions to meet water quality standards and bring aquatic habitats towards an enhanced condition

The following sections discuss in greater detail the goals and objectives related to these needs.

1.3.1. Develop Resilient Forest Conditions

Forested environments within the Beaver Creek Resource Area are influenced by climate, topography, fire, and human activity. Over time, past harvesting practices, exclusion of wildfire, insects and diseases, and other factors have changed the species composition in the resource area from that which existed prior to European settlement. The species composition that now exists contains many short-lived and fire-intolerant tree species. As a result, the landscape has become less resilient to insects, disease, fire and drought.

A primary goal of this project is to maintain and increase long-lived early seral species across the landscape, including ponderosa pine, western larch, and white pine. Increasing the abundance of these species will contribute increased resiliency to disturbances such as fire, insects, and disease. This action is needed because although all three species currently exist in the Beaver Creek watershed, they occur in lower quantities than they did historically due to selective harvesting, fire suppression and white pine blister rust.

To meet these needs, as well as the goals and objectives of the Forest Plan, stands should trend from the current composition of species more vulnerable to disturbance (grand fir, Douglas-fir, lodgepole pine) towards long-lived early seral species (ponderosa pine, western larch, and western white pine), which are more resistant to disturbances (Forest Plan, pages II-2, II-32, PF Doc. CR-002; Graham et al., 2004 PF Doc. VEG-R13).

The primary causes of mortality in the Beaver Creek area are insects and diseases, above average stand densities, relatively high proportions of Douglas-fir and grand fir, and mature stand ages. The majority of the unmanaged stands in the watershed are approximately 110-120 years old, having originated from a very large stand replacement fire that occurred in 1889. With the exclusion of fire, areas of the forest have become over-mature, resulting in widespread mortality (Figure 3). Dead and dying trees throughout the resource area are directly contributing to the increasing fuel loads throughout the watershed. Canopy openings, which result from mortality of overstory trees, are filling in with shade-tolerant conifer regeneration (Douglas-fir, grand fir, hemlock, and cedar) which form continuous ladder fuels between the forest floor and the overstory canopy. As a result, the potential for large and severe wildfire has substantially increased over time and continues to increase throughout the watershed.

Figure 3. Tree mortality in the Beaver Creek Resource Area.

There is also a need to manage the landscape arrangement of forest structure and age class within the Beaver Creek watershed. Currently, the average patch size for the seedling/sapling size classes is below the desired condition; primarily because of the lack of stand-replacement fire over the past century and the average size and pattern of contemporary regeneration harvests. Increasing the average patch size for the seedling/sapling classes is important to regenerate the early seral species (ponderosa pine, western larch, and western white pine), which are more resistant to disturbances. Additionally, because the last major fire event occurred over 100 years

ago, there is a need to manage for the arrangement of potential future old growth while considering the arrangement and condition of existing old growth.

1.3.2. Hazardous Fuels Reduction

Approximately two-thirds of the Beaver Creek Resource area is designated as wildland-urban interface (WUI) in the Shoshone County Community Wildfire Protection Plan (PF Doc. CR-020). Private land, homes, heavy summertime recreational use, and the Bonneville Power Administration (BPA) transmission line are major factors influencing the WUI designation. The communities of Prichard and Murray are not within the Beaver Creek Resource Area, but could be affected by a large fire in the area. Due to existing fuel conditions (Figure 4), it is possible that a large fire could potentially threaten the resource area in the near future.

Figure 4. Hazardous fuel loading in the Beaver Creek Resource Area.

There is a need for hazardous fuel reduction in the Beaver Creek Resource Area because the increase in hazardous fuels increases the potential of wildfire to threaten life, property, resource values and infrastructure. The objectives of fire management in the Beaver Creek Resource Area are to alter fuel profiles so that public and firefighter safety is improved and communities, infrastructure, and other values-at-risk are less vulnerable to impacts from wildfire; to restore natural ecological processes, and to achieve desired conditions and attain management objectives of the Forest Plan.

With private development so close to forested lands comes the added risk of human-caused fires, which threaten both the structures located within the WUI and the nearby forest. Wildfire has been effectively excluded from the resource area since 1908. Since then, prescribed burning has

occurred in the watershed, but the frequency and magnitude of prescribed fire has not approached levels comparable to historic fire regimes. The current fire return interval in Beaver Creek is approximately 700 years. The average historic stand fire return interval for the interior of the Coeur d'Alene Basin is 65 years (Zack and Morgan, 1994). This discrepancy between fire intervals has resulted in increased fuels across the landscape. Based on the area's high fuel levels and its proximity to private development, there is a need to reduce hazardous fuels in the Beaver Creek Resource Area to reduce the risk of fire.

Additionally, the absence of fire has also affected species composition and landscape structure, especially on the dry sites in the resource area. Dry site habitats that are dependent on fire to maintain their species composition and structure are now in a condition where a wildfire could result in complete mortality of the stands.

1.3.3. Improved Water Quality and Aquatic Habitats

There is a need to restore water quality and aquatic habitats in the Beaver Creek watershed to meet State water quality standards, improve the abundance of fisheries and other aquatic organisms, and improve the longevity of road conditions by reducing maintenance costs while providing for long-term public access.

This action is needed partly because streams within the Beaver Creek Resource Area are considered impaired and do not fully support beneficial uses of the State of Idaho (including cold water aquatic life and salmonid spawning) due to high sediment loads, elevated metals, and altered stream flow, habitat, and temperature regimes. Currently, a total maximum daily load (TMDL) for sediment exists for the Beaver Creek watershed and a temperature TMDL is under development. In the Beaver Creek Resource Area, poorly designed forest roads contribute to the impaired water quality status as defined by the Idaho Department of Environmental Quality and the Environmental Protection Agency.

This action responds to several standards, goals and objectives of the Idaho Panhandle Forest Plan (1987) and Inland Native Fish Strategy (1995), including maintaining or reducing sediment levels within State standards, not significantly impairing the long-term productivity of water resources, and maintaining the physical integrity of streams. Furthermore, the recent Beaver Creek Watershed Assessment (McFarland et al 2013; PF Doc. AQ-R15) specifically describes how roads are responsible for both contributing sediment to streams and altering natural drainage patterns and hydrologic processes. Roads with inadequate drainage can become highly erodible and contribute sediment directly to streams through a network of road surfaces, ditches, and culverts (Figure 5). Roads can also redirect surface and subsurface water into stream channels. In addition, several road/stream crossings also act as obstructions to migratory fish or pose a substantial risk of adding additional sediment to streams due to being inadequately sized to pass high flows, and excessive road densities near streams contribute to low densities of large trees for stream shade and altered fish habitat.

Finally, substantial efforts at restoring water quality conditions in Beaver Creek have occurred recently, including reclamation of the historic Idora Mine and Mill site, numerous road improvements and decommissioning projects in environmentally sensitive areas, and several culvert improvements to improve fish passage. This project would further capitalize on those actions and continue to improve water quality by reducing the effects of roads on streams and aquatic organisms.

Figure 5. Culvert failure on the Kings Pass Road in the Beaver Creek Resource Area (see PF Doc. AQ-R15).

1.4. Proposed Action Alternatives

The project interdisciplinary team developed the Proposed Action Alternatives to respond to the Purpose and Need for Action and public comments. These alternatives would implement activities that contribute to moving the resources in the resource area toward their desired future conditions. This project is designed to achieve the goals of enhanced forest stand resilience and resistance, hazardous fuel reduction, and restoration of water quality and aquatic habitats.

The action alternatives would utilize vegetation management (timber harvest, site preparation, post-harvest fuel treatments, and reforestation), fuels management (landscape prescribed burns and fuel break construction), road management (road construction, storage, maintenance, reconstruction), and watershed rehabilitation (road decommissioning and Aquatic Organism Passage [AOP] upgrades) to respond to the Purpose and Need for Action.

The Proposed Action Alternatives are designed to achieve the goals and objectives of the Forest Plan, and to meet all applicable laws and regulations, including the National Environmental Policy Act, the National Forest Management Act, the Clean Water Act, the Endangered Species Act, the Clean Air Act, and the National Historic Preservation Act, among others.

Using public comments and information from preliminary analysis, the interdisciplinary team developed alternatives to meet the Purpose and Need of the project. The Action Alternatives are described in detail in Chapter 2.

1.5. Decision Framework

This EIS is not a decision document. The EIS discloses the environmental consequences of implementing the different alternatives, including the No-Action Alternative. As the responsible official for this project, the Forest Supervisor will select an alternative based on information in this document, public comments, and how well each alternative meets the purpose and need for the project and complies with applicable state and federal laws, agency policy, and Forest Plan direction. Comments on the Draft EIS (DEIS) are used to prepare a final EIS (FEIS).

The decision and its rationale will be documented in the Record of Decision (ROD); specifically:

- Whether to implement vegetation management activities, including timber management (silvicultural prescriptions, road work, slash treatment, reforestation), non-commercial fuel reduction, and prescribed burning activities, including design features to protect resources, and if so, the site-specific location of these activities and practices.
- Whether to implement watershed improvement projects, including culvert upgrades, road decommissioning and storage work, and, if so, to what extent.
- Appropriate monitoring requirements to evaluate project implementation.

1.6. Collaboration and Public Involvement

This section summarizes collaboration and public involvement for the Beaver Creek project. More detailed information is provided in Appendix C, and supporting documents (including mailings, legal notices, notes from meetings and field trips, and comments) are located in the project file as noted.

This project has been listed on the IPNF Schedule of Proposed Actions (SOPA) since January 2013 (PF Doc. PI-063). The purpose of the schedule is to inform the public about those proposed and ongoing Forest Service actions for which a record of decision, decision notice or decision memo would be or has been prepared. The SOPA also identifies a contact for additional information on any proposed actions.

1.6.1. Scoping

Public involvement for the Beaver Creek project began in the fall of 2012. Scoping was used to help the Forest Service develop the proposed action alternatives. In September 2012, flyers were posted at twenty different locations, asking the public for input on conditions and uses in the area (PF Doc. PI-011). IDT members also handed out comment forms to individuals they met in the area and encouraged their participation in the project planning.

Site-specific public comments were requested through a letter that was mailed to potentially interested or affected members of the public on October 5, 2012 (PF Doc. PI-005). This letter

included maps and a description of the proposed action as developed at the time. The letter included a comment form so interested people could provide input on the proposal and submit their comments about proposed activities in the area. A legal notice briefly describing the project and requesting public comment was published in the *Coeur d'Alene Press* (the newspaper of record) on October 9, 2012 (PF Doc. PI-008).

An open-house meeting was held on October 30, 2012 to share information and hear from interested citizens (PF Doc. PI-019). Maps of the proposed action, photos of existing vegetation conditions, and examples of what treatment areas may look like post-harvest and/or post burning were posted for viewing. Copies of the scoping letter (describing the proposed action) were made available. An estimated 50 people attended (Appendix C, PF Doc. PI-019). Input was received on how interested parties viewed the management proposal for the area as described in the scoping notice. Questions about road decommissioning and access management were the predominate conversation.

During the formal scoping period this project was identified as being conducted as an Environmental Assessment (EA). A total of 35 comment letters were received, both from the scoping notice and through comments received at the public meeting. A thorough analysis of comments was conducted, and a preliminary response was prepared (Appendix C and PF Doc. PI-059). The project interdisciplinary team considered concerns identified through the scoping process and incorporated ideas presented by the public and other agencies into alternative design as noted in Chapter 2 and the environmental effects disclosures in Chapter 3.

After reviewing the comments, gauging the amount of public interest in the project, along with the large size and scope of the project, the Forest Service decided to move forward with analysis through preparation of an EIS rather than an EA. The Forest Service sent a letter to all interested parties informing them of the change, and explained how they could continue to stay involved in the project through the new assessment process (PF Doc. PI-064). A Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on January 22, 2013 (PF Doc. PI-066).

1.6.2. Collaboration

The IDT worked closely with the **Shoshone County Forest Health Collaborative** (SCC), a group of individuals and organizations representing diverse interests in Shoshone County, to develop the project proposal and alternatives and help facilitate public involvement. The Forest Service made periodic presentations to the SCC to keep the group apprised of the project. These included presentations on the types of models used for data collection and analysis along with trips to the field. Articles in the Shoshone County Press kept the local community updated on how the SCC and the USFS were interacting as related to Beaver Creek and how they could become involved with the SCC (PF Docs. PI-002, PI-003, PI-007, PI-014, PI-053 to PI-055, and PI-060).

The IDT also worked with the **North Fork Watershed Advisory Group** (PF Doc. PI-067). Developed in 2007, the group is comprised of both agency representatives and landowners who are interested in management of the North Fork of the Coeur d'Alene River. The Watershed Advisory Group was involved with the USFS in the collection of data for the GRAIP (Geomorphic Roads Assessment and Inventory Package) project in the Beaver Creek Resource Area (PF Doc. AQ-R15). IDT members and members of the Watershed Advisory Group met in the field while the Beaver Creek project proposal was still under development.

In addition, the project wildlife biologist met with three representatives from the Idaho Department of Fish and Game (IDFG) in Beaver Creek on September 21, 2012 to discuss big-game habitat and other wildlife in the Beaver Creek Resource Area (PF Doc. PI-004, WL-14, p.

32, PF Doc. PI-051). An additional meeting was held with IDFG in April 2013 to discuss the effectiveness of the aggregate retention design for Alternative 3 to address big-game winter habitat concerns (PF Doc. PI-071).

1.7. Potentially-Required Permits

All required permits would be obtained prior to project implementation. Potentially required permits include the Clean Water Act section 404. We will solicit comments on the project from the U.S. Environmental Protection Agency and Idaho Department of Environmental Quality Surface Water Section and contact them for further clarification if there are questions regarding permitting.

Regarding previous uncertainty of National Pollution Discharge Elimination System (NPDES) permits, in March 2013 in *Decker v. NEDC*, the Supreme Court reversed the Ninth Circuit's decision in *NEDC v. Brown* and held that **the Clean Water Act and its implementing regulations do not require the NPDES permits for storm water discharges from logging roads** into the navigable waters of the United States.

1.8. Issues

1.8.1. Issue Identification

The IDT developed a list of issues to address using comments from letters mailed in, comments received during the public meeting, and frequent interactions with the public, other agencies, and local groups such as the Shoshone County Collaborative and the North Fork Watershed Advisory Group, along with resource condition information.

The Forest Service separated the issues into three categories: issues included in the analysis (key issues and analysis issues) and issues that were not impacted by the alternatives, and therefore eliminated from detailed analysis. Issues that were included in the analysis were defined as those directly or indirectly affected by implementing the action alternatives.

1.8.2. Key Issues

Key issues are those issues within the scope of the project and of sufficient concern to drive the development of the action alternatives. The following key issues were used to develop the focus and specific activities of the action alternatives and sharply define effects of the action alternatives against each other and the no-action alternative:

- **Forest Vegetation:** Effects on forest vegetation relative to the historic range of variability, minimum/maximum/average patch size, the Forest Plan, and resilience to potential future disturbances
- **Fire/Fuels:** Effects on hazardous fuel loading that could pose a threat to life, property and resource values.
- **Hydrology:** Effects on water quality (specifically sediment contribution to streams), and effects on water quantity/peak flows
- **Fisheries:** Effects to fish distribution
- **Wildlife:** Effects to elk winter range
- **Economics:** Effects to revenues and the local economy

These key issues, which are specific to this geographic area and proposal, were also used to help define the scope of the environmental analysis and documentation. The sub-issues and analysis measures for each key issue related to the Beaver Creek proposal are identified in Table 1.

Table 1. Key issues associated with the Beaver Creek Project.

Key Issue/Sub-Issue	Analysis Measures
Forest Vegetation: Openings in excess of 40 acres	Number of openings that would be greater than 40 acres in size and, of those over 40 acres, how many openings are in each size class (including adjacent stands)
Forest Vegetation: Representation of early seral species (forest cover) across the landscape	Acres and proportion of forest cover types
Forest Vegetation: Stand level forest structure	Acres and proportion of each structure class
Forest Vegetation: Vertical Structure	Number and proportion of canopy layers
Forest Vegetation: Existing and/or potential future old growth	Proportion and acres of Beaver Creek watershed allocated as old growth per Green et al (2011) definitions; and proportion and acres of the affected old growth management units allocated as old growth per Green et al (2011) definitions. A patch size assessment of allocated old growth patches will be completed for the affected OGMUs.
Forest Vegetation: Future access for vegetation management (as related to road decommissioning)	Estimated acres with no road access for vegetation management
Fire/Fuels: Fuel loading at the stand scale over time	Surface fuels will be measured with surface flame lengths; ladder fuels will be measured with the probability of torching; crown fuels will be measured with the crowning index.
Fire/Fuels: Fire behavior at the resource area or landscape scale	The Minimum Travel Time indicator from the FlamMap model will be used to display changes in landscape-level fire behavior, specifically rate of spread.
Fire/Fuels: Species composition and forest structure within the resource area that, in the past, was heavily influenced by the historic fire regime.	Acres changed in Fire Regime Condition Class
Hydrology – Water Quality: Soil erosion and sedimentation to streams	Changes in sediment delivery to streams; length of road contributing sediment to streams
Hydrology – Water Quantity: Peak flow, including altered runoff timing, a shortened peak flow duration combined with a concurrent increased peak flow volume.	Relative change in amount of annual water yield and peak flow runoff.
Fisheries: Project-related activities may affect fish distribution.	Additional miles of stream made available to fish.
Wildlife: Project-related activities may affect distribution of forage and thermal cover in elk winter range (MA-4); of particular concern are the Kings Pass (Compartment 189) and Pony Gulch (Compartment 191) areas.	Distribution of cover and forage in winter range within Compartments 189 and 191; and the resulting overall elk habitat potential for Elk Habitat Unit 5.
Economics: The amount of timber harvested under the proposal will affect revenues and the local economy.	Total Present Net Value of the timber sale; number of jobs created

1.8.3. Analysis Issues

Analysis issues were not essential in developing action alternatives, but were important to measure, because the analysis of these issues may show effects of each alternative on different forest resources. These issues are briefly discussed in the Chapter 3 description of existing conditions as needed to set context, with more detail provided in specialist reports in the project file. These issues include:

- **Fisheries (Sensitive and Management Indicator Species)**– Effects of fish passage barrier removal on fish habitat, effects on sensitive and management indicator species (MIS) of fish (westslope cutthroat trout), and effects on pool quality, spawning and rearing habitat, cover and water temperature.
- **Soils** – Effects on soil resources
- **Wildlife (Sensitive, MIS, and species hunted or trapped)-** Effects on sensitive species (flammulated owls, pygmy nuthatch, black-backed woodpecker, fringed myotis, fisher, western toad, and gray wolf), and management indicator species (migratory birds, northern goshawk, pileated woodpecker,) and other wildlife species commonly hunted, fished or trapped (American marten).
- **Sensitive Plants–** Effects on sensitive plant habitat (moist forest, wet forest, and dry forest plant guilds) and Forest Species of Concern (FSOC) (bank monkeyflower, short-spored jelly lichen, Hall's lungwort, pine broomrape, and round-leaved rein orchid)
- **Recreation -** Effects on recreational access (both motorized and nonmotorized activities), specifically access for the Disabled Hunt Program, snowmobile access (due to snowplowing on routes groomed for snowmobiles), and OHV access.
- **Visuals** – Effects on visual characteristics

1.8.4. Issues Addressed but not Analyzed in Detail

Issues that were addressed but not analyzed in detail were those that were: 1) outside the scope of the proposed actions; 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. The Council on Environmental Quality (CEQ) handbook on NEPA explained this delineation in Sec. 1501.7, which requires agencies to "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" These issues include:

- **Specific Rare Plants -** Effects on Threatened and Endangered plants (water howellia and Spaulding's catchfly), Sensitive plant habitat guilds (grassland, subalpine, deciduous riparian, aquatic, and peatland plant guilds) and Forest Species of Concern not present in the resource area.
- **Specific Fish-** Effects on Threatened, Endangered, Sensitive, and Management Indicator Species not present in the resource area (bull trout, Kootenai River white sturgeon, redband trout, burbot, and western pearlshell mussel).

- **Specific Wildlife –** Effects on Threatened and Endangered species (Canada lynx, grizzly bear, woodland caribou), and Sensitive species (bald eagle, common loon, harlequin duck, northern bog lemming, peregrine falcon, black swift, Coeur d'Alene salamander, Townsend's big-eared bat, and North American wolverine) either not affected by the project or not present (no habitat) in the resource area.
- **Air Quality** – Effects of burning on air quality
- **Climate Change** – Carbon cycling and storage
- **Cultural** – Effects on archeological and other historical resources
- **Minerals** – Effects on minerals management and access to mining operations
- **Noxious Weeds –** Effects on noxious weed populations
- **General Motorized Access –** Effects to the district transportation system

For more detail on the reasons these issues were not analyzed in detail, see Appendix B.

2. Chapter 2 - Alternatives

2.1. Introduction

This chapter describes and compares the alternatives considered in detail for implementation in the Beaver Creek Resource Area, as well as the process used for developing alternatives. This chapter includes a description and map (enclosed) for each alternative considered. Chapter 2 also compares the alternatives, sharply defining the differences between each alternative and providing a clear basis for choice among options to be considered by the decision maker.

2.2. Development of the Alternatives

In response to the purpose and need for the Beaver Creek Resource Area and the issues identified for this project (discussed in Chapter 1), the Forest Service developed three alternatives to be analyzed in detail.

The alternatives analyzed in this assessment were developed consistent with regulations identified by the Council on Environmental Quality for implementing the National Environmental Policy Act (NEPA; 40 CFR Part 1502.14). Brief descriptions of the alternatives and their development are presented below, with greater detail provided in subsequent sections of this Chapter.

2.2.1. Development of Alternative 1

The National Environmental Policy Act (NEPA) requires that an EIS include a “no-action” alternative to serve as a baseline to compare action alternatives. The No-Action Alternative is based on the premise that ecosystems continue to change in the absence of active management.

For this project, analysis of the No-Action Alternative (identified as Alternative 1) represents the effects of *not* implementing the proposed activities in response to the purpose and need, while taking into account the effects of past, ongoing, and reasonably foreseeable activities. This alternative proposes to maintain an existing level of management within the Beaver Creek Resource area. Current management plans would continue to guide management of the resource area. Fire suppression, road maintenance, recreation use, transmission line maintenance, and previously authorized projects would continue. A list of activities that would continue no matter which alternative the responsible official chooses (ongoing activities) is provided in Table 3 of this chapter.

No vegetation management, fuels management, road management, or watershed management activities would be implemented to accomplish project goals in the Beaver Creek Resource Area. The No-Action Alternative is the baseline for comparative analysis of the effects of the action alternatives.

2.2.2. Development of Alternative 2

Alternative 2 reflects the agency's original action proposed in scoping, with modifications as described herein. Alternative 2 proposes management activities in the Beaver Creek Resource Area to establish healthy and resilient forests, to reduce hazardous fuels, and improve watershed health. The proposal was based on Forest Plan goals and objectives, other applicable direction, and the best available resource condition information.

Activities were proposed based on how well they would meet the purpose and need for the project. Following preliminary assessments and collaborative discussions, activities were modified if the risk to resources was greater than the benefit as it related to the purpose and need. The resulting proposal was presented during public scoping and identified as the Proposed-Action Alternative (PF Doc. PI-005).

Following scoping, the project team revised the proposed action based on further field reconnaissance, logging system modifications, and further refinement of data used for the Transportation Analysis Process (TAP). Alternative 2 incorporates public comments received through scoping and the public meeting. Some roads that are proposed for full decommissioning under Alternative 3 were left partially open in Alternative 2 to respond to public comments that called for maintaining existing and future access in these areas for mining needs. Further field reconnaissance found that some of the AOP upgrades originally proposed were not actually limiting fish passage. Some other AOP upgrades proposed under Alternative 3 were not proposed under Alternative 2 because they exist under the paved county road. These changes have all been incorporated into a refined action alternative, which is henceforth identified in this document as Alternative 2.

Table 2. Comparison of activities proposed during scoping and those under Alternative 2.

Proposed activity	Proposal as scoped (October 2012)	Alternative 2	Difference between proposal as scoped and Alternative 2
Commercial harvest	2,056 acres	1,973 acres	-83 acres
Prescribed burning	2,359 acres	2,086 acres	-273 acres
Road decommissioning	64 miles	66 miles	+2 miles
Aquatic Organism Passage (AOP) upgrades	20 culverts	8 culverts	-12 culverts

2.2.3. Development of Alternative 3

This alternative was developed in response to comments received during public scoping (Appendix C and PF Doc. PI022 to PI-059); further collaboration with interested stakeholders through a combination of meetings and field trips (PF Docs. PI-002 to PI-004, PI-007, PI-014, PI-018, PI-019, PI-067); and internal concerns related to elk winter range. Most of the concerns voiced about the proposed action (as scoped) were tied to the amount of new permanent and temporary road construction, density of the existing road system, and timber harvest proposed in the context of existing resource conditions. There were concerns that past timber harvest on National Forest System lands along with timber harvest and development on private lands, in conjunction with the proposed activities as scoped, would lead to unacceptable impacts on water quality and wildlife. Public scoping comments and the Forest Service's response to comments are documented in the project file (PF Doc. PI-022 through PI-059).

Alternative 3 eliminates all proposed new road construction (permanent and temporary), increases the miles of road decommissioning, and reduces the total acres of commercial timber harvest. Higher-risk units and roads were eliminated in developing the original proposed action; therefore, the reduction in relative risk comes from an overall reduction in total harvest and road-related activities. Alternative 3 also proposes upgrading or replacing additional aquatic organism passage (AOP) culverts located underneath the main paved road that goes through the Beaver Creek resource area (Road 456).

Alternative 3 also incorporates some of the concepts of variable retention harvest suggested by Idaho Conservation League (ICL; PF Doc. PI-029) on a percentage of two groups of units proposed for regeneration harvest (shelterwood and seed tree treatments).

Alternative 3 responds to concerns about new road construction and existing road densities in the area with a strong focus on the effects of the existing transportation system on aquatic resources. Some roads that are kept in Alternative 2 for access for long term vegetation management are proposed for decommissioning in Alternative 3 to further protect aquatic resources.

2.3. Range of Alternatives

Section 102(2)(e) of the National Environmental Policy Act (NEPA) states that all Federal agencies shall "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflict concerning alternative uses of available resources”.

The range of alternatives presented in this chapter was determined by evaluating public and internal comments along with the purpose and need for the project. Other influences included Forest Plan goals, objectives, desired condition, and standards and guidelines; federal laws, regulations, and policies; and economic viability. Within these parameters, the alternatives display a reasonable range of outputs, treatments, costs, management requirements, design features, and effects on resources.

2.4. Alternatives Considered but Eliminated from Detailed Study

Many of the public comments received through the scoping process were related to the analysis process or concerns that have been addressed in the effects analysis and disclosure. Other comments suggested alternatives but lacked sufficient detail to consider them further or did not demonstrate a clear tie to potential impacts or to achieving the purpose and need for the project. Those suggestions are either addressed here, or in the Forest Service’s response to scoping comments (PF Doc. PI-059).

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

2.4.1. Maximum Fuelbreak Treatment Including Mastication

One alternative to the Alternative 2 (as originally scoped), which was considered but eliminated, is an alternative that would have maximized fuelbreak construction in addition to the treatments already included in the action alternatives. This alternative would create more fuelbreaks (mainly on ridgetops in the resource area) and would implement ground-based treatments such as mastication (using equipment that chews or grinds fuels). Different methods could be used to treat fuels, including commercial harvesting to thin canopy fuels, with surface and ladder fuels treated through a combination of slashing, grapple piling and/or mastication.

There are several reasons why this alternative was eliminated. First, the action alternatives treat many, if not all, of the strategic areas within the resource area that have not already been treated with past activities. Although there are many other ridgetops that could be treated, many are not strategically important, and some are too steep to use ground-based equipment. The efficiency of narrow ridge-top fuelbreaks that are not adjacent to larger landscape treatments would likely be minimal. A large network of fuelbreaks created with mechanized equipment is probably not economically feasible under current budgets, or within the economic constraints of the Beaver Creek project. The proposed fuel activities, when considered with past fuel reduction activities, treat most of the areas within the resource area that are strategic, and economically and ecologically feasible. The addition of more mechanized fuelbreaks would likely add little effectiveness in terms of landscape fuel reduction, and would likely be too expensive to implement.

2.4.2. Maximum Harvest Treatment

Another suggested alternative to the action alternatives, which was considered but eliminated, would have maximized harvest treatments, in addition to the treatments already in Alternative 2 (as scoped), and/or maximized harvest treatments within proposed units (utilizing a clearcut harvest treatment). This alternative would create more openings, potentially larger openings, and, if more intensive harvest treatments were used, more early-seral structure across the landscape. This would create a larger supply of timber and would therefore generate more revenue from the sale, would aid in treating forest health issues, could provide additional foraging areas for wildlife and would provide greater economic return to the local communities.

Despite the benefits, there are several reasons why this alternative was eliminated. First, the action proposed in scoping was developed to treat many of the areas within the resource area that have not already been treated with past activities. These areas are in need of active management. Although there are other stands that could be treated, many are inaccessible without building many miles of road to access them, or using alternative methods of harvest, such as helicopter harvest. These options face both economic and resource barriers.

Secondly, this proposed alternative would have impacts on other resource concerns, such as watershed restoration, wildlife habitat and elk security. Maximization of some resources at the expense of other resources does not fit the purpose and need of this project. Mitigating the effects of miles of new roads and more aggressive harvest treatments may not be economically feasible.

The action proposed in scoping was developed to treat as much area as necessary without creating undue ecological burdens on the landscape or economic burdens on project implementation. The addition of larger harvest areas or more intensive harvest treatments across the resource area would likely result in tradeoffs that would not allow us to meet the purpose and need of this project.

2.4.3. Less than 40-acre Openings

Although there was not a direct suggestion to develop an alternative to address this issue, some scoping comments expressed concern regarding openings greater than 40 acres (PF Doc. PI-059). In response to the expressed concerns, the interdisciplinary team did consider an alternative that would eliminate creating openings greater than 40 acres; however, this alternative was eliminated because it would not trend the area toward desired future conditions and it would restrict treatment activities from meeting the purpose and need for the project.

The desired condition for the Beaver Creek Resource Area strives for a broad range of patch sizes in all age classes (emulating the patterns that would have been produced by natural disturbance regimes). The historic patch sizes of fires, historic extent of white pine and western larch dominated stands and recent and ongoing insect and disease caused mortality within the resource area all occur or did occur with patch sizes in the 1,000's – 10,000's of acres.

In order to meet the purpose and need of the Beaver Creek project to reduce fuels and improve species composition and stand/landscape structure, activities need to be designed based on on-the ground conditions in the resource area, which are contiguous to many stands, and are larger than 40 acres in many cases.

There is a need to reduce fuels and create a pattern of fuel treatments across the landscape that is effective in modifying potential fire behavior and able to produce a safer environment in which to conduct suppression activities. Fire research results show that larger treatment blocks are more effective than scattered smaller treatment blocks at altering fire spread rates and severities within a given treatment block. Research also shows that strategic placement of treatment blocks is important in altering fire spread rates and severities across a given landscape. It is important to match the scale of treatments to the scale of the insect and disease-driven fuels accumulations and to the scale of historic ecological processes within the resource area. Limiting opening sizes to less than 40 acres would limit their effectiveness at slowing the spread of large fires and limit their effectiveness at reducing fire severity. Smaller fuel treatment areas may not have as much significant beneficial effects on the spread, intensity and severity of large fires, especially if placed randomly on the landscape.

There is also a need to trend the landscape towards a more desirable pattern of forest structure and patch sizes. The scale of treatments should be matched to the scale of the widespread and increasing root disease and bark beetle (Douglas-fir beetle, fir engraver beetle, and mountain pine beetle) mortality in order to restore resilient tree species. The large majority of the resource area is classified as mature forest (i.e. mature forest is the matrix). Previous regeneration harvesting created the majority of the existing openings within the resource area but left untreated, mature forested stands between and around the openings. Extensive areas of mature forest in the resource area have been severely affected by western white pine blister rust, mountain pine beetle and Douglas-fir beetle and are now badly infected with root diseases.

Within the resource area there is currently very little diversity in patch sizes within the young structure class. Creating openings in excess of 40 acres would increase the diversity of patch sizes within the young structure class and eventually in the medium structure class as the young stands grow. This increased diversity in patch sizes would also translate to the western larch, western white pine and ponderosa pine forest cover types because most of these forest cover types are directly associated with regeneration harvests in the resource area. Developing large patches of resilient forest now may eventually lead to development of large patches of future old growth that have greater representation of resilient species.

Limiting openings to less than 40 acres would maintain or reduce the average patch size of the young structural stage within the resource area, which is already less variable than would have been expected from natural disturbance regimes. Large patches of young structure may, through growth and natural successional processes over time, become large patches of medium and/or mature structure that includes substantial quantities of long-lived, early-seral conifer species. Establishing large patches of resilient, potentially long-lived tree species would reflect the historic extent of western white pine, ponderosa pine and western larch within the resource area.

2.5. Activities Proposed Under the Action Alternatives

Both action alternatives propose (by varying degrees) the following types of activities:

- **Vegetation management activities** (commercial timber harvest and reforestation)
- **Fuel management activities** (site preparation, ecosystem burning, fuelbreaks**)**
- **Watershed improvement activities** (AOP upgrades, road decommissioning and storage)
- **Road management activities** (temporary and permanent road construction, road reconstruction and maintenance, road reconditioning and gate installation)

2.5.1. Summary of Proposed Activities

The following table provides a description of all activities proposed under the action alternatives. **No new activities would occur under the No-Action Alternative; therefore it is not displayed in the table.** Please refer to the enclosed alternative maps for locations of the proposed activities. A detailed description of each unit is included in Appendix D (Specific Activity Information).

Table 3. Summary of proposed activities under Alternatives 2 and 3.

Proposed vegetation management activities	Alt. 2	Alt. 3
Commercial harvest		
Shelterwood (acres)	917	498
Seed tree (acres)	263	121
Commercial thin (acres)	300	253
Improvement cut (acres)	493	430
Aggregate retention (acres)	0	360
Total commercial harvest (acres)	1,973	1,662
Logging systems		
Ground based (acres)	230	212
Skyline (acres)	1,495	1,197
Cable (acres)	10	36
Escaliner swing (acres)	238	217
Total logging systems (acres)	1,973	1,662
Reforestation (acres)	1,180	871
Proposed Fuels Management Activities		
Fuel treatments associated with timber harvest		
Prescribed burning – underburning (acres)	1,825	1,528
Jackpot burning (acres)	36	22
Mastication (acres)	18	18
Grapple piling (acres)	52	52
Yarding tops without burning (acres)	42	42
Total fuel treatments associated w/commercial harvest (acres)	1,973	1,662
Fuel treatments not associated with timber harvest		
Fuel breaks (acres)	6	6
Prescribed burning – ecosystem burning (acres)	2,080	2,080
Total prescribed burning not associated with harvest (acres)	2,086	2,086
Proposed watershed improvement activities		
Aquatic Organism Passage repair (number of culverts)	8	12
Road storage (miles)	19	0.5
Road decommissioning (miles)	66	104
Proposed road management activities		
Road reconditioning (miles)	51	51
Road reconstruction (miles)	29	25
Construction of permanent (system) road (miles)	1.2	0
Construction of temporary (nonsystem) road (miles)	1.5	0
Gate Installation (number of gates)	1	0

2.5.2. Vegetation Management Activities

2.5.2.1. Summary Comparison of Vegetation Management Activities

The result of all of the vegetation management activities would be a more resilient stand structure and species composition and reduced hazardous fuels loading across the landscape. A summary comparison of vegetation management activities proposed under the action alternatives is provided in Table 4.

Table 4. Summary comparison of vegetation management activities under the action alternatives.

Proposed Treatment	Alternative 2 (acres)	Alternative 3 (acres)
Commercial harvest		
Shelterwood	917	498
Seed tree	263	121
Commercial Thin	300	253
Improvement Cut	493	430
Aggregate Retention	0	360
Total commercial harvest	1,973	1,662
Logging systems		
Ground based	230	212
Skyline	1,495	1,197
Cable	10	36
Escaliner swing	238	217
Total logging systems	1,973	1,662
Reforestation	1,180	871

2.5.2.2. Description of Vegetation Management Activities under the Action Alternatives

Under both action alternatives, timber harvesting is proposed using a combination of yarding systems (skyline, ground-based, cable, and Escaliner with a tractor swing; an Escaliner is a specialized piece of yarding equipment with a tower and cable drum mounted on an excavator or similar machine, designed to operate “off road”). See the unit-specific descriptions in Appendix D for more information. The types of commercial timber harvest proposed are described below.

2.5.2.2.1. Shelterwood Harvests

Shelterwood harvests are proposed under both action alternatives, and include harvest on both dry and moist habitat types. This regeneration harvest prescription would retain groups and individual healthy trees to provide shelter and retain structure within the stand, while providing openings for planting long-lived early seral species. Residual stands would retain approximately 15-25% canopy cover, irregularly distributed across the units.

Shelterwood treatment units would include areas of small openings. Openings would have 10 trees per acre or less, and would generally be less than 8 acres in size. In some instances, opening sizes may exceed 8 acres due to the existing extent and severity of mortality caused by root rot, insects and/or a lack of trees capable of surviving site preparation (prescribed burning) activities, given operational constraints.

Treatment would focus on retaining and releasing healthy white pine, western larch and ponderosa pine, and removing more shade-tolerant species (Douglas-fir, grand fir, and western hemlock in particular) that are more susceptible to insects, pathogens, and/or drought.

Figure 6. Post-harvest shelterwood unit (Unit 55 in the Blue Alder Project) prior to underburn on the Coeur d'Alene River Ranger District.

These treatments are designed to establish and maintain a dominant stand component of long lived early seral species which would consist of western larch, white pine and/or ponderosa pine. This would be done through retention of healthy ponderosa pine, western larch and western white pine (if found in unit) along with planting of ponderosa pine, western larch and/or rust resistant white pine. Some large Douglas-fir, grand fir and/or cedar may be retained in shelterwood harvest units to reduce visual effects of harvest, to maintain desired large structural components within the harvest area, and as future snag and large woody debris recruitment. The location of shelterwood units focus on stands with insect and disease conditions and risk. Many of these sites are experiencing ongoing mortality due to root diseases and bark beetles.

Douglas-fir is a prominent species in the stands targeted for shelterwood harvesting. Douglas-fir is highly susceptible to root diseases. Root diseases are currently the most prominent landscape-altering process in the Coeur d'Alene River Basin. Leave trees would remain to maintain visual quality and to serve as a seed source and shelter in the short term and as live and dead structure over the long term. The shelterwood units would have 10 to 25 mature trees per acre retained, on average. Retained trees may be arranged in small clumps and/or as dispersed individual trees.

Harvest of some large-diameter trees may occur, however the goal of the treatment is to retain the largest, most resilient trees over the long term. When possible, reserve trees would be selected in locations that would facilitate survival during post-harvest prescribed burning treatments. Variability would be substantial within treatment areas because the amount and arrangement of tree retention depends on what is currently available at each site.

In harvest units, prescribed burning (the preferred treatment), grapple piling or hand piling would occur to reduce fuels and shrub competition in order to facilitate successful establishment of desired regeneration. Sites would then be planted with site-adapted long-lived seral species such as rust-resistant white pine, larch and/or ponderosa pine. Efforts would be made to increase survival rates for western white pine reserve trees where they occur. This may include the use of mechanical slash disposal on gentle slopes, pulling back of slash from the bases of individual white pines prior to underburning, and/or whole tree yarding during harvest operations to reduce slash loads and subsequent flame lengths during prescribed burning.

2.5.2.2.2. Seed-tree harvests

Seed-tree harvests (Figure 7) are designed to establish and maintain a dominant stand component of the long-lived early seral species which would consist of western larch, white pine and/or ponderosa pine. This would be accomplished by retaining only good quality ponderosa pine, western larch and western white pine (if found in the unit) along with planting of ponderosa pine, western larch and/or rust-resistant white pine. Some large Douglas-fir, grand fir and/or cedar may be retained in seed-tree harvest units to reduce visual effects of harvest, to maintain desired large structural components within the harvest area, and as future snag and large woody debris recruitment. The selection of seed tree units focused on stands with severe insect and disease conditions and risk. These sites have already experienced substantial mortality due to root diseases and insects.

The goal of a seed-tree harvest is to encourage desirable species composition, specifically increasing the representation of ponderosa pine, western larch and western white pine on the site as a result of full planting following harvest. This will only occur if the site is able to support the growth of these species. Through reestablishment of this stand, a substantial increase in growth and vigor would be expected.

In units where seed-tree harvest occurs, leave trees would remain to serve as a seed source and as structure, in the short and long term, and in some cases to maintain visual quality. Seed-tree units would tend to have less than 10 trees per acre arranged as scattered individuals and/or in small groups. Harvest units would be prescribed burned (the preferred treatment), grapple piled to reduce fuels and shrub competition in order to facilitate successful establishment of desired regeneration. Sites would then be planted with site adapted long-lived seral species such as rust-resistant white pine, larch and/or ponderosa pine.

Figure 7. Post-harvest seed tree unit prior to underburning on the Coeur d'Alene River Ranger District.

2.5.2.2.3. Aggregate Retention

Aggregate retention is proposed in Alternative 3 in 11 of the units that are proposed for shelterwood or seed-tree harvest under Alternative 2. Aggregate-retention areas were identified in response to comments received during the initial public scoping period for this project. Aggregate retention harvests, like shelterwood and seed-tree harvests, are even-aged regeneration harvests that are designed to initiate a new stand of primarily long-lived early seral species while also retaining up to 30% of the original stand as "aggregates." Aggregates are patches of trees greater than one-half acre in size that are excluded from all activities associated with the harvest in order for these areas to be retained in an undisturbed condition.

Aggregates would be centered on patches of mature or residual old trees, concentrations of course woody debris, snags, seeps, rock outcroppings, or other unique structural and/or habitat features. In particular, aggregates would be located where there are small patches of trees with old growth attributes (as described by Green et al. (2011; PF Doc. VEG-R25)), but which may otherwise be of insufficient acreage to be allocated according to Forest Plan old growth requirements. To the extent practical, aggregates would include an overall representation of the tree species that were present in the original stand. Aggregate patches are intended to be retained over the rotation length of the new stand.

Individual trees may also be retained as dispersed retention throughout the harvested portions of the new stand. In particular, healthy western larch, western white pine, and ponderosa pine would be retained as well as large, obviously old individuals, regardless of species.

2.5.2.2.4. Reforestation

Reforestation would occur across all units proposed for shelterwood, seed tree, or aggregate retention harvest after harvest and site preparation activities (prescribed burning or slashing/grapple piling and burning) activities are completed.

2.5.2.2.5. Commercial Thinning

Commercial thinning harvests are intended to reduce the shading and crowding of white pine, western larch and ponderosa pine crowns, providing the growing space needed by these resilient species over the long term. Commercial thinning would also reduce the canopy bulk density and increase the distance between surface fuels and crown fuels (crown base height) of stands, thereby reducing the crown fire hazard. This intermediate tending activity would focus on leaving the most resilient species/trees and improving their chances for continued growth. It would improve the likelihood of stands becoming large and old and would improve resiliency to disturbances such as fire, insect, disease, etc.

Following harvest, at least 60-100 trees per acre over 7 inches diameter at breast height (dbh) would remain overall. Post-harvest densities (trees/acre) would be lower on dry sites and higher on moist sites. The number of trees retained also depends upon the average size of trees available for retention; smaller average diameters would lead to more trees per acre retained, while larger average diameters would lead to fewer trees retained per acre. Harvest of some large grand fir and Douglas-fir may occur if they are directly competing with the more resilient western larch and ponderosa pine as long as the grand fir or Douglas-fir trees appear to be young. In addition, depending on resiliency and arrangement, some Douglas-fir, grand fir, western redcedar and western hemlock would be retained to meet desired stocking levels.

Retention of trees and/or species other than western larch would be based on short- and long-term objectives of 'leave trees' and their resiliency to planned treatments and natural disturbances. Harvesting would be followed by fuel reduction activities such as prescribed burning, grapple piling, jackpot burning, or a combination of these treatments.

Figure 8. Post-harvest commercial thinning unit on the Coeur d'Alene River Ranger District.

2.5.2.2.6. Improvement Cut

Improvement cuts are intermediate harvests that retain healthy trees in groups and as individuals while reducing ladder fuels and decreasing stand densities. Treatments would focus on the stand's resiliency to wildfire, insects and pathogens by removing small conifers that can act as ladder fuels (which increase the potential for crown fire) and removing competing shade-tolerant species adjacent to ponderosa pine, white pine and western larch.

Residual stands would retain at least 35% canopy cover, which would vary both within and across stands depending on the distribution of desirable species. A few individual ponderosa pine, larch or white pine may be removed either because they are of relatively low vigor, or unhealthy. Harvest of some large grand fir and Douglas-fir may occur if they are directly competing with the more resilient western larch and ponderosa pine as long as the grand fir or Douglas-fir trees appear to be young. Large and obviously old trees would be retained.

Figure 9. Post-harvest improvement cut unit on the Coeur d'Alene River Ranger District.

2.5.3. Fuel Management Activities

2.5.3.1. Summary Comparison of Fuel Management Activities

Both action alternatives propose fuel management activities, including burning for site preparation, prescribed (ecosystem) burning, and fuel break construction. The result of all of the fuel management activities would be the reduction of surface and ladder fuels. Prescribed burning will also reduce competition from unwanted vegetation which will increase the survival and growth rate of the desired trees in harvest units. A summary comparison of fuel management activities proposed under the action alternatives is provided in Table 5.

Table 5. Summary comparison of fuel management treatments under the action alternatives.

Proposed Fuel Treatment	Alt. 2 (acres)	Alt. 3 (acres)
Fuel treatments associated with timber harvest		
Underburn (prescribed burning)	1,825	1,528
Jackpot burning	36	22
Mastication	18	18
Grapple piling	52	52
Yarding tops without burning	42	42
Total fuel treatments associated with timber harvest	1,973	1,662
Fuel treatments not associated with timber harvest		
Fuel breaks	6	6
Prescribed (ecosystem) burning	2,080	2,080
Total fuel treatments not associated with timber harvest	2,086	2,086

2.5.3.2. Description of Fuel Management Activities under the Action Alternatives

2.5.3.2.1. Activity Fuel Burning and Site Preparation

Prescribed burning associated with timber harvest would take place in most harvest units to reduce fuels and prepare the regeneration harvest units for planting. Prescribed fire includes underburning, jackpot burning or pile burning. Slashing and grapple piling with pile burning may be used for fuel treatment and site preparation for planting where sufficient fire-tolerant species are not present, and slopes are appropriate for mechanized equipment (less than 35% slope). A comparison of prescribed burning activities is provided in Table 5.

Underburning in improvement cut units would reduce fuels related to harvest activities as well as those fuels naturally present, including litter, down wood, brush, and small trees. Slashing of small trees and brush may occur prior to underburning. Leave tree protection (clearing vegetation and slash) may occur in specific locations to protect residual trees during underburning. Underburning in shelterwood units would be similar to underburning in commercial thin units; however, there would be a greater amount of activity-related fuel and an additional objective of the burn would be to prepare the site for planting by removing competing vegetation and exposing bare soil.

In addition, **prescribed burning *without* any associated timber harvest** is also proposed under both action alternatives. The primary purpose of this prescribed burning is to reduce hazardous fuels. This prescribed burning has been designed in some cases to be adjacent to harvest units, which would create large patches of reduced fuels. These large patches would maximize the effectiveness of fuels reduction and reduce the spread of large fires.

Canopy fuels may be reduced slightly due to patches of mortality caused by passive crown fire (or torching), and individual tree mortality. Passive crown fire could result in patches of mortality of up to five acres, but overall mortality would be limited to about 10-15% of the unit area. Existing fuel conditions will be the primary determinant of canopy mortality – where heavy fuel loads exists, such as in root-rot pockets or ice-storm damaged areas, the fire would be more intense and result in more canopy mortality.

Proposed prescribed burning is focused primarily on southerly aspects, although some proposed burns would occur on broad landscape units that encompass many changes in topography, and a variety of habitat types. The proposed burns were delineated from ridge top to draw bottom, creating boundaries that are feasible for implementation and containment of the prescribed fire.

In some cases, unit boundaries fall within riparian buffers as identified by the Inland Native Fish Strategy (INFS). Direct ignition of fuels would not occur within INFS buffers, and all prescribed burning activities would be consistent with INFS standards and guidelines (Appendix E – Design Features). Firelines and fuelbreaks would be constructed when necessary, especially when burns are adjacent to private property. Underburning may also occur in fuelbreaks adjacent to designated prescribed burning areas.

2.5.3.2.2. Fuelbreaks

Fuelbreaks would be completed through noncommercial thinning and pruning, followed by piling and burning or chipping of the residual slash and surface fuels. The result is reduced surface and ladder fuels which will help protect the home in the event of a wildfire. The objective of fuelbreaks is to reduce surface and ladder fuels to diminish the potential fire behavior near homes, structures, private property, and access routes. Fuelbreaks would be constructed primarily within the Home Ignition Zone, or within approximately 150-300 feet of

homes. Fuelbreaks would create defensible space, allowing the home to be defended by firefighters in the event of a wildfire, and increasing the chances that the home would survive an approaching wildfire.

2.5.4. Watershed Improvement Activities

2.5.4.1. Summary Comparison of Watershed Improvement Activities

Both action alternatives propose watershed improvement activities, including AOP culvert upgrades, road storage, and road decommissioning. The result of all of the watershed improvement activities would be increased length of accessible fish habitat and improved water quality, resulting from a decrease in amount of sediment delivered to streams. A summary comparison of watershed improvement activities proposed under the action alternatives is provided in Table 6.

Table 6. Summary comparison of watershed improvement activities under the action alternatives.

Activity	Alternative 2	Alternative 3
Aquatic Organism Passage upgrades (number of culverts)	8	12
Road storage (miles)	19	0.5
Road decommissioning (miles)	66	104

2.5.4.1.1. Aquatic Organism Passage (Culvert) Upgrades

Culverts that are undersized or improperly designed can alter the ability of fish and other aquatic species to pass through these culverts. Culverts that inhibit fish passage either need to be removed, realigned, or upgraded to a larger size in order to accommodate fish passage.

2.5.4.1.2. Road Storage and Decommissioning

The project team analyzed all roads in the resource area and established a road management prescription for each road (PF Doc. TRAN-01). All post-project prescriptions are consistent with the Coeur d'Alene River Ranger District Motorized Vehicle Use Map (MVUM), which is the official map for roads and trails available to the public for motorized uses on the district. What this means is that none of the roads that are proposed for decommissioning under either alternative are currently open to public motorized travel under the MVUM. Existing legal access will not change.

As a result of the transportation analysis, a number of roads were identified for storage and other roads were identified for decommissioning as part of each action alternative.

Road Storage

Roads proposed for storage have been identified as needed for long term forest management, but do not have any foreseeable use anticipated in the next 20 years. None of the roads proposed for storage under either alternative are currently open to public motorized travel (PF Doc. TRAN-01). Some roads proposed for storage in Alternative 2 for long term vegetation management access needs are proposed for decommissioning under Alternative 3.

The goal of putting roads into storage is to make the roads hydrologically inert on the landscape. These roads are put into state where they are no longer a sediment source and do not channel water. During storage, roads should remain outsloped and if drainage features exist, they should be removed. The road prism is left intact, but in a condition that would not require regular

maintenance. Traffic is usually controlled with a permanent barrier or by recontouring the beginning of the road (i.e. front-end obliteration). Activities for these roads may include surface decompaction, culvert removal, re-establishment of stream channels, and revegetation of the road corridor. Roads may also be stored by taking no action, if they are already determined to be hydrologically inert.

Road Decommissioning

The goal of decommissioning is to reduce erosion, restore site productivity, eliminate the potential of a road related failure, and re-establish natural water infiltration and drainage patterns.

Roads proposed for decommissioning have been identified as not needed to meet long-term forest management objectives in Alternative 2 but not in Alternative 3. Many of the roads proposed for decommissioning are single-purpose legacy roads used in the past for timber harvest or mining access. None of the roads that are proposed for decommissioning under either alternative are currently open to public motorized travel under the MVUM.

During decommissioning, roads are usually decompacted and have major fills, embankments, and areas with higher risk of failure pulled up onto the road bed and stabilized. Drainage structures would be removed from stream channels and the adjacent slopes restored to resemble natural conditions. Following prescription implementation, these decommissioned roads would be removed from the National Forest Road System, but tracked as historic routes in the Forest Service database.

2.5.5. Road Management Activities

2.5.5.1. Summary Comparison of Road Management Activities

The project team analyzed the existing road system in the Beaver Creek Resource Area within the scope of existing and potential land management activities. The team also considered how the existing transportation network may affect values (such as wildlife security) in the Beaver Creek Resource Area. This was done through the Transportation Analysis Process which is available as part of the project file (PF Doc. TRAN-01).

Both action alternatives propose road management activities, which may include road building (permanent and temporary), road maintenance, road reconditioning, road reconstruction, and gate installation. A summary comparison of road management activities proposed under the action alternatives is provided in Table 7.

Table 7. Summary comparison of road management activities under the action alternatives.

Activity	Alternative 2	Alternative 3
Road reconditioning (miles)	51	51
Road reconstruction (miles)	29	25
Construction of permanent (system) roads (miles)	1.2	0
Construction of temporary (non-system) roads (miles)	1.5	0
Gate Installation (number of gates)	1	0

2.5.5.2. Description of Road Management Activities under the Action Alternatives

Road-related activities would be necessary to access treatment units safely, efficiently and economically while protecting other forest resources. For example, road-related activities may include maintenance, reconditioning or reconstruction of existing system roads, construction of permanent or temporary roads, installation of closure devices, and/or chemical treatment of noxious weeds

2.5.5.2.1. Road Reconditioning

Road reconditioning is required along portions of haul routes to provide safe access for project implementation. Reconditioning may include the following activities depending on the condition of the road: removing log or earth barricades, filling or leveling waterbars, clearing and/or roadway brushing, removing bank slough that interferes with ditches and roadway, general road blading and ditch maintenance, constructing drain dips, and/or installing gates.

2.5.5.2.2. Road Reconstruction

Road reconstruction is needed when an existing system road requires improvements or realignment to meet current road standards. Activities may include installing or upgrading culverts, repairing or replacing cross drains, road resurfacing, road brushing, clearing and/or roadway brushing, or installing or repairing bridges or other drainage structures. Reconstruction may also involve widening roads to allow for safe operations and travel, or reopening heavily brushed in or overgrown roads.

2.5.5.2.3. Road Construction

New road construction is proposed where the existing transportation system is insufficient to access areas proposed for vegetation management treatment. To provide safe access by vehicles and heavy machinery to proposed harvest units in Alternative 2, a total of 1.2 miles of **permanent** road construction would be necessary. Road width may vary but in general new roads would have an average running surface of approximately 14 feet, with additional widening for turnouts and curves. General activities would include clearing existing trees and vegetation from the proposed travel way, cut bank and fill slope; excavating and constructing and compacting road surface, cut and fill slopes, and installing appropriate drainage features.

If Alternative 2 is selected total of 1.5 miles of new **temporary** road would be constructed under this project. Activities would be similar to but less complex than new construction, and would be limited to the extent necessary for safe operation and travel.

Drainage features would be constructed and maintained to the extent necessary to protect resources for the life of the road. All new temporary roads would be decommissioned following the timber harvest, eliminating all motorized use of the road. Following project activities, all 1.5 miles of temporary road would be decompacted, recontoured, and seeded or covered with debris to prevent erosion and accelerate hydrologic and vegetative recovery. Under Alternative 3 no new permanent or temporary road construction would occur.

2.5.5.2.5. Gate Installation

Gates would be installed under **Alternative 2** to manage access in Pony Gulch. One gate would be installed near the junction of Pony Gulch Road 456UZ and Beaver Creek Road 456. Pony Gulch Road 456UZ is currently closed through District travel plan restrictions, but does not have a physical barrier restricting access. Installing a gate at this location would discourage illegal access and would aid in protecting wildlife habitat security and maintaining watershed health, while remaining accessible for non-motorized recreational experiences. No gates would be installed under Alternative 3, because in Alternative 3 Pony Gulch Road is proposed for decommissioning.

2.6. Design Features of the Action Alternatives

The Project interdisciplinary team developed design features to minimize or avoid adverse effects which could occur as a result of implementing proposed activities in the Beaver Creek Resource Area. The design features are based on Forest Plan direction and policy, best available science, and site-specific evaluations, and would be applied to both action alternatives (except where specifically stated) during project implementation.

Project implementation includes the physical on-the-ground design of the project completed by layout crews; timber sale contract administration; and reforestation activities such as site preparation and planting. Design features are applied on the ground through physical design as instructed in silvicultural prescriptions, marking guides, and cruise plans. Some features address conditions found on-the-ground during project activities, and are applied through the timber sale contract, which includes both standard and site specific provisions.

Design features applicable to specific units are included in the tables in Appendix D (Specific Unit Information). A complete list of all design features is provided in Appendix E.

2.7. Mitigation Measures

Mitigation measures are *additional* site-specific actions developed to minimize effects to resources that may occur despite design features. Both alternatives were designed with input from all resource specialists, and as such were created to reduce or eliminate effects to resources. In some cases, design features are unable to mitigate all potential effects, and additional site specific actions needs to be developed. After analyzing the potential effects of proposed activities and establishing design features, it was determined that no additional mitigation measures are necessary at this time because there are no effects needing mitigation that have not been addressed through design features.

2.8. Monitoring Activities

2.8.1. Forest Plan Monitoring

The Forest Plan documents a system to monitor and evaluate Forest activities (Forest Plan, PF Doc. CR-002). Monitoring and evaluation each have distinctly different purposes and scope. In general, monitoring is designed to gather the data necessary for project evaluation. During evaluation of project effectiveness, data provided through the monitoring effort are analyzed and interpreted. This process will provide periodic data necessary to determine if implementation is occurring as designed (Forest Plan, page IV-7; PF Doc. CR-002).

Activities in the Beaver Creek Resource Area would comply with specific monitoring requirements identified by the Forest Plan (Forest Plan, Chapter IV; PF Doc. CR-002). The necessary length of time for monitoring would be determined by the results and evaluation of what is being monitored. When it is certain that regulations and standards are being met, monitoring of a particular element will cease. If monitoring evaluations show that regulations or standards are not being achieved at the desired level, management intervention would occur.

2.8.2. Project-specific Hydrology Monitoring

Best Management Practices and INFS Standards and Guidelines would be incorporated into many different phases of the project as described in Appendix E ("Features Designed to Protect Aquatic Resources"). The District hydrologist and engineering representative would review the location of all proposed temporary roads and all road maintenance to assure compliance with Best Management Practices. A sale administrator would visit each active cutting unit at a frequency necessary to assure compliance with the Best Management Practices and the timber sale contract. Minor contract modifications would be agreed upon and enacted, when necessary, to meet objectives and standards on the ground (PF Doc. CR-016, pp. 34-41; PF Doc. CR-017, pp.27-40; PF Doc. CR-022, pp. 41-46, 76-77; and PF Doc. CR-026, pp. 37-44, 60).

Much of the proposed road reconstruction and decommissioning in each alternative could potentially result in decreased sediment contributions from roads to Beaver Creek of between 68 and 75%. However, because sediment is recognized as a major contributor of impaired water quality and a TMDL for sediment exists for its improvement, it is recommended that monitoring of sediment contributions of select road se

gments occur using the GRAIP methods, as well as the GRAIP model, to determine the extent that sediment has been decreased.

Stream no-harvest buffers exist in many units and would be routinely monitored to determine if they were implemented in the correct locations, if their width is adequate, and if they persist through time. A subset of streams would be monitored to determine if large woody debris densities change as a result of riparian buffers, and if riparian buffers are adding more large woody debris than expected to streams through wind-throw events or other disturbances.

2.8.3. Project-specific Fisheries Monitoring

Monitoring of fisheries composition and distribution would occur at specific locations after culverts have been replaced. The monitoring would be done for two reasons, 1) to measure the effectiveness of the replacement and determine changes in fishery composition upstream of each crossing; and 2) to determine if westslope cutthroat trout are able to access and utilize the far upstream reaches of White and Alder Creeks, and potentially escape the influence of non-native species.

Also, a long-term monitoring regime of flow and stream characteristics in select subwatersheds would be established in an effort to evaluate changes in streams prior to and after harvest occurs.

2.8.4. Project-specific Wildlife Monitoring

Monitoring of current and newly discovered goshawk nests in the project area would be surveyed yearly to determine nest success by the District Wildlife Biologist.

2.8.5. Project-specific Visuals Monitoring

Once the project has been implemented it would be reviewed in the field by the Landscape Architect to determine if it met the Forest Plan Visual Quality Objectives. Of greatest concern would be the visual effects of post-harvest burning on reserve trees within the units. This review would then be documented in the Idaho Panhandle National Forest Monitoring Report.

2.9. Past, Ongoing and Reasonably Foreseeable Activities

2.9.1. Introduction

NEPA requires analysis and disclosure of potential cumulative effects – the impact on the environment which results from the incremental impact of the action when added to other past, present (ongoing) and reasonably foreseeable actions, regardless of what agency or person undertakes such actions (40 CFR § 1508.7). Cumulative effects analysis shall be carried out in accordance with 40 CFR 1508.7 and in accordance with The Council on Environmental Quality Guidance Memorandum on Consideration of Past Actions in Cumulative Effects Analysis dated June 24, 2005.

During project development, the IDT identified past activities that have occurred in the resource area, activities that are ongoing at this time, and activities that are reasonably foreseeable to occur (Table 8). Additional discussion of these activities is provided in Appendix A (Past, Ongoing and Reasonably Foreseeable Activities).

Effects of past activities are reflected in the description of existing conditions for each resource in Chapter 3 as appropriate, with supporting information in the project files as noted. Effects of ongoing and reasonably foreseeable activities are disclosed as part of the cumulative effects discussion for each resource in Chapter 3 as appropriate, with supporting information in the project files as noted. There are no proposals for future timber management in the Beaver Creek Resource Area for another 25-30 years.

Table 8. Synopsis of past, ongoing and reasonably foreseeable activities.

Activities	Past	Ongoing	Reasonably Foreseeable
TIMBER MANAGEMENT			
Timber harvest and related activities on NFS lands	X	X	X
Precommercial thinning and timber stand improvement on NFS lands	X	X	X
Tree planting on NFS lands	X	X	X
Pocket gopher control on NFS lands	X	X	X
Timber harvest and related activities on BLM lands	X	X	
Log drives	X		
FIRE/FUELS			
Prescribed burning for site preparation and fuels treatments	X	X	X
Wildfires	X		Unknown
Fire suppression	X	X	X
Wildlife burns	X		
TRANSPORTATION			
Railroads	X		
Travel Plan implementation	X	X	X
Road construction	X		X
Road decommissioning	X		X
Road maintenance	X	X	X
Trail maintenance	X	X	X
Use of motorized vehicles (full-size vehicles, ATVs, motorcycles)	X	X	X
RECREATION			
Camping	X	X	X
Snowmobiling	X	X	X
Hunting	X	X	X
Hiking	X	X	X
Berry picking	X	X	X
Fishing	X	X	X
Christmas tree cutting	X	X	X
Mountain bike riding	X	X	X
MINERALS			
Mining	X	X	X
Idora Mine remediation (with road decommissioning) by the Idaho Department of Environmental Quality, Bureau of Land Management, and Forest Service	X		
WATERSHED IMPROVEMENT			
In-stream fisheries habitat improvement projects	X		Unknown
Culvert modification or replacement	X		X
Large woody debris removal	X		
Stream channel realignment at Forest Road 933, by Shoshone County	X		
Stream channel realignment at Unknown Gulch, by Shoshone County and private entities	X		

Activities	Past	Ongoing	Reasonably Foreseeable
Stream channel management at Carpenter Creek, by Shoshone County	X		
Stream channel reconstruction at Carbon Center, by Shoshone County	X		
Placer Creek culvert replacement by Shoshone County	X		
Potosi Creek culvert maintenance by Shoshone County	X		
Stream channel management at Dobson Creek, by Shoshone County and private entities	X		
Unknown Gulch culvert removal by Shoshone County, the Department of Environmental Quality, and private entities	X		
Private lands bank stabilization at multiple sites, by multiple agencies	X		
Shoshone County bank stabilization, by Shoshone County	X		
LAND MANAGEMENT			
Land exchanges	X		
Land development	X	X	X
OTHER ACTIVITIES			
Livestock grazing (ongoing and future on private lands only)	X	X	X
Livestock use	X	X	X
Utility maintenance	X	X	X
Firewood cutting/gathering	X	X	X
Spraying herbicides under the Coeur d'Alene Weed EIS	X	X	X
Special use permits	X	X	X

2.10. Summary Comparison of Effects by Key Issue

This section provides a summary of the effects of implementing each alternative. Information in the tables is focused on those effects that help distinguish the differences among alternatives. The no-action alternative (Alternative 1) is not included in these tables; effects as a result of implementing the no-action alternative are discussed in more detail by resource in Chapter 3.

2.10.1. Summary of Effects to Forest Vegetation

The analysis considered effects on forest vegetation relative to the historic range of variability; minimum, maximum and average patch size/ consistency with the Forest Plan; and resilience to potential future disturbances. The following table compares the effects of each alternative on Forest Vegetation, in terms of six sub-issues.

Table 9. Summary comparison effects of alternatives on key Forest Vegetation issues (see Chapter 3, Section 3.1).

Sub-Issue	Analysis Measures	Alternative 2	Alternative 3
Representation of early seral species across the landscape	Acres and proportion of forest cover types (western larch, ponderosa pine, white pine)	3,052 acres	2,819 acres
Forest structure	Acres and proportion of each structure class over time and space	Mature – 18,195 acres Mid – 4,029 acres Young – 5,765 acres	Mature – 18,420 acres Mid – 4,029 acres Young – 5,540 acres
Vertical Structure	Number and proportion of canopy layers	At least 2 in regeneration harvests	At least 2 in regeneration harvests
Effects on existing old growth and/or potential future old growth	Proportion and acres of Beaver Creek watershed allocated as old growth per Green et al (2008) definitions	OGMU 115 – 710 acres OGMU 116 – 909 acres OGMU 122 – 601 acres	Same as Alternative 2.
	Proportion and acres of the affected old growth management units allocated as old growth per Green et al (2008) definitions	OGMU 115 - 8.7% OGMU 116 - 11.0% OGMU 122 - 5.2%	Same as Alternative 2.
	A patch size assessment of allocated old growth patches in the affected Old-Growth Management Units (OGMUs).	minimum-maximum-mean (acres) OGMU 115 - 148 343 237 OGMU 116 - 63 407 227 OGMU 122 - 62 459 200	Same as Alternative 2.
Openings in excess of 40 acres	Number and size of openings in excess of 40 acres	24 openings; largest 434 acres	21 openings; largest 400 acres
	Of those over 40 acres, the number of openings in each size class (including adjacent stands)	17 openings, 40-99 acres each 5 openings, 100-200 acres each 2 openings, more than 200 acres each	14 openings, 40-99 acres each 6 openings, 100-200 acres each 1 opening, more than 200 acres
Future access for vegetation management	Estimated acres with no road access for vegetation management due to road decommissioning	5,387 acres	8,806 acres

2.10.2. Summary of Effects to Fire/Fuels

The analysis considered effects on hazardous fuel loading that could pose a threat to life, property, and resource values. The following table compares the effects of each alternative in terms of three sub-issues.

Table 10. Summary comparison effects of alternatives on key Fire/Fuels issues (see Chapter 3, Section 3.2).

Sub-Issue	Analysis Measures	Alternative 2	Alternative 3
Fuel loading at the stand scale over time	Surface fuels were measured by predicting surface flame lengths in comparison to taking no action	As a result of prescribed burning: In 0 years: 10 foot decrease In 20 years: 2 foot increase As a result of harvesting: In 0 years: 55 foot decrease In 20 years: 45 foot decrease	Same as Alternative 2.
	Ladder fuels were measured by predicting the probability of torching in comparison to taking no action	As a result of intermediate harvest: In 0 years: 0.96 decrease In 20 years: 0.57 decrease As a result of regen. harvesting: In 0 years: 0.40 decrease In 20 years: 0.40 increase	Same as Alternative 2.
	Crown fuels were measured by predicting the crowning index in comparison to the no action	As a result of intermediate harvest: In 0 years: 24 mph increase In 20 years: 28 mph increase As a result of regen. harvesting: In 0 years: 83 mph increase In 20 years: 40 mph increase	Same as Alternative 2.
Fire behavior at the resource area or landscape scale	The Minimum Travel Time indicator from the FlamMap model was used to display changes in landscape-level fire behavior, specifically the rate of spread	Slows potential fire spread across the landscape, considerably reducing the threat of uncontrolled wildfire to hundreds of structures in the cumulative effects analysis area.	Landscape-scale effects on fire behavior would be very similar to Alternative 2.
Proportion of species composition and forest structure in the resource area heavily influenced by historic fire regime in the past	Changes in Fire Regime Condition Class (FRCC), in comparison to taking no action	FRCC 1 = increase by 2,436 acres FRCC 2 = decrease by 2,123 acres FRCC 3 = decrease by 313 acres	FRCC 1 = increase by 1,846acres FRCC 2 = decrease by 1,581 acres FRCC 3 = decrease by 265 acres

2.10.3. Summary of Effects to Hydrology/Fisheries

The analysis considered effects on sediment contributions to streams (which can potentially delay the attainment of State water quality standards), water quantity and the timing and magnitude of peak flows, and fish distribution. The following table compares the effects of each alternative in terms of the three sub-issues.

Table 11. Summary comparison effects of alternatives on key Hydrology/Fisheries issues (see Chapter 3, Sections 3.3 and 3.4).

Sub-Issue	Analysis Measures	Alternative 2	Alternative 3
Soil erosion and sedimentation to streams	Net decrease in sediment delivery to streams over time	65.6%	74.1%
	Length of road contributing sediment to streams	4.26 miles	3.35 miles
Effects to runoff timing, and shortened peak flow duration combined with increased peak flow volume	Relative change in annual water yield and peak flow runoff	Water yield increase of 1.1% Peak flow increases of 15 to 25 percent, varying by subwatershed	Water yield increase of 0.4% Peak flow increases of 15 to 24 percent, varying by subwatershed
Fish distribution	Additional miles of stream made available to fish	4.5 miles	Over 9 miles

2.10.4. Summary of Effects to Wildlife

The analysis considered effects on distribution of forage and thermal cover in elk winter range, as displayed in the following table.

Table 12. Summary comparison effects of alternatives on key Wildlife issue (see Chapter 3, Section 3.6).

Sub-Issue	Analysis Measures	Alternative 2	Alternative 3
Distribution of cover and forage in winter range	Distribution of cover and forage in winter range within Compartments 189 (Kings Pass) and 191 (Pony Gulch), as measured by overall Elk Habitat Potential	EHU 5 = 48% Compartment 189 = 41% Compartment 191 = 67%	EHU 5 = 50% Compartment 189 = 48% Compartment 191 = 69%

2.10.5. Summary of Financial Effects

The analysis considered effects of timber harvest on revenues and the local economy, as displayed in the following table.

Table 13. Summary comparison effects of alternatives on key Finance issue (see Chapter 3, Section 3.10).

Sub-Issue	Analysis Measures	Alternative 2	Alternative 3
Effects of timber harvest on revenues and the local economy	Present net value	$1,566,000	$2,070,000
	Total jobs created	443	402

3. Chapter 3 - Affected Environment and Environmental Consequences

3.1. Forest Vegetation

3.1.1. Introduction

This analysis describes the existing condition of forest vegetation within the Beaver Creek watershed. The alternatives are described and the direct, indirect, and cumulative effects of those alternatives on forest vegetation are described and discussed.

3.1.1.1. Overview of Issues Addressed

Landscapes are healthy when their components and processes are functioning properly. A healthy and resilient forest ecosystem will supply resilient species composition, structures, landscape arrangement and growth as well as meet the multiple resource objectives for this resource area including fire/fuels, wildlife, recreation, aquatics, etc. The forest health analysis compares the existing condition and the outcome of the alternatives to the desired condition specific to the Beaver Creek Resource Area. Veblen (2003) noted that historical perspectives can reduce the chances of major future surprises. The desired condition was developed with a historic view of Coeur d'Alene Basin and restoration needs as outlined by the Geographic Assessment (PF CR-025). Development of the desired conditions was also guided by the Forest Plan (PF CR-002).

3.1.1.2. Issue Indicators

The key silvicultural issue is that the existing condition of forest vegetation in the Beaver Creek watershed is outside the historic range of variability, is not meeting Forest Plan objectives and has generally low resilience to ongoing and potential future disturbances. Related sub-issues include:

- The existing **representation of early seral species** throughout the Beaver Creek watershed is outside the historic range of variability. The lack of healthy, long-lived, early-seral species, coupled with the relative abundance of mid-seral and late-seral species, contributes to reduced resilience to future disturbances. This sub-issue is measured in acres of forest cover type at the Beaver Creek watershed scale and is also discussed in terms of landscape arrangement with a measure of patch size in acres.
- **Forest structures** have been simplified over the Beaver Creek watershed and within individual stands by large-scale historic fire, contemporary fire suppression, and broad application of the clearcut silvicultural system. This sub-issue is measured in acres of forest structure class at the Beaver Creek watershed scale, is discussed in terms of landscape arrangement with a measure of patch size in acres, and by number of canopy layers for each of the proposed harvest types.
- The **amount and arrangement of allocated old growth** has also been affected by past fire history and management history. The Forest Plan (PF Doc. CR-002) includes a number of old growth-related standards. This sub-issue is measured by the proportion and acres of the Beaver Creek watershed allocated as old growth consistent with Green et al (2011; PF Doc. VEG-R20) definitions; the

proportion and acres of affected old growth management units allocated as old growth consistent with Green et al (2011; PF Doc. VEG-R20) definitions; and the minimum, maximum and mean patch size of allocated old growth patches for the affected Old Growth Management Units.

- The proposed harvest would generate **openings in excess of 40 acres**. This sub-issue is measured by the number of new management created openings exceeding 40 acres and the number of management created openings by opening size class.
- Proposed road decommissioning may reduce **access for future vegetation management**. This issue is measured by estimating acres of land that would be inaccessible via road for mechanical vegetation management activities if proposed decommissioning were completed.

3.1.2. Affected Environment and Existing Conditions

3.1.2.1. Methodology

The Forest Vegetation Simulator (FVS) model and the suite of tools that support it were developed from the Prognosis model. FVS was originally developed in 1973 and has been used extensively across the U.S for vegetative analysis since 1983. The FVS analysis for the Beaver Creek Resource Area used the forest pest and fire/fuel extensions to predict forest stand dynamics through time given variable management regimes (PF Doc. VEG-6). FVS provided a variety of information for the Beaver Creek analysis including species composition, size of trees and fire/fuels parameters. Documentation of these FVS items are found in PF Docs.: VEG-6; USDA, 1994 VEG-R61; Dixon, 2002 VEG-R2; Crookston, 1999 VEG-R3; Frankel, 1998 VEG-R4; Reinhardt and Crookston, 2005 VEG-R5; and McGaughey, 2002 VEG-R6. Keywords, output, detailed tables of information and pertinent portions of FVS references used in this analysis are found in the project file (PF Doc. VEG-6, Dixon, 2002 VEG-R2; Crookston, 1999 VEG-R3; Frankel, 1998 VEG-R4; Reinhardt and Crookston, 2005 VEG-R5; and McGaughey, 2002 VEG-R6).

A patch analysis was used to describe landscape pattern, arrangement and patch size. This analysis is found in the project file (PF Doc. VEG-7). A separate patch analysis was completed for old growth related Forest Plan Standards and analysis and is found in the project file (PF Doc. VEG-34).

The Forest Service Activity Tracking System (FACTS) database hosts the past, present and planned future activities. The Field Sampled Vegetation (FSVeg) database stand data and other associated stand level component data such as Special Use Codes.

Information on the Beaver Creek Resource Area from before about 1976 was drawn from historic references, including maps, photos and newspapers. FACTS activity acre figures represent acres of the specified activity, not necessarily stand acres. Some stands may have had multiple activities or harvests. Existing conditions reflect past natural disturbances and management activities, including harvest. A list of harvest, non-harvest and fire activities by stand can be found in the Project File (PF Doc. VEG-2). A detailed description of individual data items and their validation methodology for the Beaver Creek vegetation analysis can be found in PF Doc. VEG-4. Silvicultural diagnosis information associated with the Beaver Creek Resource Area can be found in PF Doc. VEG-3. Information regarding existing vegetative conditions on private lands within the resource area was based on information provided by aerial photo interpretation and observations made by project team specialists.

Past activities at the stand scale are derived from a variety of sources including stand exam field data (found in the national database FSVeg), photo interpretation, contract accomplishments, historical records/maps and field observations. A summary of past activities is available in Chapter 2 and Appendix A.

ArcView/ArcMap spatial computer software was used extensively to analyze existing conditions and compare alternatives. Stand base maps and basic stand data as well as explanations on how to use available IPNF GIS data sets are found on the IPNF world wide web page at http://www.fs.usda.gov/ipnf. From the home page select the following links "Maps & Publications/IPNF GIS Data."

Various silvicultural, ecology, fire/fuels and insect and disease references were used to develop this analysis and are cited in the list of references. A more extensive list of vegetative references was used in the analysis; those are in the reference portion of the silvicultural section of the project file.

3.1.2.2. Spatial and Temporal Context for Effects Analysis

The spatial analysis area used to develop existing vegetative conditions and to assess direct, indirect and cumulative effects to forest vegetation includes the area encompassed by the Beaver Creek Resource Area boundary (for a map see Figure 1 from Chapter 1), except when discussing allocated old growth. The direct, indirect and cumulative effects analysis area for allocated old growth includes the area encompassed by Old Growth Management Units (OGMU) 115, 116 and 122 (PF Doc. VEG-31). Where appropriate, information is provided at both the resource area scale and old growth management unit scale. Old-growth is analyzed at the OGMU scale because there are specific Forest Plan standards related to old-growth management units. The Beaver Creek Resource Area is used for all other measures because it encompasses a complete watershed that is large enough to assess effects to forest vegetation at both mid-scale landscape and fine scale (stand). Landscape scale effects of the proposed action alternatives would have been diluted or un-measureable at a larger scale.

The temporal scale of the analysis is approximately 80-90 years. Effects to vegetation can be modeled for longer time frames but confidence in the modeled outputs decline substantially beyond 100 years primarily due to accumulation of assumptions and unknowns. Unknowns may include occurrences of insect outbreaks, fires, natural regeneration densities and compositions, and storms. Because these are unknowns assumptions must be made about whether they occur or not, their magnitude and severity if they occur and other factors. As simulation lengths increase the burden of assumptions and unknowns increase.

Existing and historic conditions at the Coeur d'Alene River Basin scale are included in the existing conditions section to illustrate the broad landscape context of the Beaver Creek Resource Area to show supporting information that contributed to development of desired future conditions for the resource area.

The Coeur d'Alene River Basin is approximately 1.5 million acres in size, of which three-quarters of a million acres are managed by the Forest Service. The Beaver Creek Resource Area is located in the east central portion of the Coeur d'Alene River Basin and is approximately 28,188 acres. About 24,839 acres of the resource area are National Forest System lands.

Table 14. National Forest System acres that are potentially capable of supporting old-growth forest in each of the OGMUs affected by the proposed Beaver Creek action alternatives.

OGMU	115	116	122
Acres	8,138	8,295	11,661

OGMU 123 was not included in detailed analysis because the proposed activities would have no direct or indirect effects to allocated old growth in OGMU123. A small portion of OGMU 123 is included in the northern portion of the Beaver Creek Resource Area in Carpenter Creek. There are no proposed harvest activities in this area therefore there would be no direct or indirect effects to old growth in this OGMU as a result of harvesting. There is one proposed burn unit within this portion of OGMU 123. This burn unit does not directly or indirectly affect existing or potential old growth because it occurs outside of allocated old-growth and is intended to burn open patches of grass and shrubs on a dry south slope that has very little timber so there would be no effect to old growth in OGMU 123. Currently, 10.8% of OGMU 123 is allocated.

3.1.2.3. Ecosystem Disturbances

Ecologist Aldo Leopold once referred to ecosystem health as the capacity of the land for self-renewal. Forest health has been defined as the condition of a forest when it is resilient to change, biologically diverse over a large area, and able to provide a sustained habitat for vegetation, fish, wildlife and humans (Deffer-Robinson et al, 2006, PF Doc. VEG-R69). Resiliency is the ability of the ecosystem to respond to disturbances. Resiliency is a measure of repetition or redundancy of ecosystem processes and therefore an indicator of ecosystem fragility (Borman and Likens, 1979 in: Toman and Ashton, 1996, page 370; PF Doc. VEG-R33). Resiliency is one of the characteristics that enable the ecosystem to persist in many different states or successional stages. For this analysis the primary ecosystem disturbance agents include fire, insects, disease, and timber harvest.

3.1.2.3.1. Fire in the Coeur d'Alene River Basin and Beaver Creek

Although fire is often discussed along with habitat type groups an additional broader picture of fire as a disturbance agent and its spatial and temporal characteristics at various basin and watershed scales is needed to provide context for the interactions of fire amongst the habitat groups.

Prior to European settlement in the Coeur d'Alene River Basin, fire was the most important disturbance occurring across the landscape. For additional discussion on the role of fire and fire history in the Beaver Creek Resource Area, see the Fire/Fuels section (3.2) and the Silviculture Report (PF Doc. SR-01).

3.1.2.3.2. Diseases in the Coeur d'Alene River Basin and Beaver Creek Resource Area

Disease trends for 2007-2009 are reported for the IPNF in the 2010 Forest Plan Monitoring Report (USDA, 2010, page 17-19; PF Doc. CR-022). Additional information regarding disease status in the Beaver Creek Resource Area is based on annual aerial detection flights for insects and disease identification, stand exams and silviculturist field reconnaissance (PF Docs. VEG-01, VEG-02, VEG-03, and VEG-04), and photo interpretation. Additional discussion on the role and trend of root diseases, white pine blister rust and dwarf mistletoes in the Beaver Creek Resource Area can be found in the Silviculture Report (PF Doc. SR-01).

3.1.2.3.4. Insects in the Coeur d'Alene River Basin and Beaver Creek Resource Area

Insect trends for 1988-2009 are reported for the IPNF in the 2007-2009 Forest Plan Monitoring Report (page 17-19, PF Doc. CR-022). Insect status is based on annual aerial insect and disease detection flights, stand exams (VEG-04), field reconnaissance (PF Doc. VEG-02), and photo interpretation. Bark beetles common to the Coeur d'Alene River Basin include mountain pine beetle, western pine beetle, Douglas-fir beetle, and fir engravers. While the effects of disease most often create change over long periods of time, insect mortality is often more immediate and obvious. These insects have always been present in this ecosystem causing dramatic effects on the landscape when conditions allow. The greatest biological factor affecting bark beetle populations is often the availability of food, which is determined by the condition of host species within the forest. Short-term increases in fuel loading (due to bark beetle caused tree mortality) may have historically led to increased fire intensity and severity, leading to development of small to large openings conducive to regeneration of early seral species. In some cases, insect infestations may have contributed to large stand-replacing fires (USDA, 1998, p. 30; PF Doc. CR-025). Additional discussion on the roles of insects - particularly mountain pine beetle, Douglas-fir beetle and fir engravers - can be found in the Silviculture Report (PF Doc. SR-01).

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.

Approximately 46% of the Coeur d'Alene River Basin has a moderate to high probability of insect and disease agents affecting the timber vegetation (USDA, 1998, page 29; PF Doc. CR-025).

Both insects and diseases continue to be dynamic components of most forested acres within the Beaver Creek Resource Area. Examination of many dead and dying trees within the resource area and vicinity by district personnel as well as Forest Protection Staff entomologists and pathologists have revealed the presence of a number of diseases and bark beetles.

Figure 10. *Armillaria sp.* Infection in a Douglas-fir tree in proposed Unit 69.

Figure 11. Very heavy fuel loading in proposed Unit 84 as a result of mortality caused by mountain pine beetle in lodgepole pine and excessive stand density.

3.1.2.3.5. Timber Harvest in the Beaver Creek Resource Area

Approximately 10,427 acres of timber harvest has occurred on National Forest System lands in the resource area since 1910 (Table 15). Over half of the harvests were sanitation/salvage. Because we do not know exact locations or the types of trees harvested with this harvest activity, it is not clear if this salvage changed successional pathways. Many of the stands were salvaged due to white pine blister rust and/or bark beetles mortality. Where extensive and/or repeated salvage occurred in stands, shade-tolerant trees have gained developmental advantage.

Shelterwood, seed tree, and clearcut harvests are included in the even aged (EA Regen Harvest) column of Table 15. Patch clearcut, individual tree selection, and group selection harvests are included in the uneven aged (UA Regen Harvest) column of Table 15. Improvement, commercial thin, shelterwood preparation, seed tree preparation cuts and special product removals are included in the Partial Harvest column.

While some of these areas have had multiple harvest entries, it is not always possible to track in the current database if the same acres were harvested (or had other non-harvest activities) on the re-entries because stands are often larger than the recorded activity acres. It is reasonable to have multiple harvest entries on some areas because certain silvicultural systems require multiple entries (e.g. 85 acres of permanent land clearing, recorded in 2010, was maintenance clearing of the original permanent land clearing associated with the establishment of the powerline corridor through the resource area and therefore shares the same spatial footprint).

The actual foot print of harvesting in the resource area is less than the grand total of all harvesting as shown in Table 15 because some of the past harvests overlap each other spatially.

Table 15. Acres of past timber harvest activities on NFS lands in the Beaver Creek Resource Area prior to 2010, by decade (source of harvest acres is the FACTS database).

Harvest Decade	Sanitation/ Salvage	Partial Harvest	Uneven-Aged Regeneration Harvest	Even-Aged Regeneration Harvest	Overstory Removal
1910-1919	1168	0	0	0	0
1920-1929	627	0	0	0	0
1930- 1939	215	0	0	0	9
1940-1949	0	0	0	0	0
1950-1959	288	0	0	11	0
1960-1969	1,013	0	0	123	508
1970-1979	829	198	0	52	206
1980-1989	878	96	0	401	153
1990-1999	126	0	116	2,538	7
2000-2009	288	69	0	169	16
2010-2012	0	47	0	0	85

3.1.2.4. Existing Forest Composition in the Coeur d'Alene River Basin and Beaver Creek Resource Area

The findings of the Geographic Assessment indicate that there has been a tremendous change in species composition within the Coeur d'Alene River Basin over the last 100 years (USDA, 1998, pages 36-37; PF Doc. CR-025). This change is also consistent with the Upper Columbia River Basin Assessment (USDA, 1997; PF Doc. VEG-R10) and Northern Region Overview (USDA, 1998; PF Docs. VEG-R8 and VEG-R9). While the Forest Plan does not mandate management at the levels of historic species compositions and structures (or size classes), these are helpful reference points to understand what trends may be needed over the long term to increase resiliency in the ecosystem. It should be recognized that it may not be desired or feasible to return to actual historic conditions.

3.1.2.4.1. Forest Cover Types

Forest cover types describe the dominant tree species in a given stand. Long-lived seral species (western white pine, western larch and ponderosa pine) have declined within the Coeur d'Alene River Basin as a result of changes in the role of fire, white pine blister rust, and selective harvesting that tended to remove these species while leaving species such as grand fir, hemlock and Douglas-fir (Figure 12). Neuenschwander et al. (1999; PF Doc. VEG-R18) provides a comprehensive discussion of the historic role and presence of western white pine throughout its range as well as a robust discussion of its rapid decline through the 20th century.

Given the history of fire suppression and loss of the white pine (on moist sites) over the last 100 years, current forest cover types within the Beaver Creek Resource Area contain much more Douglas-fir and grand fir than existed historically in the area. Currently Douglas-fir, grand fir and western hemlock dominate the landscape on both dry and moist habitats. White pine, western larch and ponderosa pine together represent only 6% of the forest cover types in the Beaver Creek Resource Area (Table 16). This is a substantial departure from the historical distribution of conifer species in this area. Douglas-fir, grand fir and western hemlock forest cover types occur on about 71% of the resource area. Table 16 displays the historic distribution of forest cover types in the Coeur d'Alene River Basin and the current distribution of cover types in the Beaver Creek Resource Area.

Table 16 also displays the desired future condition for forest cover types on National Forest System lands in the Beaver Creek Resource Area. At the Coeur d'Alene River Basin scale (all ownerships) the white pine cover type has substantially declined in the past 100 years due to blister rust and selective harvesting (USDA, 1998, p. 36-37; PF Doc. CR-025), while grand fir and western hemlock cover types substantially increased as they have replaced white pine (Geographic Assessment, pp. 31 and 36-37; PF Doc. CR-025). Larch forest types have also decreased due to selective harvesting and fire suppression, while the Douglas-fir type has replaced larch and white pine (USDA, 1998, p. 37; PF Doc. CR-025).

As a result of fire suppression in a very productive ecosystem, woody dead fuels and multi-story stand structures are increasing. The Coeur d'Alene River Basin showed the largest increase in forest fuels of any sampled watershed in the Interior Columbia Basin Assessment Area. Wildfire risk appears to be increasing (USDA, 1998, p. 29; PF Doc. CR-025).

Other ownerships within the resource area were generally assigned a forest cover type of unknown. Lands classified as unknown currently account for approximately 9% of the resource area. Approximately 3% of the resource is classified as non-forest.

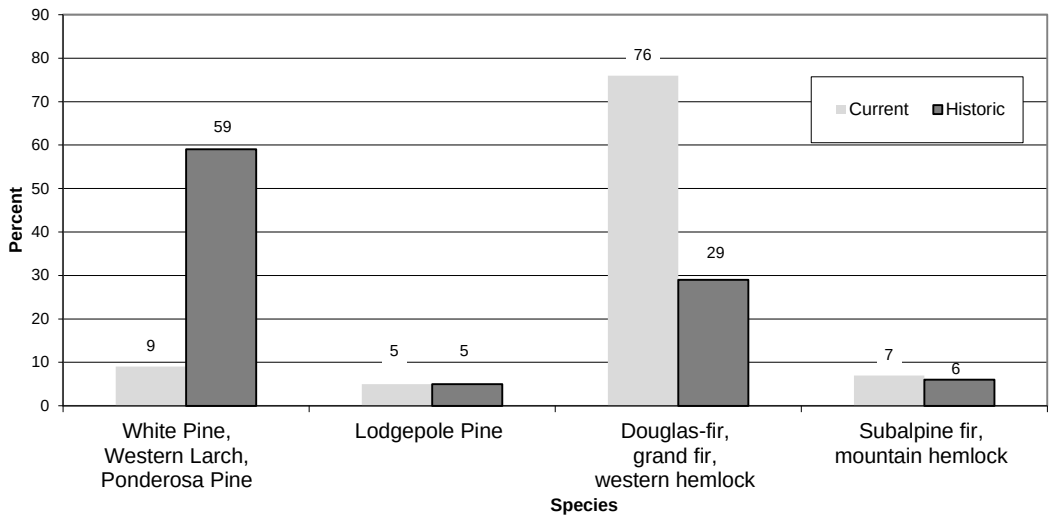


Figure 12. Current and Historic Forest Cover Types on National Forest System lands in the Coeur d'Alene River Basin (PF Doc. VEG-10).

Table 16. Forest Cover Types in the Beaver Creek Resource Area (PF Doc. VEG-07).

Forest Type	Historic – Coeur d'Alene River Basin (percent)	Existing – Beaver Creek (percent)	Desired Future Condition - Beaver Creek (percent)
Subalpine fir/ Mountain hemlock	6	2.2	0-5
Lodgepole pine	5	4.0	0-5
Western red cedar	2	5.6	5-10
Grand fir/ Western hemlock	5	25.9	10-20
Douglas-fir	24	44.7	20-30
White pine	44	1.2	30-40
Western larch/ Ponderosa pine	14	4.8	10-20

Forest Cover Type Patch Metrics

A patch analysis of forest cover types was completed for the resource area (Table 17). Total edge is the sum total of the edge (perimeters) of all patches in a given forest cover type. Mean patch edge is the average edge per patch. High values for edge metrics indicate large patch sizes and/or complex patch shapes and vice versa for low values. The number of patches is simply a count of all the patches for a given class. Mean patch size is the average patch size of all patches in a given class. Median patch size is the numerical value separating the higher half of the patches in a given class from the lower half. The minimum and maximum patch sizes are the acreages of the smallest and largest individual patches for a given forest cover type. Patch size coefficient of variation is the ratio of the patch size standard deviation of a given class to its mean patch size. The patch size standard deviation shows how much variation or dispersion exists from the mean patch size for a given class. The class area reports the total area for a given forest cover type.

Douglas-fir forest cover types have the largest mean and maximum patch sizes in the resource area, followed by grand fir and hemlock respectively (Table 17). Douglas-fir, grand fir and western hemlock forest cover types occupy approximately 71% of the landscape area within the Beaver Creek Resource Area. Collectively, ponderosa pine, western white pine, and western larch comprise approximately 6% of the forest cover types within the resource area and tend to have some of the smallest mean patch sizes.

Historically western larch, western white pine and ponderosa pine forest cover types had greater extent and connectivity in the Beaver Creek Resource Area than they do currently.

Table 17. Landscape metrics for existing forest cover types on National Forest System lands in the Beaver Creek Resource Area.

Class	# of patches	Total edge (miles)	Mean patch edge (miles)	Mean patch size (acres)	Median patch size (acres)	Maximum patch size (acres)	Minimum patch size (acres)	Patch size coefficient of variation (acres)	Patch size standard deviation (acres)	Class area (acres)
All Classes	210	552.7	2.7	135.0	38.5	4391.5	1.2	753.2	411.3	28,070.8
Unknown	19	16.3	16.3	2,477.7	2,477.7	2,477.7	2,477.7	0.0	0.0	2,477.7
Cedar	28	58.0	3.1	82.3	48.1	297.0	2.9	261.6	87.1	1,564.1
Douglas-fir	47	182.6	6.5	447.9	91.5	4391.5	10.2	506.7	918.3	12,540.3
Grand fir	23	136.3	2.9	131.1	45.5	958.1	2.2	370.7	196.7	6,163.9
Larch	21	30.7	1.3	44.8	35.6	160.7	10.1	184.5	33.5	1,031.0
Lodgepole	3	32.5	1.5	53.5	31.0	175.8	6.5	218.6	47.4	1,124.5
Mountain Hemlock	19	6.1	2.0	48.1	49.7	49.8	44.9	11.7	2.3	144.4
Non-forest	13	28.0	1.5	41.0	11.4	551.9	1.2	726.9	120.7	779.5
Ponderosa	6	11.5	0.9	23.4	22.9	51.0	3.2	159.6	15.1	304.7
Subalpine fir	1	10.0	1.7	79.0	44.8	209.4	4.9	240.0	76.7	473.9
Western hemlock	20	31.0	1.5	55.8	41.4	196.1	2.9	212.6	48.0	1,116.6
White pine	8	9.7	1.2	43.8	28.7	100.1	8.1	189.7	33.6	350.3

3.1.2.4.2. Existing Forest Structure

Structural Classes

Table 18 lists the historic fires and estimated acreages by fire that affected the Beaver Creek Watershed. These fires were primarily stand replacing events but it appears that some individual trees, clumps and stands did survive and were widely distributed throughout the larger burned areas. It is possible that the 1885 fire event was more extensive in acreage but was obscured by overlap from the 1889 fire. It is also likely that the fires of 1900 and 1908 overlapped portions of the 1889 fire. The extent of any overlap is unknown. The last known significant wildfire fire in Beaver Creek occurred in 1908.

Table 18. Historic fire acreages in the Beaver Creek Drainage.

Fire Year	Acres
1885	761.4
1889	23,259.8
1894	1.6
1900	601.3
1908	934.8
1910	3.6

The following figure displays current forest structure and historic ranges of forest structure at the Coeur d'Alene River Basin scale.

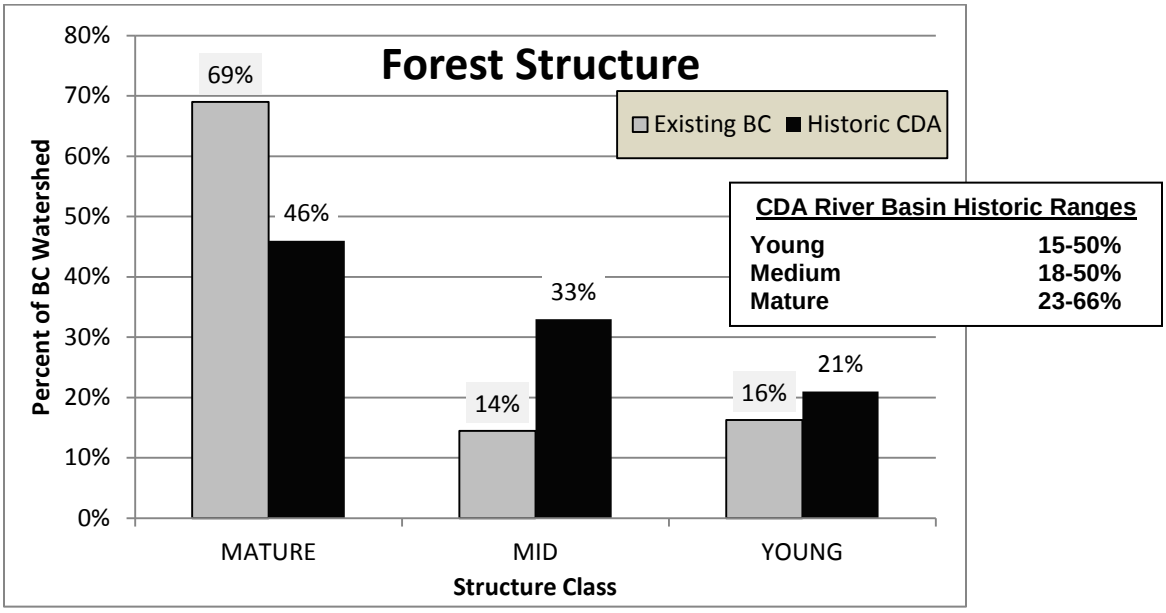


Figure 13. Existing Beaver Creek Resource Area and historic Coeur d'Alene River Basin forest structure class proportions (PF Doc. VEG-10).

Young structure class: Forest stands less than 30 years old, most often resulting from natural events (such as fire) or past regeneration harvests. Stands usually have average tree diameters less than 5 inches at breast height. Some stands may have a considerable number of overstory trees; others may have no large tree component. This stage may also include stands that are non-tree cover such as shrubs and grass.

Medium structure class: Stands generally 30 to 100 years old. These stands may have resulted from fires or may represent natural or artificial regeneration following harvest. Most of these stands can be expected to be quite dense, with high stocking levels and closed canopies. Average tree diameters are greater than 5 inches at breast height.

Mature structure class: Stands over 100 years old, generally resulting from fires prior to 1900 and presently quite varied in appearance. Stand conditions differ in species composition, structure, and canopy closure as a result of disturbances caused by insect mortality, root disease and other pathogens, fires, past harvest activity, or growth potential of the site including soil conditions. Stands unaffected by these will be dense and have fairly closed canopies for the site. Stands affected by these disturbances may have canopies ranging from open to dense. Average tree diameters are greater than 9 inches at breast height. A subset of the mature, large timber structural stage is allocated old growth.

The establishment of natural regeneration following large stand replacing events can take as much as a decade or more, depending upon availability of seed sources, density of competing shrubs and herbs, and climatic conditions following the fire event. This type of establishment results in similar age classes and structural stages (within 30 years) on much of the burned area. The majority of the areas affected by the 1889 fire event share this limited range of stand ages, with the exception of stands where management activities have occurred. Limited ranges of age class diversity are addressed in the Forest Plan (USDA, 1987, page II-1 to 2; PF Doc. CR-001) with a goal to increase future age class distributions.

Fires, harvesting and insect and disease mortality have, in combination, affected the distribution and arrangement of structural stages and within stand structure found in the Beaver Creek Resource Area today. Existing structural classes, by proportion of all ownership acreages in the resource area, are displayed in Figure 13. The combined effects of successional development, insects, and diseases in stands dominated by Douglas-fir and grand fir cause development of multi-story low to medium density stands with irregular stand level canopy cover. Stands resulting from this type of development that occur on Douglas-fir and/or grand fir habitat types tend to be unhealthy and have low vigor and are highly likely to stagnate in this condition because of repeated regeneration of disease susceptible species into disease infested sites. Mature multi-storied stands whose structure is the result of insect and/or disease mortality are likely to burn with high intensity and severity during a wildfire due to the presence of well distributed ladder fuels and moderate to high volumes of dead/down surface fuels.

Structure Class Patch Metrics

There have been changes over the last 100 years in the size and arrangement of patches across the landscape of the Coeur d'Alene River Basin. It was noted in 1998 that the large and mean patch size had decreased since the late 1800's in the Coeur d'Alene River Basin; patches became more linear, with accompanying increases in edge and decreases in core/interior habitats (USDA, 1998, p. 42; PF Doc. CR-025). This was especially true for areas of either early seral habitat (young structure) or late seral habitat (mature structure). This is true of forest young forest and medium structure classes in the Beaver Creek Resource Area; however, it is not true of the mature structure class in the resource area.

Extensive fire events that occurred in the late 1800's and early 1900's resulted in very large patches of young structure. As stands within these very large patches developed, they transitioned from the young structure class to the medium structure class at different rates. Some portions of these large burned areas were burned multiple times, occasionally resulting in persistent shrub dominated stands (young structure) of medium to small patch size thereby reducing large and mean patch sizes within the areas burned by the aforementioned large fires.

Portions of the landscape that had not burned were often the focus of harvesting activities due to lack of available timber in burned over areas. This is where the majority of past regeneration harvests occurred. Regeneration harvests have tended to be less than 40 acres in size and were often separated from one another by stands of medium or mature structure class. In addition, the large patches of young structure that resulted from past fires have grown into medium and mature structure overtime. This has resulted in increased fragmentation and smaller average patch sizes of young structure.

At the same time, medium structure classes have increased substantially as the very large forest patches develop and have been the primary matrix within which the smaller patches of young and mature structure classes are nested. Since it has been over 100 years since the last very large fire event (in 1910) much of the medium structure class is transitioning to mature structure, resulting in broad homogenization of the forest structure on the landscape. Although patch sizes of mature structure had declined as of the 1998 Geographic Assessment (USDA, 1998, p. 42; PF Doc. CR-025), they appear to be increasing again as more and more stands grow and age, transitioning into the mature structure class.

Table 19. Landscape metrics for existing structure classes on all ownerships in the Beaver Creek Resource Area.

	All	Mature	Mid	Young	Rock
Total edge (miles)	438.1	195.2	95.0	144.2	3.7
Mean patch edge (miles)	2.5	39.0	2.4	1.1	1.2
Number of patches	174	5	40	126	3
Mean patch size (acres)	161.3	3,873.2	101.4	36.2	27.9
Median patch size (acres)	29.0	40.3	39.5	27.3	31.5
Minimum patch size (acres)	1.2	23.9	2.6	1.2	9.3
Maximum patch size (acres)	19,211.2	19,211.2	1,101.2	658.3	42.9
Patch Size Coefficient of Variation (acres)	2,225.8	489.3	500.6	483.0	123.6
Patch Size Standard Deviation (acres)	1,453.2	7,669.0	205.4	70.9	13.9
Class area (acres)	28,072.2	19,365.9	4,055.7	4,566.9	83.6

A patch analysis of size classes was completed for the Beaver Creek Resource Area (Table 19). Patch edge metrics increase as patch size increases and/or as patch edge complexity increases. Although the mature structure class has the lowest number of forested patches it has the highest mean patch size and median patch size. In contrast, the young structure class has greatest number of patches and its mean patch size is a fraction the mean patch sizes of the medium and mature classes, indicating small dispersed stand-replacing disturbances within the resource area occur more often (primarily timber harvest) than large disturbances.

As patch size increases the extent of interior habitat generally increases (Forman and Godron, 1986, pg. 110; PF Doc. VEG-R199). This is true regardless of the classification assigned to a

patch (i.e. structure class, forest cover type, or any combination of classifications). Most of the stands of mature forest however do not contain substantial quantities of white pine, ponderosa pine or larch, all of which are noted as important species due to their tendency to become large and persistent snags. In the absence of large stand replacing disturbances the young structure will continue to occur in small fragmented patches and the regeneration of white pine, ponderosa pine and larch will be limited on the landscape because these species require full sunlight in order to become established and have competitive advantage over more shade-tolerant species.

Old Growth

Allocated old growth is a subset of the mature structural stage. A review of the old growth in OGMU's 115, 116 and 122 took place with this analysis. Forest Plan old growth standards/definitions were used (PF Docs. VEG-27, 28, 29, 32, 38) and validation included recent field exams (PF Docs. VEG-4 and VEG-33), field reviews and photo interpretation. Changes to old growth allocations resulting from this review in each affected OGMU are summarized in Table 20 and Table 21.

In summary, six previously allocated stands, totaling 408 acres are no longer allocated because they no longer meet minimum criteria. Twelve stands not previously allocated met old-growth definitions and are now allocated for a total of 717 acres of new allocation (PF Docs. VEG-31, VEG-32 and VEG-34). Many stands currently meet the number of trees per acre over the defined habitat type group size threshold, but they do not have enough trees that are both large enough and old enough to meet the minimum criteria to be allocated as old growth. Additional stands in the OGMU's may qualify as old growth (Special Use Codes 9 or 11) over the next 30-50 years although this depends on future natural disturbances.

Special Use Code 9 is assigned to stands that fully meet Old Growth minimum criteria as described in Green et al. (2011; PF Doc. VEG-R20). Special Use Code 11 is assigned to stands that are close to meeting minimum old growth criteria and/or are retained for old growth management to create large blocks, corridors, or logical old growth management units.

Table 20. Old Growth Allocation in Beaver Creek Resource Area and Old Growth Management Units (OGMU's) before and after the allocated old growth review.

Area	Compartments	Acres capable of supporting old growth	Acres (%) of allocated old growth in 2012, before review	Acres (%) of allocated old growth in 2013, after review
OGMU 115	191, 197	8,138	710 (8.7%)	710 (8.7%)
OGMU 116	189, 192	8,295	966 (11.6%)	909 (11%)
OGMU 122	188, 190	11,661	442 (3.8%)	601 (5.2%)
Beaver Creek Resource Area	188, 189, 190 191 and a portion of 187	24,570	666 (2.7%)	836 (3.4%)

Table 21. Changes to special use code (SUC) designations resulting from the recent review for OGMUs 115, 116 and 122.

OGMU	SUC-9 Unallocated (acres)	SUC-11 Unallocated (acres)	SUC-9 New Allocation (acres)	SUC-11 New Allocation (acres)	Changed from SUC-11 to SUC-9 (acres)	Changed from SUC-9 to SUC-11 (acres)
115	0	0	0	0	0	0
116	119	101	176	96	0	119
122	185	0	332	113	0	0
Total	304	101	508	209	0	119

Table 22. Minimum Maximum and Mean patch sizes of allocated old growth in each of the affected OGMUs.

OGMU	Maximum Patch Size (Acres)	Minimum Patch Size (Acres)	Mean Patch Size (Acres)
115	343	148	237
116	407	63	227
122	459	62	200

Maps of the three affected OGMUs and the currently allocated old growth are available in the project file (PF Doc VEG-31).

3.1.3. Management Framework

Guidance for vegetation management is provided through the following regulations, plans and policies:

- Forest Plan for the Idaho Panhandle National Forests (PF Doc. CR-002)
    - ❖ Old-growth standards 10a-10i
    - ❖ Timber standards 109
    - ❖ Forest protection standards 1-3
- Multiple-Use Sustained Yield Act of 1960
- Endangered Species Act of 1971
- National Forest Management Act of 1976
- Forest and Rangeland renewable Resources Planning Act of 1974
- Idaho Forest Practices Act
- Forest Service regulations and policy, including Forest Service Handbooks 1909.60 and 2409.17; and Forest Service Manuals 1920, 2470, 2471 and 2472.

3.1.3.1. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

3.1.3.1.1. Forest Plan Standards for Old Growth

More in-depth discussion on how some of the standards apply to the project and how activities are in compliance with the Forest Plan can be found in the Silviculture Report (PF Doc. SR-01).

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., 2011; PF DOC VEG-R20).

This standard applies to two landscape scales; the old-growth management unit (OGMU) scale (the Beaver Creek Resource Area includes OGMUs 115, 116 and 122) and the Forest (IPNF) scale. This standard is fully met under all alternatives.

Old Growth Standard 10b

Maintain at least 10 percent of the forested portion of the IPNF as old growth.

Alternative 1 does not propose any activities that would result in the loss of allocated old growth and is therefore consistent with this Forest Plan standard.

Neither of the action alternatives would affect allocated old growth because none of the proposed activities overlap with allocated old growth. Both action 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.

and

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%.

These standards apply at the Old Growth Management Unit (OGMU) scale only.

Standards 10c and 10d would be fully met under Alternative 1 and both Action Alternatives because none of the three alternatives proposed treatments in allocated old growth.

Old Growth Standard 10e

Old growth stands should reflect approximately the same habitat type series distribution as found on the IPNF.

This standard applies at the IPNF scale. All alternatives would be consistent with this Forest Plan standard because none of the alternatives would affect the distribution of habitat types of the existing old growth allocation on the IPNFs.

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.

This standard applies at the OGMU scale. None of the proposed activities in either of the action alternatives would cause a change to the current old growth allocation therefore old growth standard 10f is fully met under all alternatives.

Table 23. Disclosure of criteria to meet Forest Plan Standard 10(f), by Old Growth Management Unit (OGMU).

Criteria	OGMU 115	OGMU 116	OGMU 122
# patches	3	4	3
Smallest patch size	148	63	62
Largest patch size	343	409	429
# contiguous patches ≥300 acres[1]	1	1	1
# of patches ≥80 acres	3	3	2
# of patches ≥25 acres	3	4	3

[1] If there are no 300-acre patches, there should be stands greater than or equal to 100 acres (even though not contiguous), with a total of more than 300 acres within one mile.

Old Growth Standard 10g

Roads should be planned to avoid old growth management stands to maintain unit size criteria.

This standard applies at the OGMU scale. All alternatives comply with this standard.

Old Growth Standard 10h

A long-term objective should be to minimize or exclude domestic grazing within old growth stands.

This standard applies at the OGMU scale. This standard is met under all alternatives.

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.

This standard applies at the IPNF scale. This standard is met under Alternative 1 because no management activities are proposed. Neither of the action alternatives proposes activities that would reduce acres of allocated old growth in any of the four management areas therefore old growth standard 10i is also met under both action alternatives.

3.1.3.1.2. 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.

This requirement is not met under Alternative 1 because silvicultural activities designed to manage timber resources that are in declining conditions are not proposed in management areas with timber management emphasis (MA1) or components (MA 4 and MA6).

Under the action alternatives, treatments would include shelterwood harvesting with reserves, seedtree harvesting with reserves, aggregate retention harvesting, commercial thinning, improvement cutting, pruning (limbing, piling in fuelbreaks), and prescribed burning. These actions would promote stand structures and compositions, which reduce susceptibility in the present and future to insects, diseases, and wildfire. This standard is met under either action 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.

Salvage of trees damaged by prescribed burning would only occur with appropriate NEPA analysis; however, such salvage is not planned to occur under the action alternatives. Alternative 1 does not propose any salvage harvesting. This standard is met under all alternatives.

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) and the rationale displayed in environmental assessments. Changes from suitability classification will be done in accordance with the procedures outlined in Forest Plan Appendix M.

This standard is met under all alternatives because there are no proposed changes in land suitability in the Beaver Creek Resource Area.

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.

This requirement is met under Alternative 1 because there are no reforestation activities proposed.

All proposed regeneration harvest areas would be planted with native site-adapted rust resistant western white pine, western larch and/or ponderosa pine. All treatments would retain (to the extent possible) and promote resilient long-lived seral species and structures; therefore this standard is met for both action alternatives.

Timber Standard 5

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

This requirement is met under Alternative 1 because no harvest activities are proposed.

Proposed site preparation and/or fuel treatments may include a combination of prescribed underburning, and hand slashing and/or hand or machine piling depending on post-harvest conditions and silvicultural treatment needs; therefore this standard is met under both action alternatives.

Timber Standard 6

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

Access to private property in the Beaver Creek Resource Area would be maintained (PF Doc. TRAN-01); therefore this standard would be met under all alternatives.

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.

and

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 the Regional Guide. Lands in other ownership within or adjacent to National Forest land will be included in the analysis when planning openings.

These requirements are met under Alternative 1 because no harvest activities are proposed.

For clarity, under Timber Standard 8 all types of even-aged regeneration harvests (including shelterwood harvest with reserves and variable retention harvests) are considered openings after harvest regardless of the number of trees per acre retained.

The 2007-2009 Forest Plan Monitoring Report reviews the maximum size for harvest areas at the IPNF scale (USDA, 2010; PF Doc. CR-040). For the Beaver Creek Resource Area proposal, the public was informed during scoping that regeneration openings in excess of 40 acres were proposed (PF Doc. PI-26). A letter of approval to exceed the 40-acre opening size, with appropriate interdisciplinary analysis and documentation, would be issued by the Regional Forester prior to project decision. The action alternatives would create openings on the landscape that are closer in scale and pattern to the openings developed under historic disturbance regimes for this resource area. Proposed harvest openings greater than 40 acres are identified and displayed and discussed in Table 28 and Table 29 and associated text discussions, in the cumulative effects discussion relative to opening sizes and in Project File (PF Doc. VEG-25). This standard would be met for both action alternatives.

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.

Alternative 1 (no action) would not meet this standard because it does not respond to the management needs identified stand level diagnoses or in this analysis.

All vegetative treatments have silvicultural diagnosis (PF Doc. VEG-3) and prescriptions approved by a certified silviculturist prior to project implementation. This standard would be met under **either action alternative.**

3.1.3.1.3. 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.

and

Forest Protection Standard 2

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

Alternative 1 would not use integrated pest management methods or reduce the perpetuation of pest problems; therefore Alternative 1 would not meet Forest Protection Standards 1 and 2.

In combination with design features (Appendix E, Features Designed to Improve Vegetation Management) the proposed treatments in each of the action alternatives would reduce adverse effects associated with pests where feasible. Each of the action alternatives would meet these two Forest Plan standards.

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.

This requirement is met under Alternative 1 because no management activities are proposed.

Proposed vegetative treatments would utilize a combination of fire, hand treatment and natural and mechanical methods. Forest vegetation treatment using chemicals (excluding weed treatments) is not proposed under either action alternative; therefore this standard is met under either action alternative.

3.1.3.1.4. Consistency with Rangeland Renewable Resource Planning Act (RPA)/NFMA

Assure that technology and knowledge exists to adequately restock lands within five years after final harvest.

Technology and knowledge exist to adequately restock lands within five years of final harvest; therefore, this requirement is met under both action alternatives.

This requirement does not apply under Alternative 1 because no harvest activities are proposed.

Consider potential effects on residual trees and adjacent stands.

The analysis considered the effects on residual trees and adjacent stands; therefore this requirement is met (PF Doc. VEG-3) under both action alternatives.

This requirement does not apply under Alternative 1 because no harvest activities are proposed.

No timber harvest, other than salvage sales or sales to protect other multiple-use values, shall occur on lands not suitable for timber production.

Harvest unit layout will consider suitability limitations on an on-the-ground, site-by-site basis. Timber harvest is not proposed on unsuitable sites; therefore this requirement is met for both action alternatives.

This requirement does not apply under Alternative 1 because no harvest activities are proposed.

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.

Silvicultural diagnosis and target stand descriptions have been completed (PF Doc. VEG-3 and VEG-9). This requirement is met for both action alternatives.

This requirement does not apply under Alternative 1 because no harvest activities are proposed.

3.1.4. Environmental Consequences

3.1.4.1. Alternative 1 (No Action)

3.1.4.1.1. Direct and Indirect Effects of Alternative 1

Direct and Indirect Effects to Opening Sizes under Alternative 1

There would be no changes to the size, number or locations of openings under Alternative 1 because there are no activities proposed that would expand existing openings or create new openings.

Direct and Indirect Effects to Forest Cover under Alternative 1

Without periodic wildfires, forest cover types will trend toward climax species (Douglas-fir/grand fir/western hemlock) (Byler and Hagle, 2000, p.2-244; PF Doc. VEG-R34). As with the rest of the Coeur d'Alene River Basin, root disease will continue to be the most significant landscape altering process. Drought and fire susceptible, shade tolerant tree species will dominant the landscape (USDA, 1998, p.29; PF Doc. CR-025). In an ecosystem that is subject to periodic droughts (USDA, 1998, p.31; PF Doc. CR-25), the scale of area under climatic stress makes it very likely to see future large-scale insect and disease problems that are historically unprecedented (USDA, 1998, p.31 PF Doc. CR-025; Vose and others, 2012 PF Doc. VEG-R196). The most concise reference describing successional pathways with incorporation of root diseases is Byler and Hagle, 2000 (FHP Report No. 00-09, 10 and 11, PF Doc. VEG-R34). Dead woody fuels and multi-story stand structures are rapidly accumulating in this very productive ecosystem.

The Coeur d'Alene River Basin showed the largest increase in forest fuels of any sampled in the Interior Columbia Basin Assessment Area since Euro-American settlement. Subsequently, wildfire risk appears to be growing (USDA, 1998, p.29; PF Doc. CR-025) in the Beaver Creek Resource Area as well as the Coeur d'Alene River Basin. The effects of a given fire depend on the specific conditions (fuels, fuel arrangement, weather conditions, etc.) at the time the fire occurs at any specific point on the landscape. The availability of white pine, larch, and/or ponderosa pine seed sources would not improve relative to existing conditions. As a result, the successional development of many stands, following a naturally occurring stand replacing event such as a severe fire, would begin with shrubs and Douglas-fir/grand fir regeneration in the early seral stage because Douglas-fir and/or grand fir seed are the predominant seed on or adjacent to the affected site.

The following discussion is applicable at both the stand and resource area scales. Figure 14 compares the existing distribution of forest cover types and the potential resulting forest cover types that would occur if either of the action alternatives were implemented in the Beaver Creek Resource Area. Under Alternative 1, activities to restore forest vegetation toward increased resiliency would not be implemented. Forest cover types in the short term would continue to be comprised predominantly of Douglas-fir, grand fir and western hemlock. The ponderosa pine (PP), white pine (WP), and larch (L) forest cover types would remain steady and may increase slightly over time. This increase would be slight because most of the stands having these three cover types are young stands that originated from even aged regeneration harvest followed by planting of these early seral species.

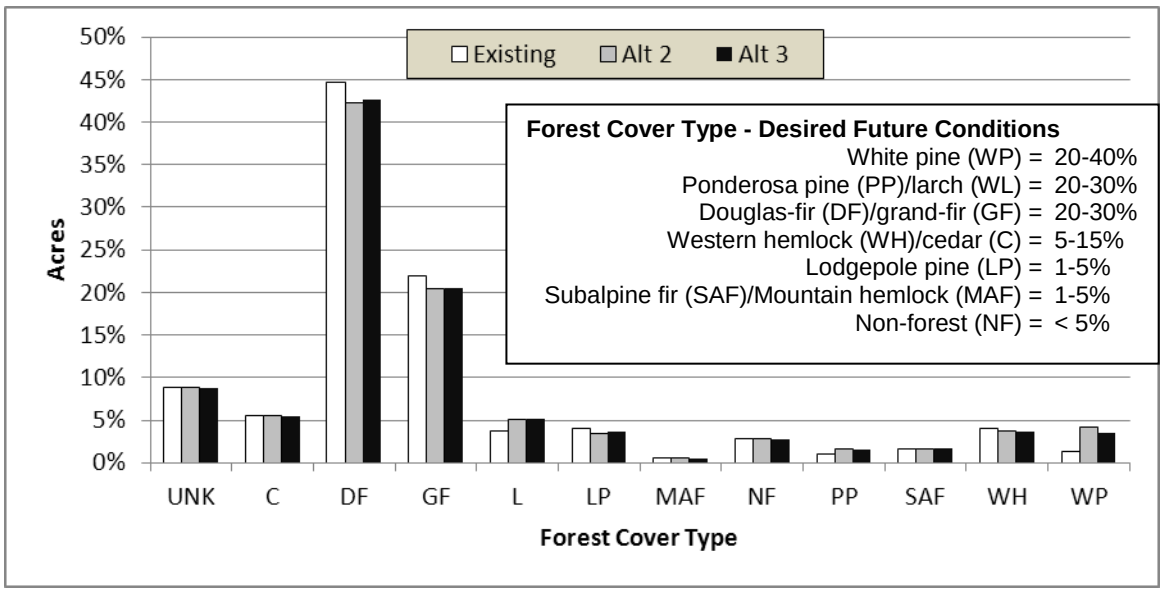


Figure 14. Comparison of Forest Cover Types on NFS lands in the Beaver Creek Resource Area.

Stand examination data was available in a format that could be used in the Forest Vegetation Simulator (FVS) for approximately 11,041 acres of the National Forest System lands in the resource area. This data included stand conditions from sapling size stands resulting from past regeneration harvesting to unmanaged mature and old growth stands. To simulate Alternative 1 (no action), growth of the stands was modeled over an 80-year period in order to detect trends in the forest cover type changes within the Beaver Creek Resource Area over time.

Potential wildfire occurrences were not estimated or modeled in this simulation because of inherently high variability in location of ignitions, management responses, and conditions at time and location of a given fire. Low to moderate root disease infection was simulated in the

modeling runs in order to account for moderate endemic mortality from native and non-native biotic agents (i.e. root diseases, white pine blister rust, bark beetles). Table 24 is a summary of the results of this modeling effort and lists acreages and percent change by species group by 20 year period with a baseline year of 2013.

While this simulation is not inclusive of all National Forest System lands in the resource area, it does include a substantial sample of those lands and provides a reliable sense of the potential trends for stand development throughout the Beaver Creek Resource Area.

Table 24. Projected changes in forest cover type over an 80-year simulation on 11,041 acres of NFS lands in the Beaver Creek Resource Area.[1]

Forest cover type	Acres in 2013 (existing)	Acres in 2033 (% change)	Acres in 2053 (% change)	Acres in 2073 (% change)	Acres in 2093 (% change)
Ponderosa pine, white pine, western larch	668	816 (+22%)	909 (+30%)	1,420 (+83%)	1,614 (+67%)
Douglas-fir, grand fir, western hemlock	9,574	8,958 (-6%)	8,147 (-16%)	7,404 (-27%)	6,585 (-40%)
Western red cedar	432	926 (+114%)	1,645 (+131%)	2,004 (+96%)	2,459 (+101%)
Subalpine fir, mountain hemlock	53	60 (+13%)	77 (+40%)	156 (+134%)	148 (+61%)
Lodgepole pine	302	281 (-7%)	249 (-19%)	0 (-121%)	0
Nonforest	12	0	14	57 (+321%)	235 (+391%)

[1] Positive numbers are increases in acreage over existing, negative numbers are decreases in acreage over existing.

Over time, Douglas-fir/grand fir/western hemlock cover types decline gradually with the majority of the decline occurring in the Douglas-fir forest cover type in particular. Grand fir and western hemlock cover types replace Douglas-fir in some stands through successional stand development. Grand fir and some Douglas-fir forest cover types would be replaced by western hemlock or western red-cedar on the more mesic habitat types through successional development (a mesic habitat is one with a moderate or well-balanced supply of moisture). The quantity of grand fir cover types therefore remains relatively stable within the resource area. Douglas-fir, grand fir and western hemlock would still be the predominant forest cover types within the resource area, collectively occupying approximately two and a half times more area than the next largest forest cover type.

The western red-cedar cover type increases over time through natural succession on many of the most moist habitat types as it replaces dying Douglas-fir and grand fir. The western hemlock cover type increases modestly as it also replaces dying fir trees.

The ponderosa pine, western white pine and western larch forest cover types are projected to increase slightly but this increase is projected to occur almost exclusively in previously regenerated stands that were planted with these species. Nearly all of these young stands have substantial quantities of natural regeneration of lodgepole pine, grand fir, Douglas-fir, western hemlock, and western red-cedar. They often have some amount of natural white pine and western larch regeneration as well. Natural regeneration of ponderosa pine also exists but is not as prevalent or as widespread as the other listed species. Many of these young stands are currently dominated by Douglas-fir/grand fir/western hemlock due to high rates of natural regeneration that

have led to greater stocking levels of these shade-tolerant species than any others. However, ponderosa pine, white pine and western larch are projected to persist and dominate over time in some stands, which is why these ponderosa pine/white pine/western larch cover types are projected to increase.

Lodgepole pine effectively loses dominance in all the projected stands. There is also a slight increase (in terms of acreage) in the non-stocked stands as some of the dry Douglas-fir stands are projected to deteriorate to the point that they are no longer have enough live conifer trees to be considered a forested stand.

The western hemlock cover type is projected to increase over time. The western red cedar cover type is also projected to increase over time, but to a lesser degree than the western hemlock cover types due to its limited range in the resource area (PF Doc. VEG-6). Acreage of non-forested stands may decrease slightly as conifers encroach on sites dominated by grasses, forbs, and/or shrubs. Lodgepole cover types would also decrease due to successional development over time. Mountain hemlock and subalpine fir forest cover types would likely increase slightly overtime.

The unknown category occurs in the Beaver Creek Resource Area on ownerships other than National Forest System; stand level forest cover type data was unavailable for these lands at the time of analysis.

Under Alternative 1 the projected trends in forest cover type move away from the desired future conditions.

Forest Cover Type Patch Metrics

Douglas-fir forest cover types have the largest mean and maximum patch sizes in the resource area, followed by grand fir and hemlock respectively (Table 17). Douglas-fir, grand fir and western hemlock forest cover types occupy approximately 71% of the landscape area within the Beaver Creek Resource Area. Collectively, ponderosa pine, western white pine, and western larch comprise approximately 6% of the forest cover types within the resource area and tend to have some of the smallest mean patch sizes.

Douglas-fir, grand fir and western hemlock forest cover types form the matrix, or predominant forest cover type complex within the resource area while ponderosa pine, western white pine and western larch occupy relatively small isolated patches within the matrix. The small patches of white pine, ponderosa pine and larch are therefore isolated and fragmented while the large patches of Douglas-fir, grand fir and western hemlock are extensive and connected.

Under Alternative 1, there would be little or no change in patch metrics of western larch, western white pine or ponderosa pine forest cover types.

Historically western larch, western white pine and ponderosa pine forest cover types had greater extent and connectivity in the Beaver Creek Resource Area than they do currently. See the discussion on the desired condition for patch metrics in the Silviculture Report (PF Doc. SR-01) for a more detailed discussion of desired landscape arrangement conditions.

Direct and Indirect Effects to Stand Level Forest Structure under Alternative 1

The following discussion of both structure classes and canopy cover are applicable at both the stand and resource area scales.

Structure Classes

Nearly all of the stands on National Forest System lands in the Beaver Creek Resource Area in the young structure class are the result of regeneration harvests. There are approximately 4,567 acres of the young structure class in the resource area (Table 19). About 3,000 acres of this young structure resulted from management activities on National Forest System lands. The remaining 1,517 acres of young structure are harvest-generated openings on other ownerships, or are natural openings.

As of 2012, approximately 20% of the seedling and sapling stands on National Forest System lands are 21-30 years old. The minimum age of the young stands is 7 years and the maximum age was 29 years. Young stands are assumed to transition into the medium structure class in their 31st year. Assuming full stocking and no disturbance, 20% of the existing young structure class will transition into the medium structure class over the next ten years. Another 60% of the current young structure class is 18-20 years old and will transition into the medium structure class between 2022 and 2024. The sum result is that, without stand-replacement events, there will be little young structure class in the resource area in two decades.

There are approximately 4,056 acres of medium structure class in the Beaver Creek Resource Area. Presuming good health and no severe disturbances, much of the National Forest System lands currently in the medium structure class will enter the mature structure class in the next 10 to 20 years. As stated above, most of the young structure stage will transition into medium structure stage in 20 years.

There are currently approximately 19,366 acres of mature structure class in the resource area. Assuming no severe disturbances occur, the amount of mature structure will increase as medium structure classes mature. The amount of increase is uncertain because root diseases and bark beetles are causing forest structure of some mature stands to transition back to medium structure.

Vertical Structure

Historically, mature stands were dominated by closed canopies (greater than 70% canopy cover) of white pine and some western larch on the moist habitat types, or more open canopies of ponderosa pine mixed with western larch and some Douglas-fir on dry habitat types. Beaver Creek landscape conditions now tend to be dominated, on both moist and dry habitat types, by Douglas-fir, grand fir and hemlock. Over time, medium density canopy conditions will dominant the dry and moderately dry habitat types on the landscape with the seral development of many stands reverting to and stalling in stand conditions comprised primarily of multi-storied stands of Douglas fir and grand fir with small to medium average diameters, dense shrub layers and few large old trees. The most concise reference describing expected development pathways is Byler and Hagle (2000; PF Doc. VEG-R34—FHP Report No. 00-09, 10 and 11).

The current modeled average canopy cover is approximately 60%. In the absence of fire or harvesting, average canopy cover could decline to approximately 45% over the next 100 years due to the persistent effects of insects and diseases; primarily root diseases (PF Doc. VEG-6). Many of the contemporary stands that are stocked with mature grand fir and/or Douglas-fir are not likely to provide the same mature canopies/structures as stands comprised of mature white pine, larch and/or ponderosa pine did historically. Although contemporary stands with mature/large structure may contain large trees and provide some old structural components, openings caused by root diseases, insects and other pathogens will be common. Over time, within-stand structures are likely to be multi-storied and multi-aged with low to moderate density and moderately open canopies. This multi-storied multi-aged structure is more susceptible to disturbances ranging from fire to insects/diseases and windfall. Stand development following

stand-replacement disturbances is unlikely to follow historic pathways because of the shortage of seed producing white pine, larch, and/or ponderosa pine.

Large mature shrubs will increasingly occupy growing space over time within stands that are heavily infected with root disease. These shrubs compete with all conifer regeneration and effectively preclude successful establishment of white pine, western larch, and ponderosa pine.

Structure Class Patch Metrics

This discussion of patch metrics is applicable at the resource area scale. Currently the average patch size is 161 acres for all structure classes at the scale of the resource area. Currently the mean patch size of the mature structure class is 3,817 acres, the medium structure class is 101 acres and for the young structural class is 36 acres. The mean patch size for the mature class exceeds the desired future condition ranges. The average patch sizes for the medium and young structure classes are below the desired ranges. In the short term, the patch size and arrangement of the mature structure would not change substantially.

The number of young structure patches would decline as the stands in these patches grow into the medium structure class. The older patches of young structure (15-30 years old) tend to be the larger patches. As these patches transition out of young structure into medium structure the mean patch size of the young structure class would decline.

While the total class area of the medium structure class may remain fairly stable, the mean patch size of the medium structure class would decline because of the influx of smaller patches from the aging young structure class.

Vose and others (2012; PF Doc. VEG-R196) note that the potential for large disturbances that could substantially alter forested landscapes is increasing given the current trends in climate. Current trends in stand conditions within the Beaver Creek resource area also increase the potential for large disturbances within the resource area. Therefore, under Alternative 1, some changes in structure within the patches/patterns should be expected, though the extent of these changes is not entirely predictable in the long term (i.e. the ignition points and burning conditions of future fires are unknown). In addition, the potential for large-scale stand-replacing disturbances (particularly wildfire) would increase over time because mortality in the Douglas-fir and grand fir forest cover types is increasing dead fuel loading and live ladder fuel development, both of which increase fire hazard.

Large patches of Douglas-fir and/or grand fir forest cover types tend to overlap large patches of mature structure. Healthy long-lived early-seral species are typically only present in low numbers in these large patches of mature shade tolerant species. Landscape-scale resilience to acute large-scale disturbances is reduced if there are inadequate numbers of long-lived early seral trees distributed throughout the resource area that are large enough to survive moderate severity fires and disperse seed.

The young structure class is broadly dispersed throughout the resource area in relatively small patches. Rust-resistant white pine, larch and ponderosa pine have been planted in most of these patches, which is consistent with objectives to increase the presence of these species on the landscape. However, the size and arrangement of patches is inconsistent with the pattern in which regeneration of these species historically occurred as a result of large-scale mixed- or high-severity fire events. Naturally-occurring openings that result from these types of disturbances tend to be much larger in size and more variable in shape than openings generated by contemporary forest management practices. Natural openings often conform to the terrain. The existing openings (young structure class) are fairly regular in shape, often being rectangular and are generally 40 acres or less in size.

Desired patch metrics

The desired patch size and arrangement for this resource area is based on the arrangement of moist and dry habitat types, likely fire-free intervals of 50-200 years or more with stand-replacing fire intervals of about 200 years on average (Zack and Morgan, 1994; PF Doc VEG-R14), and a need to improve landscape fire resiliency within and immediately adjacent to the urban interface. It is desirable to develop patches of young structure classes that are hundreds of acres in size on National Forest System lands in the Beaver Creek Resource Area. Larger young structure classes would result in larger areas stocked with early seral species that are more resistant to known diseases in the resource area and more resilient to variability in climate. Developing large patches of young structure class now will result in large patches of medium and mature structure in the future as trees in these patches of young structure grow in both size and age over time. These large future patches would be more likely to include long-lived early seral species in their overstory composition than most contemporary stands do.

Past fire disturbances typically created patches of young structure in the thousands to tens of thousands of acres. There were often smaller patches of surviving forest (medium or mature structure) embedded within the large patches of young structure. For the Beaver Creek Resource Area it would be desirable to develop patches of young structure ranging in size from tens of acres up to as much as 600 acres. The desired mean patch size would be in the 200-300 acre range. Smaller patches of medium and mature structure would be desirable within young patches that are larger than 100 acres. Green tree retention within patches of young structure would also be desirable in order to maintain connectivity of habitat structures species richness and species diversity which have been associated with mature trees over space and time (Rosenvald and Lohmus, 2008; PF Doc. VEG-R197). This would better mimic the scale and pattern of historic disturbances while minimizing detrimental effects to other resources.

Summary of Forest Structure Class Trends

In summary, the general trend of forest structure classes under Alternative 1 will be:

- A substantial decrease in the amount of young structure in the next 20 years.
- Maintenance of the amount of medium structure class because the transition of medium structure to mature structure will be at least partially offset by the transition of young structure to medium structure over the next 20 years.
- An increase in the amount of mature structure as stands in the medium structure class age.
- An increase in multi-storied multi-aged within stand structure due to the effects of root diseases and bark beetles in Douglas-fir and grand fir forest cover types.

These general trends would result in stand scale and resource area scale trends away from the desired future conditions for the Beaver Creek Resource Area.

Direct and Indirect Effects to Old Growth under Alternative 1

There are no anticipated short term changes in allocated old growth under Alternative 1. Old growth is expected to increase in the next 20 to 50 years on moist habitat types currently classified as mature structure with hemlock or cedar forest cover types. There is less certainty about the likelihood of mature stands of grand fir or Douglas-fir forest cover types becoming old growth because of the mortality rates that are being seen in these species in the resource area at this time. There may be a reduction in Douglas-fir or grand fir forest cover types that meet minimum old growth criteria over the next 50 years, because of the high mortality rates in these

two species and the general shortage of ponderosa pine, larch and/or white pine, which are resistant to root diseases.

Direct and Indirect Effects to Vegetation Management Access under Alternative 1

There are no proposed transportation system management activities under Alternative 1; therefore access for vegetation management activities would not change. Currently there are approximately 4,738 acres that do not have access for vegetation management activities via a road system (PF Doc. VEG-13).

3.1.4.1.2. Cumulative Effects under Alternative 1

Cumulative effects result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. Under Alternative 1, forest vegetation in the majority of the resource area would continue to be dominated by current trends as described earlier in the Alternative 1 direct and indirect effects section. The existing condition of the Beaver Creek Resource Area is a function of past natural disturbances and management activities combined with successional development of forest stands. This existing condition is inclusive of past activities that have affected forest vegetation. Table 25 lists the past activities and shows which activities are accounted for in the existing forest vegetation condition and those that have no measureable effect to the forest vegetation resource.

The effects of white pine blister rust introduction resulted in the widespread loss of western white pine. Western white pine is capable of producing substantial volume growth over relatively long periods of time due to its long average life span. Grand fir and Douglas-fir, which largely replace western white pine, are also capable of substantial volume growth but tend to have shorter lifespans than western white pine, therefore there has been a reduction in productivity potential as a result of the wide spread replacement of white pine by these two firs.

Past fire suppression has resulted in the virtual exclusion of fire as an ecological process within the cumulative effects area. As a result fire related successional pathways that favored long-lived early seral species such as white pine, ponderosa pine and larch have been excluded in favor of insect and disease related pathways that favor short lived shade tolerant species such as Douglas-fir and grand fir.

Fire suppression in combination with past harvesting patterns have also resulted in landscape patterns that are different than what would be expected based on understanding of historic patterns of vegetation on the landscape. Patch sizes of young structure have declined substantially because the scale of stand replacing events has declined in the resource area since the early 1900's.

The amount of Douglas-fir and grand fir forest cover types has increased over time. Average rates of volume accretion are now beginning to decline because these species are highly prone to insect infestations and diseases which increase mortality and subsequently reduce volume accretion.

Past pre-commercial thinning and timber stand improvement activities have reduced stocking and related inter-tree competition and favored retention and survival of long-lived early seral species, increasing the likelihood of their persistence where this thinning has been conducted.

Although past regeneration harvests (and associated prescribed burning and planting) have resulted in much of the current long-lived early seral forest cover types and pre-commercial thinning has served to maintain dominance of these desired forest cover types in some of these

previously regenerated stands the effects have been at too small a scale or magnitude and have been too dispersed thus far to offset the broader cumulative effects of fire suppression and blister rust. Past prescribed burning in the resource area that was not associated with timber harvests was of limited acreage and was primarily designed to apply low to moderate intensity fire in order to rejuvenate browse for wildlife and reduce dead fuel loadings on selected southerly aspects in winter range.

The combined effects of white pine blister rust, fire suppression, and past harvesting patterns have cumulatively lead to landscape scale forest vegetation conditions that now have generally low populations of long-lived early seral species that are, for the most part, scattered in small concentrations that are associated with past regeneration harvests. These conditions are reflected in the results of the Fire Regime Condition Class Assessment that is described in the Fire/Fuels Section 3.2.

Future pre-commercial thinning would improve growing conditions for long-lived early seral species in young stands but would not increase the extent of their presence in the Beaver Creek Resource Area because these stands planned for thinning are all the result of past regeneration harvests and thus share the same footprint on the landscape.

The ongoing and future salvage harvesting associated with the Capital Dudley Timber Sale would have negligible effects to forest vegetation as the entire sale is a roadside salvage of dead trees that are close enough to roads that are open to public traffic that they have potential to fall on the road and pose a hazard to the public.

As noted in the Fire/Fuels Section 3.2, the cumulative effect of suppressing each small fire in the resource area has been substantial and has not been offset by past timber harvesting and prescribed burning. The effects of white pine blister rust introduction on forest vegetation have also been collectively significant in combination with the effects of fire suppression. Taking no action will permit the effects of these past activities to persist and continue unabated in to the future.

Table 25. Synopsis of past, ongoing and reasonably foreseeable activities that are incorporated into the existing condition for Forest Vegetation.

Activities	Incorporated into analysis	Past (no effect)
TIMBER MANAGEMENT		
Timber harvest and related activities on NFS lands	X	
Precommercial thinning/timber stand improvement on NFS lands	X	
Tree planting on NFS lands	X	
Pocket gopher control on NFS lands	X	
Timber harvest and related activities on BLM lands	X	
Log drives	X	
White pine blister rust introduction	X	
FIRE/FUELS		
Prescribed burning for site preparation and fuels treatments	X	
Wildfires	X	
Fire suppression	X	
Wildlife burns	X	
TRANSPORTATION		
Railroads	X	
Travel Plan implementation	X	
Road construction	X	

Activities	Incorporated into analysis	Past (no effect)
Road decommissioning	X	
Road maintenance	X	
Trail maintenance		X
Use of motorized vehicles (full-size vehicles, ATVs, motorcycles)	X	
RECREATION		
Camping		X
Snowmobiling		X
Hunting		X
Hiking	X	
Berry picking		X
Fishing		X
Christmas tree cutting	X	
Mountain bike riding		X
MINERALS		
Mining	X	
Idora Mine remediation (with road decommissioning) by the Idaho Department of Environmental Quality, Bureau of Land Management, and Forest Service	X	
WATERSHED IMPROVEMENT		
In-stream fisheries habitat improvement projects		X
Culvert modification or replacement	X	
Large woody debris removal		X
Stream channel realignment at Forest Road 933, by Shoshone County		X
Stream channel realignment at Unknown Gulch, by Shoshone County and private entities		X
Stream channel management at Carpenter Creek, by Shoshone County		X
Stream channel reconstruction at Carbon Center, by Shoshone County		X
Placer Creek culvert replacement by Shoshone County		X
Potosi Creek culvert maintenance by Shoshone County		X
Stream channel management at Dobson Creek, by Shoshone County and private entities		X
Unknown Gulch culvert removal by Shoshone County, the Department of Environmental Quality, and private entities		X
Private lands bank stabilization at multiple sites, by multiple agencies		X
Shoshone County bank stabilization, by Shoshone County		X
LAND MANAGEMENT		
Land exchanges	X	
Land development	X	
OTHER ACTIVITIES		
Livestock grazing (ongoing and future on private lands only)	X	
Livestock use	X	
Utility maintenance	X	
Firewood cutting/gathering	X	
Spraying herbicides under the Coeur d'Alene Weed EIS	X	
Special use permits	X	

3.1.4.2. Alternative 2

3.1.4.2.1. Direct and Indirect Effects Unique to Alternative 2

Alternative 2 has the most extensive vegetation treatments of all the alternatives – it treats a total of 4,059 acres, while building a total of approximately 1.2 miles of new Forest system roads and 1.5 miles of temporary roads and completing various watershed improvement activities. The primary differences between the action alternatives are the proposed harvest types and acres, development of openings and the proposed road management. Direct and indirect effects of the proposed harvesting and burning for both action alternatives are discussed under "Effects Common to Both Action Alternatives" in Section 3.1.4.4.

Direct and Indirect Effects to Opening Sizes under Alternative 2

Under Alternative 2, the mean patch size of proposed regeneration harvests is 30 acres, with a minimum of 4 acres and a maximum of 74 acres (PF Doc. VEG-07). There are 30 regeneration patches proposed. Some patches are comprised of more than one proposed harvest unit. Many of the proposed regeneration harvest units share boundaries with existing openings by design and therefore contribute to development of large patches of young forest structure.

The mean patch size of the young structure class under Alternative 2 increases relative to the existing condition (Table 26). As displayed in Table 28, the two largest young structure patches affected by Alternative 2 would exceed 200 acres (434 acres and 204 acres) immediately following harvest due to expansion of existing openings through proposed regeneration harvesting; five young structure patches would be between 100 and 199 acres; 17 young structure patches would be between 40 and 99 acres; and six patches would be less than 40 acres (PF Doc. VEG-07).

Table 26. Changes in mean patch size (acres) in the Beaver Creek Resource Area.

Structural class	Alternative 1/ Existing (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Mature	3,873	2,022	2,047
Mid	101	98	98
Young	36	48	45
Rock	28	28	28
Landscape	161	163	160

Table 27. Changes in structure class proportion (%) in the Beaver Creek Resource Area.

Structural class	Alternative 1/ Existing (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Mature	69	65	66
Mid	14	14	14
Young	16	21	20
Rock	0.3	0.3	0.3
Landscape	100	100	100

Table 28. Potential openings created and/or affected by regeneration harvests under Alternative 2.

Opening ID #	Unit #	Unit Acres	Approximate total opening size (acres)	Additional Information
01	Unit 59 Unit 60 Unit 60A Unit 63 Unit 63A Unit 69	16 39 4 25 19 54	434	Includes approximately 278 acres of past harvest, ranging in age from 19-23 years old.
04	Unit 61 Unit 62	32 2	82	Includes approximately 48 acres of past harvest that is 18 years old.
10	Unit 65 Unit 65A Unit 68 Unit 84 Unit 84A	17 16 55 15 8	204	Includes approximately 94 acres of past harvest that is 23 years old.
11	Unit 66 Unit 66A Unit 67 Unit 75 Unit 82 Unit 82A	21 3 16 21 7 5	86	Includes approximately 11 acres of past harvest that is 24 years old.
21	Unit 52	10	48	Includes approximately 38 acres of past harvest that is 14 years old.
22	Unit 47A Unit 48 Unit 49 Unit 50	3 7 13 8	49	Includes approximately 17 acres of past harvest that is 16 years old.
23	Unit 78	36	74	Includes approximately 39 acres of past harvest that is 14 years old.
24	Unit 40 Unit 40A	17 2	77	Includes approximately 58 acres of past harvest ranging in age from 16-17 years old.
25	Unit 43	11	44	Includes approximately 33 acres of past harvest that is 16 years old.
26	Unit 44	14	14	No adjacent existing openings.
29	Unit 38 Unit 39	17 26	81	Includes approximately 39 acres of past harvest that is 16 years old.
36	Unit 33 Unit 34A	32 7	65	Includes approximately 25 acres of past harvest that is 18 years old.
40	Unit 31 Unit 31A Unit 32	22 5 13	68	Includes approximately 28 acres of past harvest that is 19 years old.
41	Unit 30	32	32	No adjacent existing openings.
42	Unit 79	27	66	Includes approximately 39 acres of past harvest ranging in age from 18-26 years old.
43	Unit 29	20	20	No adjacent existing openings.
46	Unit 27	45	45	No adjacent existing openings.

Opening ID #	Unit #	Unit Acres	Approximate total opening size (acres)	Additional Information
48	Unit 25 Unit 25A	3 1	5	Includes approximately 1 acre of past harvest that is 26 years old.
50	Unit 21	8	96	Includes approximately 88 acres of past harvest ranging in age from 18-27 years old.
60	Unit 17 Unit 18	36 18	122	Includes approximately 68 acres of past harvest ranging in age from 18-20 years old.
64	Unit 16T	12	12	No adjacent existing openings.
65	Unit 13	48	122	Includes approximately 74 acres of past harvest that is 18 years old.
66	Unit 15 Unit 15A	53 14	179	Includes approximately 112 acres of past harvest ranging in age from 18-26 years old.
67	Unit 14B	20	62	Includes approximately 42 acres of past harvest ranging in age from 18-26 years old.
69	Unit 7	17	79	Includes approximately 62 acres of past harvest ranging in age from 17-26 years old.
70	Unit 10 Unit 10A	41 13	136	Includes approximately 83 acres of past harvest that is 18 years old.
71	Unit 8	35	35	No adjacent existing openings.
72	Unit 4	38	77	Includes approximately 38 acres of past harvest that is 17 years old.
78	Unit 74	29	65	Includes approximately 35 acres of past harvest that is 19 years old.
84	Unit 55 Unit 55A Unit 56	22 16 11	144	Includes approximately 94 acres of past harvest that is 20 years old.

Direct and Indirect Effects to Vegetation Management Access under Alternative 2

The road decommissioning included in Alternative 2 does not affect any roads that are important for vegetation management access (PF Doc. TRAN-01). Decommissioning of roads, as proposed in Alternative 2 would move the future road system towards the minimum road system required for forest vegetation management. There would be an estimated 5,387 acres that would not have access for vegetation management activities via a road system (PF Doc. VEG-13).

The proposed temporary and system road construction would be necessary in order to access certain harvest units or portions of units on approximately 311 acres. The proposed watershed improvement activities included in Alternative 2 would not have any perceivable effects on the forest vegetation resource, so they will not be discussed in this section. Alternative 2 would treat forest vegetation on about 311 more acres than would Alternative 3.

3.1.4.3. Alternative 3

3.1.4.3.1. Direct and Indirect Effects under Alternative 3

Alternative 3 is very similar to Alternative 2 from a vegetation management perspective relative to the proposed harvest and prescribed fire activities. Road decommissioning included in Alternative 3 would have a different effect on vegetation management access. Other watershed

Direct and Indirect Effects to Opening Sizes under Alternative 3

Alternative 3 treats a total of 3,749 acres, approximately 311 acres fewer than under Alternative 2. Alternative 3 also contains 360 acres of aggregate retention units, which include untreated patches of forest. Fewer acres treated under Alternative 3 slightly reduce the landscape-scale effects of the combined treatments; however the differences between Alternatives 2 and 3 at the landscape scale are subtle, and not immediately apparent. These subtle differences are discussed under the "Effects Common to Both Action Alternatives" (Section 3.1.4.4). There is an approximately 10% difference in treatment acres between Alternatives 2 and 3; the relatively small difference in treatment acres between the action alternatives leads to small differences in landscape scale effects.

Alternative 3 treats fewer acres, plus includes some untreated areas within aggregate retention units. The harvested portions of the Alternative 3 Aggregate Retention units would have the same physical stand-level effects to the forest vegetation resource as the shelterwood and seedtree harvests that are proposed in the same locations in Alternative 2. The spatial extent of the effects however would be up to 30% less than the seedtree or shelterwood treatments that are proposed on the same locations in Alternative 2. Direct and indirect effects of proposed harvesting and prescribed burning are discussed under "Effects Common to Both Action Alternatives" in Section 3.1.4.4.

Under Alternative 3, the mean patch size of proposed regeneration treatments is 26 acres, with a minimum of 3 acres and a maximum of 60 acres (PF Doc. VEG-07). There are 27 regeneration patches proposed and some patches are comprised of more than one proposed harvest unit. Many of the proposed regeneration units share boundaries with existing openings by design. The mean patch size of the young structure class under Alternative 3 increases relative to the existing condition (Table 30), although not quite as much as it does in Alternative 2. The largest young structure patch affected by Alternative 3 would be approximately 400 acres immediately following harvest due to expansion of existing openings through proposed regeneration harvesting (Table 33). There are no other patches greater than 200 acres under Alternative 3.

Six young structure patches affected by Alternative 3 would be between 100 and 199 acres (Table 29). Fourteen young structure patches affected by Alternative 3 would be between 40 and 99 acres immediately following harvest. Six patches affected by Alternative 3 would be less than 40 acres (PF Doc. VEG-07).

Table 29. Potential openings created and/or affected by regeneration harvests under Alternative 3.

Opening ID #	Unit #	Unit Acres	Approximate total opening size (acres)	Additional Information
01	Unit 59 Unit 60 Unit 60A Unit 63 Unit 63A Unit 69 Unit 69A	11 29 4 17 17 39 3	400	Includes approximately 280 acres of past harvest, ranging in age from 19 to 23 years old.
04	Unit 61 Unit 62	32 2	82	Includes approximately 48 acres of past harvest that is 18 years old.

Opening ID #	Unit #	Unit Acres	Approximate total opening size (acres)	Additional Information
10	Unit 65 Unit 65A Unit 68 Unit 84 Unit 84A	17 16 55 3 10	184	Includes approximately 95 acres of past harvest that is 23 years old.
11	Unit 66 Unit 66A Unit 67 Unit 75 Unit 82 Unit 82A	21 3 16 4 1 5	63	Includes approximately 11 acres of past harvest that is 24 years old.
21	Unit 52	10	48	Includes approximately 38 acres of past harvest that is 14 years old.
22	Unit 47A Unit 48 Unit 49 Unit 50	3 7 13 8	49	Includes approximately 17 acres of past harvest that is 16 years old.
23	Unit 78	26	65	Includes approximately 39 acres of past harvest that is 14 years old.
25	Unit 43	10	44	Includes approximately 34 acres of past harvest that is 16 years old.
26	Unit 44	3	3	No adjacent existing openings.
29	Unit 38 Unit 39	18 26	82	Includes approximately 38 acres of past harvest that is 16 years old.
36	Unit 33 Unit 34A	17 7	49	Includes approximately 25 acres of past harvest that is 18 years old.
40	Unit 31 Unit 32	5 13	47	Includes approximately 28 acres of past harvest that is 19 years old.
41	Unit 30	32	32	No adjacent existing openings.
43	Unit 29	17	17	No adjacent existing openings.
48	Unit 25 Unit 25A	3 1	5	Includes approximately 1 acre of past harvest that is 26 years old.
50	Unit 21	8	96	Includes approximately 88 acres of past harvest ranging in age from 18 - 27 years old.
60	Unit 17 Unit 18	22 18	108	Includes approximately 68 acres of past harvest ranging in age from 18 - 20 years old.
64	Unit 16T	12	12	No adjacent existing openings.
65	Unit 13	48	123	Includes approximately 75 acres of past harvest that is 18 years old.
66	Unit 15 Unit 15A	45 12	168	Includes approximately 111 acres of past harvest ranging in age from 18 - 26 years old.
67	Unit 14B	20	62	Includes approximately 42 acres of past harvest ranging in age from 18 - 26 years old.

Opening ID #	Unit #	Unit Acres	Approximate total opening size (acres)	Additional Information
69	Unit 7	17	78	Includes approximately 61 acres of past harvest ranging in age from 17- 26 years old.
70	Unit 10 Unit 10A	30 11	123	Includes approximately 83 acres of past harvest that is 18 years old.
71	Unit 8	35	35	No adjacent existing openings.
72	Unit 4	38	77	Includes approximately 38 acres of past harvest that is 17 years old.
78	Unit 74	29	65	Includes approximately 35 acres of past harvest that is 19 years old.
84	Unit 55 Unit 55A Unit 56	22 16 11	144	Includes approximately 94 acres of past harvest that is 20 years old.

Figure 15 shows a conceptual design for aggregate retention in one of the proposed aggregate retention harvest units. In this example, the harvest unit is outlined in white and the aggregate patches are opaque green. Approximately 29% of the treatment area would be retained as aggregate patches ranging in size from about 1.5 to 5 acres would be applied with this layout. In application layout may vary due to operational constraints and/or locations of unique or valuable biological legacies and habitat features. A shelterwood harvest retaining primarily larch and white pine would be applied in the harvest unit outside of the retention patches in this example.

Figure 15. Conceptual design for aggregate retention patches (shown as cross-hatching) in proposed Unit 10.

Direct and Indirect Effects to Vegetation Management Access under Alternative 3

Alternative 3 does not propose any new system or temporary road construction. This resulted in the elimination of harvest units and portions of harvest units that are included in Alternative 2 where new road construction for access is contingent for harvesting. Some of the eliminated harvest area may become aggregated retention patches in Alternative 3 but the large majority of the harvest acreage that was dependent upon new road access was simply eliminated in Alternative 3.

Alternative 3 includes approximately 40 more miles of road decommissioning than Alternative 2. Much of the additional decommissioning proposed in Alternative 3 would eliminate motorized access to stands that were previously harvested and planted and have future pre-commercial thinning needs. Without motorized access the cost of thinning would increase in proportion to the distance from the nearest accessible road because of the time required to hike personnel and supplies into the work locations. The additional costs may become prohibitive to pre-commercial thinning in some stands. Lack of access for medical response in the event of an injury may also become prohibitive to pre-commercial thinning in some stands. Young stands dominated by larch, ponderosa pine, and white pine are more likely to maintain these forest cover types over the long term if pre-commercial thinning is accomplished in a timely manner.

Much of the additional decommissioning would reduce the efficiency of future land management activities in lands designated for timber production by eliminating existing roads that were designed and located to facilitate vegetation management access. There would be an estimated 8,806 acres of that would not have access for vegetation management activities via a road system (PF Doc. VEG-13).

3.1.4.4. Effects Common to Both Action Alternatives

3.1.4.4.1. Direct and Indirect Effects of the Action Alternatives

Direct and Indirect Effects to Forest Composition under the Action Alternatives

Improvement cutting would directly increase the proportion of long-lived early serals (white pine/western larch/ponderosa pine) within the treated areas. The proportion of early seral species would increase because the proposed improvement cutting is focused in areas with an existing component of long-lived early seral species in the overstory. The proposed improvement cutting would reduce the proportions of shade-tolerant species by specifically removing them from the suppressed and intermediate crown classes. Some shade-tolerant species may also be removed from the co-dominant crown class where stand densities are excessive and when necessary to release large mature early seral individuals. These removals would result in a net reduction of mid and late seral species, thereby increasing the proportion of early seral species.

Where long-lived early seral species are abundant in the overstory, improvement cutting may directly change the cover type of the stand to one dominated by early seral species. Growth rates of trees in the resulting stand should increase following treatment. Stand level structure class would not be affected by commercial thinning because most of the larger trees that characterize the stand structure class prior to harvest would still remain following harvest.

Commercial thinning includes harvesting of trees primarily in the suppressed and intermediate crown classes. This is a thinning from below which removes relatively small diameter trees that tend to be of shade tolerant species while retaining larger diameter trees that often are shade intolerant early seral species.

Long-lived early seral species in the affected commercial thinning units tend to occur in the dominant and co-dominant overstory. This activity will increase the proportions of long-lived early seral species relative to the proportions of shade tolerant species in the affected stands in the near-term and mid-term (20 to 40 years) but is unlikely to reduce the stocking of shade tolerant species enough to cause a change from a shade tolerant forest cover type to a shade intolerant forest cover type. Growth rates of trees in the resulting stand should increase following thinning. Stand level structure class would not be affected by commercial thinning because the largest trees that characterize the stand structure class prior to harvest would still remain following harvest.

Shelterwood harvests would directly change the species composition to ponderosa pine, white pine, western larch or a combination of any of the three. Shelterwood harvesting would retain existing early seral species and certain individuals and/or groups of other species. On dry habitats shelterwood harvesting would maintain hospitable conditions for the establishment of new regeneration. On moist habitats components of the harvested stand would be retained for purposes other than providing shelter because site conditions (temperature, soil moisture, etc.) would be favorable for the establishment of new regeneration even in the absence of residual overstory. On both moist and dry habitats, long-lived early seral trees would be retained for seed because they are important sources of site-adapted genetic material (including seed), they provide wildlife habitat components, and they contribute to achievement of visual quality objectives.

Individual trees meeting minimum old growth criteria and other trees having characteristics that are beneficial to wildlife (i.e. cavities, dead tops, heart rot) would be retained regardless of species as biological legacies of the harvested stand. Retention on both dry and moist sites may occur as individual trees and/or small groups of trees. Under Alternative 3, some retention may also occur as patches of undisturbed forest, no less than one-half acre in size. All retention would remain in the affected stands over the full rotation of the stand.

White pine, larch, and/or ponderosa pine would be planted in shelterwood harvests in quantities and proportions appropriate for each site. Planting of these species is necessary because reproductively mature, seed producing individuals are of limited availability within many of the proposed harvest units. Forest cover types in aggregate retention areas, as described in Alternative 3, would not change on moist sites because there would be no harvesting and any fire encroachment into them during the prescribed burning of the adjoining harvest unit is expected to be minimal in extent and cause negligible impact to the aggregate retention area(s).

Seedtree harvests would have the same effects as shelterwood harvests with the exception that fewer mature trees would be retained because there are fewer healthy trees of desirable genetic stock that are available to retain on these sites than there are on sites selected for shelterwood harvesting.

Prescribed burning without harvesting or planting of white pine, western larch and/or ponderosa pine would not directly change forest cover type. While understory burning does kill seedling, sapling, and pole-sized trees and shrubs, it does not tend to kill larger diameter overstory trees when applied on sites dominated by mid-aged to mature Douglas-fir ponderosa pine and/or larch. Understory burning would maintain most of the mature overstory, particularly the fire-tolerant individuals such as large Douglas-fir, ponderosa pine and larch.

Underburning alone may indirectly change forest cover types by preparing the seedbed for successful establishment intolerant species where there is ponderosa pine, white pine, or western larch in the overstory. Underburning without subsequent planting of long lived early seral species would not change forest cover types when completed in stands that have few of these species in the overstory. Where there are few or no intolerant species in the overstory Douglas-fir and grand fir will persist or be replaced by more shade tolerant western hemlock and/or cedar.

Fuel breaks include cutting and piling of small understory trees and shrubs. Piles are burned during moist weather conditions. The small understory trees targeted for removal tend to be of shade tolerant species. If long-lived early seral species are present in the affected fuel breaks they will tend to occur in the dominant overstory. This activity would not change forest cover type but would increase the proportion of long-lived early seral species relative to the proportion of shade tolerant species slightly and for a short period of time (less than 20 years).

Table 30. Differences in forest cover types on NFS lands in the Beaver Creek Resource Area relative to the existing condition for Alternatives 2 and 3.1

Forest Cover Type	Desired (acres)	Existing (acres)	Alt. 2 (acres)	Alt. 2 (% change)	Alt. 3 (acres)	Alt. 3 (% change)
White pine	5,000-10,000	350.3	805.4	3.1	628.9	2.5
Ponderosa pine	5,000-8,000	304.7	160.1	0.6	109.6	0.4
Lodgepole pine		1,031.0	400.9	1.6	394.5	1.5
Douglas-fir	5,000-8,000	12,540.3	-658.1	-2.6	-550.6	-2.2
Grand-fir		6,163.9	-444.4	-1.7	-395.2	-1.5
Western hemlock	1,500-4,000	1,116.6	-91.4	-0.4	-72.6	-0.3
Cedar		1,564.1	-14.9	-0.1	-14.9	-0.1
Lodgepole pine	500-1,500	1,124.5	-148.3	-0.6	-89.2	-0.3
Subalpine fir	500-1,500	473.9	-8.9	0.0	-8.9	0.0
Mountain hemlock		144.4	-1.6	0.0	-1.6	0.0
Nonforest	< 1,000	779.5	1.1	0.0	0.0	0.0

[1] Positive numbers are increases in acreage over existing, negative numbers are decreases in acreage over existing.

Table 30 shows the potential direct changes, in acres, between the two action alternatives relative to the existing condition. White pine, ponderosa pine and western larch forest cover types on National Forest System lands would increase about 4% under Alternative 2 and about 2% under Alternative 3. While the projected changes move toward the desired future condition for the Beaver Creek Resource Area, the magnitude of changes in either action alternative would be small.

Forest Cover Type Patch Metrics

Mean patch sizes are projected to decline but the number of patches characterized as larch, white pine or ponderosa pine are projected to increase as are the maximum patch sizes for these three species (Table 31and Table 32). Figure 16 shows the projected changes to mean patch size for the action alternatives relative to the existing condition.

Table 31. Existing and projected number of patches by forest cover type.

Forest Cover Type	Existing (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Cedar	28	19	19
Douglas-fir	47	35	33
Grand-fir	23	51	52
Larch	21	40	39
Lodgepole pine	3	24	23
Mountain hemlock	19	3	3
Nonforest	13	18	19
Ponderosa pine	6	18	21
Subalpine fir	1	6	6
Western hemlock	20	21	21
White pine	8	32	32

Table 32. Existing and projected maximum patch size by forest cover type.

Forest Cover Type	Existing (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Cedar	297.0	284.6	284.6
Douglas-fir	4391.5	4272.9	4097.1
Grand-fir	958.1	958.1	958.1
Larch	160.7	160.5	160.7
Lodgepole pine	175.8	139.9	146.6
Mountain hemlock	49.8	49.8	49.8
Nonforest	551.9	551.9	551.9
Ponderosa pine	51.0	78.1	78.1
Subalpine fir	209.4	200.6	200.6
Western hemlock	196.1	196.1	196.1
White pine	100.1	134.0	119.7

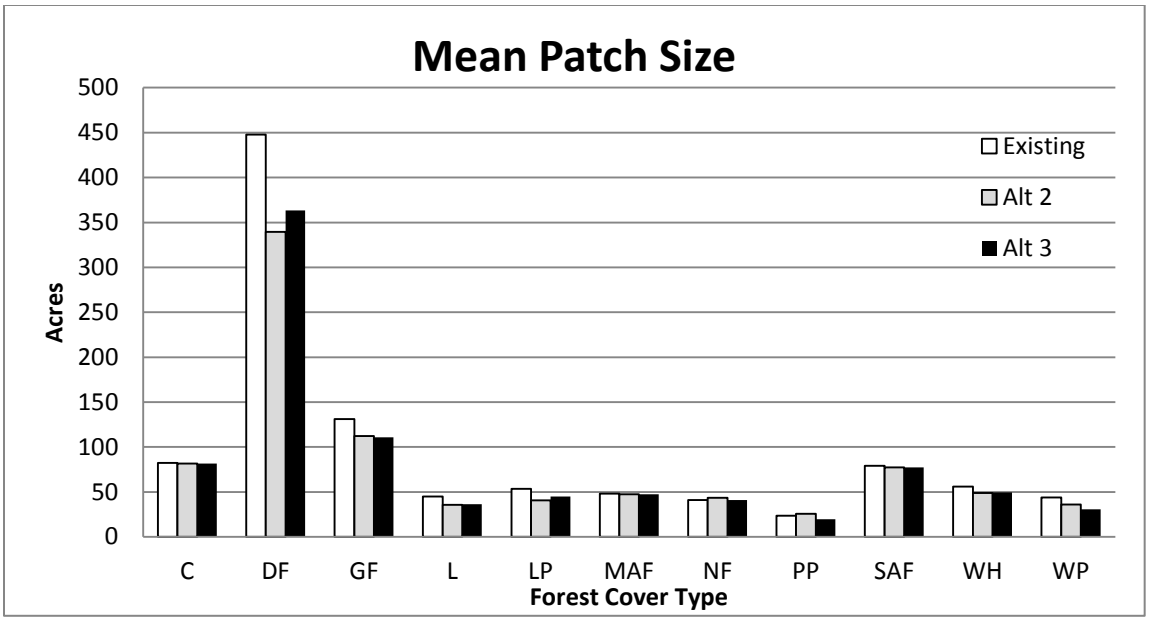


Figure 16. Existing and projected mean patch sizes (acres) for NFS lands in the Beaver Creek Resource Area.

Many of the previously-harvested stands that are directly adjacent to proposed harvest units are currently classified as Douglas-fir or grand fir forest cover types because of natural establishment rates that greatly exceed establishment rates for planted and natural white pine, ponderosa pine, or larch. As noted in the direct and indirect effects of Alternative 1, many of these previously harvested and planted stands are projected to change dominance type to white pine, ponderosa pine, or larch. This could lead to substantial increases in mean and maximum patch size for these species in the future.

Direct and Indirect Effects to Stand Level Forest Structure under Alternatives 2 and 3

Structure Classes

Currently the proportion of the resource area in the young structure class is within the lower end of the desired range of conditions (Figure 17). The medium (MID) and mature classes are below and above the desired future condition respectively. Young forest structure would remain within the range of desired future conditions for the Resource Area (Figure 17) and would move towards the median values of the desired range. The medium structure class would not change substantially under either action alternative. The proportion of mature structure class is reduced under both action alternatives but still remains above the desired future condition. On all but the driest sites (Douglas-fir habitat types), prescribed underburning without planting of early seral seedlings would have no effect on the existing trend toward climax species composition (Douglas-fir, grand fir, western hemlock) and multi-storied stand structures.

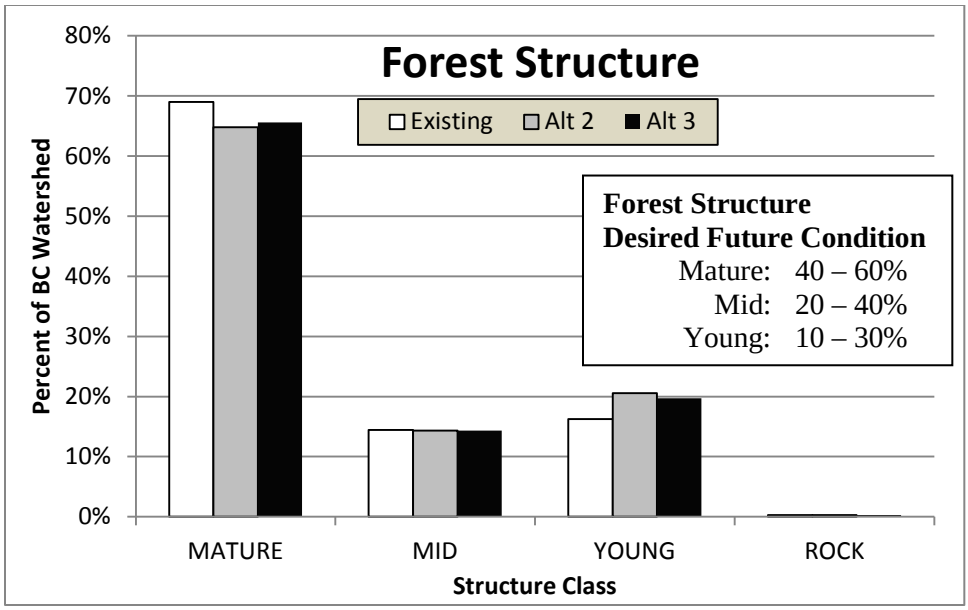


Figure 17. Comparison of changes in the proportions of structure classes in the Beaver Creek Resource Area (see PF Docs. VEG-07 and VEG-10).

The retention of shelter trees results in greater within stand diversity following harvest than would occur with clear cutting. The regeneration harvests in the action alternatives include shelterwood harvests, seedtree harvests and variable retention harvests. All three of these harvests are even aged regeneration harvests and each retains varying amounts of mature overstory over the rotation length of the new stand. Seedtree harvests retain the least residual overstory while variable retention harvests would retain the most.

Structure classes in areas designed as **aggregate retention patches** would retain their original structure class because they would be excluded from harvesting and associated activities.

Research suggests that intermediate harvesting (such as improvement cutting and commercial thinning) where susceptible species are retained will increase the incidence of root disease in those susceptible trees in the Inland Northwest. Management activities that favor resistant tree species on sites that are prone to and/or infected with root disease should be utilized (Rippy et al., 2005 VEG-R40; Hagle, 2005 VEG-R55; Hagle, 2006 VEG-R73). Resistant early seral species that are native to and appropriate for sites within the Beaver Creek Resource Area are western white pine, ponderosa pine and western larch. Intermediate harvesting systems (such as improvement cutting) are likely to exacerbate root disease because of the preponderance of susceptible species that would remain after harvest. Harvests that create open growing conditions followed by artificial regeneration are therefore the best silvicultural techniques available for the establishment of these three species. Within the Beaver Creek Resource Area, conditions following harvest should be open enough to at least provide competitive advantage for western white pine, western larch, and/or ponderosa pine in order to ensure successful establishment and long-term survival of these species.

Shelterwood, seedtree, and **aggregate retention harvests** would directly change medium or mature structure classes to the young structural class. The proposed regeneration harvests would result in long-term improvement to landscape scale structure and increase resiliency to disturbances (such as insects, diseases and fire) through species conversion from disease prone drought intolerant late and mid seral species to more resilient rust resistant white pine, western larch and/or ponderosa pine.

Improvement cutting would maintain a sustainable stocking level of the healthiest and most resilient available trees. This would be achieved primarily by thinning from below, which involves removal of intermediate and/or suppressed trees and retention of co-dominant and/or dominant trees in sufficient numbers to maintain a stocked stand. Douglas-fir and/or grand fir would be the primary species removed during harvest.

The larger and (usually) older trees of all species would be retained wherever possible while many of the smaller younger trees of shade tolerant species would be removed. Mature stands would therefore remain in the mature structure class because the large mature trees would be preferentially retained. The average diameter of the residual stand would increase because of the removal of the smaller diameter trees. The cover type of the affected stands may change following harvest if there are enough healthy white pine, larch and/or ponderosa pine present because these species would be preferentially retained.

Commercial thinning would maintain a sustainable stocking level of the healthiest and most resilient available trees. This would be achieved primarily by thinning from below, which involves removal of intermediate and/or suppressed trees and retention of co-dominant and/or dominant trees in sufficient numbers to maintain a fully-stocked stand. Douglas-fir and/or grand fir would be the primary species removed during harvest.

The larger and (usually) older trees of all species would be retained wherever possible while many of the smaller younger trees of shade tolerant species would be removed. Mature stands would therefore remain in the mature structure class because the large mature trees would be preferentially retained. The average diameter of the residual stand would increase because of the removal of the smaller diameter trees. The cover type of the affected stands may change following harvest if there are enough healthy white pine, larch and/or ponderosa pine present because these species would be preferentially retained.

Within-Stand Structural Changes

Forest structure is one of many factors influencing fire behavior and burn severity (Jain and Graham, 2007 PF Doc. VEG-R83; Jain et al. 2006 VEG-R84). Forest structure is relevant at both the stand and resource area scales.

Fuel breaks utilize understory thinning of small-diameter conifers and shrubs to reduce/remove ladder fuels. The slash from the understory thinning is then disposed of through piling and burning or chipping, thereby eliminating the additional fine fuel load that would otherwise remain. The result is a surface fuel profile that can only generate short flame lengths. The low-volatility fuel bed is located directly beneath a forest canopy that is relatively closed and is relatively high above the surface of the ground, meaning that long flame lengths are required to transition a surface fire into the canopy. In addition, the shade provided by the remaining overstory cools the surface fuels and inhibits establishment and growth of new conifer and shrub regeneration that would become new ladder fuels.

The use of even-aged regeneration systems including **seedtree, shelterwood** and **aggregate retention** regeneration systems with long-term retention of shelter trees, seed trees and other reserved trees (also referred to as “reserves”) provides within-stand structure while creating conditions that facilitate the successful establishment of shade-intolerant early seral species. The result is a stand that classifies as a young structure stage but still has large, often mature or old “relic” trees in the overstory. In shelterwood and seedtree harvests, retained overstory trees are typically dispersed as individual trees and/or groups of trees with either regular or irregular arrangement.

In the short term, reserved trees provide seed to the site as well as some shade and wind reduction. In the long term, reserved trees contribute to vertical and horizontal heterogeneity within the stand and provide valuable wildlife habitat as perches, nest trees, foraging trees, and eventually large snags and/or large down logs. For these reasons, shelterwood regeneration systems with reserves more closely mimic the effects of moderate- to high-severity fires than most other regeneration methods. The combination of even-aged harvesting and retention described above is also described as dispersed variable retention (Mitchell and Beese, 2002, PF Doc. VEG-R160; Schnepf, 2006 PF Doc. VEG-R155).

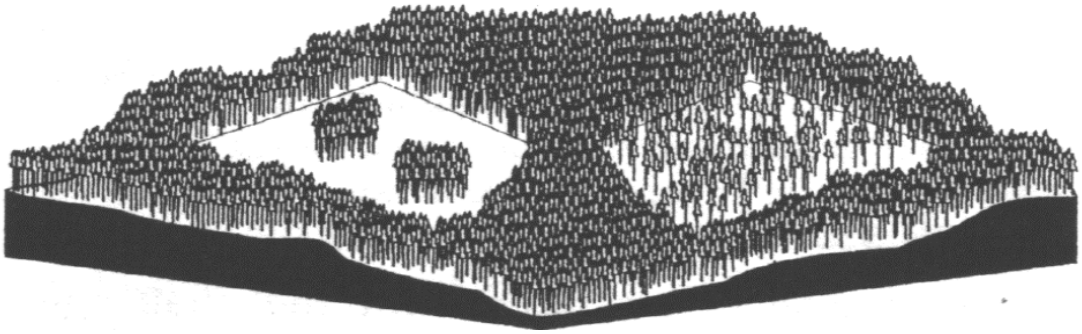


Figure 18. Visual comparison of aggregated retention and dispersed retention in regeneration harvests that retain equal proportions of the original overstory (from Franklin et al. 1997).

Aggregated retention is the retention of undisturbed forested patches typically between 0.5 and 2.5 acres in size that, for the most part, are wholly within a given regeneration harvest unit. Aggregated retention can be used to retain and protect the same biological legacies that are described in the dispersed retention discussion above. The advantages of aggregated retention include leaving portions of the forest floor intact, leaving soft snags in a way that does not threaten logger safety, and allowing more light into the unit for shade-intolerant species (Schnepf, 2006, PF Doc. VEG-R155). Aggregate retention would have greater within stand structural diversity than traditional shelterwood or seedtree harvesting because skidding and burning activities are excluded from aggregate patches. Excluding skidding and burning would permit complete retention of seedlings, saplings, shrubs grasses and forbs that exist in the understory of the retained patches.

Aggregated retention can be costly to apply in units that are too steep for mechanized equipment and may not be effective at retaining desired biological legacies because of a high risk of burning during site preparation/hazard reduction activities. Protection of aggregated retention patches on steep slopes would require fire line construction around individual patches, substantially increasing the cost of the total treatment. Steep slopes limit options for yarding systems and slash disposal because they limit the use of mechanized equipment. Consequently, patches of aggregated retention on steep slopes tend to be located on the lower slopes.

Where retention patches extend onto the mid and upper slopes they will tend to be arranged in linear strips that run parallel with the slope in order to avoid conflicts with yarding systems and with prescribed burning. On gentler terrain, grapple piling may be used to reduce slash-fuel loading around aggregates, protecting them from subsequent prescribed burning activities and allowing more freedom of location and a shape of aggregate patches.

Under Alternative 3, aggregated retention would be utilized specifically in harvest Units 10, 10A, 15, 15A, 59, 60, 60A, 63, 63A, 68, 69 and 78 and could be utilized in other regeneration harvest units as feasible opportunities permit. There would be no direct or indirect effects to within-stand structure in aggregate retention patches.

Improvement cutting and commercial thinning would affect within-stand structure in the same manner as fuel breaks but with greater magnitude. The canopy would be reduced more than in a fuel break due to the harvesting of some trees of commercial value. This would increase the amount of air movement through the affected stands and increase the amount of sunlight reaching the forest floor relative to the existing condition of the stands. These two factors would increase the drying rate of dead and down fuels during the summer months and may stimulate additional growth of understory herbs, shrubs, and shade-tolerant conifer regeneration.

Slash and other dead and down fuels would be reduced through underburning following harvest. Underburning would also reduce ladder fuels, further increasing the distance between the ground and the base of the live overstory canopy.

Improvement cutting typically increases the growth rate of the residual stand of trees. It may also increase the rate of infection by root diseases in residual Douglas-fir and grand fir because stumps and their attached root systems will become readily available for colonization by fungi that cause root disease. Included stands would have an even-aged overstory that may be uniformly distributed throughout the stand or may be clumpy and somewhat irregular where clumps of health white pine, western larch or ponderosa pine are retained.

Healthy white pine, western larch and ponderosa pine would be preferentially retained over other species in all of the shelterwood and improvement cut harvests.

Prescribed burning outside of proposed harvest units would reduce dead and down woody fuels, increase ground-to-live crown base heights and reduce ladder fuels where burning actually occurs. Fire effects would be variable both in extent of actual burned acreage within each respective burn unit and in effects to vegetation due to variability in fuel moisture, fuel loading, mid-flame wind speed, and slope and aspect within any given burn unit on any given burn day. Within-stand structure would be altered, primarily through reduction of seedling, sapling and pole-sized understory trees, and may be highly variable following prescribed burning.

Canopy Cover

In 40 to 60 years, units receiving the shelterwood, seed tree or aggregate retention treatments with no subsequent future treatment would have about 60 percent or more canopy cover and high stand densities. It is likely that regenerated stands would need pre-commercial stand-tending activities within 20 years of the proposed harvesting in order to maintain favorable growing conditions for the young white pine, ponderosa pine and larch.

In 40 to 60 years, Douglas-fir and grand fir habitat types with no prescribed treatment would have 40 percent or more canopy cover due to the effects of root disease and other pathogens while stands with hemlock or cedar habitat types would have 60 percent or more canopy cover (PF Doc. VEG-6). Hemlock and cedar habitat types would have higher canopy cover because the dominant late-seral species (hemlock and cedar) are more resistant or tolerant of root diseases and bark beetles than grand fir or Douglas-fir, often resulting in higher stocking levels in the later stages of stand development.

Both action alternatives would result in increased representation of resilient long-lived seral species (white pine, western larch and ponderosa pine). Because the amount of change in structure class is such a small percentage of the Coeur d'Alene River Basin, the action alternatives would not result in a detectable change in structural stages at the overall basin scale. Potential changes in proportions of structure classes at the resource area scale are detectable but small (Figure 17).

Structure Class Patch Metrics

The following discussion of effects to landscape arrangement is applicable at the resource area scale. Changes in structure class patch sizes are displayed by alternative in Table 33.

The **desired future condition** for patch sizes of forest structure on moist habitats is to have mean patch sizes in the hundreds of acres for all structure classes other than rock (Section 3.1.2.4.1). The desired future condition for patch sizes of forest structure on dry habitats is for the young and medium structure classes to occur in relatively small patches (tens of acres) and be intricately intermingled within a matrix of predominantly mature structure. The current average patch size of the young structure class is smaller than the desired condition on moist habitats, primarily due to the pattern of past regeneration harvests. Currently the mean patch sizes of the medium and mature structure classes are within the desired range. Patch sizes of young structure on dry habitats are within the desired range due to patchy mortality caused by root diseases and bark beetles. However, the species composition in the young dry-site patches is not in alignment with desired conditions.

Table 33. Existing and projected mean, maximum and minimum patch size, by structure class.

Structure class	Existing mean patch size (acres)	Mean patch size Alt. 2 (acres)	Mean patch size Alt. 3 (acres)	Existing maximum patch size (acres)	Maximum patch size Alt. 2 (acres)	Maximum patch size Alt 3 (acres)	Existing minimum patch size (acres)	Minimum patch size Alt. 2 (acres)	Minimum patch size Alt. 3 (acres)
Mature	3,873	2,022	2,047	19,211	17,996	18,238	23.9	0.4	0.3
Medium	101	98	98	1,101	1,101	1,101	2.6	2.6	2.6
Young	36	48	45	658	658	658	1.2	2.5	2.5
Rock	28	28	28	43	43	43	9.3	9.3	9.3

Under the action alternatives, the patch size of individual patches in the young structure class was determined by adding the acres of existing openings (young patches) with the acres of planned openings (regeneration harvest) where boundaries were shared.

The prescribed treatments under both action alternatives strive to trend treatment patches toward the size and extent of fire disturbances before the 1900's on these landscapes. Models and observations of landscape-scale fire behavior and the impact of fuel treatments clearly suggest that a landscape approach is more likely to have a substantial impact on fire spread, intensity, perimeters and suppression capability than an approach that treats individual stands in isolation.

Treating small or isolated stands without assessing the broader landscape would most likely be ineffective in reducing wildfire extent and severity (Graham et al., 2004, page 29; PF Doc. VEG-R13). Fire severity increased with time since treatment but decreased with unit size in the analyses of the Rodeo/Chedeski (pages 1 and 9; Finney and McHugh, 2004; PF Doc. VEG-R62) and the Hayman Fires (Graham, 2003, pages 9 to 18; PF Doc. VEG-R35). These findings indicate that larger treatment areas do have beneficial effects when tested by fires occurring under severe burning conditions.

Silvicultural systems using density and species management, along with the judicial use of prescribed fire, are fundamental to managing western forests (Graham et al., 2004, page 23; PF Doc. VEG-R13). Proposed treatment areas focus on stands with high insect and disease mortality and current risk as well as areas to increase overall health and resiliency in a connected landscape block arrangement using the inherent arrangement of habitat type groups, aspect, and current structure along with the desired arrangement to decrease fire risk in the wildland urban interface.

All of the proposed harvest treatment types are intended to retain individual trees and/or groups of trees that would most likely survive a fire. Additional fire-intolerant trees may also be retained in order to provide future snags and logs. While regeneration harvests do not duplicate all aspects of fire disturbances retention harvesting, as proposed under both Action Alternatives, does mimic many aspect of fire disturbances better than more intensive clear cutting (Rosenvald and Lohmus, 2008, PF Doc. VEG-R197; PF Doc. VEG-08). Generally, with fire disturbances before the early 1900's, the dead trees remained standing until decay progressed to a point where they fell over. Some snags may have stood for decades. There are still some standing white pine, larch, ponderosa pine and cedar snags that were killed by fires in the late 19th and early 20th centuries. Grand fir, hemlock, lodgepole pine and most Douglas-fir snags do not tend to remain standing for very long because of their propensity to rot after they are dead.

Regeneration after fire was dependent on surviving, scattered remnant trees (usually fire-resistant species), seeds that survived on dying trees, or seeds carried by wind and animals from adjacent seed sources. Due to the lack of adequate and/or dependable on site early-seral seed sources, regeneration would be achieved operationally through planting of larch, ponderosa pine, and/or rust-resistant western white pine.

Forest Service policy (FSM 2471.1, PF Doc. VEG-25) directs land managers to normally limit the size of harvest openings created by even-aged silvicultural methods to 40 acres or less. With some exceptions, creation of larger openings is allowable with Regional Forester approval. Alternative 2 affects 32 patches that would each exceed 40 acres as a result of the proposed regeneration harvesting in combination with past harvest created openings, as displayed in Table 28 (PF Doc. VEG-25). All acres are approximate.

Alternative 3 includes 29 patches that would exceed 40 acres as a result of the proposed regeneration harvesting, as displayed in Table 29 (PF Doc. VEG-25). All acres are approximate.

The proposed openings trend toward the scale and pattern of the desired condition. Openings were developed to attain increased fire resiliency in the wildland urban interface and immediately-adjacent lands within the context of aspect, slope, habitat type, and fire history of the Beaver Creek Resource Area. Shelterwood harvests fit the definition of an opening; units would have up to 25 trees per acre in groups and/or dispersed individuals at irregular spacing. Following harvest and prescribed burning, the regeneration openings of the unit would have both live and dead trees.

Treatments were designed to take advantage of the current landscape arrangement of resilient components (both on the stand and landscape scales) and treatments centered on areas where fuel treatment is a priority and areas with the highest concern in terms of insect and disease mortality, risk, and location of man-made structures (homes, egress roads, etc.). The spatial patterns of fuel treatments in the landscape would most likely determine their effectiveness in modifying wildfire behavior (Hessburg et al., 2000 In: Graham et al., 2004, p. 29; PF Doc. VEG-R13). Fuel treatments are expected to change fire behavior but not necessarily stop fire spread (Graham et al, 2003, p. 11; PF Doc. VEG-R35). Treating small or isolated stands without assessing the broader landscape would most likely be ineffective in reducing wildfire extent and severity (Graham et al., 2004, p. 29; PF Doc. VEG-R13). Random fuel treatment arrangements are extremely inefficient in changing fire behavior, requiring perhaps 50 to 60 percent of the area to be treated compared to 20 percent in a strategic fashion (Finney, 2001 In: Graham et al., 2004, p. 30; PF Doc. VEG-R13).

Alternative 2 would treat approximately 1,250 acres with commercial harvest, approximately 3,759 acres with prescribed burning, and approximately 51 acres through fuel breaks. The sum of

all treatments would occur on approximately 19% of the National Forest System lands in the resource area.

Alternative 3 would treat approximately 725 acres with commercial harvest, approximately 3,792 acres with prescribed burning, and approximately 51 acres through fuel breaks. The sum of all treatments would occur on approximately 17% of the National Forest System lands in the resource area.

Under both action alternatives, many treatments are located near previous vegetation treatments, reducing the need for new road construction and improving their collective effectiveness at modifying landscape-scale fire spread and behavior.

Most of the proposed regeneration units have a high Douglas-fir or grand fir component affected by root disease mortality. The design and size of treatment units under both action alternatives focused on fire, vegetative, wildlife and visual objectives within other resource management objectives and constraints. Fire management concerns included landscape arrangement of fuels over the short and long term in the wildland urban interface and areas immediately adjacent (refer to the Fire/Fuels section in this chapter). Vegetative objectives focused on areas where existing long lived seral species could be maintained by managing stand density and in locations where they are essentially absent and active regeneration of them would increase stand-level resiliency to insects, diseases, fire and changes in climate.

Direct and Indirect Effects to Old Growth under the Action Alternatives

There are no activities proposed in allocated old growth under either action alternative.

None of the proposed activities directly affect allocated old growth. Harvest units 20, 28, 29, 60, 64 and 69 are all adjacent to allocated old growth stands and may indirectly affect the portions of the allocated stands that they share edges with under Alternative 2. Unit 69 is the only harvest unit in the list that does not share the same edge with allocated old growth in both action alternatives as it would not share an edge with allocated old growth under Alternative 3.

Edges between stands of timber can be qualitatively described as soft edges or hard edges. The more similar the forest structure is between two stands the softer the edge. Conversely adjacent stands with very different structure have hard edges. Hard edges have greater magnitude of edge effect than do soft edges. A visual comparison of a hard edge and a relatively soft edge can be seen in Figure 18. In this example the aggregate retention on the left has hard edges with the adjacent forest while the dispersed retention on the right has a softer edge. Edge effects emanate away from the actual edge in all directions. An example of this would be that additional sunlight penetrates some distance into adjacent un-harvested mature stand and dense shade extends some distance into the recently harvested stand.

Heithecker and Halpern (2007) measured edge effects in aggregate patches in harvests in western Washington State. They found the detectable edge effects on the variables they measured occurred within 100 feet of the edge of a patch. Conditions for the same measured variables in patch interiors that were more than 100 feet from the edge of the patch were not statistically different from interior forest conditions in un-harvested control stands. Chen and others (1995) found detectible edge effects for wind speed, temperature and relative humidity up to 800 feet into an un-harvested old growth Douglas-fir stand that was adjacent to a clear cut in western Washington State.

Harvesting of Unit 20 as proposed would result in an abrupt hard edge which would induce edge effects into that portion of the adjacent allocated stand that do not currently exist. This edge

effect would be relatively minor however as the affected edges are located on a “finger” of the adjacent allocated stand that extends out and away from the main body of the stand.

The hardest edge of the listed units would occur along the west boundary of Unit 29 because it is a proposed seedtree unit that is planned in a declining stand of nearly pure grand fir. There are only a few trees in unit 29 that could survive site preparation if retained because of the steep slopes and expected fuel loading following harvest. Harvesting of Unit 29 as proposed would result in an abrupt “hard” edge which would induce edge effects into that portion of the allocated stand that do not currently exist.

Unit 28 is a commercial thin and shares short boundary with the allocated stand, therefore its resulting edge effect would be minor or “soft.”

The allocated old growth stands that are adjacent to units 60, 64, and 69 are all located on the opposite side of a major ridgeline. This topographic feature results in naturally occurring edge and the proposed harvesting would temporarily add to the effects of this natural edge. Edge effects resulting from Unit 64 would be minor or “soft” because the proposed harvest is an improvement cut which will maintain a stocked stand of mature timber at a lower density than what currently exists. Edge effects in units 60 and 69 would be more abrupt and “hard” because these two units have seed tree and shelterwood prescriptions respectively. Aggregate patches of retention are unlikely to occur near the boundary with the adjacent allocated old growth because the existing species composition, slope position and anticipated fuel loading would likely result in mortality of retained trees during associated prescribed burning activities.

3.1.4.4.2. Cumulative Effects under the Action Alternatives

Under the action alternatives, forest vegetation in the majority of the resource area would continue to follow the vegetative trends discussed for Alternative 1. While the effect of Alternative 1 is progression away from the desired forest structure and neutral-to-negative progression towards desired forest composition, the action alternatives would make progress towards the desired future conditions and counteract, even if only to a small degree, the effects of past fire suppression, white pine blister rust, and past harvesting practices. The action alternatives would each result in progression towards the desired future conditions for forest composition and forest structure. Under either of the action alternatives, the cumulative effects to forest vegetation in portions of the resource area that where there are no proposed activities would be the same as described for Alternative 1.

The existing condition of the Beaver Creek Resource Area is a function of past natural disturbances and management activities combined with successional development of forest stands. This existing condition is inclusive of past activities that have affected forest vegetation. Table 25 lists the past activities and shows which activities are accounted for in the existing forest vegetation condition and those that have no measureable effect to the forest vegetation resource.

The effects of white pine blister rust introduction resulted in the widespread loss of western white pine. Western white pine is capable of producing substantial volume growth over relatively long periods of time due to its long average life span. Grand fir and Douglas-fir, which largely replace western white pine, are also capable of substantial volume growth but tend to have shorter lifespans than western white pine, therefore there has been a reduction in productivity potential as a result of the wide spread replacement of white pine by these two firs. Each of the action alternatives would reduce these effects by re-establishing ponderosa pine, western larch and rust resistant white pine; reducing the acreage dominated by decadent stands of grand fir and Douglas-fir, and by improving long term productivity.

Past fire suppression has resulted in the virtual exclusion of fire as an ecological process within the cumulative effects area. As a result fire related successional pathways that once favored long-lived early seral species such as white pine, ponderosa pine and larch have been excluded in favor of insect and disease related pathways that favor short lived shade tolerant species such as Douglas-fir and grand fir. Each of the action alternatives would re-introduce low to moderate severity fire on extensive portions of the resource area.

Fire suppression in combination with past harvesting patterns have also resulted in landscape patterns that are different than what would be expected based on understanding of historic patterns of vegetation on the landscape. Patch sizes of young structure have declined substantially because the scale of stand replacing events has declined in the resource area since the early 1900's. Each of the action alternatives would begin to reverse this trend, increasing the average and maximum patch sizes of the young structure class.

Past regeneration harvests (and associated prescribed burning and planting) have resulted in much of the current long-lived early seral forest cover types. Pre-commercial thinning and pruning activities occur in past regeneration harvests. Past pre-commercial thinning and pruning have reduced stocking and related inter-tree competition and favored retention and survival of long-lived early seral species, increasing the likelihood of their persistence where this thinning has been conducted. Future pre-commercial thinning and pruning would have the same effect(s). Where stands with past or future pre-commercial thinning share boundaries with proposed regeneration harvest units they may collectively contribute to larger future patch sizes western larch, ponderosa pine and/or western white pine forest cover types.

The combined effects of white pine blister rust, fire suppression, and past harvesting patterns have cumulatively lead to landscape scale forest vegetation conditions that now have generally low populations of long-lived early seral species that are, for the most part, scattered in small concentrations that are associated with past regeneration harvests. These conditions are reflected in the results of the Fire Regime Condition Class Assessment that is described in the Fire and Fuels analysis. The regeneration harvests proposed in the action alternatives would connect many of these dispersed patches of long-lived early seral species.

The ongoing and future salvage harvesting associated with the Capital Dudley timber sale would have negligible effects to forest vegetation as the entire sale is a roadside salvage of dead trees that are close enough to roads that are open to public traffic that they have potential to fall on the road and pose a hazard to the public. Portions of the Capital Dudley salvage units would overlap portions of proposed harvest units under both alternatives. The proposed harvest units would further reduce stand densities and would also implement prescribed burning that would reduce shade tolerant regeneration and dead fuels and would improve conditions for natural regeneration of early seral species.

As noted in the Fire/Fuels section (3.2), the cumulative effect of suppressing each small fire in the resource area has been "individually minor but collectively significant," and has not been offset by past timber harvesting and prescribed burning. The effects of white pine blister rust introduction on forest vegetation have also been collectively significant in combination with the effects of fire suppression. Both of the action alternatives would reduce or mitigate the effects of past actions. The past regeneration harvesting, pre-commercial thinning and pruning, in combination with the proposed activities, would move the conditions of the forest vegetation within the resource area closer to the desired future conditions. Alternative 2 would have slightly more movement towards desired future conditions than Alternative 3.

3.1.5. Effects Summary

The analysis considered effects on forest vegetation relative to the historic range of variability; minimum, maximum and average patch size/ consistency with the Forest Plan; and resilience to potential future disturbances. The following table compares the effects of each alternative on Forest Vegetation, in terms of the six sub-issues.

Table 34. Summary comparison effects of alternatives on key Forest Vegetation issues.

Sub-Issue	Analysis Measures	Alternative 2	Alternative 3
Representation of early seral species across the landscape	Acres and proportion of forest cover types (western larch, ponderosa pine, white pine)	3,052 acres	2,819 acres
Forest structure	Acres and proportion of each structure class over time and space	Mature – 18,195 acres Mid – 4,029 acres Young – 5,765 acres	Mature – 18,420 acres Mid – 4,029 acres Young – 5,540 acres
Vertical Structure	Number and proportion of canopy layers	At least 2 in regeneration harvests	At least 2 in regeneration harvests
Effects on existing old growth and/or potential future old growth	Proportion and acres of Beaver Creek watershed allocated as old growth per Green et al (2008) definitions	OGMU 115 – 710 acres OGMU 116 – 909 acres OGMU 122 – 601 acres	Same as Alternative 2.
	Proportion and acres of the affected old growth management units allocated as old growth per Green et al (2008) definitions	OGMU 115 - 8.7% OGMU 116 - 11.0% OGMU 122 - 5.2%	Same as Alternative 2.
	A patch size assessment of allocated old growth patches in the affected Old-Growth Management Units (OGMUs).	minimum-maximum-mean (acres) OGMU 115 - 148 343 237 OGMU 116 - 63 407 227 OGMU 122 - 62 459 200	Same as Alternative 2.
Openings in excess of 40 acres	Number and size of openings in excess of 40 acres	24 openings; largest 434 acres	21 openings; largest 400 acres
	Of those over 40 acres, the number of openings in each size class (including adjacent stands)	17 openings, 40-99 acres each 5 openings, 100-200 acres each 2 openings, more than 200 acres each	14 openings, 40-99 acres each 6 openings, 100-200 acres each 1 opening, more than 200 acres
Future access for vegetation management	Estimated acres with no road access for vegetation management due to road decommissioning	5,387 acres	8,806 acres

3.1.6. Forest Vegetation References

Brackebusch, Arthur P. 1973. Fuel Management – A prerequisite, not an alternative to fire control. Journal of Forestry. 71:637-639. PF Doc. VEG-R23

Byler, James W. and Sara Zimmer-Gorve. 1990. A Forest Health Perspective on Interior Douglas-fir Management. In Interior Douglas-fir: The Species and Its Management. Washington State University, Dept. of Natural Resource Sciences, Cooperative Extension. page 103. PF Doc. VEG-R17

Byler, J.W. and Hagle, S.K. USDA, Forest Service. 2000, Successional Functions of Pathogens and Insects for Ecoregion Sections M332a and M333d in Northern Idaho and Western Montana- Volume 2-Results and Conclusions. Forest Service, State and Private Forestry, Forest Health Protection, Northern Region, FHP Report No. 00-11, July 2000. PF Doc. VEG-R34

Chen, Jiquan, Jerry F. Franklin and Thomas A. Spies. 1995. Growing-Season Microclimatic Gradients from Clearcut Edges into Old-Growth Douglas-Fir Forests. Ecological Applications , Vol. 5, No. 1 (Feb., 1995), pp. 74-86. PF Doc. VEG-R198

Cooper, Stephen V., Kenneth E. Neiman, David W. Roberts, 1991. Forest Habitat Types of Northern Idaho: A Second Approximation. USDA Forest Service, Intermountain Research Station, General Technical Report INT-236. PF Doc. VEG-R1

Crookston, Nicholas L., 1999. Percent canopy Cover and Stand Structure from the Forest Vegetation Simulator. RMRS-GTR-24, USDA, Forest Service Rocky Mountain Research Station. PF Doc. VEG-R3

Dixon, Gary E., 2002. Essential FVS: A User's Guide to the Forest Vegetation Simulator. USDA, Forest Service, Forest Management Service Center, Fort Collins, CO. PF Doc. VEG-R2

Finney, Mark A. and Jack D. Cohen. 2003. Expectation and Evaluation of Fuel Management Objectives. USDA Forest Service Proceedings RMRS-P-29. Pages 353 to 366. PF Doc. VEG-R38

Finney, M.A., C.W. McHugh, and I.C. Grenfell. 2005. Stand- and landscape-level effects of prescribed burning on two Arizona wildfires. Can. J. For. Res 35:1714-1722. PF Doc. VEG-R62

Finney, Mark A. 2006. A computational method for optimizing fuel treatment locations. In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management-How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. P. 107-123. PF Doc. VEG-R192

Forman, Richard T.T. and Michel Godron, 1986. Landscape Ecology. Wiley & Sons, New York. 620 pp. PF Doc. VEG-R199

Frankel, Susan J, technical coordinator, 1998. User's Guide to the Western Root Disease Model, Version 3.0. PSW-GTR-165, USDA, Forest Service, Pacific Southwest Research Station. PF Doc. VEG-R4

Franklin, J.F., D.R. Berg, D.A. Thornburg, J.C. Tappeiner. 1997. Alternative silvicultural approaches to timber harvesting: variable retention harvest systems. In: Kohm, K.A. and J.F. Franklin (Eds.) 1997. Creating a Forestry for the 21st Century. Island Press, Washington, DC, pp. 111-140. PF Doc. VEG-R37

Franklin, Jerry F. and K. N. Johnson. 2011. Moist Forest Principles and Prescriptions (Emphasizing the creation of diverse early successional ecosystems through variable retention regeneration harvest). Unpublished. PF Doc. VEG-R193

Garrison, Mariann T. and James A. Moore. 1998. Nutrition Management: A Summary and Review. Intermountain Forest Tree Nutrition Cooperative. Supplemental Report 98-5. PF Doc. VEG-66

Graham, Russell T., Technical Editor. 2003. Hayman Fire Case Study. USDA Forest Service, RMRS-GTR-114, September 2003. PF Doc. VEG-R35

Graham, Russell T.; Sarah McCaffrey, Theresa B. Jain (tech. eds.), 2004. Science bases for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Rep. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. RMRS-GTR-120. PF Doc. VEG-R13

Green, P.; Joy J. Sirucek, W. Hann; A. Zack, B. Naumann, 1992. Old Growth Forest Types of the Northern Region. USDA, Forest Service, Northern Region, Errata corrected 2011. PF Doc. VEG-R20

Heithecker, T.D.; C.B. Halpern. 2007. Edge-related gradients in microclimate in forest aggregates following structural retention harvests in western Washington. Forest Ecology and Management 248:163-173. PF Doc. VEG-R200

Idaho Panhandle National Forests, 1998, Toward an Ecosystem Approach: An Assessment of the Coeur d'Alene River Basin. Ecosystem Paper #4, United States Department of Agriculture, Idaho Panhandle National Forests. Pages 12, 28-33, and 36-42. PF Doc. CR-025.

Jain, Theresa B., Russell T. Graham. 2007. The Relation Between Tree Burn Severity and Forest Structure in the Rocky Mountains. USDA Forest Service Gen. Tech. Rep. PSW-GTR-203. PF Doc. VEG-R83

Jain, Theresa B., Russell T. Graham and David S. Pilliod. 2006. The Relation Between Forest Structure and Soil Burn Severity. In: Andrews, Patricia L.; Bret W. Butler, comps. 2006 Fuels Management—How to Measure Success: Conference Proceedings. March 28-30, 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Research Station. PF Doc. VEG-R84

Jain, Theresa B., Graham, Russell T., and Morgan, Penelope. 2004. Western white pine growth relative to forest openings. Can. J. For. Res. 34:2187-2198. PF Doc. VEG-R42

Jennings, S.B., N.D. Brown, D. Sheil, 1999. Assessing forest canopies and understory illumination: canopy closure, canopy cover and other measures. Institute of Chartered Foresters, Forestry, Vol. 72, No. 1, 1999. PF Doc. VEG-R32

Keenan, R.J. and J.P. Kimmins. 1993. The ecological effects of clear-cutting. Environ. Rev. 1: 121–144. PF Doc. VEG-R194

Lockman, Blakey; Kenneth E. Gibson, 1998. Trip Report on visit to various locations on Kootenai National Forest regarding Douglas-fir bark beetle infestations, USDA Forest Service. PF Doc. VEG-R28

McGaughey, Robert J. 2002. Creating Visual Simulations of Fuel Conditions Predicted by the Fire and Fuels Extension to the Forest Vegetation Simulator. USDA Forest Service. Rocky Mountain Research Station, RMRS-P-25. PF Doc. VEG-R6

McGaughey, Robert J., 2004. Stand Visualization System, Version 3.3. USDA Forest Service. Pacific Northwest Research Station. April 2004. 141 pages. PF Doc. VEG-R30

Mitchell, S.J. and W.J. Beese. 2002. The retention system: reconciling variable retention with the principles of silvicultural systems. The Forestry Chronicle 78(3): 397-403. PF Doc. VEG-R160

Neuenschwander, Leon F. et al., 1999. White Pine in the American West: A Vanishing Species-Can We Save It? Rocky Mountain Research Station General Technical Report RMRS-GTR-35. USDA Forest Service and University of Idaho. PF Doc. VEG-R18

Reinhardt, Elizabeth and Nicholas L. Crookston, 2005. The Fire and Fuels Extension to the Forest Vegetation Simulator. RMRS-GTR-116, January 2005. PF Doc. VEG-R5

Rippy, Raini C.; Stewart, Jane E.; Zambino, Paul J.; Klopfenstein, Ned B.; Tirocke, Joanne M.; Kim, Mee-Sook; Thies, Walter G. 2005. Root diseases in coniferous forests of the Inland West: potential implications of fuels treatments. Gen. Tech. Rep. RMRS-GTR-141. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. PF Doc. VEG-R40

Rosenvald, Raul and Asko Lõhmus, 2008. For what, when, and where is green-tree retention better than clear-cutting? A review of the biodiversity aspects. Forest Ecology and Management 255 (2008) 1–15. PF Doc. VEG-R197

Schwandt J.W., M.A. Marsden, and G.I. McDonald, 1994. Pruning and thinning effects on white pine survival and volume in northern Idaho. In: Baumgartner D.M. et al., Eds. Interior cedar-hemlock forests: ecology and management. 1993. March 2-4, Spokane. Washington State University Coop. Ext. p. 167-172. PF Doc. VEG-R19

Schwandt, John and Art Zack. 1996. White Pine Leave Tree Guidelines. USDA Forest Service, FHP-Report-96-3. PF Doc. VEG-R58

Schnepf, Christopher. 2006. Variable Retention Harvesting? Woodland Notes, Vol.16, No.2.UI Extension Forestry Information Series Forest Management No.49. PF Doc. VEG-R155

Schoennagel, Tania; Veblen, Thomas T. and Romme, William H. 2004. The Interaction of Fire, Fuels, and Climate across Rocky Mountain Forests. BioScience, pages 661-676, July 2004, Vol.54 No.7. PF Doc. VEG-R25

Toman Michael A., Mark S. Ashton, 1996. Sustainable Forest Ecosystems and Management: A Review Article. Society of American Foresters, Forest Science 42(3) 1996. PF Doc. VEG-R33

USDA, Forest Service. 1994. Graham, Russell T.; Alan E. Harvey; Martin F. Jurgensen; Theresa B. Jain; Jonalea R. Tonn; Deborah S. Page-Dumroese. Managing Coarse Woody Debris in Forests of the Rocky Mountains. Research Paper INT-RP-477. PF Doc. VEG-R61

USDA Forest Service, 1997. Upper Columbia River Basin Draft Environmental Impact Statement: Volume 1. USDA Forest Service, Pacific Northwest Research Station; USDI Bureau of Land Management. Pages 37 and 59-67. PF Doc. VEG-R10

USDA Forest Service, Region 1, Landscape Ecology Peer Group, 1997 revised 7/2003. Biophysical Classification: Habitat Groups and Descriptions. USDA Forest Service, Missoula, Montana. PF Doc. VEG-R15

USDA, Forest Service, 1998, Northern Region Overview- Detailed Report. PF Doc. VEG-R8

USDA Forest Service, 1998, Northern Region Overview - Summary Report. PF Doc. VEG-R9

USDA Forest Service, 2000. Northern Region Snag Management Protocol. Northern Region. Missoula, Montana. PF Doc. VEG-R57

USDA Forest Service, 2000. Successional Functions of Pathogens and Insects for Ecoregion Sections M332a and M333d in Northern Idaho and Western Montana- Volume 2-Results and Conclusions. Forest Service, State and Private Forestry, Forest Health Protection, Northern Region, FHP Report No. 00-11, July 2000. PF Doc. VEG-R34

USDA Forest Service, 2003. Analysis of the Management Situation for Revision of the Kootenai and Idaho Panhandle Forest Plans. Online at www.fs.fed.us/kipz/documents/ams/index.php. PF Doc. VEG-R21

USDA Forest Service, 2003, Idaho Panhandle National Forest Plan Monitoring and Evaluation Report. Pages 10, 13-14, OG. PF Doc. CR-022

USDA Forest Service, 2004, Idaho Panhandle National Forest Plan Monitoring and Evaluation Report. PF Doc. CR-026

USDA, Forest Service, 2010. 2007-09 Idaho Panhandle National Forest Plan Monitoring and Evaluation Report. PF DOC. CR-040

USDA, Forest Service, 2013. 2010-11 Idaho Panhandle National Forest Plan Monitoring and Evaluation Report. PF Doc. CR-047

Vose, James M.; Peterson, David L.; Patel-Weynand, Toral, eds. 2012. Effects of climatic variability and change on forest ecosystems: a comprehensive science synthesis for the U.S. forest sector. Gen. Tech. Rep. PNW-GTR-870. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 265 pp. PF Doc. VEG-R196

Washington State University- Department of Natural Resource Sciences Extension, Forest Health Notes, 2006. An Overview of Forest Health. at http://ext.nrs.wsu.edu/forestryext/foresthealth/notes/overviewforesthealth.htm; accessed 12/2/06. PF Doc. VEG-R69

Weatherspoon, C Phillip; Skinner, Carl N (1995): An assessment of factors associated with damage to tree crowns from the 1987 wildfires in northern California. Forest Science 41: 430-451. PF Doc. VEG-R191

Zack, Arthur C.; Penelope Morgan; 1994. Fire History on the Idaho Panhandle National Forests. Moscow, Idaho: University of Idaho. 55 pages. Review Draft. PF Doc. VEG-R14

3.2. Fire/Fuels

3.2.1. Introduction

Hazardous fuels in the Resource Area could pose a threat to life, property and resource values. About two-thirds of the Resource Area is designated as wildland-urban interface (WUI) according to the Shoshone County Community Wildfire Protection Plan (PF Doc. CR-020). The Beaver Creek Resource Area was ranked as a high priority area for fuel reduction by the Shoshone County CWPP (PF Doc. CR-020, page 93). Hazardous fuels in the Resource area have resulted in part due to a lack of fire in these fire-adapted ecosystems, causing increased fuel loadings, changes in species composition and forest structure. The potential fire behavior associated with hazardous fuels in the Resource Area not only threatens WUI values, but also key ecosystem components such as old growth stands and wildlife habitat.

3.2.1.1. Overview of Issues Addressed

In the past, fire was a very common and significant force in shaping the fuels and vegetation in the Resource Area. Fire influenced species composition, age structure, fuel loading and potential fire behavior. However, wildfire has been effectively excluded from the Resource Area for over 100 years, and prescribed fire has not been applied comparable to historic wildfire levels. As a result of this and other factors, fuels have increased at both the stand and landscape scales. The WUI designation was influenced by the presence of private land (including homes), the Bonneville Power Administration power transmission line, communications sites (including Emergency Management Systems), and primary escape routes for people to use during emergencies. Beaver Creek is near the communities of Prichard and Murray; a large fire in Beaver Creek would affect and likely threaten these communities. In addition, firewood cutting, berry picking, ATV riding, hunting and recreational mining bring many visitors to the area during fire season. It is impossible to predict when a large fire would threaten the many values in the resource area, but the existing fuel conditions could support such a fire in the near future.

Uncontrolled fires in the Resource Area would not only threaten the nearby structures, but would also threaten the safety of the residents who could be trapped in a life-threatening situation. Conditions in the Resource Area could support an uncontrolled fire which would threaten the lives of people living nearby, their homes and property. Fire behavior outside the natural fire regime could jeopardize key ecosystem components and natural resources such as old growth, air quality, water quality, forest cover, soil productivity and wildlife habitat.

Indicators used in this analysis fall into two categories: fire behavior indicators and ecological indicators. The fire behavior indicators show the effects of the activities on fuel loading and associated fire behavior, while the ecological indicator shows departure from the natural fire regime, and how vegetation management activities restore fire-adapted ecosystems.

3.2.1.2. Issue Indicators

3.2.1.2.1. Fire Behavior Indicators

There are three different kinds of fuels: surface, ladder and crown fuels. The proposal may affect fuel loading at the stand scale over time. Surface fuel loading and arrangement is directly related to **flame length,** which is the first indicator of the fire/fuels analysis. Suppression tactics are directly related to flame lengths. For example, flame lengths less than four feet can be effectively attacked using hand crews constructing direct fire line, while flame lengths greater than four feet

will likely have to be attacked using dozers, engines, and retardant aircraft (NWCG 1993, page B-59; PF Doc. FF-REF-11).

The second indicator measures ladder fuels with an indicator called **probability of torching**. The probability of torching measures the probability of finding a torching situation in a forest stand, or in simpler terms, the proportion of the stand where there are enough ladder fuels for fire to climb up into the trees (Crookston and Reinhardt, 2004; PF Doc FF-REF-18, pg. 159). A torching situation is generally defined as one where tree crowns of large trees are ignited by the flames of a surface fire or flames from burning crowns of small trees that reach the larger trees (Figure 19).

Figure 19. Passive crown fire behavior (torching).

Crown fuels are measured with the **crowning index**, which is the wind speed 20 feet above the canopy at which active crowning is possible (Scott and Reinhardt 2001, page 17; PF Doc. FF-REF-10). 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. As depicted in Figure 20, 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, page 4; PF Doc. FF-REF-10). The higher the crowning index, the lower the crown fuel loading and the lower the crown fire hazard.

Figure 20. Active crown fire behavior.

The indicators discussed thus far have been *stand-level* indicators, meaning that they only tell us about fire behavior at the stand level. In order to determine the effects of the alternatives at the landscape-level, a fourth indicator called **minimum travel time** was used. **Minimum travel time** is an output from FlamMap (Finney, 2006 PF Doc FF-REF-2), which uses 8 layers of information on fuels (PF Doc. FF-3, FF-4), topography and static weather conditions to simulate fire behavior on a landscape. Minimum travel time shows the minimum amount of time it would take a fire to travel across the landscape.

3.2.1.2.2. Ecological Indicator

The proposal may affect the proportions of species composition and forest structure within the resource area that, in the past, was heavily influenced by the historic fire regime. **Fire Regime Condition Class** (FRCC) is not necessarily a measure of fire hazard, but a classification of the departure from the natural regime. Changes in the proportions of species composition and forest structure will be measured with acres changed in Fire Regime Condition Class. The FRCC analysis was completed according to the procedures in the Interagency Fire Regime Condition Class Guidebook (2008, PF Doc FF-REF-19). A full description of the analysis including the data used, field verification process, and rationale is included in the project file (PF Docs FF-5, FF-6, FF-17, and FF-22).

These indicators (flame length, probability of torching, crowning index, minimum travel time and acres of changed FRCC) show the effectiveness of the alternatives to reduce the risk of fire to life, property and resource values.

3.2.2. Methodology

Several sources of information were used to assess the existing conditions in the Beaver Creek Resource Area. The fire history of the Coeur d'Alene River Ranger District, including Beaver Creek, has been recorded and mapped by the Forest Service since its inception. This fire history map was used to make assumptions as to when effective fire suppression began (PF Doc. FF-7). Additionally, a fire history study of the Idaho Panhandle National Forests was conducted by Zack and Morgan (1994; PF Doc. FF-REF-23). The information gathered by this study and the subsequent conclusions drawn from it are relevant to the Beaver Creek area and were used to help characterize existing conditions. An extensive literature review was completed in order to find the best, most current science applicable to the Beaver Creek Resource Area.

Records of fire ignitions are compiled by the Forest Service (1970 to 2012); these records include the year, size, location, and cause of each fire reported. These records differ from the fire history map in that they are more recent, the fires are generally much smaller; since they are smaller they are recorded only as points rather than polygons. Records for fire ignitions in the Beaver Creek Resource Area were used in this analysis (PF Doc. FF-8).

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-REF-19). LANDFIRE data was used as part of the FRCC analysis and in FlamMap for the Minimum Travel Time analysis (PF Doc. FF-3, FF-4, FF-6).

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 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, page 12; PF Doc. FF-REF-14). FFE-FVS was used in this analysis to describe the existing conditions of the forest stands in the Beaver Creek Resource Area, as well as to compare the effects of proposed treatments within each alternative. Site-specific data gathered from field exams were used in the FFE-FVS model. FFE-FVS was used to assess the risk of fire to a stand with indicators such as potential flame length, the probability of torching, 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-REF-14). It is used solely to assess the potential fire behavior and fire effects possible considering current and future stand conditions.

The FlamMap model was used to simulate a fire's spread across the landscape, and to determine the collective effect of all of the treatments. FlamMap was used to calculate the **Minimum Travel Time** for the fire to reach each small piece of the landscape. As with all models, FlamMap is based on simplifying assumptions and has several limitations (Finney 2006, PF Doc FF-REF-2); results should not be interpreted literally, but can be compared on a relative scale. Also, each theoretical fire and weather pattern may never occur; however, the general theme of the modeling results is valid.

As with all models, those used in this analysis are based on simplifying assumptions and all have limitations which are explained in the respective model description in the project file (PF Doc. FF-REF-2, 14 and 18). Results of all modeling scenarios are included in the project file (PF Doc. FF-21), as are maps of all fuel characteristics that were used in the modeling scenarios (PF Doc. FF-3 and 4).

3.2.2.1. Public Comments on Science

Included in responses to scoping were references to scientific research relative to the fire/fuels analysis. All research was reviewed for its applicability (or lack thereof) to the Beaver Creek Resource Area. Following is a discussion of many of the comments received, and why the research was used, or why it was not applicable to this project.

Scoping comments from The Lands Council (PF Doc. PI-28) question the need to reduce fuels, and suggest that the best available scientific information says that the focus for fuel reduction should be within the Home Ignition Zone (HIZ), and that the effectiveness of fuel treatments beyond the HIZ is highly uncertain (Cohen 1999, PF Doc FF-REF-45; Finney and Cohen 2003, PF Doc FF-REF-31). Cohen's research is widely accepted; however, the sole purpose of the cited research is to determine the factors influencing home ignitability. In the Beaver Creek Resource Area, there are other goals to the fuel reduction proposed in addition to reducing home ignitability. More recent research has found substantial reductions in burn probability and flame lengths around structures where fuel treatments were located 5-10 kilometers away (approximately 3-6 miles, Ager et al. 2010; PF Doc FF-REF-51). Proposed activities take into account both research perspectives by reducing fuels in the Home Ignition Zone, and reducing fuels across the landscape in order to meet multiple objectives for fuel reduction. Reducing fuels across the landscape may help prevent a potential fire from ever reaching a house in the first place.

The Lands Council refers to research by Cohen and Butler (2005, PF Doc FF-REF-83) and Finney and Cohen (2003, PF Doc FF-REF-31). This research has been carefully reviewed and has been included in the project files for projects on the Coeur d'Alene River Ranger District for many years. The Lands Council also cites Rhodes (2007, PF Doc FF-REF-84), who questions the effectiveness of mechanical fuel treatments at reducing fire severity. A primary tenet of Rhodes' argument is that mechanical fuel treatments can only reduce fire severity if fire burns the treated areas during the window where the treatments are still effective, and that chances are fire won't burn the treated areas during that time. A parallel argument is that wearing your seatbelt on a trip to the grocery store is ineffective because you probably won't get in a wreck on the trip. Both are true, but the consequences of the severe fire or the car wreck are such that it is prudent to be prepared in the face of uncertain outcomes. Agee and Skinner (2005, PF Doc FF-REF-65) say that it may be quite difficult to point to a particular stand and define its probability of burning in some given future period, but the probability that substantial areas of dry forest will continue to be burned by severe wildfire is known, and it is high.

Rhodes (2007, PF Doc FF-REF-84) assumes that in many cases activity fuels are left untreated after timber harvest, and that the largest trees are harvested, leaving the smaller trees, both of which are not true for this proposal. Rhodes does concede that if fire affects treated areas while fuels are reduced, there is some potential for mechanical fuel treatments to reduce fire severity and restore the natural fire regimes in forests with natural fire regimes of mixed-severity fire or infrequent low-severity fire.

3.2.3. Spatial and Temporal Context for Effects Analysis

The fire/fuels analysis completes analyses at different scales. Stand-level fire behavior indicators are used to portray the direct, local effects of vegetative treatments on fire and fuel characteristics, and are reported at the stand level. These stand-level effects are modeled for approximately 70 years into the future. The Fire Regime Condition Class analysis is completed at the resource area scale, and displays conditions for only a snapshot in time; it does not show how FRCC will change in the future under the alternatives. The analysis of landscape level fire behavior

(FlamMap Minimum Travel Time analysis) is completed at the largest scale, shown here as the cumulative effects analysis area. The Fire CEA extends beyond the resource area to the north and east, and includes homes and structures that could be affected by a wildland fire in Beaver Creek. The cumulative effects area boundary follows major ridgelines, rivers and paved roads which could act as a barrier to fire (Figure 21). The Minimum Travel Time analysis is also only a snapshot in time – it does not show how landscape level fire behavior will change over time.

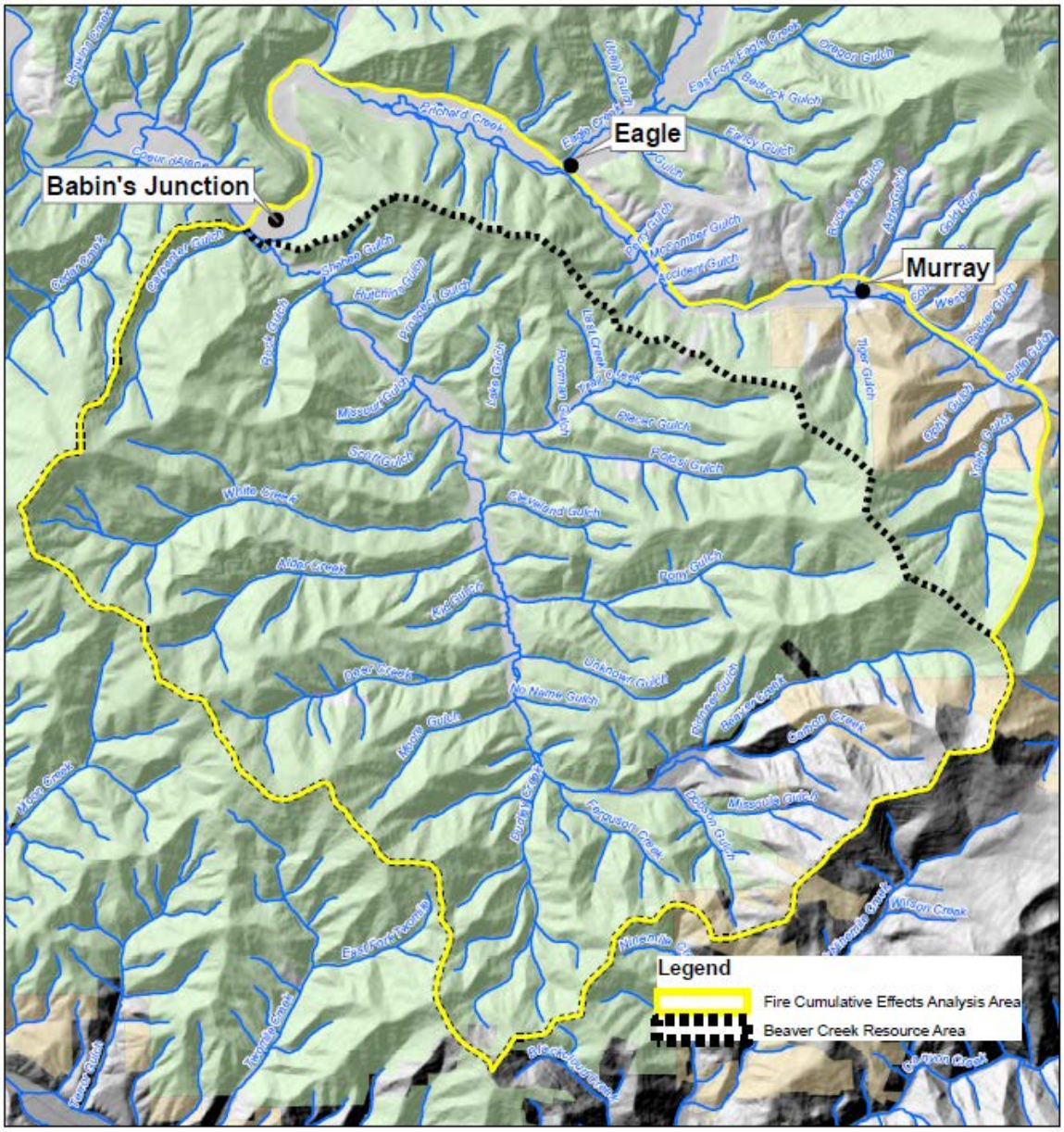


Figure 21. Cumulative Effects Area used for the Fire/Fuels analysis.

3.2.4. Existing Conditions

3.2.4.1. Overview

The Beaver Creek Resource area is comprised mostly of National Forest System (NFS) lands (about 88% of the area). However, private ownership is intermixed with the NFS lands. Most of the private land occurs along the main stem of Beaver and Trail Creeks, as well as in the southeastern portion of the resource area near Sunset Peak. Homes are scattered throughout the private land along Beaver Creek, with several adjacent to NFS Lands (Figure 22). Seasonal recreational residences occur primarily at the lower end of Beaver Creek.

Figure 22. A structure directly adjacent to NFS lands in the Beaver Creek Resource Area.

Site-specific inventories of surface fuels in the Beaver Creek Resource Area show that very high fuel loadings are common, especially in sites affected by ice storm damage, beetle mortality and white pine blister rust (Figure 23). One stand in Deer Creek that avoided burning in both 1889 and 1908 fires now has approximately 120 tons per acre of fuels on the ground, which is very high, but not necessarily unique. This stand exemplifies the effects of fire exclusion.

Figure 23. An example of heavy fuels in the Beaver Creek Resource Area.

In stands with heavy overstory mortality resulting from various insects and diseases, fuel loadings of around 80 tons per acre are not uncommon. Over one-third of the sampled stands had over 30 tons per acre of surface fuels, which is generally what is recommended by Graham et al. (1994) to remain on site **after harvest** in order to maintain forest productivity (PF Doc. VEG-22). Since these sites with high fuel loadings are usually unharvested, fully-stocked stands, they have the potential for extreme fire behavior (including crown fires) and even more fuel accumulation in the future if left unmanaged. Although high concentrations of heavy fuels are not necessarily uncommon or askew on some sites, these heavy fuels contribute to longer residence times (meaning they burn longer), leading to higher levels of soil heating and higher fire severity. Even though high fuel loads may be ecologically appropriate on some sites, the Beaver Creek Resource Area contains Wildland-Urban Interface values which may be threatened by widespread high fuel loadings.

"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.*

"Return interval" *refers to how often a particular type of fire occurs.*

"Fireline intensity" *is the energy release rate per unit length of fire line and is a physical parameter that can be related to flame length.*

3.2.4.2. Historical Perspective

Much of the Beaver Creek Resource Area burned in 1889 (Figure 25). A fire burned about 930 acres in the Deer Creek area in 1908, but since then, fires have been effectively suppressed and kept very small. Prior to effective suppression, forest fires were a common occurrence. In fact, John B. Leiberg, who completed a botanical survey of the Coeur d'Alene Mountains in 1895, said that "forest fires have always raged in the Coeur d'Alenes" (Leiberg 1897, PF Doc. FF-REF-17). Evidence of the pervasive presence of fire in the Beaver Creek Resource Area exists in the form of many fire scars that can be found throughout the area (PF Doc FF-11).

Zack and Morgan (1994, PF Doc. FF-REF-23) completed a fire history study of the Coeur d'Alene Basin; they found that the Coeur d'Alene River drainage historically had a variable fire regime of long-interval, large, lethal fires mixed with shorter return interval non-lethal and mixed-severity fires. Prior to Euro-American settlement (1880), the mean fire return interval within the Interior North Fork of the Coeur d'Alene River (which includes Beaver Creek) was 65 years, (Zack and Morgan 1994, page 27; PF Doc. FF-REF-23). Most of the resource area consists of moist forests, where a mixed-severity fire regime as described by Zack and Morgan dominates.

Since there is a mix of habitat types in the Beaver Creek Resource Area, there has been a mix of low, mixed, and high severity fires in the past. The entire Resource Area could be characterized as a mixed-severity fire regime, with a higher frequency of low-severity fires on the dry sites, and moist sites seeing more mixed and high-severity fires (Schoennagel et al. 2004 PF Doc FF-REF-34).

Less than 20% of the Beaver Creek Resource area is comprised of dry habitat types, but many of these sites provide high-quality habitat (Figure 24). The drier sites in the Beaver Creek Resource Area probably had a much shorter fire return interval. Leiberg (1897, PF Doc. FF-REF-17) described open forests, with trees far apart and a sparse undergrowth of shrubs and a fair to luxuriant growth of grass.

In Leiberg's description of these open forests, there was little fallen timber, and where the growth of ponderosa pine (or yellow pine) was pure, the forest was park-like and had a clean and open appearance. However, Leiberg noted that mixed forests of ponderosa pine, Douglas-fir, grand fir and lodgepole pine and western larch were more common.

These lower severity fires that occurred more frequently "structured how the landscape responded when a lethal severity fire did occur" (Zack and Morgan 1994; PF Doc. FF-REF-23). The lower severity fires increased the proportion of the landscape with big trees and open canopies that would not sustain a crown fire. Reduction of ladder fuels would mean that even high intensity fire might not reach tree canopies in some cases. The larger trees that grew as a result of this thinning would be more likely to survive even intense fires. The net result would be that even mostly lethal severity fires would be likely to leave more individual residual trees and patches of residual trees than if the lower severity fires had not occurred. This type of fire regime would have led to open, old growth forests which were dependent on low-severity fires to maintain their stand structure.

Figure 24. A dry site in the Beaver Creek Resource Area; these dry sites make up less than 20% of the resource area, and are dependent on frequent fire to maintain their structure and resilience.

The more frequent surface fires that occurred on the drier sites may have spread into the more moist sites occasionally and burned as mixed severity fires, even turning into lethal fires as the fire season progressed. On the other hand, in wetter conditions, fires that spread through the ponderosa pine forests may have slowed considerably or even stopped when they reached the moist forests. Moist forests can be relatively resilient to wildfire, likely due to higher moisture content of surface fuels (Jain et al. 2006, PF Doc FF-REF-39). Because the moist forests have a longer fire return interval, they have probably changed less as a result of fire suppression (Schoennagel et al., 2004; PF Doc. FF-REF-34). Although lower severity fires affected the structure of moist forests, they were not as dependent on low severity, frequent fire to maintain a sustainable structure as were drier ponderosa pine forests.

The structural changes that have occurred due to fire exclusion are more pronounced in dry forests than they are in more moist forests. In dry forests of the Inland Northwest, low-severity fires favored fire-tolerant forest structures by removing the lower crown classes (Hessburg et al. 2005; PF Doc. FF-REF-37). These fires also cycled nutrients from foliage and branches into the soil, promoted the growth of a low and patchy shrub and herb cover, reduced the threat of running crown fires by continually thinning stands, eliminating fuel ladders, elevating crown bases, and reduced competition for site resources among surviving trees, shrubs, and herbs (Hessburg et al. 2005; PF Doc. FF-REF-37). Without periodic fire in these forests, the old growth component of the stands is at risk to lethal fire, among other things.

3.2.4.3. Past Management Activities

There have been 4,156 acres of prescribed burning in the Beaver Creek Resource Area, nearly two-thirds of which was associated with timber harvesting as a post-harvest activity (PF Doc FF-14; broadcast, jackpot, underburn and wildlife habitat prescribed fire). This level of prescribed burning is not likely equivalent to what would have burned under the natural fire regime during the same time period, especially since we know there have been at least 27 lightning-caused fires in the cumulative effects analysis area within the last 42 years. Not only is this level of prescribed burning not equivalent to what may have burned under the natural regime, it was not distributed over the landscape as natural fire would have been. As discussed previously, dry sites would have burned with more frequency than moist sites, while timber harvesting has been focused on the more productive moist sites.

A total of 64 wildfires have burned 42 acres within the cumulative effects analysis area within the last 40 years; 27 of these fires were caused by lightning. If the lightning-caused fires had been allowed to burn, each would have burned under different weather conditions, and would have burned with different severities, intensities, and spatial extent. Under natural conditions, some of these fires could have burned for 1-3 months during the fire season, growing unchecked until fall rains finally extinguished them. Under these conditions, each fire had the potential to burn several hundred, if not several thousand acres. Additionally, records for lightning-caused fires prior to about 1970 are not available, and it is highly likely that there have been many more lightning ignitions in the Beaver Creek Resource Area that have been suppressed.

Fire exclusion likely had considerable effects on the vegetation in the Resource Area. When fire is excluded, ponderosa pine loses competitive advantage relative to Douglas-fir (MacKenzie et al. 2004, PF Doc FF-REF-41). With fire exclusion, forests that historically experienced mixed severity fire regimes have developed a more homogenous forest structure across the landscape, resulting in larger areas of continuously dense forest and perhaps in larger patches of crown fire than were witnessed historically (Schoennagel et al. 2004, PF Doc. FF-REF-34; Keane et al. 2002, PF Doc FF-REF-32).

Hessburg et al. (2005; PF Doc. FF-REF-37) found that fire exclusion and other changes in disturbance processes in Inland Northwest forests have led to:

- elevated fuel loadings and increased connectivity of high fuel loading
- increased potential for running crown fires
- increased vulnerability to many insect and disease disturbances of fire-intolerant tree species
- increased likelihood of severe fire behavior in forest stands or patches with respect to flame length, rate of spread, and fireline intensity
- increased contagion or spatial aggregation of vulnerability to severe fire and insect and disease disturbances

Several fires burned in the drought year of 1889. The most recent fires in the Beaver Creek Resource Area large enough to be mapped occurred in 1908 in Deer Creek; as depicted in Figure 25. The removal of fire from the fire-dominated ecosystems of the Rocky Mountains has caused a plethora of cascading effects that has permeated nearly every part of this rugged landscape (Keane et al. 2002; PF Doc FF-REF-32). Stand-level effects include increases in woody fuel loading, canopy cover, vertical fuel distribution, canopy stratum, and fuel continuity.

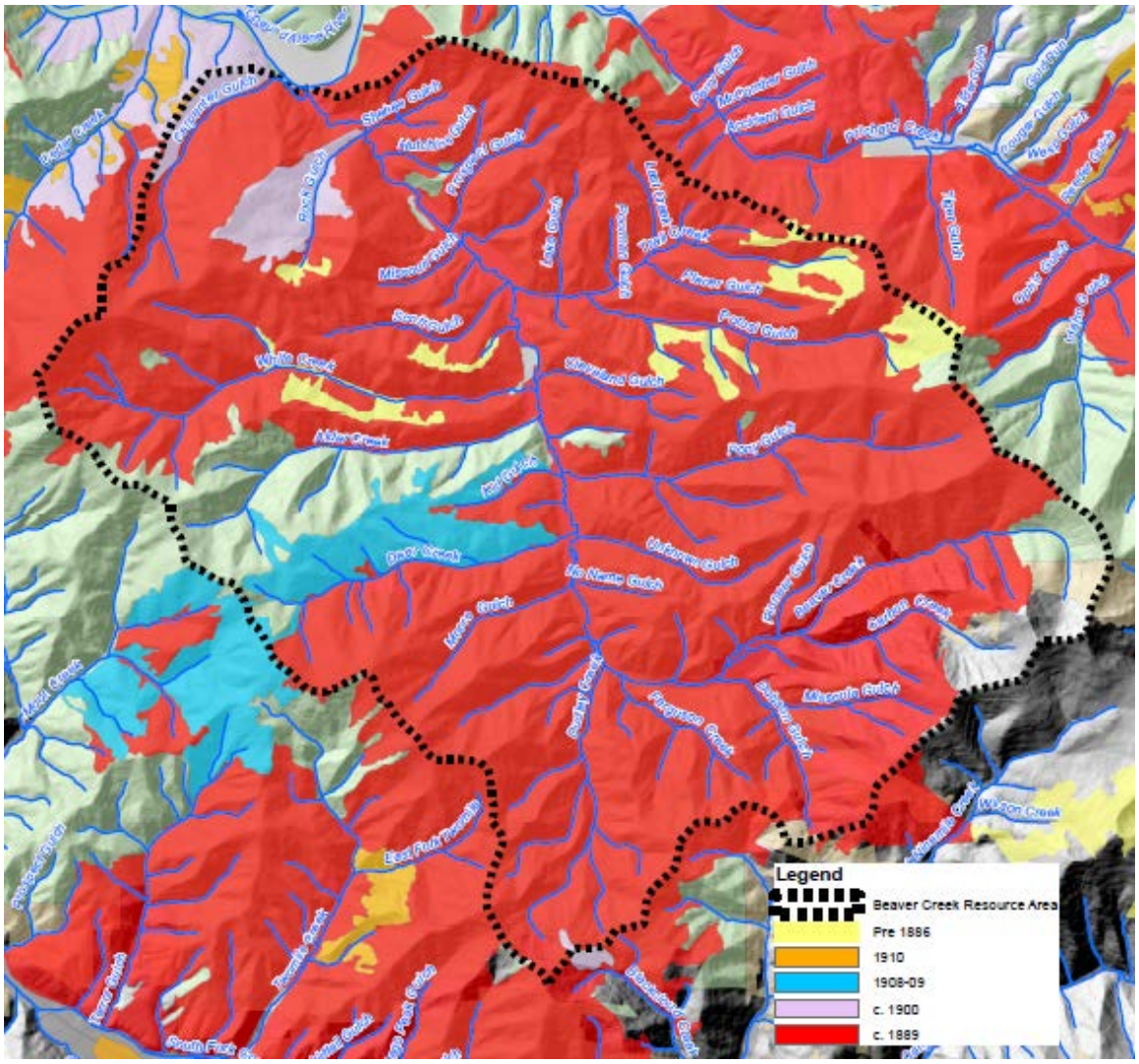


Figure 25. Recorded fire history of the Red Beauty Resource Area 1905 – present.

3.2.4.4. Fire Regime Condition Class

The Fire Regime Condition Class (FRCC) analysis is not necessarily an analysis of fire hazard, but a classification of the amount of departure from the natural regime (Hann and Bunnell 2001, PF Doc. FF-REF-42). FRCC includes three condition classes for each fire regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing and drought).

The three classes are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural (historical) regime. Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside of the natural range of variability. **The desired landscape-level FRCC for the Beaver Creek Resource Area is FRCC 1 (0-33% departure). Currently, the landscape as a whole is in FRCC 2 (56% departure).** For details and maps of the FRCC analysis, see project file documents FF-5, FF-6, FF-17 and FF-22.

The FRCC analysis divides the resource area into 5 different biophysical settings: ponderosa pine/Douglas-fir, grand fir, mesic mixed conifer, riparian, and subalpine. The following are some conclusions derived from the FRCC analysis:

- Every biophysical setting has an under-representation of the early seral post-disturbance successional class.
- At least 20% of the Resource Area is in an uncharacteristic condition due to white pine blister rust.
- The driest biophysical setting (Ponderosa Pine/Douglas-fir) is the most departed from its historical conditions. These sites had the most frequent fire interval, so fire exclusion has had the most significant effects. Fire exclusion (and a lack of prescribed fire) has caused an under-representation of the early seral post-disturbance successional class, as well as an over-representation of closed canopy successional classes. Open-canopy successional classes only occur in trace amounts relative to historic conditions.
- The Grand Fir biophysical setting has trace amounts of mid-seral successional classes and an over-representation of late seral successional classes relative to historic conditions. Again, the early seral post-disturbance successional class is under-represented.
- The Mesic Mixed Conifer biophysical setting has an over-representation of open-canopy successional classes, while the mid-seral, closed canopy successional class only occurs in trace amounts relative to historic conditions. The early seral post-disturbance successional class is under-represented.

3.2.5. Management Framework

Fire management includes all of the activities undertaken for the purposes of firefighter safety, public safety and community protection. Fire management also includes the protection of resources and other values from wildfire, and the use of prescribed and wildland fire to meet land and resource management goals and objectives. Forest Service fire management activities always put human life as the single, overriding priority. Forest Service fire management activities shall result in safe, cost-effective fire management programs that protect, maintain, and enhance NFS lands, adjacent lands, and lands protected by the Forest Service under cooperative agreement (FSM 5100, PF Doc FF-REF-29).

The authority for fire management on NFS lands is described in Forest Service Manual (FSM) 5100 - Fire Management (PF Doc. FF-REF-29). The objectives of fire management are (FSM 5140, PF Doc FF-REF-30):

1. To use fire from planned or unplanned ignitions in a safe, carefully planned, and cost-effective manner to benefit, protect, maintain, and enhance NFS resources.
2. To alter fuel profiles so that public and firefighter safety is improved and communities, infrastructure, and other values-at-risk are less vulnerable to impacts from wildfire.
3. To reduce future fire suppression costs and unwanted effects.
4. To restore natural ecological processes.
5. To achieve desired conditions and attain management objectives adopted in

approved forest land and resource management plans (FSM 1920).

As part of the Federal Land Assistance, Management and Enhancement act of 2009 (the FLAME Act), the Secretaries of Interior and Agriculture were directed to submit a cohesive wildfire management strategy. The *National Cohesive Wildland Fire Management Strategy* ('Strategy'; PF Doc FF-REF-24) was published in 2011 as the result of this direction. The Strategy says that addressing wildfire is not simply a fire management, fire operations, or wildland-urban interface problem – it is a larger, more complex land management and societal issue. The vision for the next century is to:

> *Safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire.*

Three primary factors have been identified to achieve this vision. They are:

- Restoring and maintaining resilient landscapes
- Creating fire-adapted communities
- Responding to wildfires

The Forest Plan objective for fire management is to implement efficient fire protection and use programs based on management objectives, site-specific conditions, and expected fire occurrence and behavior (PF Doc. CR-002). Forest-wide standards require that fire management plans are to be guided by management area standards. Management area standards and goals provide direction for appropriate use of prescribed fire and initial attack strategies. Human life and property are to be protected, and activity fuels should 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 identified four management area designations for National Forest System lands in the Beaver Creek Resource Area (MA 1, MA 4, MA 6, and MA 9). (See Chapter 2, Section 1.2, for a description of the management area designations in the Beaver Creek Resource Area.) Appropriate initial attack strategies (confine, contain and control) are to be used to achieve the best benefit based on commercial timber, big-game, and other values (PF Doc. CR-002, pages III-4, III-20, III-30, III-41, and III-72). Prescribed fire is to be used as needed to meet silvicultural objectives and the objectives of the management area. The Forest Plan allows the use of unplanned ignitions to meet resource objectives in these designated management areas in the Beaver Creek Resource Area (PF Doc. CR-002, page F-3).

Under 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.

Under Forest Plan Fire Management Standard 2, the Fire Management is to be guided by the following Forest-wide standards:

1. Management area standards.
2. Human life and property will be protected.
3. 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 Forest Plan Appendix F, Table 10 using unplanned ignitions.

4. Management area standards will be used in Escaped Fire Situation Analyses as a basis for establishing resource priorities and values.
5. 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.
6. 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.
7. Forest Fuel Management Fund expenditure priorities are:
8. Natural fuels that pose a threat to human life and property
9. Unfunded activity fuel projects
10. Areas where fuels/fire behavior is a threat to management area objectives

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.

As part of the National Fire Plan (PF Doc. CR-033), private lands are being treated by Shoshone County's Fire Mitigation program. Land management agencies in Shoshone County are part of a group that coordinates and guides fuel reduction and fire mitigation work for the participating agencies throughout Shoshone County.

An important change in fire management occurred in 2009, when the implementation of federal fire policy underwent significant changes (PF Doc FF-REF-26). Prior to 2009, wildland fires were either managed for resource benefits (wildland fire use) or were suppressed, and could not interchange. With the 2009 direction, wildland fires can be managed for one or more objectives based on the Forest Plan. For example, the same fire could be under a suppression strategy at one time or place and under a less restrictive strategy at another time or place; this would result in more cost-effective management of fires while allowing fire to play a more natural role in the ecosystem. All fire management responses are possible in the future in the Beaver Creek Resource Area; each fire will be individually assessed and a management strategy formed based on Forest Plan direction, current conditions, risks and benefits.

3.2.6. Environmental Consequences

3.2.6.1. Alternative 1 – No Action

3.2.6.1.1. Direct and Indirect Effects of Taking No Action

Direct effects (those which are caused by the action and occur at the same time and place) to fire and fuel conditions would be absent under Alternative 1, because no activities are proposed. Indirect effects are also caused by the action, but occur later in time or farther removed in distance.

With no direct effects, the Alternative 1 does not respond to the purpose and need to reduce fuels in the WUI and within the resource area; does not make communities, infrastructure and natural resource values less vulnerable to impacts from wildfire; and does not improve the resiliency of

the landscape to insects, disease, fire and drought. Alternative 1 would not improve Fire Regime Condition Class.

Indirect effects of Alternative 1 include the persistence of many areas of heavy surface, ladder and crown fuels within Beaver Creek Resource Area. These heavy fuels could support active crown fire behavior, which consumes the entire tree canopy and causes complete mortality of the forest stand.

Figure 26 through Figure 31 and Table 35 display the indirect effects of Alternative 1 on flame length, probability of torching, crowning index, Fire Regime Condition Class and Minimum Travel Time. All show that no action leaves the potential for high-intensity, severe fires compared to treated stands for many years to come. Alternative 1 allows higher levels of surface, ladder and crown fuels to remain for 20 to 70 years longer than with the action alternatives. With no action, the Fire Regime Condition Class of the Beaver Creek landscape would likely deteriorate to FRCC 3, farther away from the desired future condition.

Successful fire suppression in the absence of prescribed fire has caused an increase in amount and continuity of the living and the dead material that fuels fires (Saveland 1998, page 4; PF Doc. FF-REF-3). The continued loss of species such as ponderosa pine and western larch 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.

The presence of multi-layered (or continuous) canopies and dense crowns in parts of the resource area 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-REF-32, internal citations omitted). Brackebusch (1973, PF Doc FF-REF-8) stated that wildland fires simply cannot be kept out of fire-prone vegetative types indefinitely. During any period of fire exclusion, the hazard usually continues to build and the probability of a disastrous fire increases correspondingly (Brackebusch 1973, PF Doc FF-REF-8).

With no fuel treatment activities, Alternative 1 allows fires to spread more quickly across the Resource Area (see Figure 26 and Figure 27). The FlamMap model was used to simulate a fire's spread across the landscape, and to determine the collective effect of all of the treatments. Several fire scenarios were modeled for each alternative; results of only one scenario are shown here (results of other scenarios are in the project file, PF Doc FF-21). FlamMap was used to calculate the **Minimum Travel Time** for the fire to reach each small piece of the landscape, resulting in the graphic in Figure 26 and Figure 27.

Figure 26 and Figure 27 show a hypothetical fire, ignited near King's Point and pushed by 20 mile per hour westerly winds. Under Alternative 1, the fire reaches 149 structures within the cumulative effects analysis area within 48 hours. The fire reaches all structures within the cumulative effects analysis area within 64 hours.

3.2.6.1.2. Cumulative Effects

Cumulative effects result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. A relatively small amount of underburning and pile burning is planned with the Capitol Dudley timber sale (12 acres). This burning is too small in scale to contribute significantly to cumulative effects. However, 6,129 acres of precommercial thinning and pruning is planned over the next two decades. Pre-commercial thinning has both short and long-term effects to the fire/fuels resource. A direct short-term (less than 10 years) effect of pre-commercial thinning is an

increased fuel load from the trees that are cut and left on the ground. This fuel load can pose a fire hazard until the slash collapses and decomposes. On moist sites, the decomposition rate will be higher than on dry sites, and the hazard will be abated more quickly. To reduce fuel bed depth and facilitate decomposition, trees will be directionally felled and lopping will occur where directional felling is not possible. Pre-commercial thinning activities will create a short-term fire hazard, although no thinned units have burned in wildfires on the Coeur d'Alene River Ranger District in the past. In the long term, favoring long-lived seral species such as ponderosa pine, western larch and white pine will create more fire resistant and resilient stands, reducing potential future fire severity. On average, only about 300 acres of pre-commercial thinning would be completed each year, which is a small portion of the project area. Pre-commercial thinning would create a short-term fire hazard in small areas across the landscape which could increase a wildfire's rate of spread, if the slash were to burn prior to decomposing.

Although there is no way to predict future fire ignitions, both human-caused and lightning caused fires will occur in the future within the Beaver Creek Resource Area. We know that the ignitions will occur, but do not know the location, the time of year, the cause, what the weather conditions will be at the time, the fire management strategy, etc. For these reasons, it is impossible to accurately quantify the effects of future fires. The analysis does have an underlying assumption that future fires will occur, however.

The Shoshone County Fire Mitigation Program helps 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-REF-16). This program has treated many private structures in the cumulative effects analysis area, particularly in areas near Prichard and Murray (PF Doc FF-19). The County's activities have reduced the potential for structure ignition on private land (Cohen 1999, PF Doc. FF-REF-45), even under Alternative 1.

In the Beaver Creek Resource Area the past activities that contribute the most to cumulative effects are fire exclusion, timber harvest, and prescribed burning. Harvest, in this analysis, includes related activities such as prescribed burning and planting. Most of the timber harvesting that has occurred in the Resource Area has been on moist sites. This harvesting counteracts to some extent the effects of fire exclusion. Wildland fire has a huge influence on forest characteristics such as species composition, age, structure, and spatial pattern. Wildfires can have different effects and different spatial patterns than harvest (followed by prescribed burning); however, the strong similarity is that they would both reduce fuels, can reset succession to the early seral stage, and can favor fire-resistant and shade-intolerant species.

One way to resolve the question of whether past harvest (followed by prescribed burning) has offset the effects of fire exclusion over the years is to compare the acres that were harvested and/or prescribed burned with the acres that could possibly have burned if fires were not suppressed. There is no way of knowing exactly how many acres would have burned under natural conditions – this must be inferred from other evidence. We know that 4,156 acres of prescribed burning has been completed, primarily following timber harvest in the Beaver Creek Resource Area. We also know that there have been 27 lightning-caused fires in the cumulative effects analysis area since 1970 (all of which were effectively suppressed), and that there were likely many more in the years before records were kept. As explained in existing conditions, each suppressed fire had the potential to grow to several hundred or even several thousand acres in size over the fire season. If even one of these fires reached this potential, it would have affected more acres than all of the harvest and prescribed burning that has been completed in Beaver Creek. For these reasons, it is reasonable to believe that past harvest has not offset the cumulative effects of

fire exclusion in the Beaver Creek Resource Area because prescribed fire and harvest have affected far fewer areas than would have burned without wildfire suppression.

The Fire Regime Condition Class (FRCC) analysis confirms the conclusion that past harvest and prescribed burning have not offset the effects of fire exclusion. The FRCC analysis measures departure from the natural (historical) regime, and as such, is an indicator of cumulative effects on the landscape. The FRCC analysis establishes the natural fire regime based on the area's biophysical settings, and takes into account the effects past activities have had on existing conditions. The Beaver Creek Resource Area as a whole is in FRCC 2 (56% departure, PF Doc FF-22), which means that the risk of losing key ecosystem components is moderate and fire frequencies have departed by one or more return intervals, resulting in moderate changes in fire and vegetation attributes.

In addition, the past regeneration harvesting in the resource area does not resemble any natural spatial pattern that would have been created by wildfire or any other natural disturbance. The harvest units are generally scattered across the resource area, but, as stated before, are primarily on moist sites. Dry sites in the resource area have been harvested or prescribed burned at only a negligible fraction of the rate of the historic fire return interval. The result of suppressing every small, mixed-severity fire is that fuels continue to build, making large, stand-replacing fires more likely to happen earlier than if the mixed-severity fires had burned.

The cumulative effect of suppressing each small fire in the resource area has been "individually minor but collectively significant," and has not been offset by past timber harvesting and prescribed burning.

3.2.6.2. Alternative 2

The primary differences between the Action Alternatives are the landscape-scale effects. Direct and indirect effects at the stand scale are discussed under "Effects Common to Both Action Alternatives" 3.2.6.4.

3.2.6.2.1. Direct and Indirect Effects Unique to Alternative 2

Alternative 2 has the most extensive fuel treatments of all the alternatives – it treats a total of 4,059 acres, while building a total of 2.7 miles of road and completing various watershed improvement activities. The road decommissioning included in Alternative 2 does not affect any roads that are important for fire suppression access (see PF Doc. TRAN-01). The road construction and watershed improvement activities included in Alternative 2 do not have any significant effects on the fire/fuels resource, so they will not be discussed in this section. Alternative 2 treats fuels on about 311 more acres than Alternative 3.

The vegetative treatments in Alternative 2 are extensive enough to have impacts at the landscape scale. For example, a fire progressing across the resource area would be influenced by many of the treatments, resulting in altered spread patterns and a slower spread rate. Maintaining natural openings with prescribed fire and regenerating some stands in the Resource Area would create a mosaic of vegetation (Brackebusch, PF Doc. FF-REF-8). This mosaic would create fuel interruptions that reduce the potential for conflagrations or serious fast spreading fires. Fuel mosaics can result in delayed fire spread or fire build-up, reducing the risk of escaped fires. The spatial arrangement of vegetation influences the growth of large fires. Patches of vegetation that burn relatively slower or less severely than surrounding patches can reduce fire intensity, severity, or spread rate, or may force the fire to move around them by flanking (at a lower intensity), which locally delays the forward progress of a fire (Graham et al. 2004, page 29; PF Doc. FF-REF-6).

Recent research has shown that fuel reduction treatments can alter fire behavior and severity both in treated areas and for a limited distance downwind of treated areas (Finney et al. 2005, PF Doc FF-REF-40). Fuel reduction treatments have also been shown to be effective at altering fire spread across a landscape, especially when placed in a repeated and overlapping pattern (Finney 2001, PF Doc FF-REF-9). Ager et al. (2010, PF Doc FF-REF-51) found a substantial reduction in risk to highly valued large trees and structures well outside of treatment areas (approximately 3-6 miles) and thus the restoration strategy in the wildlands reduced wildfire probability and intensity to structures in the WUI, even at the low range of area treated. A slower moving fire would allow more effective fire suppression, resulting in fewer acres burned, reduced threats to human life and property, community infrastructure, air quality, water quality, and forest cover.

The Minimum Travel Time analysis of the FlamMap model was used to simulate a fire's spread across the landscape, and to determine how the alternatives influence landscape-scale fire spread. Existing conditions on the entire cumulative effects analysis area reflect past activities, and therefore past activities are considered in the Minimum Travel Time model. The model shows that fires moving across the Resource Area are significantly slowed by the treatments in the Action Alternatives. Figure 26 shows the result of a fire starting in the northern part of the Resource Area, near King's Point. In the model, the fire is pushed by 20 mile per hour westerly winds. The harvest, prescribed fire and fuelbreak treatments in Alternative 2 significantly slow this theoretical fire, delaying its arrival at the homes in near Prichard and Murray by approximately 16 hours, and the homes in Beaver Creek by about 24 hours. This extra time could allow for more effective suppression, safe evacuations and less risk to lives and property. Under Alternative 2, only 2 structures are affected by the hypothetical fire within 48 hours, and it takes a full 88 hours for the fire to reach all structures within the Resource Area. The more treatments any given fire encounters as it spreads across the landscape, the more they would influence the fire's behavior and spread. If a fire did not encounter any treatments, there would be no effect on fire behavior.

Under Alternative 1 (no action), this theoretical fire could engulf 149 structures within 48 hours (Figure 26 and Figure 27), primarily in the Prichard area. Under Alternatives 2 and 3, the fire would only affect 2 structures within 48 hours. Remember to note that these modeling results do not take into account any potential suppression actions; they only model fire spread across the landscape given certain fuels and weather conditions. Given that the model is based on simplifying assumptions and has several limitations (PF Doc FF-REF-2), the results of this scenario are informative, and illustrate key differences between the alternatives.

The Minimum Travel Time analysis shows that under Alternative 1, existing fuel conditions could allow for large fire growth, which would threaten homes and public safety within the wildland-urban interface. The treatments in Alternative 2 and 3 would have considerable landscape-scale effects, slowing fire spread and reducing the threat of wildfire to nearby homes and private property. While Alternative 3 also has landscape-scale effects in slowing fire spread, it is slightly less effective than Alternative 2. Refer to the project file for more modeling scenarios (PF Doc FF-21).

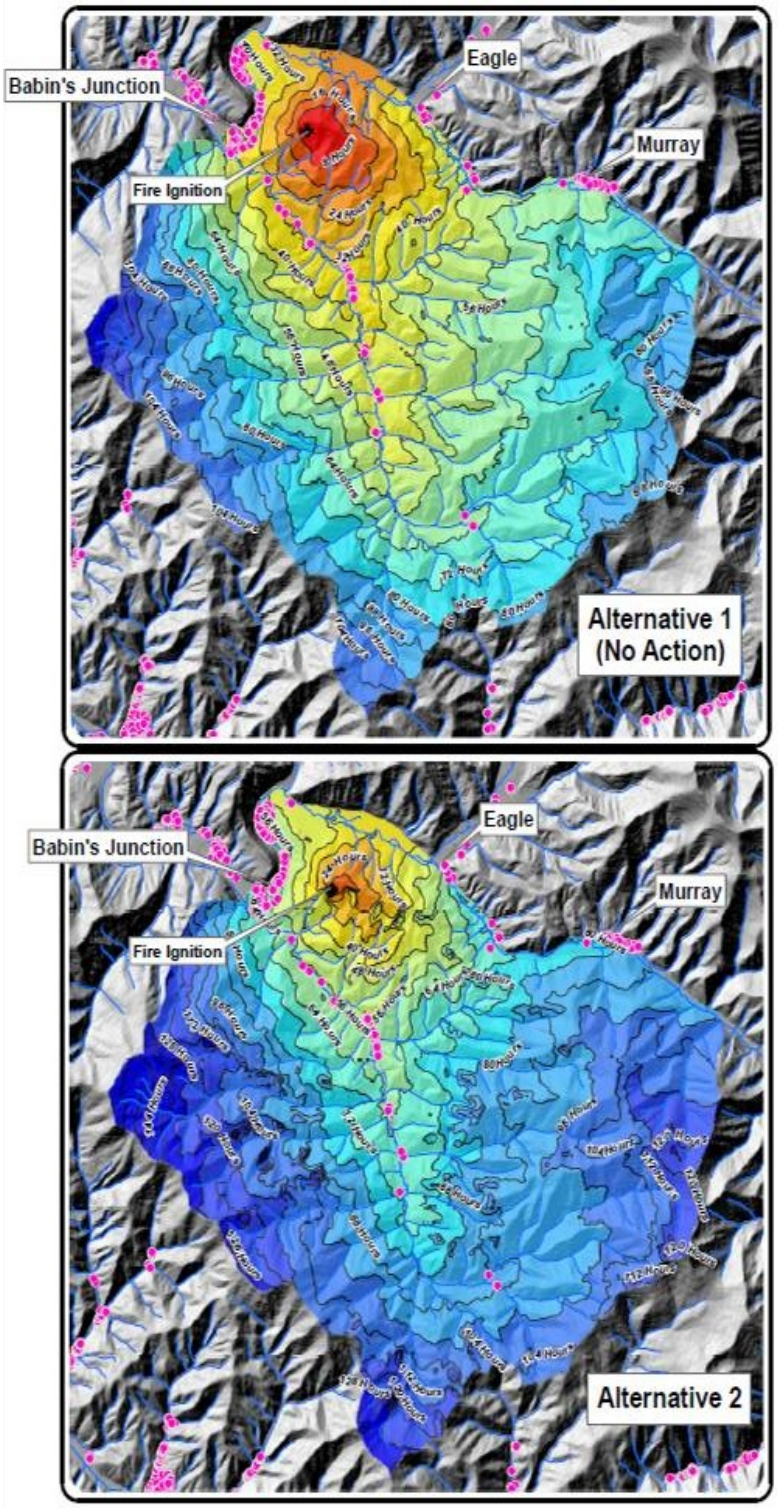


Figure 26. Minimum Travel Time Analysis for Alternative 2.

Under Alternative 2, fire spread is significantly slower for this hypothetical fire. The fire ignition (shown with a 'cross' in the figure above) is pushed by 20 mph westerly winds in both scenarios. In Alternative 2, the fire would only reach two structures (shown as pink dots) within 48 hours, while 149 structures would be affected within 48 hours under Alternative 1.

3.2.6.3. Alternative 3

The primary differences between the Action Alternatives are the landscape-scale effects. Direct and indirect effects at the stand scale are discussed under “Effects Common to Both Action Alternatives” 3.2.6.4.

3.2.6.3.1. Direct and Indirect Effects Unique to Alternative 3

Alternative 3 is very similar to Alternative 2 from a fire/fuels perspective; however, Alternative 3 would treat fewer acres, and includes some untreated areas within aggregate retention units. The treated areas within the Alternative 3 Aggregate Retention units have the same stand-level effects to the fire/fuels resource as the regeneration harvests included in Alternative 2.

Road decommissioning included in Alternative 3 could have a very minor effect on fire suppression access, particularly from the decommissioning of the Pony Gulch Road 456UZ. However, this road is in poor condition, currently does not allow safe access for fire engines, and provides access to a relatively small area, as there are extensive road systems adjacent to Pony Gulch (1505 and 3100 road systems). Other watershed improvement activities would have no effect on the fire/fuels resource, and will not be discussed further.

Alternative 3 treats a total of 3,748 acres, approximately 311 acres fewer than under Alternative 2. Alternative 3 also contains 360 acres of Aggregate Retention units, which include untreated patches of forest. Fewer acres treated under Alternative 3 slightly reduce the landscape-scale effects of the combined treatments, however the differences between Alternative 2 and Alternative 3 at the landscape scale are subtle, and not immediately apparent (see Figure 26 and Figure 27, PF Doc FF-21). There is an approximately 10% difference in treatment acres between Alternatives 2 and 3; the relatively small difference in treatment acres between the action alternatives leads to small differences in landscape scale effects. The difference between the two alternatives would only be apparent if a fire ignition were to occur in an area that was treated under Alternative 2, but was not treated under Alternative 3. This difference would be very limited in spatial extent and would be short-term in nature, depending on how the fire spread across the landscape.

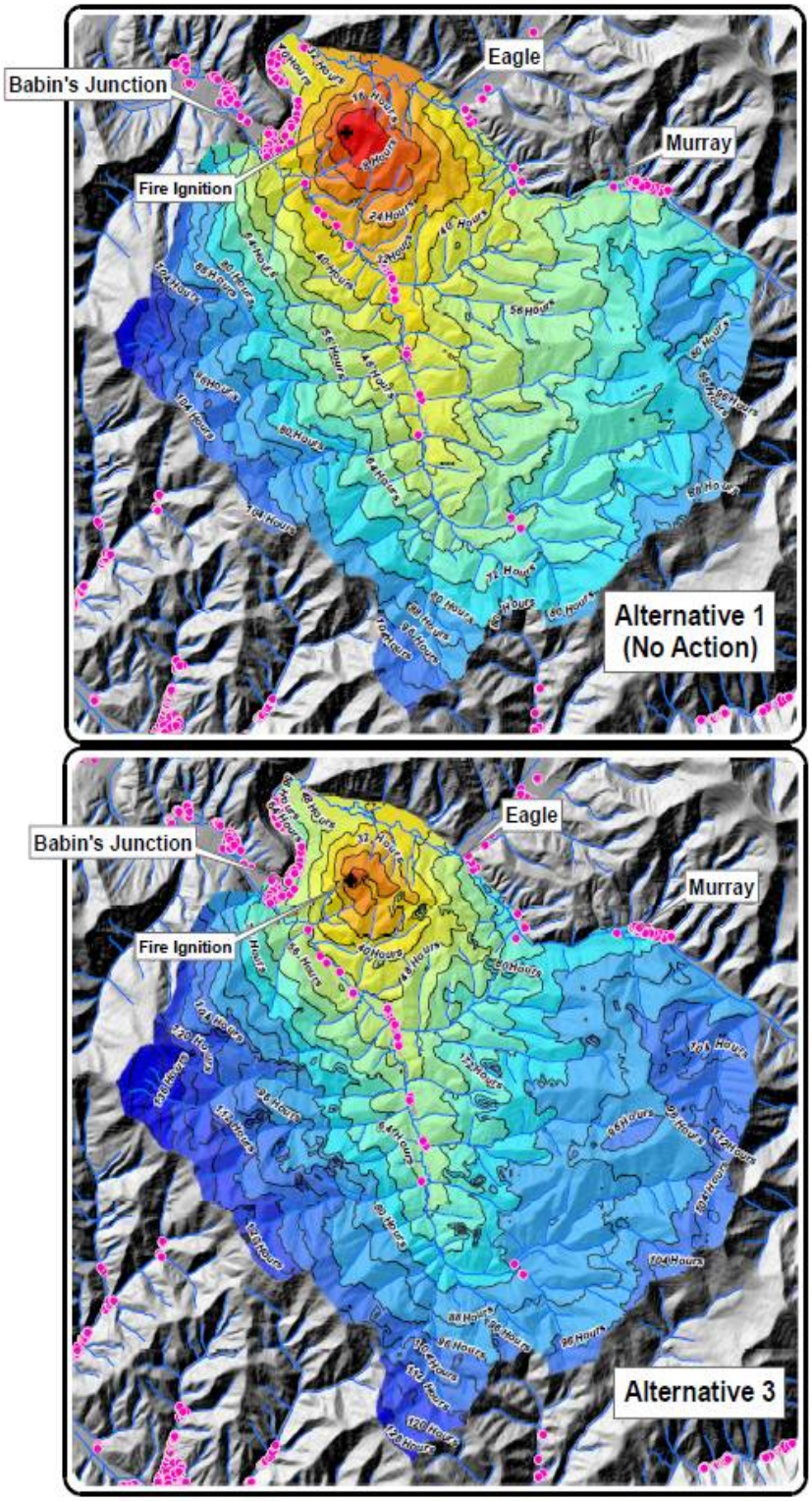


Figure 27. Minimum Travel Time analysis for Alternative 3.

The landscape effects of Alternative 3 would be very similar to Alternative 2. The hypothetical fire would only reach two structures within 48 hours, in contrast to Alternative 1, where 149 structures would be affected by the fire within 48 hours.

3.2.6.4. Effects Common to Both Action Alternatives

Under the Action Alternatives, fuels would be reduced through several different strategies. First, fuelbreaks would be completed where structures are immediately adjacent to National Forest System lands. These fuelbreaks would reduce the potential for structure ignition during a wildfire, and would allow for safe access/egress in the event of a wildfire. Second, prescribed burning would be used to reduce surface and ladder fuels, to modify stands to create more early seral conditions, favor fire-resistant species such as ponderosa pine, and reduce stocking of fire intolerant species such as grand fir. Third, timber harvesting would result in reductions in surface (in most cases), ladder and crown fuels. Fuel reduction treatments such as grapple piling, underburning, or broadcast burning would be completed in all harvest units except Units 6, 41 and 42. In these units, tops would be yarded to the landing, where they would either be removed or piled and burned.

The Action Alternatives both respond to the purpose and need, but to slightly different degrees. The differences between Alternatives 2 and 3 are small from a fire/fuels perspective, and are indicated by the FRCC analysis (Table 35) and the Minimum Travel Time maps (Figure 26 and Figure 27, PF Doc FF-21). Following is a discussion of the effects of treatments that are common to both action alternatives.

3.2.6.4.1. Comparison of Effects at the Stand Scale, by Issue Indicator

The following graphs briefly compare the No-Action Alternative with vegetation management activities under the Action Alternatives in terms of three fire behavior indicators (flame length, probability of torching and crowning index) plus Fire Regime Condition Class, which is an ecological indicator. The fire behavior figures describe one representative stand, and effects vary somewhat between stands depending on site conditions and other factors, but the general trends would be the same (refer to PF Doc. VEG-6 for all modeling results). All figures show fire behavior under high fire danger conditions, which could be expected nearly every summer. Graphs depict actual stands proposed for treatments. The graphs show the effects in those areas that would be commercially harvested, either with improvement cuts or shelterwood harvests. It is important to note that the effects of treatments vary between stands – not all treated areas will have such dramatic effects, although there would be a significant fuel reduction over No Action. A more detailed discussion of the effects of each alternative follows the comparison.

Flame Lengths

Only flame lengths of 4 feet or less can be safely attacked directly using hand crews. Once flame lengths surpass this mark, other suppression tactics must be employed, which often result in more acreage burned (National Wildland Fire Coordinating Group 1993, page B-59; PF Doc. FF-REF-11). 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, page 20; PF Doc. FF-REF-6). Figure 28 shows the flame lengths over time as modeled by the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE-FVS).

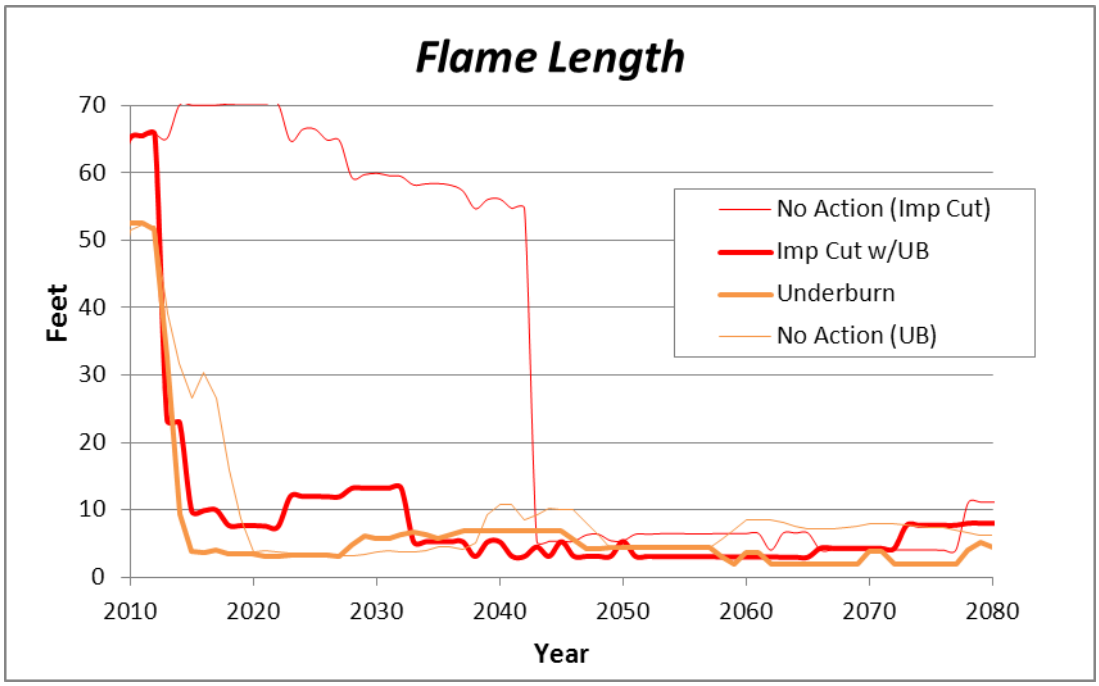


Figure 28. Flame length over time in two stands with different treatments.

Flame lengths in these stands under wildfire conditions are both over 50 feet, due to the heavy surface, ladder and crown fuels that would all contribute to form an active crown fire. Under the Action Alternatives, prescribed burning and harvesting followed by prescribed burning would reduce surface, ladder and crown fuels, drastically reducing fire behavior. Under the same weather conditions, fire behavior would be that of a controllable surface fire with about 4 foot flame lengths. Flame lengths would be improved for about 10 years using prescribed fire alone while an improvement cut followed by prescribed fire would improve flame lengths for at least 30 years. Regeneration harvesting is not shown on the graph, but effects on surface fuels are similar.

Probability of Torching and Crowning Index

Effects of regeneration and thinning harvests on crown fire behavior under specific weather conditions are shown in the following figures. The probability of torching is the proportion of small places where trees are present and torching is possible. The higher the probability of torching, the more ladder fuels and the higher the likelihood that the fire will climb into the tree crowns. The proposed regeneration, thinning and improvement harvests followed by fuel reduction would result in a dramatic decrease in ladder fuels.

The proposed shelterwood harvesting and subsequent fuel reduction results in a significant reduction in ladder fuels that lasts at least 20 years. The improvement harvest results in a reduction in ladder fuels that persists over the entire modeling period in this stand. In each case, ladder fuels are reduced very low levels for many years (Figure 29). Although there is an immediate reduction in ladder fuels with the shelterwood harvest, ladder fuels increase dramatically after about 20 years. This increase is due to the small trees with branches close to the ground that have regenerated after planting. The subsequent increase in ladder fuels is of less concern because the almost complete reduction of crown fuels in a shelterwood harvest means that there is nowhere for the fire to climb; torching will not lead to a crown fire because crown fuels will not be dense enough to support a crown fire until much later in the stand's development (Figure 30).

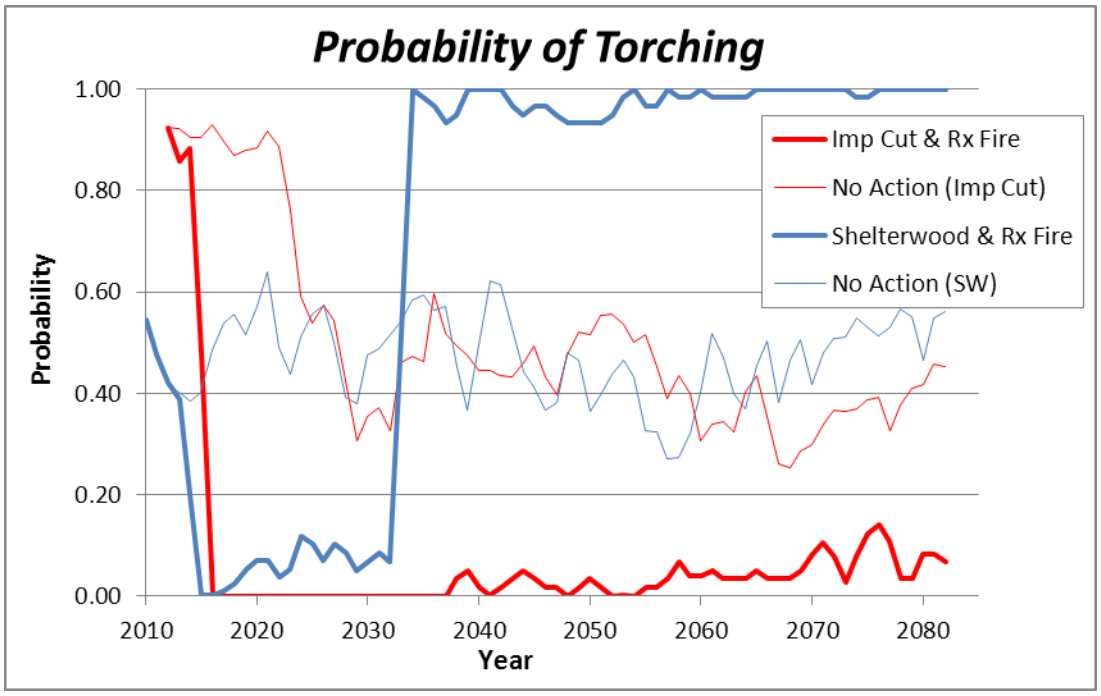


Figure 29. Probability of torching in a representative stand.

Crown fires present special problems to managers since they are more difficult to control than surface fires. The rate of spread of crown fires is several times faster than surface fires. Spotting is frequent and can occur over long distances. Larger flames from crown fires require larger firefighter safety zones. In addition, spotting and increased radiation make structures more difficult to defend from crown fire than surface fire. Near total tree mortality would be expected from a crown fire, smoke production would be greater, and foliar nutrients may be lost from the site. Crown fires' high spread rates and resistance to control lead to high acreage burned and significant adverse effects (Scott and Reinhardt 2001, PF Doc. FF-REF-10; Rothermel 1983, PF Doc. FF-REF-28; Butler and Cohen 1998, PF Doc. FF-REF-44; Cohen and Butler 1998, in Scott and Reinhardt 2001, PF Doc. FF-REF-10).

The crowning index reflects the density of the tree canopy, and its ability to sustain an active crown fire. When the crowning index increases, it means that it takes a stronger wind to keep the fire in the crowns of the trees – a higher crowning index means a lower crown fire hazard. The effects of harvest and subsequent fuel reduction on the crowning index are shown in Figure 30. The following graph shows the effects of a regeneration harvest and a thinning harvest on the crowning index. In both stands, the existing crowning index is less than 20 mph, meaning that these stands would support active crown fire with less than 20 mph winds. The regeneration harvest results in a huge increase in the crowning index – the lack of crown fuels make it almost impossible to generate a crown fire for many years after the stand is treated. In the thinning harvest, there is a smaller, though significant increase in the crowning index. The majority of the scientific literature supports the effectiveness of fuel treatments in reducing the probability of crown fire (PF Doc FF-REF-43, Peterson et al. 2005).

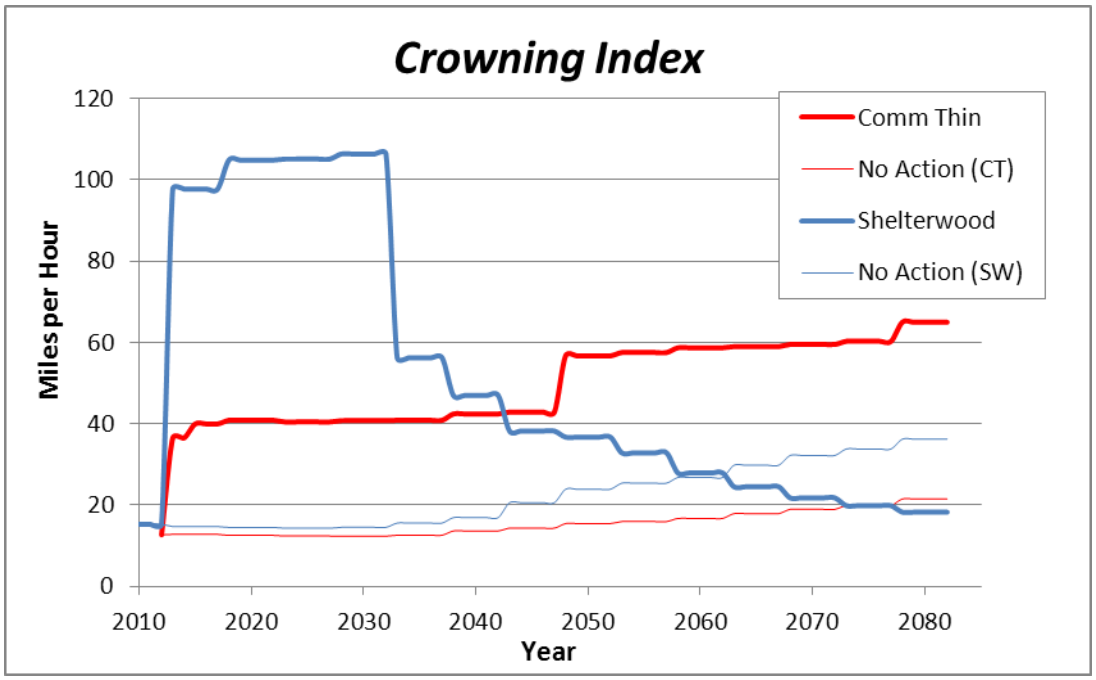


Figure 30. Crowning Index in representative stands.

Fire Regime Condition Class

Fire Regime Condition Class (FRCC) analysis reflects variation from the landscape conditions that existed under the natural (historical) disturbance regime. FRCC shows changes in structural stage and species composition, which are both key components of the purpose and need. Details of the FRCC analysis are in the project file (PF Docs. FF-5, 6 and 17).

Alternatives 2 and 3 both improve FRCC compared to no action. Alternative 2 increases FRCC 1 (low departure) by 2,436 acres, while Alternative 3 increases FRCC 1 by 1,846 acres. Even with these improvements, the landscape-level FRCC would stay at FRCC 2 (moderate departure).

Table 35. Fire Regime Condition Class (FRCC) within the Beaver Creek Resource Area, by alternative and in comparison to Alternative 1 (existing condition).

FRCC	Alternative 1	Alternative 2	Alternative 3
1 - Low	6,187 acres (22%)	8,623 acres (31%) Increase of 2,436 acres (9%)	8,033 acres (29%) Increase of 1,846 acres (7%)
2 - Moderate	16,289 acres (58%)	14,166 acres (50%) Decrease of 2,123 acres (8%)	14,708 acres (52%) Decrease of 1,581 acres (6%)
3 - High	5,714 acres (20%)	5,401 acres (19%) Decrease of 313 acres (1%)	5,449 acres (19%) Decrease of 265 acres (1%)

3.2.6.4.2. Direct and Indirect Effects of Fuelbreaks under the Action Alternatives

Cohen (2006, FF-REF-16) defined a limited area 100 to 200 feet adjacent to a home as the Home Ignition Zone. The potential for home ignitions during wildfires principally depends on a home's fuel characteristics and the heat sources within this area. In three areas, National Forest System lands occur within the Home Ignition Zone of private structures. Fuelbreak units FB1, FB2 and FB3 are included in both action alternatives, and are designed to reduce surface and ladder fuels in order to reduce potential fire behavior near homes and other structures in the Beaver Creek Resource Area. These fuelbreaks are designed to reduce home ignitions, as well as to provide areas for firefighters to safely defend a home in the event of a wildfire. Fuelbreak construction would consist of tree thinning, brush cutting, chipping, piling and burning of residual slash. All brush would be slashed, and trees less than 5" dbh would be thinned to a 20 to 25 foot spacing (70 to 110 trees per acre). Trees greater than 5" inches dbh would not be cut if possible but have their lower branches pruned to reduce ladder fuels. Snags would not likely be retained as they could pose a hazard both to the structure and/or firefighters. Fuelbreaks cover a very limited area and have a very specific purpose, which is to reduce the chance of structure ignition during a wildfire.

Fuelbreaks would reduce surface fuels such that flame lengths would not likely exceed 2 feet during wildfire conditions. Ladder fuels will also be reduced so fire will not be able to climb from the ground to the tree crowns. Crown fuels would not be reduced with fuelbreak treatments, as commercial-sized trees would not be removed.

3.2.6.4.3. Direct and Indirect Effects of Prescribed Burning Under the Action Alternatives

Prescribed burning is a significant component of the proposed activities in the Beaver Creek Resource Area; the following discussion applies to underburning, pile burning and fuelbreak construction. Prescribed burning would reduce surface fuels (low vegetation, woody fuel, shrub layer), decreasing the chances that a surface fire would be able to ignite ladder fuels and canopy fuels (Graham et al. 2004, page 23; PF Doc. FF-REF-6).

Prescribed burning can have a range of effects depending on the fuel and weather conditions at the time of the fire. Prescribed fire can effectively alter potential fire behavior by influencing multiple fuel bed characteristics (Graham et al. 2004, page 24; PF Doc. FF-REF-6), including:

- Reducing the loading of fine fuels, duff, large woody fuels, rotten material, shrubs and other live surface fuels, which together with compactness and continuity change the fuel energy stored on the site and potential spread rate and intensity.
- Reducing horizontal fuel continuity (shrub, low vegetation, woody fuel strata), which disrupts growth of surface fires, limits buildup of intensity, and reduces spot fire ignition probability.
- Increasing compactness of surface fuel components, which retards combustion rates.

Prescribed burning reduces surface fuels and the associated flame lengths, as shown in Figure 28. Flame lengths are significantly reduced for approximately 10 years relative to no action, and the prescribed fire sets the stand on a trajectory that has lower flame lengths through much of the modeling period (Figure 28). Prescribed burning has both stand-level and landscape-level effects, even in extreme burning conditions. At the stand scale, prescribed burning has been shown to reduce subsequent tree mortality, crown scorch, and exposed and blackened soil (Finney et al. 2005, PF Doc FF-REF-40). This reduction in severity was caused by a reduction in fire intensity

in the treated area. At the landscape scale, the huge Rodeo-Chediski fire was observed to actually circumvent treated areas, even under extreme burning conditions, leaving unburned inclusions as the fire was actively spreading. Finney et al.'s (2005) research suggests that fire growth and severity of a large wildfire under extreme weather conditions were mitigated by fuel treatments that included prescribed burning. Longevity of treatment benefits was suggested to improve with unit size. Observations of fire movement near fuel treatments indicate that overall fire growth and large fire sizes can be reduced (Finney et al. 2005, page 1721, PF Doc FF-REF-40).

Arkle et al. (2012, PF Doc FF-REF-82) found that early season (spring) prescribed fires significantly lowered wildfire severity compared to untreated areas. They found considerable evidence that prescribed fires have landscape-level influences within treatment boundaries. Early season prescribed fires may not directly target the locations most at risk of high severity wildfire, but proximity of these areas to treated patches and the discontinuity of fuels following treatment may influence wildfire severity and explain how even low severity treatments can be effective management tools in fire-prone landscapes (Arkle et al., 2012; PF Doc FF-REF-82).

The boundaries of the proposed treatment areas were established with consideration of the prescribed burning to occur, and will likely allow efficient ignition and suppression of prescribed fires. Whenever possible, changes in aspect and shaded draws would be used as burn boundaries; these areas often have higher fuel moistures (especially in the spring), and in many cases burn with very little intensity, if at all. Fireline would be used to contain prescribed burns when necessary (this determination would be based on site-specific characteristics and weather conditions at the time of the burn). Even with careful forethought and planning, prescribed burning can be uncertain, and small burned areas outside of the designated treatment areas should be expected. These "slop-overs" are commonly relatively small and contained as necessary.

Prescribed burning would improve FRCC where it changes stands from a closed-canopy succession class to an open-canopy succession class. In some cases, burning alone does not improve FRCC because it doesn't necessarily change species composition or successional class.

3.2.6.4.4. Direct and Indirect Effects of Intermediate Harvests under the Action Alternatives

Intermediate harvests such as improvement and thinning harvests remove ladder fuels and decrease tree crown density. When followed by prescribed fire, piling and burning of fuels, or other mechanical treatments that reduce surface fuel amounts, this approach reduces canopy, ladder, and surface fuels, thereby reducing both the intensity and severity of potential wildfires (Graham et al. 2004, page 27; PF Doc. FF-REF-6). It is important to note that in Units 6, 41 and 42 yarding of tops will occur rather than prescribed burning. Yarding tops will mechanically remove fuel from the site, although breakage will still likely result in a short-term increase in surface fuels. These units are north aspect moist sites, so decomposition will reduce the fuels created by the thinning harvest within about 10 years. Thinning and harvesting can reduce vertical and horizontal continuity of the tree canopy and limit initiation and spread of crown fires, especially when done in conjunction with prescribed burning (Finney et al. 2005, page 1720, PF Doc. FF-REF-40).

Any removal of canopy would reduce the moderating effect of canopy on wind speed, so surface winds would increase. Scott and Reinhardt (2001, pages 31-32; PF Doc. FF-REF-10) have addressed this subject. They state,

> *"The increased fuel-level wind speed coupled with increased insolation (exposure to sunlight) also leads to lower dead fuel moisture in treated stands during summer. These two factors tend to exacerbate surface fire behavior. However, properly executed*

> *treatments also tend to reduce the crown fire potential. Crown fire mitigation treatments often represent a tradeoff – the decrease in crown fire potential comes at the expense of increased surface fire spread rate and intensity. The greatly increased spread rate and intensity of crown fires makes this tradeoff reasonable.*"

The timber harvesting included under the Action Alternatives would immediately cause an increase in surface fuel loading, as well as an immediate decrease in ladder and crown fuels (see Figure 28 through Figure 30). The unmerchantable branches and other fuels that are left after harvest can substantially increase the fuel load, and consequently the potential flame lengths on any given site. This fuel load would then pose a slash fire hazard for a short period of time (one or two years), until the fuel on the site was consumed with prescribed fire. Any type of human activity increases the possibility of ignition and wildfire. Common ignition sources include equipment and vehicle operation, smoking, and arson. A timber purchaser would be required to have fire suppression equipment on site and to take necessary fire precautions to prevent a wildfire from occurring. In the event of extreme fire conditions, harvest activities would be regulated or suspended until conditions improved. A timber sale administrator closely monitors the fire prevention requirements of the timber contract throughout the timber harvest operations.

Under the Action Alternatives, thinning and improvement harvests and subsequent prescribed burning would result in a dramatic reduction of surface and ladder fuels, with a lesser reduction in crown fuels. The reduction in ladder fuels in the thinning treatments is effective for at least 70 years (Figure 29). Crown fuels would also be reduced throughout the entire modeling period (about 70 years) compared to no action. The total effect of the proposed activities is a dramatic, long-term reduction in potential fire behavior, which would also result in less tree mortality in the event of a fire (all FVS modeling results are included in PF Doc VEG-6).

Increasing the proportion of fire-resistant tree species such as ponderosa pine would increase the survivability of trees because they have thicker bark, taller crowns, and a higher canopy base height (Graham et al. 2004, page 36; PF Doc. FF-REF-6). Proposed improvement cuts would promote early-seral, fire resistant species which are more likely to survive even intense fires, reducing future potential fire severities. Improvement cuts would result in more open stands where early seral species such as ponderosa pine are abundant, so these stands would result in Fire Regime Condition Class 1 after treatment.

Surface winds *are those beneath the canopy that affect surface fuels.*

3.2.6.4.5. Direct and Indirect Effects of Regeneration Harvesting Under the Action Alternatives

The Action Alternatives include regeneration harvesting (seed tree, shelterwood, and harvested portions of aggregate retention units) which reduce surface, ladder and crown fuels. The reduction in the density of crown fuels caused by a regeneration harvest is reflected in Figure 30. With the regeneration treatments, the crowning index would increase substantially over what would occur under no action. According to the model, this effect would last about 50 years, although it will vary somewhat by stand (see PF Doc VEG-6 for all modeling results).

A major direct effect of regeneration harvest is the almost complete reduction in crown fuels in the treated stands. This reduction results in a disruption in the continuity of crown fuels. Because regeneration harvests remove almost all crown fuels, they act as a barrier to crown fire spread. Any crown fire that encounters a regeneration harvest will be forced to the ground because of the

lack of crown fuels. This effect is not permanent; however; as the regenerated stand grows, it once again builds crown fuels.

Although regeneration harvests and the accompanying fuel treatments have the similar effects as intermediate treatments on surface and crown fuels, their effect on ladder fuels is different. Regeneration harvests remove most of the canopy and initiate the establishment and growth of small trees, which generally have their branches lower to the ground than larger trees. This growth causes an increase in ladder fuels, and thus an increase in the probability of torching. This increase in ladder fuels is not a concern, especially in the short-term, primarily because the canopy has been removed and there is nowhere for the fire to climb. As shown in Figure 29, ladder fuels remain low for approximately 20 years post-treatment, and then increase.

Projections of stand growth and associated fire behavior show that the crown fire hazard in regenerated stands will immediately decrease after treatment (see Figure 30). Over time, the crown fire hazard in the stand would slowly build. Regeneration harvests may need treatments in 20-30 years, such as pre-commercial thinning and/or underburning to maintain and perpetuate the conditions of reduced fire hazard.

Jain et al. (2006, PF Doc FF-REF-39) found that in stands typified by management (e.g. thinned stands, plantations), crown fires would burn around these areas and most often there was evidence that firebrands landed in these stands but the surface fuel conditions prevented sufficient fire from developing that could create a smoldering fire. A more recent study completed on the Tripod Fire on the east slope of the Cascade Range found that forest landscaped prone to high-severity wildfire, young stands can experience a lower-severity wildfire if treated for surface fuels (Lyons-Tinsley and Peterson, 2012; PF Doc FF-REF-81). Personal observations of fire behavior in regeneration harvests on the Coeur d'Alene River Ranger District substantiate both research conclusions (Jerome 2007, PF Doc FF-20).

The timber harvesting included under the Action Alternatives would immediately cause an increase in surface fuel loading, as well as an immediate decrease in ladder and crown fuels (see Figure 28 through Figure 30). The unmerchantable branches and other fuels that are left after harvest can substantially increase the fuel load, and consequently the potential flame lengths on any given site. This fuel load would then pose a slash fire hazard for a short period of time (one to three years), until the fuel on the site was treated with prescribed burning. Depending on the amount of fuel on the site and the potential effects of a prescribed burn to the remaining overstory, several methods may be used to control the effects of a prescribed burn. Slashing of the understory, protection of leave trees by pulling slash away from their boles, and piling and burning of slash are possible methods that could be used to decrease the slash load on a site and prepare the site for safe and efficient underburning.

Any type of human activity increases the possibility of ignition and wildfire. Common ignition sources include equipment and vehicle operation, smoking, and arson. A timber purchaser would be required to have fire suppression equipment on site and to take necessary fire precautions to prevent a wildfire from occurring. In the event of extreme fire conditions, harvest activities would be regulated or suspended until conditions improved. A timber sale administrator closely monitors the fire prevention requirements of the timber contract throughout the timber harvest operations.

Regeneration harvesting would result in Fire Regime Condition Class 1 because the stands would change from a late-seral to an early-seral structural stage and ponderosa pine, western larch, and/or white pine would be re-established.

3.2.6.5. Cumulative Effects of the Action Alternatives

Cumulative effects are those that would result from the Action Alternatives in addition to the incremental impacts of past, ongoing and reasonably foreseeable actions. In the cumulative effects discussion of Alternative 1 (no action), it was established that past timber harvesting and prescribed burning has not offset the effects of fire exclusion on the Beaver Creek landscape. The inherent effects wildland fire has on forest characteristics such as species composition, age, structure, and spatial pattern have been missing from the Beaver Creek Resource Area for over 100 years. This discussion will attempt to quantify the cumulative effects of Alternative 2.

As discussed in the cumulative effects of Alternative 1, the only reasonably foreseeable activity that could have a perceptible effect on the fire/fuels resource is the approximately 6,129 acres of pre-commercial thinning planned for the next two decades in the resource area. Effects of the pre-commercial thinning were discussed under Alternative 1, and would be the same for the Action Alternatives. As discussed in the analysis of the No-Action Alternative, fire exclusion, timber harvesting and prescribed burning are the past activities that contribute to cumulative effects.

Alternative 2 treats over 4,000 acres in the Beaver Creek Resource Area with harvesting and prescribed burning, while Alternative 3 would treat over 3,700 acres. A fundamental question in the cumulative effects analysis is whether this amount of treatment, when considered together with past actions, would offset the effects of fire exclusion over the past 100 years. As discussed in Alternative 1, there is no way of knowing exactly how many acres would have burned under natural conditions – this must be inferred from other evidence. We know that there have been 27 lightning-caused fires in the cumulative effects analysis area since 1970 (all of which were effectively suppressed), and that there were likely many more in the years before records were kept. Each suppressed fire had the potential to grow to several hundred or even several thousand acres in size over the fire season. It is almost certain that lightning-caused wildfires would have burned far more acres than either Action Alternative combined with past activities. Given this rationale, it is reasonable to believe that the Action Alternatives makes progress in counteracting the effects of fire exclusion, but do not compensate for the effects of 100 years of effective fire exclusion.

The FRCC analysis measures departure from the natural (historical) regime, and as such, is an indicator of cumulative effects on the landscape. The FRCC analysis establishes the natural fire regime based on the area's biophysical settings, and takes into account the effects past activities have had on existing conditions. The Beaver Creek Resource Area is in FRCC 2 (56% departure), which means that the risk of losing key ecosystem components is moderate and fire frequencies have departed by one or more return intervals, resulting in moderate changes in fire and vegetation attributes. Alternative 2 improves FRCC on a total of 2, 436 acres over no action, while Alternative 3 improves FRCC on a total of 1,846 acres over no action.

3.2.6.6. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 does not address the objectives of fire management (FSM 5140, PF Doc. FF-30) or the goals of the *National Cohesive Wildland Fire Management Strategy* ('Strategy'; PF Doc FF-REF-24). The Forest Plan (PF Doc. CR-002, page II-38) identifies two standards regarding fire management.

Alternative 1 would not use prescribed fire to help meet the goals of the management areas within the Resource Area. This 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 Alternative 1, 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.

Alternative 1 would not take any preventative steps to protect human life and property within the Resource Area from an uncontrolled wildfire. No activity fuels would be created Alternative 1, so there is no need to treat activity fuels, which is consistent with the Forest Plan.

The Action Alternatives addresses all five of the objectives of fire management (FSM 5140, PF Doc. FF-REF-30), in addition to responding to 2 of the three factors identified in the *National Cohesive Wildland Fire Management Strategy* ('Strategy'; PF Doc FF-REF-24).

The Action Alternatives would use prescribed fire to help meet the goals of the management areas within the Resource Area, consistent with the Forest Plan. They would help develop cost-effective fire programs by making substantial progress toward reducing potential intensities of wildfire in areas affected by past fire exclusion. By inference, the more area treated to restore and maintain stands toward historical species composition, the better the alternative meets the Forest Plan goals. Alternative 2 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. Alternative 3 treats slightly fewer acres, but would still make considerable progress towards Forest Plan goals. Treatments under the Action Alternatives would reduce the fuels and potential fire behavior in the WUI of the Beaver Creek Resource Area. The existing conditions of high fuel levels in the WUI could threaten human life and property in the event of an uncontrolled fire. The activity fuels created would be treated in a manner that is consistent with the standards of the Forest Plan.

3.2.7. Effects Summary

Alternative 1(no action) would not address the purpose and need to reduce fuels in the wildland-urban interface and within the resource area to improve public and firefighter safety, as well as make communities, infrastructure and natural resource values less vulnerable to impacts from wildfire. It does not reduce surface, ladder or crown fuels. The No-Action Alternative allows the continued threat of uncontrolled wildland fire to exist, with no proactive management to protect forest resources and wildland-urban interface values. Alternative 1 allows an increased risk of a more intense, faster spreading fire that could approach nearby homes and threaten lives, homes, infrastructure, and air quality. The No-Action Alternative maintains an increased potential for running crown fires and an increased likelihood of severe fire behavior with respect to flame length, probability of torching and crowning index. Wildland fires would be less controllable and more of a threat to life and property. In addition, Fire Regime Condition Class would deteriorate over time towards Condition Class 3 (Figure 31).

Alternative 2 would have the most extensive treatments of all of the alternatives. It effectively responds to the purpose and need to reduce fuels and improve the resiliency of the landscape to fire. The intermediate and regeneration harvests (followed by fuel reduction treatments) would result in a dramatic decrease in fuel loads and potential fire behavior, allowing more successful fire management and fewer threats to nearby resources. The proposed prescribed burning would reduce surface and ladder fuels in key locations across the resource area, and would reintroduce fire onto dry sites where fire has been excluded for approximately 100 years. Alternative 2 slows potential fire spread across the landscape, considerably reducing the threat of uncontrolled wildfire to hundreds of structures in the cumulative effects analysis area. Alternative 2 improves 2,436 acres in the resource area to Fire Regime Condition Class 1.

Alternative 3 is very similar to Alternative 2, especially in terms of stand-level effects on fuel loads, as indicated by the flame length, probability of torching and crowning index. The

differences between Alternative 2 and 3 are subtle in terms of effects to the fire/fuels resource; landscape-scale effects on fire behavior are very similar between the two action alternatives. Alternative 3 improves 1,846 acres in the resource area to Fire Regime Condition Class 1, 590 acres less than under Alternative 2.

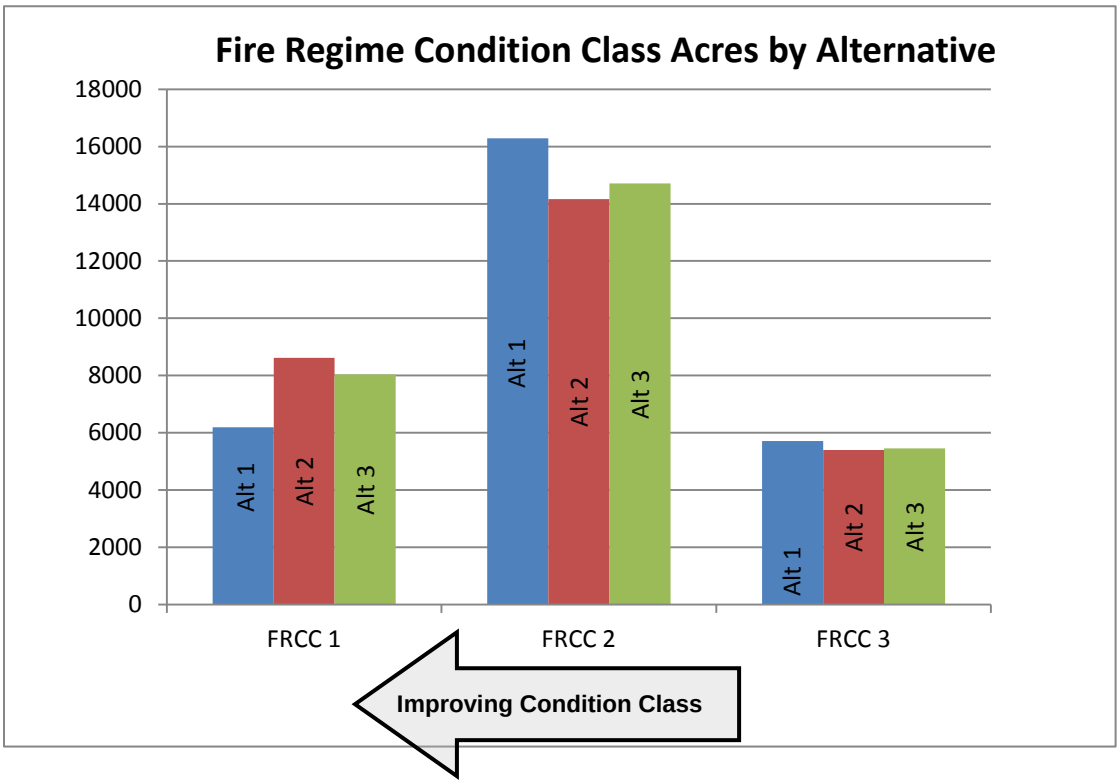


Figure 31. Acres in each Fire Regime Condition Class, by alternative.

Although neither Action Alternative completely resolves the fuels and fire issues that have developed after 100 years of fire exclusion, both Action Alternatives respond to the purpose and need to slightly different degrees. Alternative 2 best responds to the purpose and need, and does the most to reduce fuels and fuel continuity across the resource area, as illustrated by the Minimum Travel Time analysis (Figure 26 and Figure 27, PF Doc FF-21).

Also refer to Table 10 in Chapter 2 for effects summary information for fire/fuels.

3.2.8. Fire/Fuel References

Agee, James K. 1997. Severe fire weather – Too hot to handle? Northwest Science. Volume 71, No. 1. PF DOC. FF-REF-64

Agee, James K. 2002. The Fallacy of Passive Management Managing for Firesafe Forest Reserves. Conservation in Practice 3 (1), 18–26. PF DOC. FF-REF-74

Agee, James K. and Carl N. Skinner. 2005. Basic principles of forest fuel reduction treatments. Forest Ecology and Management 211 (2005) 83–96. PF DOC. FF-REF-65

Ager, Alan A., Nicole M. Vaillant and Mark A. Finney. 2010. A comparison of landscape fuel treatment strategies to mitigate wildland fire risk in the urban interface and preserve old forest structure. Forest Ecology and Management 259 (2010) p. 1556-1570. PF DOC. FF-REF-51

Anderson, Hal E. 1968. Sundance Fire: An analysis of fire phenomena. USDA Forest Service Research Paper INT-56. Intermountain Forest and Range Experiment Station, Ogden, Utah 84401. 38 p. PF DOC. FF-REF-27

Arkle, Robert S., David S. Pilliod and Justin L. Welty. 2012. Pattern and process of prescribed fires influence effectiveness at reducing wildfire severity in dry coniferous forests. Forest Ecology and Management 276 (2012) 174-184. PF DOC FF-REF-82

Arno, Stephen F. Forest Fire History in the Northern Rockies. Journal of Forestry. August 1980, pp 460-465. PF DOC. FF-REF-60

Baker, William L. and Donna Ehle. 2001. Uncertainty in surface-fire history: the case of ponderosa pine forests in the western United States. Can. J. For. Res. 31: 1205–1226. PF DOC. FF-REF-12

Baker, William L., Thomas T. Veblen and Rosemary L. Sherriff; 2006. Fire, fuels and restoration of ponderosa pine–Douglas fir forests in the Rocky Mountains, USA. Journal of Biogeography. (2006) PF DOC. FF-REF-52

Beukema, Sarah J.; Reinhardt, Elizabeth D.; Kurz, Werner A.; Crookston, Nicholas L. 1999. An overview of the fire and fuels extension to the forest vegetation simulator. In: Proceedings from the Joint Fire Science Conference and Workshop, Grove Hotel, Boise, ID, June 15-17, 1999. Available online at http://www.nifc.gov/joint_fire_sci/conferenceproc/index.htm. PF DOC. FF-REF-7

Boas, Franz and James Teit. 1996. Coeur d'Alene, Flathead and Okanogan Indians. Ye Galleon Press, Fairfield, WA. Reprinted from the forty-fifth annual report of the Bureau of American Ethnology, 1927-1928. 381 p. PF DOC. FF-REF-33

Boyd, Robert, Editor. 1999. Indians, fire and the land in the Pacific Northwest. Oregon State University Press, Corvallis, OR. PF DOC. FF-REF-13

Brackebusch, Arthur P. 1973. Fuel Management – A prerequisite, not an alternative to fire control. Journal of Forestry. 71:637-639. PF DOC. FF-REF-8

Brown, James K. 1974. Handbook for Inventorying Downed Woody Material. USDA Forest Service General Technical Report INT-16. September 1974. 32 p. PF DOC. FF-REF-36

Brown, J.K.; Arno, S.F.; Barrett S. W. Menakis, J.P. 1994. Comparing the prescribed natural fire program with presettlement fires in the Selway-Bitterroot Wilderness. Int. Jour. Wildland Fire 4 (3):157-168. PF DOC. FF-REF-20

Brown, Timothy J., Beth L. Hall and Anthony L. Westerling. 2004. The impact of twenty-first century climate change on wildland fire danger in the western United States: An applications perspective. Climatic Change 62: 365–388. PF DOC. FF-REF-73

Butler, B. W.; Cohen, J. D. 1998. Firefighter safety zones: a theoretical model based on radiative heating. International Journal of Wildland Fire. 8(2): 73–77. PF DOC. FF-REF-44

Cohen, Jack D. 1999. Reducing the wildland fire threat to homes: where and how much? USDA Forest Service General Technical Report PSW-GTR-173. pp 189-195. PF Doc FF-REF-45

Cohen, J.D. 2000. Preventing disaster: home ignitability in the wildland-urban interface. Journal of Forestry. 98(3): 15–21. PF DOC. FF-REF-50

Cohen, Jack D. Wildland-Urban Fire – A Different Approach. On the internet at www.firelab.org. Accessed 2006. PF DOC. FF-REF-16

Cohen, Jack and Bret Butler. 2005. Wildfire threat analysis in the Boulder River Canyon: Revisited. Fire Sciences Laboratory, USDA Forest Service, Rocky Mountain Research Station. Missoula MT. PF DOC. FF-REF-83

Cram, D.; Baker, T.; Boren, J. 2006. Wildland fire effects in silviculturally treated vs. untreated stands of New Mexico and Arizona. Research Paper RMRS-RP-55. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 28 p. PF DOC. FF-REF-69

Crookston, Nicholas L. and Elizabeth Reinhardt. 2004. Fire and Fuels Extension: Addendum, Appendix A: P-Torch. P-Torch: A new torching index. Gen. Tech. Rep. RMRS-GTR-116. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Pp 156-164. PF DOC. FF-REF-18

Countryman, C.M. 1956. Old-growth conversion also converts fire climate. Fire Control Notes Vol. 16 No. 4. p. 15-19. PF DOC. FF-REF-61

DellaSala, Dominick A., D. M. Olson, S. E. Barth, S. L. Crane, and S. A. Primm, 1995. Forest health: moving beyond rhetoric to restore healthy landscapes in the inland Northwest. Wildlife Society Bulletin 1995, 23(3): 346-356. PF DOC. FF-REF-54

DellaSala, Dominick A and Evan Frost 2001. An ecologically based strategy for fire and fuels management in National Forest roadless areas. Fire Management Today. Vol. 61, No. 2. PF DOC. FF-63

Finney, M.A. 2001. Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. Forest Science 47:219-228. PF DOC. FF-REF-9

Finney, Mark A. 2006. An overview of FlamMap fire modeling capabilities. In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management—How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. PF DOC. FF-REF-2

Finney, M.A. and Cohen, J.D. 2003. Expectation and evaluation of fuel management objectives. In P.N. Omi (ed.) Proceedings of Fire, Fuel Treatments, and Ecological Restoration, April 14-17 Fort. Collins CO. USDA Forest Service Proceedings RMRS-P-29, PP 353-366. PF DOC. FF-REF-31

Finney, M.A., C.W. McHugh, and I.C. Grenfell. 2005. Stand- and landscape-level effects of prescribed burning on two Arizona wildfires. Canadian Journal of Forest Research. Vol. 35 pp 1714-1722. PF DOC. FF-REF-40

Graham, Russell T.; McCaffrey, Sarah; Jain, Theresa B. (tech. eds.) 2004. Science basis for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Rep. RMRS-GTR-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 43 p. PF DOC. FF-REF-6

Graham, Russell T.; Harvey, Alan E.; Jain, Theresa B.; Tonn, Jonalea R. 1999. The effects of thinning and similar stand treatments on fire behavior in Western Forests. Gen. Tech. Rep. PNW-GTR-463. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p. PF DOC. FF-REF-15

Hann, Wendell J. and David L. Bunnell, 2001. Fire and land management planning and implementation across multiple scales. International Journal of Wildland Fire, 10; pp. 389-403. PF DOC. FF-REF-42

Hessburg, Paul F., James K. Agee, Jerry F. Franklin. 2005. Dry forests and wildland fires of the inland Northwest USA: Contrasting the landscape ecology of the pre-settlement and modern eras. Forest Ecology and Management 211 (2005) 117–139. PF DOC. FF-REF-37

Huff, Mark H.; Ottmar, Roger D.; Alvarado, Ernesto; Vihnanek, Robert E.; Lehmkuhl, John F.; Hessburg, Paul F.; Everett, Richard L. 1995. Historical and current forest landscapes in eastern Oregon and Washington. Part II: Linking vegetation characteristics to potential fire behavior and related smoke production. Gen. Tech. Rep. PNW-GTR-355. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 43 p. PF DOC. FF-REF-77

Interagency Fire Regime Condition Class Guidebook Version 1.3.0, June 2008. PF DOC. FF-REF-19

Jain, Theresa B., Russell T. Graham, and David S. Pilliod. 2006. The Relation Between Forest Structure and Soil Burn Severity. In: Andrews, Patricia L.; Butler, Bret W., comps. 2006. Fuels Management—How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. PF DOC. FF-REF-39

Keane, Robert E.; Ryan, Kevin C.; Veblen, Tom T.; Allen, Craig D.; Logan, Jessie; Hawkes, Brad. 2002. Cascading effects of fire exclusion in the Rocky Mountain ecosystems: a literature review. General Technical Report. RMRS-GTR-91. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 24 p. PF DOC. FF-REF-32

Keeling, E.G., A. Sala, T.H. DeLuca. 2006. Effects of fire exclusion on forest structure and composition in unlogged ponderosa pine/Douglas-fir forests. Forest Ecology and Management 237 (2006) 418–428. PF Doc. FF-REF-53

Kline, Jeffrey D. 2004. Issues in Evaluating the Costs and Benefits of Fuel Treatments to Reduce Wildfire in the Nation's Forests. USDA Forest Service Research Note PNW-RN-542. 46 pp. PF DOC. FF-REF-49

Leiberg, John B. 1897. General report on a botanical survey of the Coeur d'Alene Mountains in Idaho during the summer of 1895. U.S. Department of Agriculture. Division of Botany. Contributions from the U.S. National Herbarium. Vol. V, No. 1. PF DOC. FF-REF-17

Lyons-Tinsley, Christina and David L. Peterson. 2012. Surface fuel treatments in young, regenerating stands affect wildfire severity in a mixed conifer forest, eastside Cascade Range, Washington, USA. Forest Ecology and Management 270 (2012) 117-125. PF DOC. FF-REF-81

MacKenzie, M.D., T.H. DeLuca, A. Sala. 2004. Forest structure and organic horizon analysis along a fire chronosequence in the low elevation forests of western Montana. Forest Ecology and Management 203 (2004) 331–343. PF DOC. FF-REF-41

McKenzie, Donald, Ze'ev Gedalof, David L. Peterson, and Philip Mote. 2004. Climatic Change, Wildfire, and Conservation. Conservation Biology. Volume 18, No. 4. PF DOC. FF-REF-56

Millar, Constance I., Nathan L. Stephenson and Scott L. Stephens. 2007. Climate change and forests of the future: Managing in the face of uncertainty. Ecological Applications, 17(8), pp. 2145–2151. PF Doc FF-REF-75

Montana/Idaho Airshed Group Operating Guide. June 2010. PF DOC. FF-REF-47

Morgan, Penelope, Emily K. Heyerdahl and Carly E. Gibson. 2008. Multi-Season climate synchronized forest fires throughout the 20th century, Northern Rockies, USA. Ecology, 89(3), pp. 717–728. PF Doc FF-REF-76

Naficy Cameron, Anna Sala, Eric G. Keeling, Jon Graham and Thomas H. Deluca. 2010. Interactive effects of historical logging and fire exclusion on ponderosa pine forest structure in the Northern Rockies. Ecological Applications, 20(7) pp. 1851-1864. PF DOC. FF-REF-38

Nowicki, Brian. 2002. The Community Protection Zone: Defending Houses and Communities from the Threat of Forest Fire. Center for Biological Diversity. PF DOC. FF-REF-46

National Wildfire Coordinating Group, 1993. Fireline Handbook Appendix B, Fire Behavior. National Wildfire Coordinating Group. NFES 2165. PF DOC. FF-REF-11

Omi, Philip N., Erik J. Martinson, Geneva W. Chong. 2006. Effectiveness of Pre-Fire Fuel Treatments. Final Report JFSP Project 03-2-1-07. Submitted to the Joint Fire Science Program Governing Board December 31, 2006. PF DOC. FF-71

Peterson, David L.; Johnson, Morris C.; Agee, James K.; Jain, Theresa B.; McKenzie, Donald; Reinhardt, Elizabeth D. 2005. Forest structure and fire hazard in dry forests of the Western United States. Gen. Tech. Rep. PNW-GTR-628. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 30 p. PF DOC. FF-REF-43

Perry, David A., Huang Jing, Andrew Youngblood, Doug R. Oetter. 2004. Forest Structure and Fire Susceptibility in Volcanic Landscapes of the Eastern High Cascades, Oregon Conservation Biology 18 (4), 913–926. PF DOC. FF-REF-68

Prichard, Susan J., David L. Peterson and Kyle Jacobson. 2010. Fuel treatments reduce the severity of wildfire effects in dry mixed conifer forest, Washington, USA. Canadian Journal of Forest Research, Vol. 40, pp. 1615-1626. PF DOC. FF-REF-59

Quigley, Thomas M.; Haynes, Richard W.; Graham, Russell T., tech. eds. 1996. Integrated scientific assessment for ecosystem management in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-382. Portland, OR; USDA Forest Service, Pacific Northwest Research Station. 303 p. PF DOC. FF-REF-21

Raymond, Crystal L and David L. Peterson. 2005. Fuel treatments alter the effects of wildfire in a mixed-evergreen forest, Oregon, USA. Can. J. For. Res. Vol. 35. PF DOC. FF-REF-70

Reinhardt, Elizabeth; Crookston, Nicholas L. (tech. eds.). 2003. The Fire and Fuels Extension to the Forest Vegetation Simulator. Gen. Tech. Rep. RMRS-GTR-116. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 209 p. PF DOC. FF-REF-14

Rhodes, Jonathan J. 2007. Watershed Impacts of Forest Treatments to Reduce Fuels and Modify Fire Behavior. Prepared for Pacific Rivers Council. www.pacrivers.org PF DOC. FF-REF-84

Ritchie, Martin W., Carl N. Skinner, Todd A. Hamilton. 2007. Probability of tree survival after wildfire in an interior pine forest of northern California: Effects of thinning and prescribed fire. Forest Ecology and Management 247 (2007) 200–208. PF DOC. FF-REF-62

Rothermel, Richard C. 1983. How to predict the spread and intensity of forest and range fires. USDA Forest Service Gen. Tech. Rep. INT-143. Intermountain Forest and Range Experiment Station, Ogden, Utah 84401. 161 p. PF DOC. FF-REF-28

Saveland, Jim. 1998. Prescribed fire: the fundamental solution. Pages 12-16 in: Teresa L. Pruden and Leonard A. Brennan, (eds.). Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timber Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL. PF DOC. FF-REF-3

Schmidt, Kirsten M.; Menakis, James P.; Hardy, Colin C.; Hann, Wendall J.;Bunnell, David L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 41 p. + CD. PF DOC. FF-REF-1

Schoennagel, Tania, Thomas T. Veblen, William H. Romme. 2004. The Interaction of Fire, Fuels, and Climate across Rocky Mountain Forests. BioScience. July 2004. Vol. 54 No. 7. PF DOC. FF-REF-34

Scott, Joe H.; Reinhardt, Elizabeth D. 2001. Assessing crown fire potential by linking models of surface and crown fire behavior. Res. Pap. RMRS-RP-29. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p. PF DOC. FF-REF-10

Scott, Joe H.; Burgan, Robert E. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p. PF DOC. FF-REF-35

Smith, Jane Kapler. 1994. Presettlement fire regimes in northern Idaho. In: Fire Management under Fire (Adapting to Change) Proceedings of the 1994 Interior West Fire Council Meeting and Program, 1994 November 1-4, Coeur d'Alene, ID. Interior West Fire Council: 83-92. PF DOC. FF-REF-5

Smith, Jane Kapler and William C. Fischer. 1997. Fire ecology of the forest habitat types of northern Idaho. Gen. Tech. Rep. INT-GTR-363. Ogden, Utah: US Department of Agriculture, Forest Service Intermountain Research Station. 142 p. PF DOC. FF-REF-4

Stephens, Scott L. and Jason J. Moghaddas. 2005a. Experimental fuel treatment impacts on forest structure, potential fire behavior, and predicted tree mortality in a California mixed conifer forest. Forest Ecology and Management 215 (2005) 21–36. PF DOC. FF-REF-66

Stephens, Scott L. and Jason J. Moghaddas. 2005b. Silvicultural and reserve impacts on potential fire behavior and forest conservation: Twenty-five years of experience from Sierra Nevada mixed conifer forests. Biological Conservation 125 (2005) 369–379. PF DOC. FF-REF-67

Strom, Barbara A. and Peter Z. Fulé. 2007. Pre-wildfire fuel treatments affect long-term ponderosa pine forest dynamics. International Journal of Wildland Fire, 16, 128–138. PF DOC. FF-REF-72

Theobald, David M. and William H. Romme. 2007. Expansion of the US wildland–urban interface. Landscape and Urban Planning 83 (2007) 340–354. PF DOC. FF-REF-48

USDA Forest Service. Forest Service Manual, Title 5100 Fire Management USDA Forest Service. Washington D.C. PF DOC. FF-REF-29

USDA Forest Service. Forest Service Manual, Title 5100 Fire Management. Chapter 5140, Fire Use. USDA Forest Service. Washington D.C. PF DOC. FF-REF-30

USDA Forest Service. 1987. Forest Plan Idaho Panhandle National Forests. PF DOC. CR-002

USDI and USDA. 2001a. Review and update of the 1995 Federal Wildland Fire Management Policy. Available online at http://www.nifc.gov/fire_policy/index.htm. PF DOC. FF-REF-22

USDI and USDA 2001b. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy. Available online at www.fireplan.gov. PF DOC. FF-REF-24

USDI and USDA 2006. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan. Available online at www.fireplan.gov. PF DOC. FF-REF-25

USDI and USDA 2009. Guidance for the Implementation of Federal Wildland Fire Management Policy. FF-REF-26.

VanWagtendonk, Jan W. 1996. Use of a Deterministic Fire Growth Model to Test Fuel Treatments. Sierra Nevada Ecosystem Project: Final report to Congress, vol. II, Assessments and scientific basis for management options. PF Doc. FF-REF-78

Veblen, Thomas T. 2003. Key Issues in Fire Regime Research for Fuels Management and Ecological Restoration. USDA Forest Service Proceedings RMRS-P-29. PF DOC. FF-REF-55

Weatherspoon, C. Phillip. 1996. Fire-Silviculture Relationships in Sierra Forests. Sierra Nevada Ecosystem Project: Final report to Congress, vol. II, Assessments and scientific basis for management options. PF Doc. FF-REF-79

Westerling, A. L., H. G. Hidalgo, D. R. Cayan, T. W. Swetnam. 2006. Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity. Science Vol 313 p, 940-943. PF DOC. FF-REF-58

Wildland Fire Leadership Council. 2011. National Comprehensive Wildland Fire Management Strategy. Available online at www.forestsandrangelands.gov PF DOC FF-REF-24

Whitlock, Cathy, Sarah L. Shafer, Jennifer Marlon. 2003 The role of climate and vegetation change in shaping past and future fire regimes in the northwestern US and the implications for ecosystem management. Forest Ecology and Management 178 (2003) 5–21. PF DOC. FF-REF-57

Zack, Arthur C. and Penelope Morgan. 1994. Fire history on the Idaho Panhandle National Forest (Review Draft). PF DOC. FF-REF-23

3.3. Hydrology

3.3.1. Introduction

This analysis reviews the existing hydrologic conditions in the Beaver Creek watershed, with particular focus on the subwatersheds that have the greatest likelihood to influence conditions in Beaver Creek through the actions proposed here. This analysis specifically reviews the existing conditions found in those subwatersheds with particular attention to known and relevant historic management activities and natural historic disturbance processes. This analysis also attempts to describe the potential effects that the proposed activities may have on those hydrologic conditions through the use of the best available science, relevant modeling, and professional interpretation based on conditions found through field surveys and other observations.

3.3.1.1. Overview of Issues Addressed

The proposed actions include vegetation treatments (i.e. timber harvest and prescribed burning), upgrading culverts, minor road construction, some road reconstruction, and effectively decommissioning a relatively large number of road miles across the entire Beaver Creek watershed.

3.3.1.2. Issue Indicators

Issues related to the proposed actions affecting hydrologic and aquatic conditions in Beaver Creek and its tributaries include water quality, and water quantity and peak flows (Table 36). Water quality in Beaver Creek does not support beneficial uses as defined by the Clean Water Act and Idaho water quality standards. In particular, increased levels of sediment and metals are currently known to be at least partly responsible for lower water quality conditions (IDEQ 2008; PF Doc. AQ-R11), and water temperature may also be partly responsible for reduced biological conditions in Beaver Creek (IDEQ water temperature TMDL, in prep). Water quantity, and peak flows in particular, while not formally recognized as directly related to water quality, can be responsible for increased sediment loads in streams and may affect habitat conditions and the persistence of certain aquatic organisms as well.

Water quality was determined to be an issue to analyze specifically because the proposed actions, including timber harvest, road construction, and road obliteration and decommissioning, could have both positive and negative effects on soil erosion and sedimentation in streams. For this issue, the net change in sediment delivery over time was chosen for analysis, as was the length of road contributing sediment to streams.

Water quantity and peak flows were also chosen as in issue that could be affected by the proposed actions. Changes in water quantity, particularly changes in the magnitude and frequency of peak flows, may contribute to increased erosion and scour of the streambed and banks and negatively alter in-stream habitat conditions for aquatic organisms. For this issue, the relative change in annual water yield, and the relative change in peak flow runoff as defined by recurrence interval, is also used to determine the effects of the proposed actions on the hydrologic environment in Beaver Creek and its tributaries.

The peak flow issue is further defined here to represent a low to moderate flow that tends to have about a 6 year recurrence interval, following the recommendations by Grant and others (2008). This is partly because of the relative lack of research on the effects of forest harvest on larger peak flows, and because there is greater chance that additional factors driving runoff in forested watersheds play an increasingly larger role at higher flows.

Table 36. Issues and analysis indicators for the analysis of the effects of the proposed actions on hydrologic conditions in the Beaver Creek watershed.

Key Issue	Sub Issue	Analysis Measures
Water quality- The proposed activities may have effects on sediment contributions to streams and potentially delaying the attainment of state water quality standards.	The proposed activities may contribute to soil erosion and sedimentation to streams.	Change s in sediment delivery to streams
Water quantity and peak flows- The proposed activities may have effects on water quantity and the timing and magnitude of peak flows.	The proposed activities may lead to altered runoff timing, a shortened peak flow duration combined with a concurrent increased peak flow volume.	Changes in water yield Changes in peak flows

3.3.2. Existing Conditions

3.3.2.1. Watershed Descriptions

The Beaver Creek watershed is nearly 44 square miles in size, contains 237 miles of road in various conditions and for a variety of uses, is predominately forested, and receives approximately 30 to 40 inches of precipitation per year. Aside from several prescribed fires that have occurred in the recent decades, the last major wildfire occurred in 1889. The Beaver Creek watershed has had an extensive and widespread history of mining, timber harvest, and private land development, including two historic mine and mill sites that were operational for many decades in both upper Beaver Creek (the Idora mine), and in Carbon Creek (the Ray Carlile mine). See the Beaver Creek Watershed Assessment (McFarland et al. 2013; PF Doc. AQ-R15) for a greater in-depth analysis of the current watershed conditions in Beaver Creek.

3.3.2.1.1. Water Yield

Harvesting timber can reduce forest canopy and may increase water yield with increasing amounts of harvest, and decrease water yield with increasing forest regeneration. In northern Idaho, Hubbart and others (2007; PF Doc. AQ-R09) showed increases in water yield immediately after both clearcut and partial cut harvesting, as well as after road construction. Their study showed that partial harvesting (50% canopy removal) across 24% of a small watershed (<370 ac) increased water yield in smaller headwater watersheds by over 20%, and that increases were smaller further from treatment areas. In Beaver Creek, all proposed harvest would utilize partial harvesting techniques resulting in between 25% and 90% canopy removal in subwatersheds of between 500 and 3,700 acres.

Effectively harvested condition describes the amount of an area in an equivalent clearcut condition, based on a set of canopy removal values for each type of treatment, as well as vegetation recovery curves for a set of habitat types found in northern Idaho.

As of 2010, approximately 7% of the entire Beaver Creek watershed (2,168 acres) exists in an effectively harvested condition (Table 37). The potential increase in water yield based on 7% of the watershed being effectively harvested is approximately 2% greater than it was in 1970 (Figure 32); the arrow represents the existing condition of water yield according to the Equivalent Clearcut Area (ECA) analysis. Water yield in the Beaver Creek watershed were estimated to be the highest in 1995, because of intensive timber harvest activity and those effects are assumed to be declining as a result of natural recovery of vegetation and reforestation efforts. The effectively harvested area in each subwatershed also varies substantially. Carpenter and Pony Creek each have the least amount of effectively harvested area (Table 37).

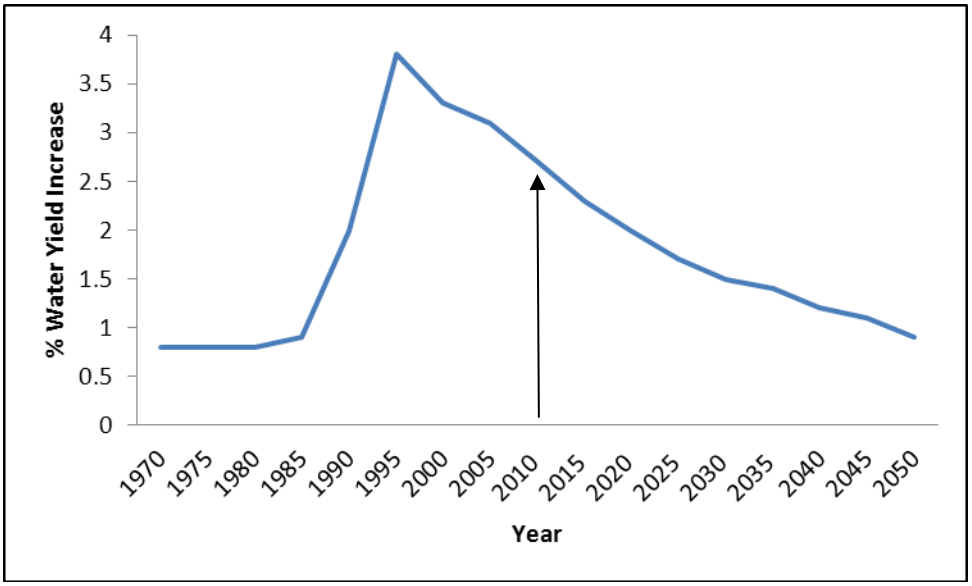


Figure 32. Estimated and predicted relative change in water yield in the Beaver Creek watershed.

3.3.2.1.2. Peak Flow

Forest harvest has been shown to potentially alter peak flows by increasing the frequency and magnitude of small to moderate peak flows (Grant et al 2008; PF Doc. AQ-R08, Tonina et al 2008), and some recent studies have found increases in occurrence of larger flows in harvested areas (Kuras et al 2012; PF Doc. AQ-R12). Although changes have been observed, controversy still exists as to the potential magnitude of changes and effects to the biophysical environment (Alila 2009; PF Doc. AQ-R34). Our assumption is that where stream channels do not have inherent characteristics to provide stability and attenuate flood events (e.g. access to flood prone area, presence of large woody debris, large rocks, step pool morphology, or other energy dissipaters), or are of lower gradient below 2%, increasing the frequency or magnitude may alter geomorphic characteristics of unstable stream segments by increasing streambed and bank erosion rates, although those relationships have yet to be fully substantiated in the scientific literature. Increasing erosion rates can affect habitat for aquatic organisms, and has been shown to potentially occur in other tributaries of the Coeur d'Alene River (Tonina et al 2008; PF Doc. AQ-R25).

Drainage density is a measure of drainage efficiency, and describes a watershed's ability to drain water from a watershed more rapidly.

Considering effectively harvested area with the synopsis provided by Grant and others (2008) allows some estimation of increasing the likelihood of moderately sized peak flows. Grant et al. (2008) compiled the results of many published studies on changes in peak flows from forest harvest, and found that many studies in the transient snow zone showed detectable changes in peak flow of greater than 10%, when more than 15% of a watershed was effectively harvested. This analysis then compares effectively harvested area data from Beaver Creek and its tributaries to those values in Grant's 2008 (PF Doc. AQ-R08) study because it allows some generalized estimation of peak flows changes that may change occur with increasing timber harvest.

It also places the likelihood of those potentially increased peak flows in the context of average and maximum amount of change. For example, if road densities, drainage densities, and amount of harvested area are all high, then the likelihood for larger increases in peak flow may be more like the maximum increases observed in other studies. At the same time, if those variables tend to be lower, then the potential increase in peak flows may also be more like the 'average' increase in peak flows found in Grant's 2008 study (PF Doc. AQ-R08).

Prospect Gulch and Unknown Gulch are currently the only subwatersheds with more than 15% area in an effectively harvested condition. Prospect and Unknown Gulch both have relatively high drainage densities and average road densities (Table 37), so it may be more likely that moderately-sized peak flows have increased in the recent past due to harvest and road construction, and may have increased as much as 18 or 19%, or the average amount found in other studies.

Of the remaining subwatersheds, Moore Creek had the next highest amount of effectively harvested area, and has a low drainage density but relatively high road density. In this case, it may be more likely to 'absorb' the effects of increased water availability because of the lower drainage density (i.e. it may take longer for water to flow out of Moore Creek than in some other subwatersheds), but the higher road density may effectively increase the drainage network or alter soil permeability and result in a greater likelihood for larger increased peak flows.

Ferguson had the fifth-largest effectively harvested area and the highest drainage density of all the subwatersheds, but a relatively low road density. In this case, Ferguson Creek may have a moderate likelihood of increased peak flows because of its ability to drain water from the watershed more rapidly. However, the effectively harvested area is still relatively small and therefore changes in moderately-sized peak flows are less likely from historic timber harvest and roads.

The remaining subwatersheds all have less than 10% of their area in an effectively harvested condition and have a low likelihood to be detrimentally influenced by increased peak flows or decreased recurrence interval of higher flows.

Table 37. Existing condition of the estimated percent of each subwatershed in an effectively harvested condition.

Subwatershed*	Size (acres)	Effectively harvested area (percent)
Alder	1,726	9.0
Carpenter	1,101	4.9
Deer	1,663	10.0
Dudley	1,885	8.1
Ferguson	711	11.5
Moore	679	12.4
Prospect	512	18.3
Pony	2,291	4.9
Potosi	1,450	6.5
Trail	3,645	6.1
Unknown	557	15.6
White	2,698	9.5
Beaver (all)	28,183	7.7

* Subwatersheds with an asterisk (*) are those with the greatest likelihood of increased peak flows because of their percent ECA, drainage density, and length of road.

3.3.2.1.3. Water Quality and Sediment

Forest roads can intercept surface and subsurface water, leading to the erosion of road surfaces and the delivery of sediment into streams, as well as affect peak discharges in small streams (Luce and Black 1999, PF Doc. AQ-R14; Luce 2002, PF Doc. AQ-R13; Wemple et al. 1996, PF Doc. AQ-R28). Sediment from roads can affect water quality, and increases in peak flows may affect channel morphology and in-stream scour and erosion, though there is less evidence for such linkages (see Grant et al 2008).

Today, water quality in Beaver Creek does not fully support beneficial uses as outlined in the Clean Water Act and Idaho water quality standards due to sediment, temperatures, cadmium, lead and zinc. Beaver Creek is subject to Total Maximum Daily Load (TMDL) requirements for sediment, and TMDLs are currently in development for temperature, cadmium, lead and zinc.

Roads lengths and densities in the Beaver Creek watershed, as well as their influence on streams, vary across subwatersheds. Approximately 237 miles of forest and county road exist in the Beaver Creek watershed, and subwatersheds generally contain between 5 and 20 miles each. Road density, which is sometimes used as a proxy for impacts to streams and has been shown to generally reduce fisheries composition and persistence (USDA 1997; PF Doc. AQ-R26), ranged from 3 miles of road per square mile of area (mi/mi2) in Pony Gulch, to 10 mi/mi2 in Carpenter Gulch.

The road survey found a total of over one mile of road connected to streams and contributing sediment into surface waters in each of five subwatersheds, with over two miles of road connected to streams in the Dudley Creek watershed (Figure 33 and Table 37). Ferguson Gulch and Unknown Gulch each had less than one-tenth of one mile of road connected to streams. It should be noted that these are cumulative lengths from many road segments across many roads, and not from a single long road. Rarely was more than a few hundred feet of road found to be contributing sediment to streams, and in most cases many short road segments across any given

subwatersheds were individually responsible for contributing relatively low amounts of sediment, but collectively were responsible for contributing most of the sediment from roads.

The GRAIP model also provides some ability to estimate the amount of sediment being contributed by roads to streams. Though the model used a base erosion rate from roads that is likely to be more erosive than roads in Beaver Creek, this analysis used relative values because they allow a comparison of road segments regardless of actual sediment amounts. Roads in Trail Creek, including Potosi Gulch, contributed approximately 45% of the sediment from roads to Beaver Creek. Roads in the Alder, Moore, and Unknown watersheds each contributed less than 1% of the sediment. Roads in Ferguson Gulch contributed one-tenth of one percent of the overall sediment contribution from surveyed roads (Table 37).

The amount of sediment contributed per watershed area was also determined, because in some cases the subwatersheds that contribute the most sediment may actually not contribute as much sediment per area. In fact roads in Potosi Gulch contributed more sediment per area than Trail Creek, and even though roads in Prospect Gulch contributed less than 5% of the overall sediment contribution, it contributed the third highest amount of sediment per area because of its relatively small size and combined length of road connected to streams (Table 37).

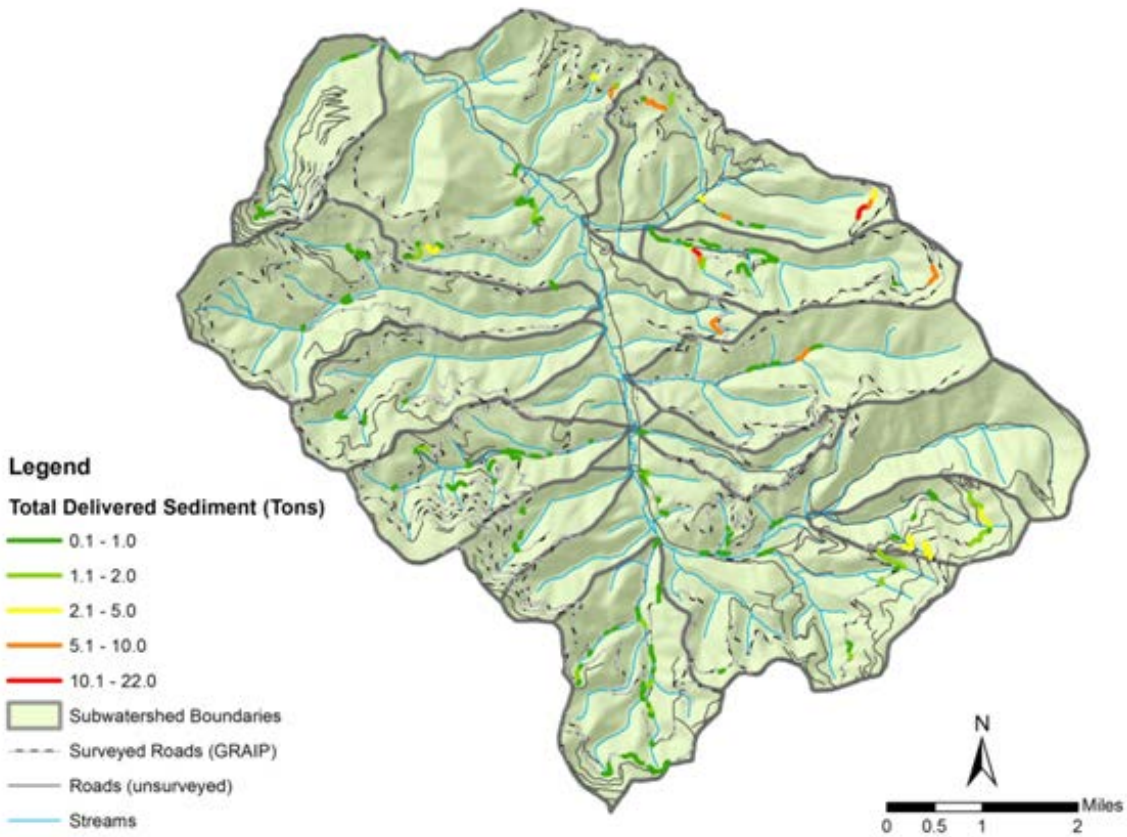


Figure 33. Locations where road segments are known to contribute sediment to streams.

Table 38. Existing conditions of roads by subwatershed and their relative contributions of sediment in the Beaver Creek watershed.

Watershed	Area (mi^2)	Length of road (miles)	Road density (mi/mi^2)	Length of road connected to streams (miles)	Sediment contributed by roads (tons)	Relative amount of sediment contributed by roads (percent)	Amount of sediment per unit area (tons/ mi^2)
Alder	2.7	14.1	5.2	0.27	1.8	0.8	0.7
Carpenter	1.7	17.4	10.1	0.43	4.5	2.0	2.6
Deer	2.6	20.3	7.8	1.18	10.0	4.5	3.9
Dudley	2.9	18.6	6.3	2.22	17.3	7.8	5.9
Ferguson	1.1	5.3	4.8	0.04	0.3	0.1	0.2
Moore	1.1	7.8	7.4	0.23	1.7	0.8	1.6
Pony	3.6	11.5	3.2	0.50	17.5	7.9	4.9
Potosi	2.3	13.7	6.0	1.88	43.8	19.8	19.3
Prospect	0.7	4.9	7.0	0.23	10.7	4.8	15.2
Trail	3.4	17.1	5.0	1.12	54.4	24.6	15.9
Unknown	0.9	5.2	6.0	0.09	0.4	0.2	0.4
White	4.2	23.6	5.6	0.67	8.1	3.7	1.9
Lower Beaver Subwatersheds	7.7	25.3	3.3	1.74	22.0	10.0	2.9
Upper Beaver Subwatersheds	7.7	40.9	5.3	1.49	14.1	6.4	1.8
Total (all of Beaver Creek)	42.6	225.7	5.4	12.03	206.4	100.0	5.0

3.3.2.2. Desired Condition

Beaver Creek and its tributaries do not fully support beneficial uses as outlined by Idaho water quality standards (IDAPA 58.01.02) due to sediment, temperatures, cadmium, lead and zinc. Beaver Creek is also subject to requirements outlined in the 2001 Total Maximum Daily Load (TMDL) for sediment. According the TMDL assessment for the entire North Fork Coeur d'Alene River (IDEQ 2001; PF Doc. AQ-R10), the U.S. Forest Service's current allocation of sediment in Beaver Creek is 863 tons/ year, and the required sediment reduction of all landowners in Beaver Creek is to reduce sediment loads by 704 tons/year. The analysis suggests that forest roads are responsible for approximately 1,700 tons of sediment per year, 440 tons of which are believed to be fine sediment.

3.3.3. Management Framework

The regulations, laws, and policies governing management of watersheds and fisheries in the project include, but may not be limited to the following.

3.3.3.1. National Forest Management Act

The National Forest Management Act (NFMA) requires that the Forest Service "insure that timber will be harvested from NFS lands only where soil, slope, or other watershed conditions will not be irreversibly damaged; and 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," (1976, Title16 USC §1604 NFMA §6 (g)(3)(e)(i) and (iii)).

3.3.3.2. Forest Plan

The existing IPNF Forest Plan (1987; PF Doc. CR-002) and the draft Forest Plan (in preparation) require compliance with clean water act and forest practices act regulations through the implementation of Best Management Practices. The desired future condition of the 1987 Forest Plan states '…minimize sediment levels through analysis of harvest, roading, and fire activities and the use of best management practices' (PF Doc. CR-002). Objectives of the plan include improving water quality in streams where water quality is below Forest standards through restoration projects, and that the quality of individual water bodies will not be significantly affected by sediment production through the application of appropriate conservation practices.

3.3.3.3. Inland Native Fish Strategy

Management of riparian and wetland areas in the Idaho Panhandle National Forests are guided by the Inland Native Fish Strategy (INFS, USDA 1995; PF Doc. CR-003), which amended the Forest Plan (USDA 1987; PF Doc. CR-002) regarding stream and fish habitat protection measures. In summary, the goals for riparian management are to establish and maintain healthy functioning watershed, riparian areas, and associated fish habitats. These goals include maintenance and restoration of water quality; stream channel integrity and processes, including sediment regime; management of instream flows; meadow and wetland integrity; productivity and diversity of native and desirable non-native plant species; and protection, maintenance, and/or restoration of riparian and stream channel function needed to support invertebrates, fish, and other terrestrial species.

3.3.3.4. Clean Water Act

Under authority of the Clean Water Act, the U.S. Environmental Protection Agency (EPA) and the States must develop plans and objectives that will not further harm, and eventually restore, streams that do not meet beneficial uses of the State. The Forest Service has developed Best Management Practices as outlined in the Soil and Water Conservation Handbook (Forest Service Manual 2509.22, PF Soil-R-72), to meet the intent of the water quality standards of the State of Idaho.

3.3.3.5. Idaho Forest Practices Act

The Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code 2000) regulates forest management on all ownerships in Idaho, including National Forest System lands (IDAPA 20.02.01).The Forest Service has agreements with the state to implement best management practices (BMPs) for all management activities. All activities will meet or exceed guidelines described in the Soil and Water Conservation Handbook (Forest Service Manual 2509.22; PF.Doc. Soil-R-72). Following these best management practices will meet the water quality protection elements of the Idaho Forest Practices Act.

3.3.3.6. Idaho Stream Channel Protection Act

The Idaho Stream Channel Protection Act regulates stream channel alterations between mean high water marks on perennial streams in Idaho. Instream activities on National Forest system lands must adhere to rules pertaining to the Act (IDAPA 37.03.07). These rules are also incorporated as best management practices in the Idaho Water Quality Standards.

3.3.3.7. Executive Order 11988 – Management of Floodplains

Executive Order 11988 provides for the protection and management of floodplains. These rules are also incorporated as best management practices in the Idaho Water Quality Standards.

3.3.3.8. Executive Order 11990 – Management of Wetlands

Executive Order 11990 provides rules for the protection and management of wetlands. These rules are also incorporated as best management practices in the Idaho Water Quality Standards.

3.3.4. Environmental Consequences

3.3.4.1. Spatial and Temporal Context for Effects Analysis

The peak flow and water yield analysis each were initiated at beginning at year 1970, partly because of more reliable record keeping occurred during that time, recorded timber harvest activity on Forest Service land was less intense and more widespread up to that point, and partly because it was determined that the effects of timber harvest activities that occurred prior to that year would have minimal effects on water yield and peak flow today. The ECA analysis was done for each alternative in each of 13 subwatersheds in 5-year increments from 1970 until the year 2050.

The roads analysis represents conditions in 2010 when surveys were completed. It is likely that in some cases road conditions and sediment contributions to streams have changed since then, but there have been no large scale road reconstruction projects in Beaver Creek since 2010 and it is generally assumed for the purposes of this analysis that if the general conditions of road surfaces have not changed (i.e., drainage mechanisms have not been modified), then sediment

contributions from roads and road segments connected to streams have also not changed. There is one known exception, where several waterbars were recently constructed on Road 933. However a review of these drainage features determined that these would be ineffective in only a few years and under this proposal, these features would be removed and more permanent drainage features would be constructed.

The direct and indirect effects of the proposed actions regarding road reconstruction or decommissioning are also analyzed in terms of their immediate, short-term effects on sedimentation to streams, as well as their long-term effects that might be realized after about 5 years.

3.3.4.2. Methodology

3.3.4.2.1. Watersheds

The Beaver Creek watershed consists of many various sized subwatersheds, thirteen of which were analyzed separately for this analysis. Two additional clusters of the remaining subwatersheds that generally contain smaller tributaries of Beaver Creek, as well as the mainstem, were also included for portions of the analysis if they were relevant to the proposed actions. The thirteen subwatersheds generally contain some aspect of the proposed actions within them and those actions would mostly likely also affect smaller tributaries or the organisms that live in them.

3.3.4.2.2. Water Yield

Changes in water yield were only analyzed at the Beaver Creek watershed scale, partly because the likelihood that changes in smaller subwatersheds would generally be small, and because relatively small changes in water yield in small watersheds would likely be less relevant to aquatic habitats and organisms.

3.3.4.2.3. Peak Flow

Conversely, peak flows are analyzed at the subwatershed scale because changes in peak flow at the Beaver Creek watershed due to those changes in tributaries are likely to be equal to or less than combined changes in the peak flow in those tributaries scale (Grant et al. 2008; PF Doc. AQ-R08). Therefore, any changes in peak flow in tributaries of Beaver Creek can be assumed to be of similar size or smaller in Beaver Creek itself, and most likely would be smaller because each subwatershed varies in terms of topography, drainage density, and treatment type and intensity. For the same reason, changes in peak flow are also likely to be more relevant to biological communities in smaller streams where equal sized increases may have disproportionate effects in smaller watersheds than in larger mainstem streams.

For example, it is unlikely that changes in peak flow in Beaver Creek would be attributable to individual harvest units, or that sediment contribution by individual road segments would be observable in Beaver Creek. However, the effects of those actions are more likely to be both observable and influential on water quality or stream conditions in the tributaries themselves. At the same time, many of the remaining populations of native fish species in the Beaver Creek watershed reside in these upper headwater tributaries, making the analysis at the subwatershed scale more biologically relevant. The two groups of subwatersheds, called upper and lower Beaver Creek, contain many smaller-sized subwatersheds for which an analysis of water quality, peak flow, or water yield was difficult, or that individually would not receive any forest or road treatments. These larger subwatersheds are included in the analyses, but the results of which do not pertain to any single tributary of Beaver Creek and therefore may not be as relevant.

Information for the water yield, peak flow analyses includes the amount of historic forest harvest and length and width of roads in an equivalent clearcut area model to determine effects on water yield. It was also used in conjunction with data compiled by Grant and others (2008; PF Doc. AQ-R08) to estimate effects of forest harvest on peak flows (Figure 34). The equivalent clearcut area model uses a set of canopy removal values for each type of treatment, as well as vegetation recovery curves for a set of habitat types found in northern Idaho, to generate an amount of area in an equivalent clearcut condition, herein referred to as an effectively harvested area. Effects of changes in water yield or peak flows on streams used information from recent stream survey data collected between 2005 and 2012. The peak flow analysis also used a measure of drainage density (the watershed's intrinsic ability to drain water from the watershed) to evaluate the potential for peak flows to increase. In this way, a watershed with a highly dissected stream network may have a greater ability to drain water at a faster rate, than a less dissected watershed.

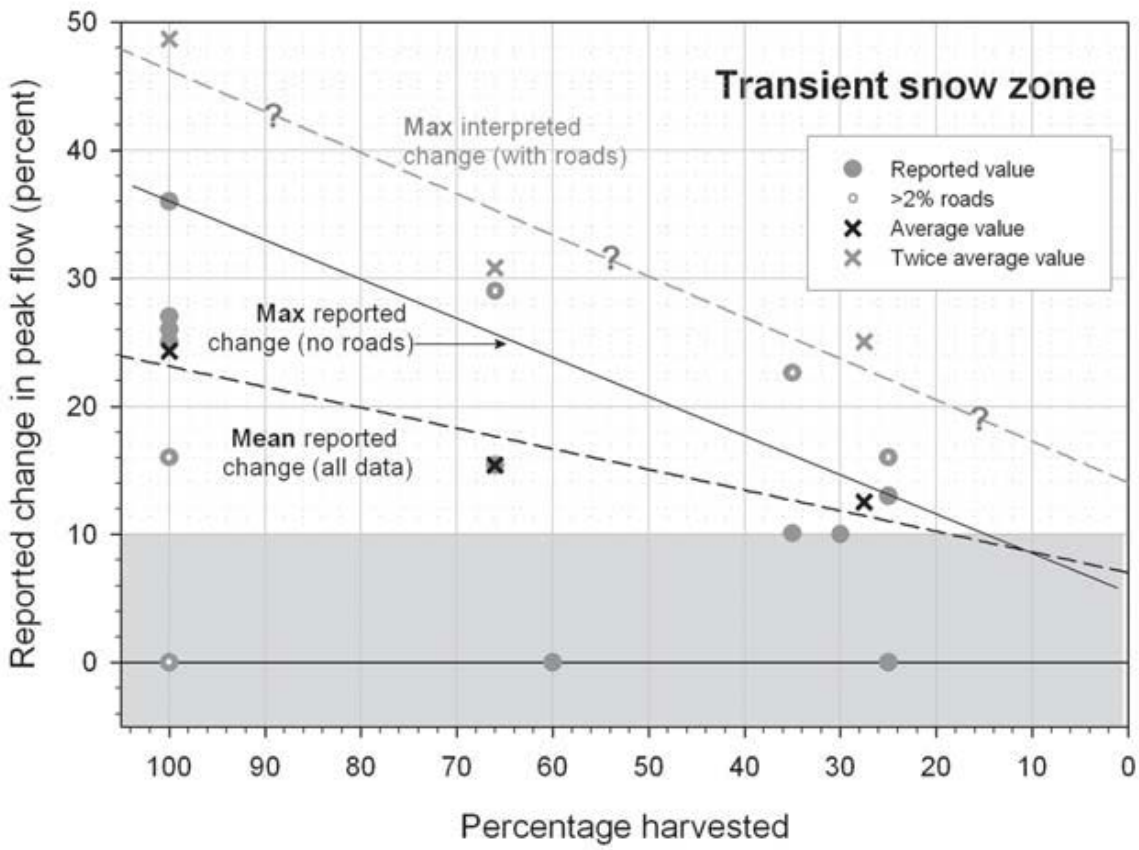


Figure 34. From Grant et al 2008, representing peak flow response to harvest in the transient snow hydrologic zone.

In the figure above, the solid line represents maximum values reported for basins without roads. The dashed black line represents the mean reported change for all data. The dashed grey line represents interpreted change with roads, and is a linear fit through doubling of the average values. Grey shading around zero indicates limit of detection (±10%). Harvested area below an average of about 20% of a watershed has been found to result in undetectable changes in peak flow, while harvesting 15% of a watershed represents the least amount capable of producing an observable maximum change in peak flow of 10%.

The ECA method generally followed the procedures in the Flathead National Forest ECA User Guide (adapted from Montana Department of Natural Resource Conservation, 2002 (US Forest

Service 2012, PF Doc. AQ_R37). Using the ECA method alone to determine effects to water yield or peak flow should only be applied to relatively large vegetation management projects where proposed timber harvest, fuel treatments, or both, would affect large proportions of 6th code hydrologic units. For the purposes of this analysis, the ECA method was only used to determine the effectively harvested area of subwatersheds in order to estimate changes in peak flow using Figure 3, and compare potential effects from the two action alternatives against existing baseline (i.e. the No-Action Alternative – Alternative 1). See Reid, 1993 (PF Doc. AQ-R21) for a detailed explanation of the uses and limitations of the equivalent clearcut area model. Briefly, the equivalent clearcut area method is not designed for complete watershed analyses, and does not incorporate the effects of other types of land use that may affect stream channels. The ECA model also does not apply to cumulative changes in streams through time, partly because recovery periods of impact variables, i.e. stream organisms, are not included (Reid, 1993; PF Doc. AQ-R21). The equivalent clearcut area method is also not designed to develop precise estimates of flow, nor does it consider extreme or rare climatic events or include stream channel density in its water yield model. It assumes that watersheds are entirely forested, and the model does not incorporate differences in overland flow, soil depth, or soil moisture. This analysis also assumes that all harvest occurs in the same year, and any effects on water yield or peak flows would likely be reduced if harvest occurred over longer time frames.

The equivalent clearcut area model was used at the subwatershed scale to only generate an approximate amount of harvested area that could be compared to studies of forest harvest on peak flows in similar climatic conditions (Grant et al, 2008; PF Doc. AQ-R08). The equivalent clearcut area model was also used to estimate the effects of forest harvest on water yield, though it is generally acknowledged that because the equivalent clearcut area model is limited in its ability to determine actual changes in water yield, it was used to compare the effects of the proposed action in each alternative only at the Beaver Creek watershed scale.

Water yield was analyzed at the Beaver Creek watershed scale and was not further evaluated for each tributary. The equivalent clearcut area analysis, or the measure of the effectively harvested area, was based on Forest Service forest data from 1970 until today; data prior to 1970 was generally less specific in terms of where harvest occurred and the methods used to harvest timber. Timber harvest prior to 1970 was also sporadic and widespread in Beaver Creek, and it is generally believed that forest canopies greater than 40 years old in northern Idaho likely affect the interception and evaporation of precipitation in similar ways as older forests.

In addition, hydrologic recovery curves for the most predominant forest habitat types harvested in the Beaver Creek watershed tend to be nearly 90% recovered at 40 years of age, and nearly 65% of the harvested area since 1970 is identified as an ‘A’ category (Figure 35). Each habitat type in Table 38 used in the ECA analysis corresponds to values in USDA 2005 (PF Doc. AQ-R26), and can be found in PF Doc. AQ-31.

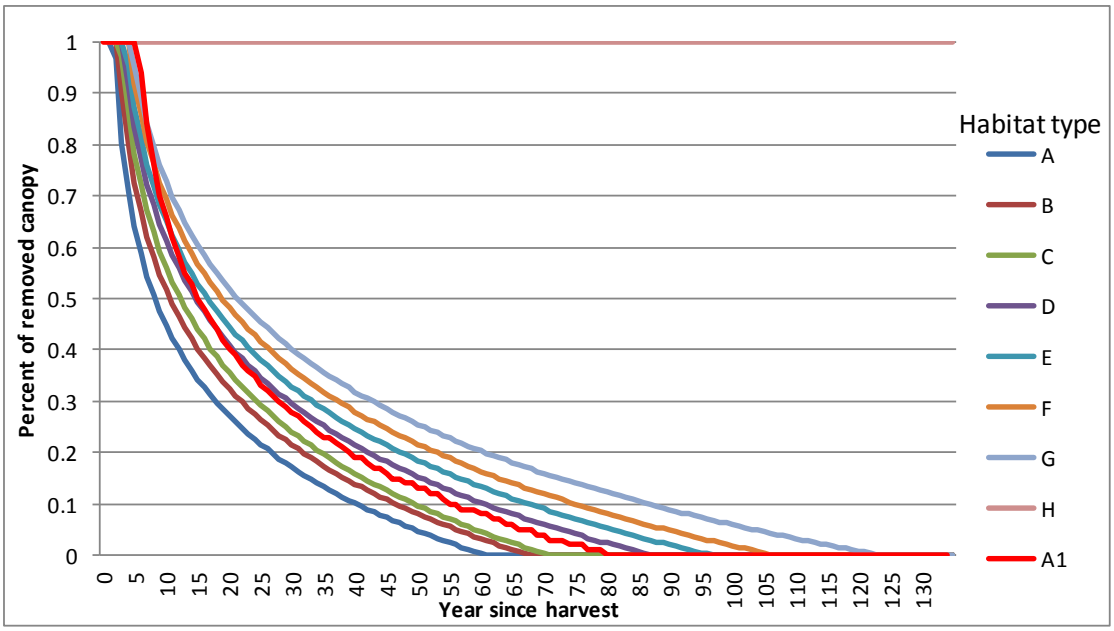


Figure 35. Hydrologic recovery curves used for each forest habitat type; definitions of each habitat type can be found in USDA 2005, PF Doc. AQ-27 and AQ-R26.

For the peak flow analysis, effectively harvested area, road length, and stream density were used following recommendations in Grant et al (2008; PF Doc. AQ-R08). Effectively harvested area and road length are the only variables that change in each alternative, while stream density generally remains the same through time. For road density, only those roads known to possibly affect snow interception and water infiltration were used, and they were further stratified by width, as either 30 feet wide on main arterial roads, or 14 feet wide on standard forest roads. If roads remaining after proposed actions in any alternative were known to effectively be vegetation-free, they were incorporated into the analysis. If, however, the proposed action required a road to effectively be disconnected from hydrologic processes (i.e., be decommissioned or have existing vegetation capable of intercepting snow or rain on its surface), then it was removed from the analysis and considered to have a forest canopy capable of influencing water yield and peak flow. A hydrologic recovery rate was not applied to roads because the amount of effectively harvested area represented by road was generally small compared to effectively harvested area created by harvested areas. Therefore roads that would be decommissioned as part of the proposed actions were considered immediately recovered to their full extent, even though a forest canopy may not have truly existed for several years after decommissioning.

Water quantity and peak flows effects were analyzed in the same way as they were for the existing conditions, and specific results were compared for each alternative. The water yield analysis compares the time at which estimated water yield returns to approximate pre-harvest conditions for Beaver Creek.

The analysis of peak flow compares the time at which hydrologic conditions would be less than the detectable range of 10% change in peak flow, or 15% effectively harvested area based on the average amount of forest harvest resulting in peak flow changes in Grant et al (2008; PF Doc. AQ-R08), as well as the density of roads in each subwatershed. The value of 15% was chosen rather than 20% because of the density of roads existing in each of subwatershed. The analysis also compares the time at which effectively harvested area reaches pre-harvest conditions.

The water yield and peak flow effects analysis was also run on 5-year increments, and existing conditions are generally represented by those in 2010. The proposed actions were all implemented in the year 2014, and the immediate effects of the proposed actions in each alternative are represented by those in year 2015. Realizing that the proposed actions could occur any time after 2013, these dates were chosen because conditions likely will not have changed much between 2010 and 2013. Furthermore, the effects of the proposed action are also described as a continuum, so that even if the analysis describes conditions in 2010 or 2015, the reader can see how conditions may change in any given year (see Figure 38 as an example).

3.3.4.2.4. Water Quality

The water quality analysis regarding the effects of roads also compares the length of road to be reconstructed or decommissioned, the resulting road density, as well as the resulting change in length of road contributing sediment to streams, to the existing conditions.

The effects of roads on sediment contributions to streams was analyzed from road survey information collected in 2010 using the Geomorphic Roads Analysis and Inventory (GRAIP) methods (Black et al. 2012; PF Doc. AQ-R01). Briefly, the GRAIP method requires the observation of surface water, or the evidence of water, flowing along roads and ditches. It includes the evaluation of how water flows along or across a road, the feature that causes water to flow off of a road surface, and a determination of where water flows once it leaves the road. It collects information about the type of road surface and its relative use, and requires a physical observation of whether water from a road surface directly flows into a stream via overland flow. It also collects extensive information about stream crossings (i.e. bridges and culverts), and the stream that flows through those structures. The model then evaluates these observations with regards to their topographic location and slope, and uses an empirically derived base erosion rate from roads to generate an estimated amount of sediment from each road segment. The model then routes and accumulates sediment downstream through the stream network.

In Beaver Creek, nearly 150 miles of road were surveyed and included the analysis of nearly 3,000 drainage features along those roads. These included culverts, waterbars, excavated stream crossings, as well non-engineered drainage features where drainage from the road surface was not through a constructed feature. The GRAIP model was then used to estimate the length of roads contributing sediment to streams, as well as the amount of sediment being contributed to streams by road surfaces. The model was also used to create and analyze road reconstruction plans for the proposed actions.

The effects of the proposed actions in each alternative on existing water quality conditions in the Beaver Creek watershed were analyzed using the GRAIP model to determine how road use, reconstruction, and decommissioning might affect erosion from roads and the subsequent sedimentation to streams. In addition, roads that are proposed to be effectively decommissioned as part of the proposed action were removed from each analysis and treated as if they had no effect on water yield or peak flow. Even though it is known that hydrologic recovery on recently decommissioned roads may take several years, the equivalent clearcut area model is limited in its ability to incorporate the hydrologic recovery of roads. Therefore, the effectively harvested area for each alternative is actually a representation of conditions if all treated roads were hydrologically removed from the watershed immediately after implementation, even though it is understood that hydrologic recovery of roads may be similar to, or even longer than that of surrounding forests.

Existing stream conditions were used to evaluate the potential effects of the proposed actions on the stream environment, and used historic and current data from recent Forest Service surveys. These surveys included a combination of the Forest Service R1/R4 habitat survey (Overton 1997;

PF Doc. AQ-R20), as well as a modified version of the Iowa Department of Natural Resources' Rapid Assessment of Stream Conditions Along Length (RASCAL; PF Doc. AQ-R39) survey method. RASCAL is a modified version of the USDA Natural Resource Conservation Service Stream Visual Assessment Protocol (SVAP), and data collection was accomplished with a GPS installed with the RASCAL program. Briefly, stream assessments were conducted at pre-determined segment lengths or wherever there were significant changes in channel characteristics. Parameters assessed included flow, channel condition, in-stream habitat diversity, substrate, riparian and bank conditions (see PF Doc. AQ-29). Points of interest, such as log jams or stream crossings, were also noted. The RASCAL survey was conducted in the Beaver Creek Watershed by a Forest Service field crew in 2010 and the stream network was prioritized to provide for a representative sample that had the necessary access for the crew to be most efficient with their time. Over 11 miles were surveyed across 5 tributaries of Beaver Creek, and included Carpenter Gulch, Potosi Gulch, White Creek, Pony Gulch and Dudley Creek (Figure 36).

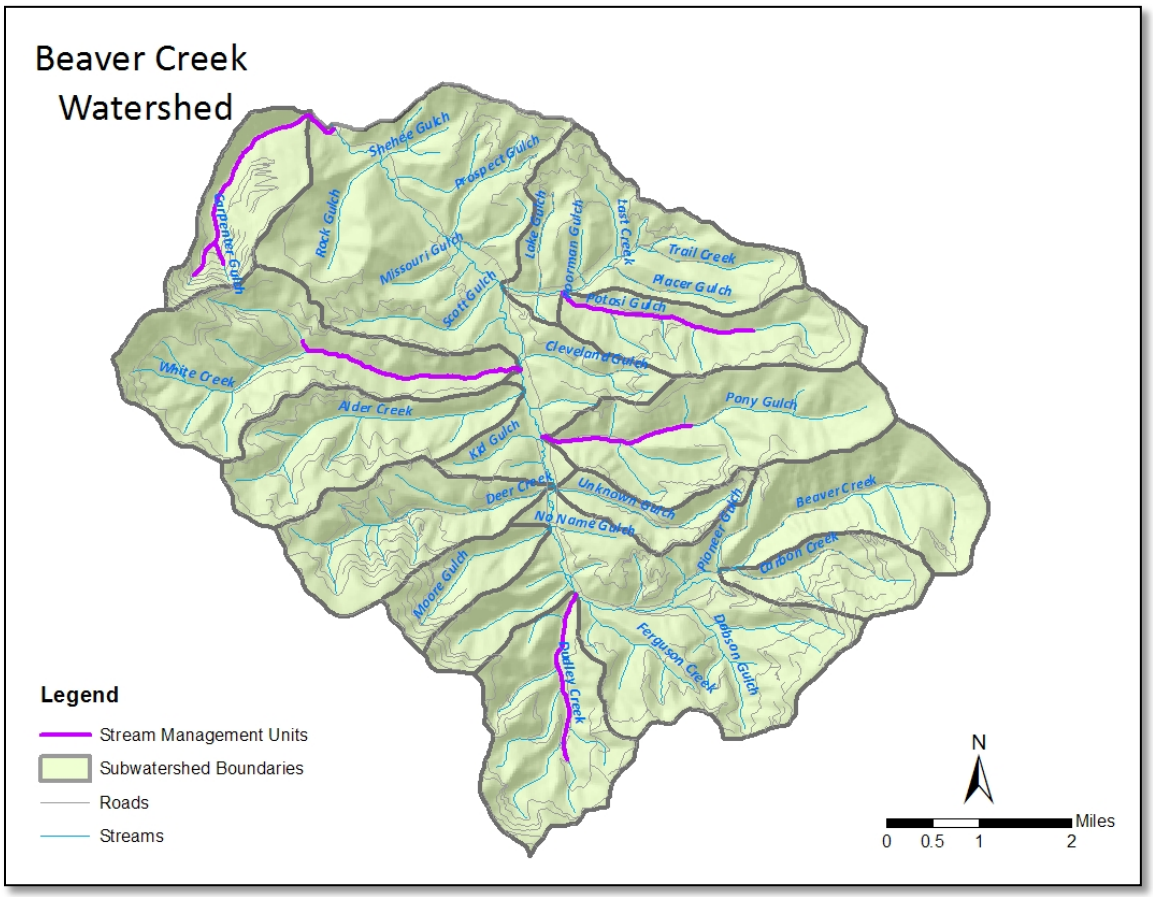


Figure 36. Subwatersheds of Beaver Creek surveyed for instream conditions using the modified RASCAL method.

3.3.4.4. Effects of Alternatives

3.3.4.4.1. Alternative 1 – No Action

Alternative 1 would not result in any agency action and effects from current and ongoing activities would continue to affect water yield, peak flows, and water quality.

Water Yield

Currently, water yield is estimated at less than 2% above 1970 levels, and had increased to a maximum level by as much as nearly 4% around 1995 (Figure 32). Predicted water yield would continue to return to pre-harvest levels at an estimated rate of between 0.3% and 0.7% per decade and that could be nearly realized by 2050 (Figure 32).

Peak Flow

Effects of the No-Action Alternative on peak flows also include a gradual return to pre-harvest or approximately 1970 conditions (Figure 32). The rate at which peak flows in each subwatershed recover from historic timber harvest and road construction varies widely, but most subwatersheds would likely return to pre-harvest conditions, or at least retain less than 5% of their area in a harvested condition, by 2050. Only Prospect Gulch and Unknown Gulch have yet to recover the effectively harvested area to 15% of their watershed area, or the point at which it is believed that peak flows could no longer be observable.

Water Quality

Water quality in Beaver Creek, specifically sediment contributions from road, would remain unchanged. Regular road maintenance activities would continue to repair areas that compromise human health and safety or preclude administrative use.

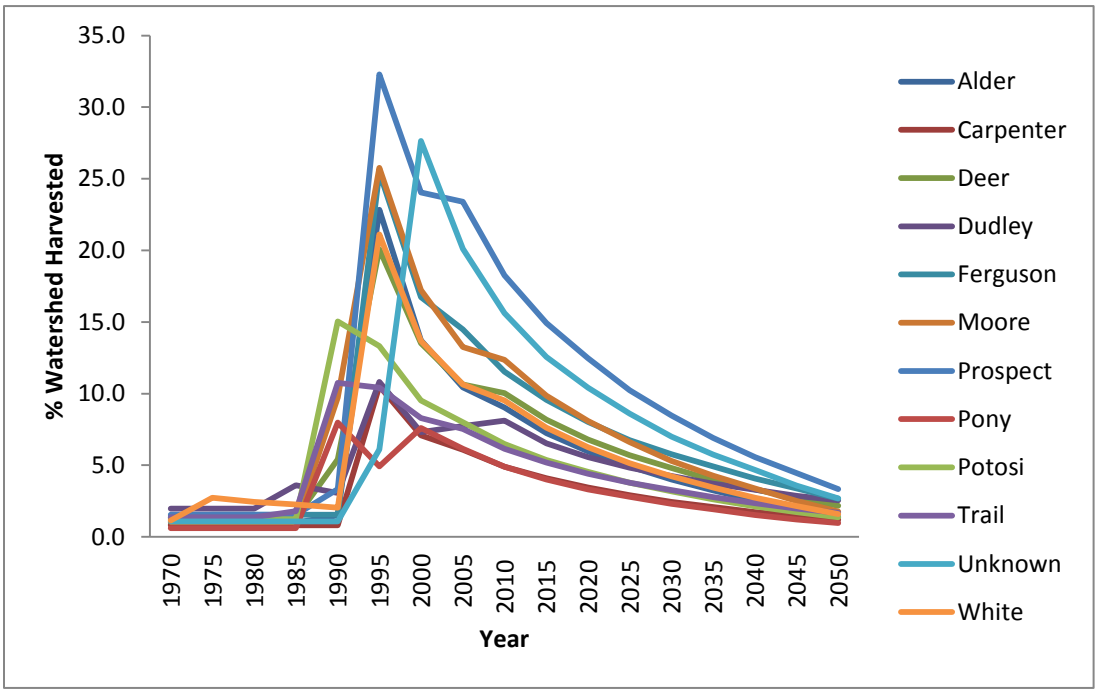


Figure 37. Percent of effectively harvested area, by subwatershed in the Beaver Creek Resource Area.

3.3.4.4.2. Alternative 2

A detailed explanation of the proposed actions in Alternative 2 is found in Chapter 2. Briefly it includes approximately 2,000 acres of vegetation harvest, including four types of harvest treatments followed by prescribed burning. There is also an additional 2,000 acres of prescribed burning that are not associated with timber harvest.

A little over one mile of new permanent road would be constructed, and 1.5 miles of temporary road would be constructed. In addition, 80 miles of road would be reconditioned or reconstructed to improve driving conditions for timber haul and public use, as well improve water quality conditions in the Beaver Creek watershed. Reconstruction activities may include the use of spraying roads for noxious weeds, applying dust abatement palliatives to reduce erosion and improve driving safety, installing additional waterbars or rolling dips, replacing culverts, or adding additional drainage culverts.

Over 60 miles of road would be decommissioned to reduce overall sediment delivery, improve water quality, and meet the intent of the existing TMDL. Of the 60 miles of road to be decommissioned, over 48 miles would be through administrative actions and would not require ground disturbing activities. These roads are effectively closed through natural processes, are believed to be largely hydrologically stable, and were found to have little or no effects to streams or watershed processes. Over 11 miles would require construction activities to improve drainage to reduce long term effects on water quality. Ground-disturbing activities may include recontouring entire roads or segments of roads, or simply removing segments known to contribute sediment to streams as well as drainage structures such as culverts. In some cases, small segments of stream channels at those crossings may require minor construction to restore the channels to their original gradient and condition.

Finally, eight culverts are proposed to be replaced to improve passage of native fish to upstream habitats (see the Fisheries Section, 3.4), which will indirectly reduce the potential for failure of the crossing, as those culverts will be designed to pass aquatic organisms as well as large flow events (greater than 100 year flows). In most cases, these culverts are already large enough to accommodate relatively large flow events, but their existing design may actually be detrimental to downstream conditions and cause excessive streambed and bank erosion during high flows, or do not fully allow upstream fisheries migration during critical times of the year. In each case, these culverts would be replaced with structures designed to incorporate natural channel designs and structures when possible, and be designed to have minimal effects on stream conditions both upstream and downstream of their location.

The analyses of water yield and peak flows for Alternative 2 were similar to Alternative 1, and proposed actions were compared to the existing conditions described above. For the purposes of this analysis, results from the Alternative 3 analysis are also shown on some figures and tables in order to display similar figures only once. However, the results from the Alternative 3 analysis will only be discussed in the Alternative 3 section.

Direct Effects of Alternative 2

Water Yield

The amount of effectively harvested area that could influence water yield in Beaver Creek would increase from about 8% currently, to slightly over 10% as a result of Alternative 2 (Figure 38). As a result, water yield in Beaver Creek could be increased by 1.1% above existing conditions- a relatively minor amount and still well within the range of natural variability. The relatively small increase in effectively harvested area, in addition to the possibility that water yield increases

generally decline further downstream (Hubart et al. 2008) make the likelihood of changes in water yield in Beaver Creek highly improbable as a result of Alternative 2. Consequently, increases in water yield of such small magnitude are also unlikely to directly or indirectly affect aquatic organisms or their habitats, and there would likely be no adverse or beneficial effects to streams as a result.

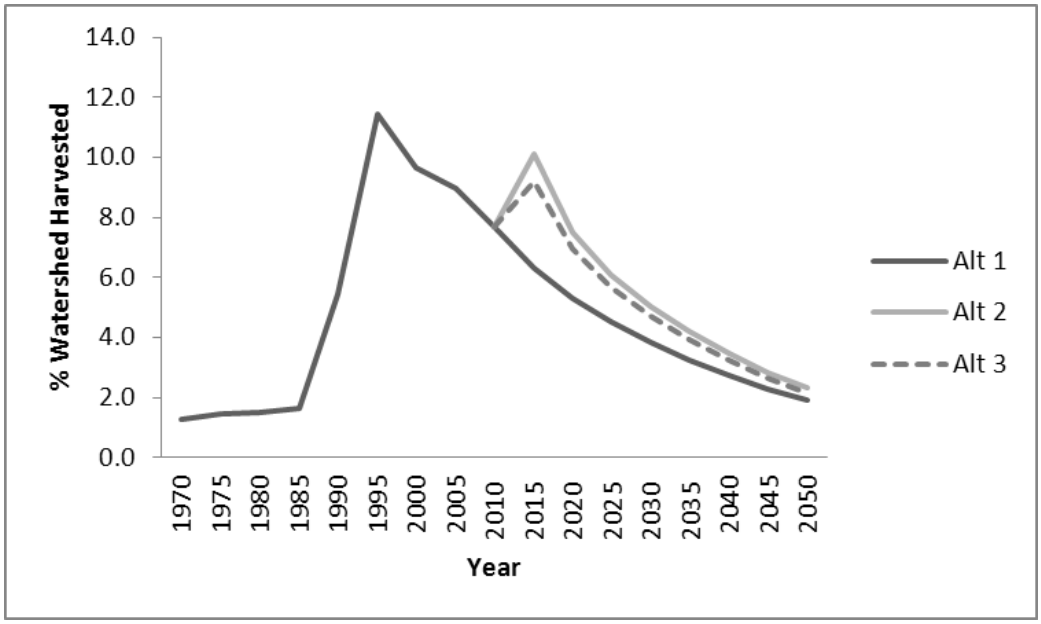


Figure 38. Estimated relative amount of effectively harvested area as a result of proposed activities in the Beaver Creek Resource Area, by alternative.

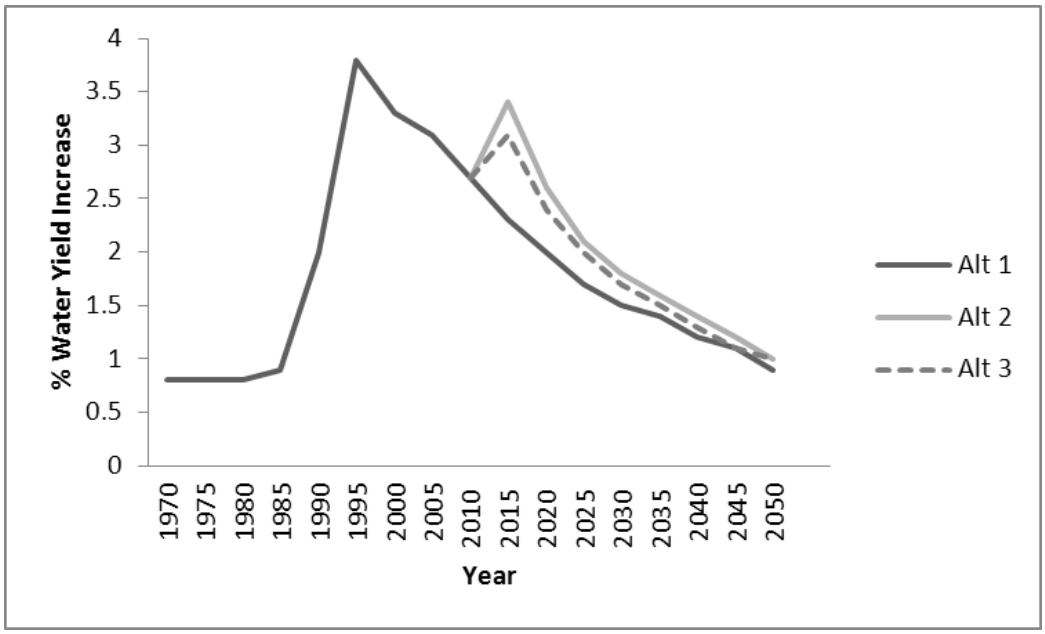


Figure 39. Estimated relative increase in water yield as a result of proposed activities in the Beaver Creek Resource Area, by alternative.

Peak Flow

The likelihood of changes in moderately sized peak flows for each subwatershed, as described earlier, was determined using a combination of the effectively harvested area, road length, and stream density. The analysis incorporated the effects of the proposed road decommissioning, and considered the potential effects that roads may have on water quantity by stratifying roads into those with existing canopies, those that will eventually contain vegetation with a canopy through decommissioning, and those that will likely not have a canopy. In this case, only roads that do not currently have or will not have a canopy of vegetation were used. Those roads known to have, or that may have a vegetation canopy in the near future through decommissioning, were omitted from this analysis because they were not considered part of the effectively harvested area.

The length of road that was considered to affect the peak flow analysis for Alternative 2 varied from nearly 2.5 miles in Moore Creek, to 21.5 in Trail Creek, and decreased in 7 of the 13 subwatersheds as part of Alternative 2 as a result of proposed decommissioning (Figure 40). The amount of effectively harvested area contributing to peak flow, including roads, generally increased across subwatersheds for Alternative 2 (Figure 41), and only decreased in Carpenter Creek and Moore Gulch because only road decommissioning is proposed and does not include any vegetation treatment areas (see Table 43 for lengths of road to be decommissioned under Alternative 2).

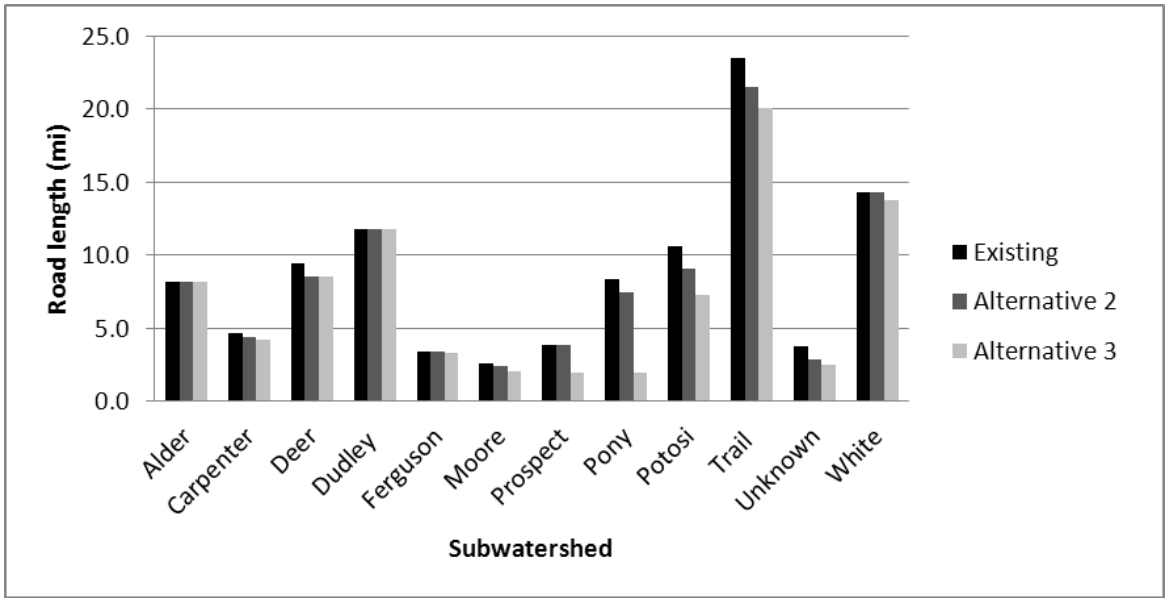


Figure 40. Length of road included in the analysis of peak flows in each subwatershed, by alternative.

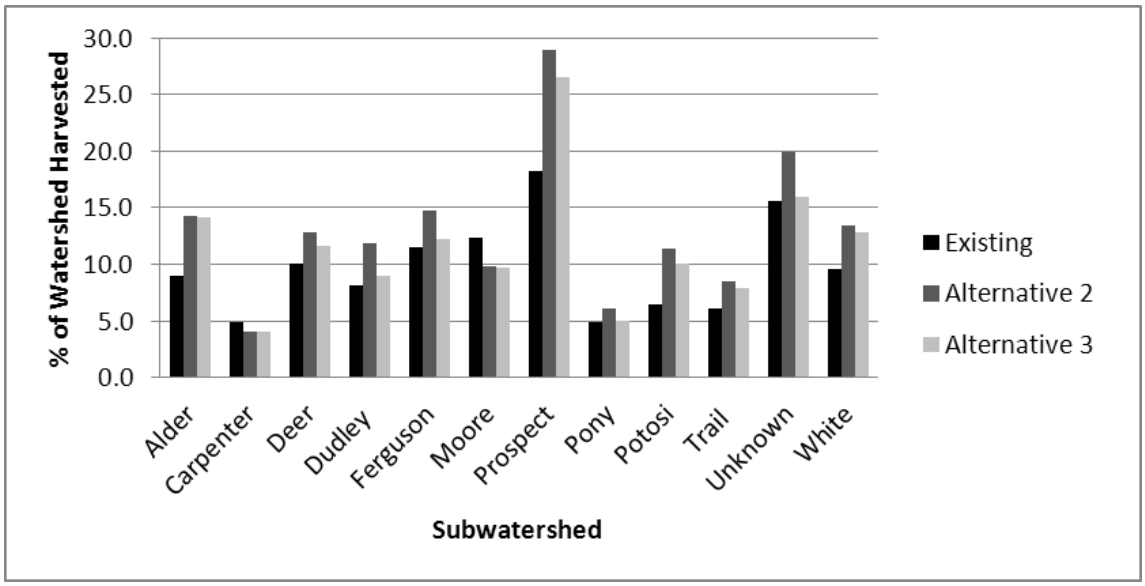


Figure 41. Percent of subwatershed areas in an effectively harvested condition immediately following proposed harvest, by alternative.

The proposed actions for Alternative 2 increased effectively harvested area in Prospect Gulch by over 10%, while the remaining subwatersheds except for Carpenter and Moore increased by between 1 and 5% (Table 39). Carpenter and Moore do not have any proposed canopy removal projects in Alternative 2, but do include approximately 10 miles of road decommissioning in Carpenter Gulch, and 2.5 miles in Moore, both of which contribute to the slight decrease in the amount of effectively harvested area.

Prospect and Unknown would also be the only subwatersheds to exceed 15% of their watershed area where increases in peak flow may be observable (Table 40). Effectively harvested area in Prospect Gulch increases by nearly 11% from 18% to 29% (Table 39) of the watershed as a result of the proposed action, and could increase moderately sized peak flows from between 15% to 24% (Table 40). Effectively harvested area in Unknown Gulch would increase by slightly over 4% and could increase peak flows from between 12% to 20%. In general, the estimated amount of minimum and maximum potential change in peak flow in other subwatersheds either remained the same, or increased by about one percent.

Estimated increases in effectively harvested area also returned to pre-harvest conditions at various times, and in general increased the amount of time necessary to return to those conditions. However, all the subwatersheds except Prospect and Unknown are likely to remain below the 15% effectively harvested area that could produce detectable changes in moderate peak flows. Prospect Creek would likely reach the 15% criteria around the year 2030, or about 15 years after harvest (Figure 42). Unknown Gulch would reach 15% around 2020 (Figure 43).

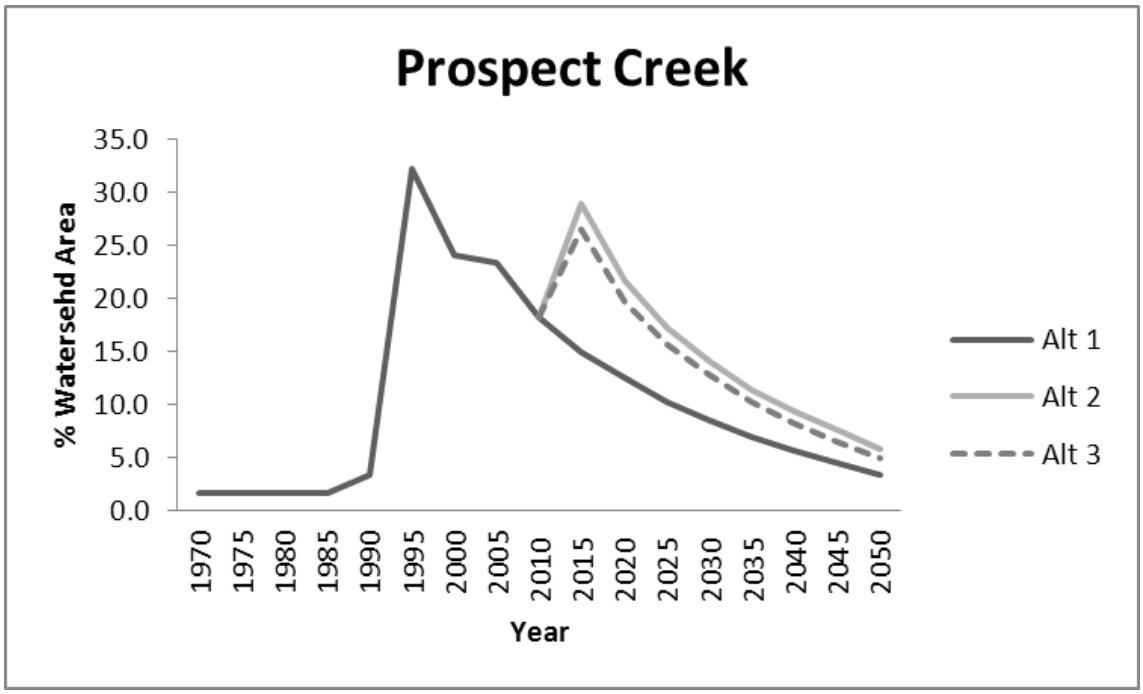


Figure 42. Effectively harvested areas potentially affecting peak flows in the Prospect Creek subwatershed, where harvest and road decommissioning is proposed.

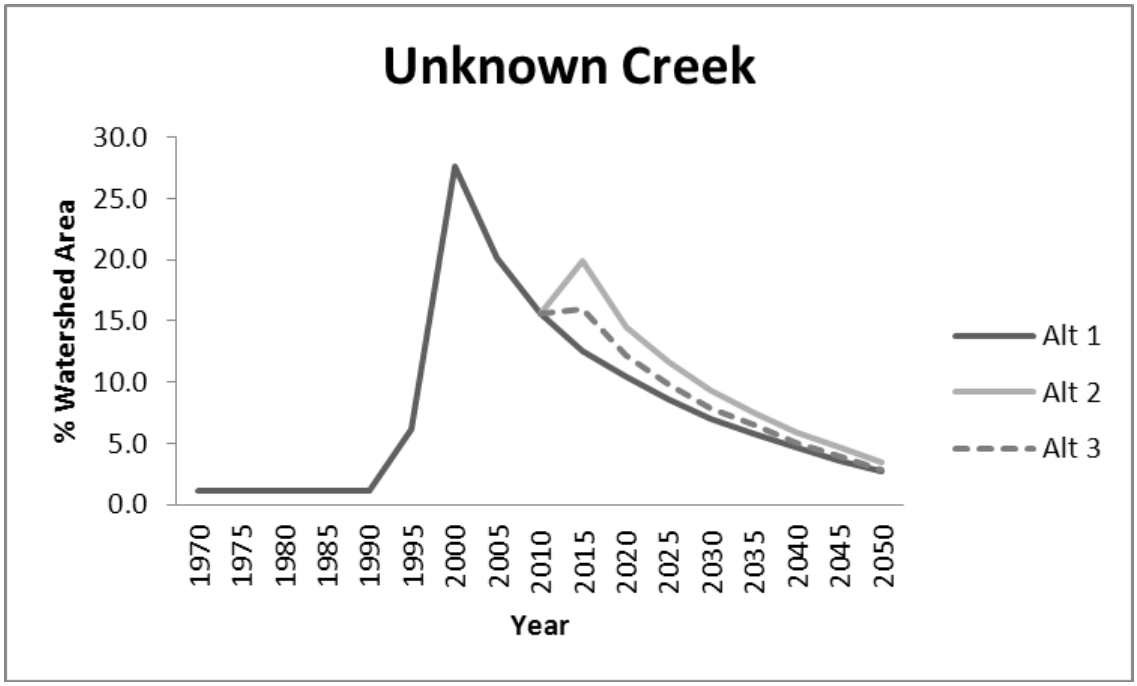


Figure 43. Effectively harvested areas potentially affecting peak flows in the Unknown Creek subwatershed, where harvest and road decommissioning is proposed.

Table 39. Percent of each subwatershed area effectively harvested, and the percent increase from existing conditions, used in the peak flow analysis for each alternative.

Subwatershed	Size (acres)	Existing (percent)	Alt. 2 (percent)	Alt 2 increase above existing (percent)	Alt. 3 (percent)	Alt 3 increase above existing (percent)
Beaver (all)	28,183	7.7	10.1	2.4	9.2	1.5
Alder	1,726	9.0	14.3	5.3	14.2	5.2
Carpenter	1,101	4.9	4.1	-0.8	4.0	-0.9
Deer	1,663	10.0	12.8	2.8	11.7	1.6
Dudley	1,885	8.1	11.8	3.7	9.0	0.8
Ferguson	711	11.5	14.8	3.2	12.2	0.7
Moore	679	12.4	9.9	-2.5	9.7	-2.7
Prospect	512	18.3	29.0	10.7	26.5	8.2
Pony	2,291	4.9	6.2	1.3	5.0	0.1
Potosi	1,450	6.5	11.4	4.9	10.1	3.6
Trail	3,645	6.1	8.5	2.3	7.8	1.7
Unknown	557	15.6	19.9	4.3	16.0	0.4
White	2,698	9.5	13.5	3.9	12.9	3.3

Table 40. Estimated percent equivalent clearcut area (ECA) of each subwatershed as a result of proposed activities under Alternative 2.

Subwatershed[1]	Size (acres)	ECA resulting from Alt 2. (percent)	Drainage density (miles of stream per square mile)	Estimated minimum potential peak flow increase[2] (percent)	Estimated maximum potential peak flow increase[2] (percent
Alder	1,726	14.3	2.0	no data	18
Carpenter	1,101	4.1	1.9	no data	15
Deer	1,663	12.8	2.6	no data	18
Dudley	1,885	11.8	2.3	no data	18
Ferguson*	711	14.8	2.7	10	19
Moore	679	9.9	1.7	no data	17
Prospect*	512	29.0	2.3	15	24
Pony	2,291	6.2	2.0	no data	15
Potosi	1,450	11.4	2.1	no data	18
Trail	3,645	8.5	1.5	no data	16
Unknown*	557	19.9	2.5	12	20
White	2,698	13.5	2.1	no data	18

[1] Subwatersheds with an asterisk (*) are those with the greatest likelihood of increased peak flows because of their percent ECA, drainage density, and length of road.

[2] Data in columns marked with a double asterisk (**) are based on Figure 10 in the Grant et al (2008) study on effects of forest harvest on peak flows (PF Doc. AQ_R08).

Implementation of Alternative 2 would result in overall decreases in sediment contributions by roads, and small increases in peak flows in up to two subwatersheds. Small to moderately-sized peak flow events were not estimated to increase in observable amounts in 11 of the 13 subwatersheds analyzed, based on the ECA analysis. However, EHA would increase to 29% in Prospect Gulch, and equal 20% in Unknown Gulch. Although potentially detectible, stream channel conditions are in relatively good shape and the potential for increased channel erosion from increased peak flows is not anticipated.

Water Quality

Reconstruction of 6.5 miles of road in Alternative 2 would improve road conditions and drainage on 48% of the segments known to deliver sediment to streams and thereby reduce sediment contributions to streams by 36%. Dudley Creek and Potosi Creek would receive the greatest amount of road reconstruction, and those actions alone could reduce sediment contributions to streams by approximately 6% each (Table 41).

Decommissioning through administrative action is proposed on over 48 miles of road and would reduce the length of roads in Beaver Creek by over 20%. It would also reduce the length of road contributing sediment to streams by nearly 9%, and decrease sediment contributions by over 6%. Administrative decommissioning is generally not ground disturbing and instead tends to only require a change to the designation in Forest Service records, but can result in long-term decreases in sediment contributions as roads revegetate and drainage naturally becomes self-sustaining. In addition, much of the sediment contribution from these roads comes from roads that have had structures removed to reduce their risk of failure, but continue to contribute small amounts of sediment from existing road surfaces.

Decommissioning roads with ground disturbing activities, including culvert removal and site specific road recontouring would reduce overall road length in Beaver Creek by an additional 5%. It would also decrease the length of road connected to streams by 12% and further reduce the amount of sediment to streams by 23% (Table 43).

These proposed activities would decrease 100% of all known sediment sources by roads in five subwatersheds. There would be no decrease in length of road connected to streams or sediment contribution to streams in Moore, Pony, or Prospect, and over 34% of the total sediment contribution by roads across Beaver Creek would continue to be delivered to streams in those subwatersheds. In all, over 68% of all road segments known to contribute sediment to streams throughout Beaver Creek would no longer contribute sediment as a result of the project actions in Alternative 2, and these actions would decrease known sediment contributions from roads by over 65% (Table 44). The remaining roads that contribute the other 32% of the known sediment contribution were determined to be necessary for future use but would not be utilized as part of this project, and therefore would not receive any improvements as part of this alternative.

Other such projects have also resulted in similar decreases in sediment or at least length of road connected to streams. In the Gallatin National Forest, for example, 40 m of road was decommissioned and later found to reduce sediment contributions to streams by 120 kilograms (Cissel et al 2009; PF Doc. AQ-R02). The Payette National Forest also decommissioned 3,000 meters of road known to be contributing sediment to streams, resulting in a decrease of over 41 tons of sediment to stream per year (Nelson et al 2011; PF Doc. AQ-R18).

Table 41. Effects on sediment contributions and water quality in streams as a result of proposed road reconstruction and maintenance activities in Alternative 2.

Watershed	Length of road disconnected from streams (miles)	Sediment removed from streams (percent)
Alder	0.24	0.7
Carbon	0.00	0.0
Carpenter	0.00	0.0
Deer	0.46	2.4
Dudley	1.90	5.7
Ferguson	0.04	0.1
Moore	0.00	0.0
Pony	0.00	0.0
Potosi	1.37	6.5
Prospect	0.00	4.8
Trail	0.41	5.0
Unknown	0.00	0.0
White	0.26	1.0
Lower Beaver Subwatersheds	1.63	9.5
Upper Beaver Subwatersheds	0.23	0.8
Total (all of Beaver Creek)	6.50	36.3
Percent of total roads	47.80	---

Table 42. Effects on sediment contributions and water quality in streams as a result of proposed administrative decommissioning activities in Alternative 2.

watershed	length of road decommissioned (miles)	length of road disconnected from streams (miles)	sediment removed from streams (percent)
Alder	2.20	0.00	0.00
Carbon	0.04	0.00	0.00
Carpenter	7.90	0.00	0.00
Deer	9.40	0.58	1.80
Dudley	2.30	0.10	0.80
Ferguson	0.20	0.00	0.00
Moore	2.60	0.00	0.00
Pony	1.20	0.00	0.00
Potosi	1.20	0.05	0.80
Prospect	0.00	0.00	0.00
Trail	3.10	0.00	0.00
Unknown	1.90	0.07	0.20
White	6.60	0.42	2.70
Lower Beaver subwatersheds	4.00	0.00	0.00
Upper Beaver subwatersheds	6.00	0.00	0.00
Total (all of Beaver Creek)	48.50	1.22	6.20
Percent of total roads	20.36	8.90	---

Table 43. Effects on sediment contributions and water quality in streams as a result of proposed ground-disturbing decommissioning activities in Alternative 2.

watershed	length of road decommissioned (miles)	length of road disconnected from streams (miles)	sediment removed from streams (percent)
Alder	0.6	0.03	0.1
Carbon	0.0	0.00	0.0
Carpenter	1.9	0.16	0.7
Deer	1.4	0.12	0.2
Dudley	1.9	0.22	1.4
Ferguson	0.0	0.00	0.0
Moore	0.0	0.00	0.0
Pony	0.0	0.00	0.0
Potosi	2.2	0.50	12.9
Prospect	0.0	0.00	0.0
Trail	1.7	0.32	5.7
Unknown	0.0	0.00	0.0
White	0.0	0.00	0.0
Lower Beaver subwatersheds	0.2	0.00	0.0
Upper Beaver subwatersheds	1.8	0.34	2.0
Total (all of Beaver Creek)	11.6	1.60	23.0
Percent of total roads	4.9	12.1	---

Table 44. Summary of effects on sediment contributions and water quality in streams as a result of proposed of road reconstruction and decommissioning activities in Alternative 2.

watershed	total sediment reduction (percent)	length of road left connected to streams (miles)	relative amount of sediment still being contributed to streams (percent)	total road disconnected from streams via all decommissioning and reconstruction actions (percent)
Alder	0.8	0.00	0.0	100.0
Carbon	0.0	1.64	6.6	0.0
Carpenter	0.7	0.27	1.3	37.3
Deer	4.3	0.02	0.2	98.3
Dudley	7.8	0.00	0.0	100.0
Ferguson	0.1	0.00	0.0	100.0
Moore	0.0	0.23	0.8	0.0
Pony	0.0	0.50	7.9	0.0
Potosi	20.2	0.00	0.0	100.0
Prospect	4.8	0.23	0.0	0.0
Trail	10.7	0.39	13.9	65.2
Unknown	0.2	0.02	0.0	79.5
White	3.6	0.00	0.0	100.0
Lower Beaver subwatersheds	9.5	0.11	0.5	93.8
Upper Beaver subwatersheds	2.8	0.92	3.6	38.3
Total (all of Beaver Creek)	65.6	4.26	34.4	68.8

Indirect Effects of Alternative 2

Water yield is not expected to change by any observable amount as a result of Alternative 2 and therefore should not have any indirect effects on streams or water uses.

The proposed actions in Alternative 2 may increase the frequency and magnitude of small to moderately-sized peak flows in Prospect and Unknown Gulches that could result in localized bed or bank scour but is not expected to alter stream conditions by any observable amount. Unknown Gulch appeared to be relatively stable and have little streambank erosion, high densities of large woody debris, frequent pools, and low width to depth ratios (see the Fisheries section, 3.4). In-stream conditions in Prospect Gulch are also not expected to change as a result of the timber harvest in Alternative 2, though there could be some degree of localized bed and stream bank scour. Prospect Gulch was surveyed in 2013 using a modified Proper Functioning Condition method in spring of 2013 (PFC; DOI 1998; PF Doc. AQ-32) and appeared to be in generally stable condition with moderate amounts of woody debris, riparian vegetation growth, and a plan and profile similar to that of other nearby streams. There were small and localized reaches of marginal conditions as a result of in-stream and riparian minerals exploration, a streamside road, and possible effects from previous timber harvest.

The effects of the road reconstruction and decommissioning will reduce the effect of roads on streams, reduce the amount of sediment being contributed to streams by roads, and generally improve water quality in Beaver Creek. The effects of replacing culverts in order to improve migration of fish to upstream habitats will likely have small and short term effects to streams from the construction practices, but will result in reduced effects to stream morphology and reduce the long term risk of failure and subsequent additions of sediment.

Road reconstruction, maintenance, storage, and decommissioning will result in a net benefit for water quality, particularly in Alder, Deer, Dudley, Ferguson, Potosi, Prospect, Unknown, White, and the lower Beaver Creek subwatershed group, all of which would reduce estimated sediment contributions by 80 to 100%. Decommissioning over 60 miles of road would also reduce road densities in all subwatersheds except Prospect Gulch, though approximately 1.5 miles of road would be placed into storage in Prospect Gulch and remove 5% of the sediment contributed to Beaver Creek by roads. Road density would be reduced by between 3 and 56%, and result in road densities of between 3 and 8 mi/mi^2 in the subwatersheds (Table 45).

Reduced sediment contributions from roads, combined with an overall reduction in road density, will improve stream conditions for fish and other aquatic organisms. Improved fish passage will result in greater capacity for culverts to accommodate high flows, reducing the risk of failure of these culverts and the potential for catastrophic introduction of sediment into streams.

Table 45. Road densities in the subwatersheds of Beaver Creek as a result of proposed actions in Alternative 2.

Watershed	existing length of road (miles)	existing road density (mi/mi2)	Alt. 2 road density (mi/mi2)	Alt. 2 road density reduction (percent)
Alder	14.1	5.2	4.2	19.6
Carpenter	17.4	10.1	4.4	56.3
Deer	20.3	7.8	3.7	53.0
Dudley	18.6	6.3	4.9	22.5
Ferguson	5.3	4.8	4.7	3.3
Moore	7.8	7.4	4.9	33.8
Pony	11.5	3.2	2.9	10.1
Potosi	13.7	6.0	4.6	24.6
Prospect	4.9	7.0	7.0	0
Trail	17.1	5.0	3.6	27.9
Unknown	5.2	6.0	3.8	36.1
White	23.6	5.6	4.0	28.1
Lower Beaver Subwatersheds	25.3	3.3	2.7	16.6
Upper Beaver Subwatersheds	40.9	5.3	4.3	19.0
Total (all of Beaver Creek)	237.5	5.4	4.0	25.3

Reduced sediment contributions from roads, combined with an overall reduction in road density, will improve stream conditions for fish and other aquatic organisms. Culvert replacements at eight locations will result in greater capacity to accommodate high flows, and reduce the risk of failure of these culverts and the potential for catastrophic introduction of sediment into streams. Replacing these culverts may include the short term (less than 2 years) generation of sediment from the removal and replacement of the culvert that may result in small increases in sediment to Beaver Creek. However, all applicable BMP's would be applied during construction and negative effects are expected to be both minimal and short-lived.

3.3.4.4.3. Alternative 3

A detailed explanation of the activities proposed under Alternative 3 is found in Chapter 2 of the DEIS. Briefly, it includes approximately 1,600 acres of vegetation harvest, including four types of harvest treatments, in addition to aggregate retention harvests in the place of some shelterwood and seed tree harvest. Over 2,000 acres would be prescribed burned not as a result of timber harvest, as in Alternative 2. In addition, nearly 80 miles of road would be reconditions or reconstructed to improve driving conditions for hauling timber and public use, as well improving water quality conditions. There would be no new road construction of any kind. Over 100 miles of road would also be decommissioned to improve water quality conditions, 90 miles of which would be in the Beaver Creek watershed while the remaining roads would be immediately adjacent to the watershed boundary. Reconstruction activities may include the use of spraying roads for noxious weeds, applying dust abatement palliatives to reduce erosion and improve driving safety, installing additional waterbars or rolling dips, replacing culverts, or adding additional drainage culverts.

Of the over 90 miles of road to be decommissioned in the Beaver Creek watershed, 58 miles would be through administrative actions that do not require ground disturbing activities, and 36 miles would require ground disturbing activities to improve drainage and reduce both short and

long term effects on water quality. Ground disturbing activities may include recontouring entire roads or segments of roads, or simply removing segments known to contribute sediment to streams as well as drainage structures such as culverts. In some cases, small segments of stream channels at those crossings may require minor construction to restore the channels to their original gradient and condition.

Finally, 12 culverts are proposed to be replaced to improve passage of native fish to upstream habitats (Table 6 in Chapter 2). Eight of these culverts are the same as in Alternative 2, and this alternative would add four culverts on Road 456.

Direct Effects of Alternative 3

Water Yield

The amount of effectively harvested area that could influence water yield in Beaver Creek would increase from about 8% currently, to slightly over 9% as a result of Alternative 3 (Figure 38), or about 1% less than from Alternative 2. Water yield could be increased by 0.4% (Figure 39), and like Alternative 2, is an extremely small amount and likely well within the natural range of variability and would have very limited short and long term effects on aquatic organisms or their habitats.

Peak Flow

Similar to the analysis for Alternative 2, the changes in moderately sized peak flows for each subwatershed used a combination of effectively harvested area, road length, and stream density. The length of road potentially affecting peak flow in Alternative 3 remained the same for Alder, Deer, and Dudley as in Alternative 2. The length of road was reduced in the remaining subwatersheds, and was reduced by the greatest amount in Pony Gulch (Figure 40).

Like Alternative 2, the amount of effectively harvested area varied across subwatersheds as a result of actions proposed in Alternative 3. Carpenter and Moore each decreased in amount of effectively harvested area compared to Alternative 2 because more roads would be decommissioned. Effectively harvested area again increased the most in Prospect Creek, but was 2.5% less than predicted in Alternative 2 (Figure 41 and Table 39). Effectively harvested area in Dudley, Ferguson, Pony, and Unknown each increased by less than 1% above existing effectively harvested area, and was generally between 0.1 and 4% less than would result from Alternative 2 (Table 39).

In general, the likelihood of increased peak flows also increased above existing conditions as a result of Alternative 3, but to a lesser extent than in Alternative 2. Again, only Prospect and Unknown exceeded the 15% effectively harvested area that could result in an observable increase in peak flow occurrence (Table 46). The potential estimated maximum increase in peak flows was generally less under Alternative 3 than under Alternative 2, and was approximately equal to Alternative 2 in only Prospect Gulch because the increase in effectively harvested area in Prospect Gulch was only 2.5% less in Alternative 3 than in Alternative 2 (Table 39).

Effectively harvested area also returned to estimated pre-harvest conditions slightly earlier as a result of Alternative 3 than Alternative 2, but in general it was difficult to discern much difference in when conditions would reach pre-harvest conditions (Figure 42 and Figure 43). For several subwatersheds, the increase in effectively harvested area was far less than in Alternative 2, including Dudley, Ferguson, Pony, and Unknown. Again, only Unknown and Prospect have the potential to increase effectively harvested area above 15%, though unlike Alternative 2, these subwatersheds would return to 15% effectively harvested area in approximately 2017 and 2025, respectively.

Table 46. Estimated percent equivalent clearcut area (ECA) of each subwatershed as a result of proposed activities under Alternative 3.

Subwatershed [1]	Size (acres)	ECA resulting from Alt 3. (percent)	Drainage density (miles of stream per square mile)	Estimated minimum potential peak flow increase[2] (percent)	Estimated Maximum potential peak flow increase[2] (percent
Alder	1,726	14.2	2.0	no data	18
Carpenter	1,101	4.0	1.9	no data	15
Deer	1,663	11.7	2.6	no data	17
Dudley	1,885	9.0	2.3	no data	17
Ferguson*	711	12.2	2.7	10	17
Moore	679	9.7	1.7	no data	16
Prospect*	511	26.5	2.3	14	24
Pony	2,291	5.0	2.0	no data	15
Potosi	1,450	10.1	2.1	no data	18
Trail	3,645	7.8	1.5	no data	16
Unknown*	557	16.0	2.5	11	19
White	2,698	12.9	2.1	no data	18

[1] Subwatersheds with an asterisk (*) are those with the greatest likelihood of increased peak flows because of their percent ECA, drainage density, and length of road.

[2] Data in columns marked with a double asterisk (**) are based on Figure 10 in the Grant et al (2008) study on effects of forest harvest on peak flows (PF Doc. AQ_R08).

Water Quality

Reconstruction and maintenance of 5.7 miles of road in Alternative 3 would reduce the length of road contributing sediment to streams by nearly 42%, and reduce the amount of sediment to streams from roads by nearly 22%. Dudley and Potosi would again receive the most reconstruction on road segments delivering sediment to streams, and would reduce sediment contribution by nearly 6% each (Table 46).

Decommissioning through administrative action is proposed on nearly 58 miles of road and would reduce the length of usable road in Beaver Creek by 24% (Table 48). Administrative decommissioning would reduce the length of road contributing sediment to streams by nearly 9% and decrease the amount of sediment being delivered to streams by over 6%. Again, many of these roads no longer have drainage structures but continue to contribute sediment into streams because their surrounding road surfaces were not recontoured. Some roads in Deer, Dudley, Potosi, Unknown, and White that already have drainage structures removed would also be administratively decommissioned even though they were found to be contributing sediment to streams. In these cases, culverts were likely removed to reduce the risk of their failure, yet their surrounding roads surfaces continue to route water and sediment into those streams. These locations contribute approximately 6% of the sediment to Beaver Creek, the greatest amount of which comes from White Creek (2.7%), but because of the difficulty in reaching these areas as well as the relatively small amount of sediment being contributed, these locations were not chosen for further ground-disturbing decommissioning activities (Table 48).

Decommissioning roads with ground disturbing activities would reduce overall road length in Beaver Creek by an additional 15%, and would decrease the length of road connected to streams by 25%. This type of decommissioning would also further reduce the amount of sediment to streams by nearly 46%. Decommissioning through removing roads and culverts known to contribute sediment to streams would occur on between 1 and 5 miles of road in each subwatershed, and would result in between 0.03 miles 0.7 miles of road no longer contributing

sediment to streams. Perhaps most notable is that while 4.3 miles of road would be decommissioned in Potosi Creek, it would include 0.5 miles of road found to deliver sediment to streams and result in a reduction of nearly 13% of the sediment to Beaver Creek. Decommissioning 4.4 miles of road in Trail Creek would also result in an additional 10.5% reduction of sediment (Table 49).

These proposed activities would potentially decrease 100% of all known sediment sources from roads in seven subwatersheds. Nearly 26% of the total sediment contribution by roads across Beaver Creek would continue to be delivered to streams in those subwatersheds. In all, over 75% of all road segments contributing sediment to streams throughout Beaver Creek would no longer contribute sediment as a result of the project actions in Alternative 3, and these actions would decrease known sediment contributions by roads by over 74% (Table 46).

Table 47. Effects on sediment contributions and water quality in streams as a result of proposed reconstruction and maintenance activities in Alternative 3.

Watershed	Length of road disconnected from streams (miles)	Sediment removed from streams (percent
Alder	0.24	0.7
Carbon	0.00	0.0
Carpenter	0.00	0.0
Deer	0.46	2.4
Dudley	1.90	5.7
Ferguson	0.04	0.1
Moore	0.00	0.0
Pony	0.00	0.0
Potosi	1.37	6.5
Prospect	0.00	0.0
Trail	0.00	0.0
Unknown	0.00	0.0
White	0.15	0.6
Lower Beaver subwatersheds	1.30	5.2
Upper Beaver subwatersheds	0.23	0.8
Total (all of Beaver Creek)	5.70	21.9
Percent of total	41.60	---

Table 48. Effects on sediment contributions and water quality in streams as a result of proposed administrative decommissioning activities in Alternative 3.

Watershed	Length of road decommissioned (miles)	Length of road disconnected from streams (miles)	Sediment removed from streams (percent)
Alder	3.80	0.00	0.00
Carbon	0.04	0.00	0.00
Carpenter	10.00	0.00	0.00
Deer	9.40	0.58	1.80
Dudley	2.30	0.10	0.80
Ferguson	2.20	0.00	0.00
Moore	3.30	0.00	0.00
Pony	1.20	0.00	0.00
Potosi	1.20	0.04	0.80
Prospect	0.00	0.00	0.00
Trail	3.10	0.00	0.00
Unknown	1.90	0.07	0.20
White	7.70	0.41	2.70
Lower Beaver subwatersheds	4.40	0.00	0.00
Upper Beaver subwatersheds	7.50	0.00	0.00
Total (all of Beaver Creek)	57.80	1.20	6.20
Percent of total	24.40	8.80	---

Table 49. Effects on sediment contributions and water quality in streams as a result of proposed ground-disturbing decommissioning activities in Alternative 3.

Watershed	Length of road decommissioned (miles)	Length of road disconnected from streams (miles)	Sediment removed from streams (percent)
Alder	1.2	0.03	0.1
Carbon	0.0	0.00	0.0
Carpenter	3.2	0.16	0.7
Deer	2.4	0.12	0.2
Dudley	1.9	0.22	1.4
Ferguson	0.0	0.00	0.0
Moore	2.3	0.22	0.8
Pony	2.8	0.50	7.9
Potosi	4.3	0.47	12.9
Prospect	2.3	0.23	4.8
Trail	4.4	0.79	10.5
Unknown	0.4	0.00	0.0
White	1.9	0.10	0.3
Lower Beaver subwatersheds	4.8	0.31	4.3
Upper Beaver subwatersheds	4.1	0.34	2.0
Total (all of Beaver Creek)	35.9	3.40	45.9
Percent of total	15.1	25.10	---

Table 50. Summary of effects on sediment contributions and water quality in streams as a result of proposed of road reconstruction and decommissioning activities in Alternative 3.

Watershed	Total sediment reduction (percent)	Length of road left connected to streams (miles)	Relative amount of sediment still being contributed to streams (percent)	Total road disconnected from streams via all decommissioning and reconstruction actions (percent)
Alder	0.8	0.00	0.0	100.0
Carbon	0.0	1.64	6.6	0.0
Carpenter	0.7	0.27	1.3	37.3
Deer	4.3	0.02	0.2	98.3
Dudley	7.8	0.00	0.0	100.0
Ferguson	0.1	0.00	0.0	100.0
Moore	0.8	0.01	0.0	96.1
Pony	7.9	0.00	0.0	100.0
Potosi	20.2	0.00	0.0	100.0
Prospect	4.8	0.00	0.0	100.0
Trail	10.5	0.39	14.1	65.2
Unknown	0.2	0.02	0.0	79.5
White	3.6	0.01	0.0	100.0
Lower Beaver subwatersheds	9.5	0.13	0.5	92.7
Upper Beaver subwatersheds	2.8	0.92	3.6	38.3
Total (all of Beaver Creek)	74.1	3.35	25.9	75.5

Indirect Effects of Alternative 3

Water yield would not change by any detectable amount and therefore should not have any effect on streams or water use.

The effects to Prospect and Unknown subwatersheds would be similar or less than those from Alternative 2 because effectively harvested area in each subwatershed would be 2.5% and 3.9% less in Alternative 3, respectively (see Table 46). The potential increases in peak flows in Prospect and Unknown are likely to be similar to that of Alternative 2 and could result in small scale and localized bed or bank scour, but would likely not affect stream characteristics to an observable extent because of its relative vertical and lateral stability, density of woody debris, and other channel forming structures, The effects of the road reconstruction and decommissioning will further reduce the effects of roads on streams and improve water quality conditions in Beaver Creek. The overall effect of the road reconstruction and decommissioning would result in a net benefit for water quality in all subwatersheds, and sediment contributions from roads would be reduced by 80 to 100%. The decommissioning of over 90 miles of road would also reduce road densities in all subwatersheds by between 22 and 75%, and result in road densities of between 2 and 5 mi/mi^2 across subwatersheds (Table 51).

Table 51. Road densities in subwatersheds of Beaver Creek as a result of proposed actions in Alternative 3.

Watershed	Existing length of road (mi)	Existing road density (mi/mi2)	Road density (mi/mi2)	Road density reduction (percent)
Alder	14.1	5.2	3.4	35.1
Carpenter	17.4	10.1	2.5	75.4
Deer	20.3	7.8	3.3	58.0
Dudley	18.6	6.3	4.9	22.5
Ferguson	5.3	4.8	2.9	40.6
Moore	7.8	7.4	2.2	70.7
Pony	11.5	3.2	2.1	34.7
Potosi	13.7	6.0	3.6	40.0
Prospect	4.9	7.0	3.6	47.7
Trail	17.1	5.0	2.8	43.9
Unknown	5.2	6.0	3.4	43.6
White	23.6	5.6	3.3	40.9
Lower Beaver Subwatersheds	25.3	3.3	2.1	36.6
Upper Beaver Subwatersheds	40.9	5.3	3.8	28.2
Total (all of Beaver Creek)	237.5	5.4	3.3	39.5

Reduced sediment contributions from roads in these subwatersheds, combined with an overall reduction in road density, will improve water quality and stream conditions in a similar way to Alternative 2. Culvert replacements at 12 locations will result in greater capacity for culverts to accommodate high flows, reducing the risk of failure of these culverts and the potential for catastrophic introduction of sediment into streams. Replacing these culverts may include the short term generation of sediment to Beaver Creek as they may in Alternative 2, but all applicable BMP's would be applied during construction and negative effects are expected to be both minimal and short-lived.

3.3.4.4.4. Effects Common to Both Action Alternatives

Over 2,000 acres of prescribed fire not associated with timber harvest is proposed in both Alternative 2 and 3, but was not incorporated into the equivalent clearcut area model for water yield and peak flows. The equivalent clearcut area model is only intended for actions that may remove forest canopy, and prescribed fires in both alternatives are not intended to remove forest canopy and therefore should have no discernible effect on water yield or peak flows.

Prescribed fires following timber harvest, or in areas where fire will be used without timber harvest, should also not affect streams because fires will not be ignited in riparian areas, and following all BMP's for ignition timing and weather, should not result in substantial burning of overstory vegetation. Prescribed fire without timber harvest is proposed in two locations in the upper reaches of Pony Creek and Beaver Creek where streams are not located and so long term loading sediment resulting from erosion after prescribed fires is not anticipated. There may be some short term erosion and sediment delivered to small headwater intermittent channels resulting from surface erosion, but it is not expected to be last more than a few years, and may in fact actually deliver organic material and other constituents necessary for stream function. The primary effects of the proposed actions in each alternative on water quantity and water quality will likely result from the timber harvest and road work, and are unlikely to be from prescribed burning.

Cumulative Effects

About 0.7 miles of the riparian area along one side of Prospect Gulch (about 20%) was also harvested in 1993. This harvest likely does not influence water temperatures in Prospect Gulch because deciduous vegetation is abundant along its length and likely sufficient to reduce summer high stream temperatures. The reduced riparian overstory in these areas may, however, reduce the amount of large woody debris in those reaches of Prospect Gulch for several decades, but likely not to the extent to be detrimental to Prospect Gulch or its fisheries.

Changes in water yield have been affected by relatively widespread and intense forest harvest in recent decades. Since 1970, slightly more than 9,000 acres of forest have been harvested. In 1995, water yield increases in Beaver Creek may have increased by as much as 3.8% more than pre-harvest conditions because nearly 12% of the watershed was in an effectively harvested condition, and because nearly 10% of the watershed was harvested in a ten year period from 1985 to 1995. However, the effect of increasing water yield by 2 to 4% is likely to be well within the range of natural variability and is unlikely to be either detectable or related entirely to forest harvest practices.

Peak flows have likely increased as a result of previous harvest and road construction in nearly all of Beaver Creek's subwatersheds. In 7 of the 13 subwatersheds studied in this analysis, effectively harvested area exceeded 20% around the mid-1990's, and exceeded 30% in Prospect Gulch (Figure 42). It is unknown whether these increases in effectively harvested area resulted in changes to stream conditions, though it is likely that if peak flows increased to their maximum potential amount (26% in Prospect Gulch, for instance), then localized changes to streams likely resulted, and appeared to be observable in some locations during field surveys (see Tonina et al. 2008; PF Doc. AQ-R25).

Water quality and stream conditions in Beaver Creek have also been affected by current and historic uses, including mining, grazing, and private land development that includes the widespread reduction of forested riparian areas along Beaver Creek and Trail Creek (McFarland et al. 2013; PF Doc. AQ-R13). However recent reclamation efforts at one of the two largest mine

and mill operations, the Idora Mine, has largely removed most of its remaining tailings from the drainage and will likely improve water quality in Beaver Creek to a large extent.

Other cumulative effects include private mineral developments projects along Trail Creek and it is unknown how many of these operations qualify for or contain State or Federal permits for operation. However, few if any appear to have non-point source pollution permits administered by the state or the Environmental Protection Agency (McFarland et al. 2013; PF Doc. AQ-R13). Several Forest Service-permitted minerals developments exist on National Forest System lands (most of which occur in Trail, Potosi, or Placer Gulch watersheds), and several more are planned. Small-scale mineral exploration, including recreational suction dredging, occurs in smaller tributaries throughout the Beaver Creek drainage, including Potosi Creek, Pony Creek and Scott Gulch. These generally result in substantial short-term modification of the streambed and bank, though the effects are usually fairly localized in extent.

The effects of minerals activities would continue to influence streams, much of which is beyond the control of the Forest Service. Current and historic minerals activity in Potosi Creek, some of which is on National Forest System land, has resulted in detrimental stream conditions (A. Prussian, personal observation). Additional minerals activities are permitted in and around Potosi and Trail Creek, though activities have not yet begun, and some may result in additional but minor sediment contributions.

Regular road maintenance activities typically occur on publicly-accessible roads, and occasionally on Forest Service access roads, at somewhat regular intervals. These activities occasionally improve road drainage but usually include blading of the road surface, and occasional brushing of the surrounding vegetation to improve visibility. Regular maintenance may also include culvert improvements if imminent failure is possible, or has already occurred, and in those cases drainage is usually improved. However these are typically not regularly scheduled maintenance activities and usually occur as access or safety is compromised.

Some of the road use activities associated with the timber harvest may also require dust abatement, most of which would follow typical application guidelines depending on the palliative used (USDA 1999). Dust abatement would be useful on most roads in controlling sediment contributions to streams during wet conditions or to prevent the generation of fine sediment during especially dry conditions; all applicable best management practices would be applied in any case where dust abatement was used to prevent its entry into streams. Some haul roads, however, including at least one mile of Road 1505, are immediately adjacent to streams and make the application of dust abatement palliatives more difficult to control and more likely to enter streams. Idaho administrative procedures act (IDAPA) 20.02.10.060.09c directs the application of chemicals for forest applications to be prevented from entering any water sources or stream, and in most cases chemical dust palliatives would not be sprayed on roads within 25 feet of stream crossings (IDAPA; PF Doc. AQ-R35). For Road 1505, chemical dust abatement palliatives may be necessary to control the deposition of sediment into Potosi Creek.

Stream restoration of other mine and mill sites may affect stream conditions. The reclamation of these sites will likely introduce a source of sediment during construction activities, but would ultimately result in lowered sediment and metals concentrations, and improved water quality.

Past, ongoing, and future vegetation harvest and road management will likely affect water quality in Beaver Creek. Past timber harvest is incorporated into the equivalent clearcut area analysis for each alternative, however, future timber harvest, particularly in some subwatersheds, could continue to keep effectively harvested area above 15% and result in a near continual increase in channel altering flows compared to those of pre-harvest conditions. Increases in these moderately-sized peak flows may not result in adverse changes to streams or aquatic organisms

immediately, however, longer term or persistent increases in peak flow may lead to eventual changes in channel morphology.

These effects could combine with the effects of minerals activities, private land activities, and other reclamation activities to result in both short term adverse and long term beneficial effects to streams. Short term effects include the increased sedimentation resulting from reclamation activities of mines and roads on both federal and private land, but would likely result in improved stream conditions for aquatic organisms within 5 to 10 years.

3.3.4.4.5. Compliance of Alternative 1, 2 and 3 with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Consistency with the Forest Plan

Consistency with Forest Plan Water Standards

Water Standard 1: 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.

Alternative 1 would not change the existing productivity of water resources, and in fact may actually lead to continued and possibly further degradation of water quality as roads continue to contribute sediment to stream channels. Foreseeable actions, including regularly scheduled road maintenance, are unlikely to improve drainage because they rarely include reconstruction activities and additional BMP's and therefore will be unlikely to address areas where roads directly contribute sediment into streams. The absence of timber harvest activities in Alternative 1 may have an overall beneficial effect on streams and riparian areas as vegetation continues to grow and lead to less potential to influence water yield or peak flows.

Alternatives 2 and 3 would lead to improved water quality through the improvement of useable forest roads and the decommissioning of unnecessary roads that deliver sediment to streams or otherwise may affect the aquatic environment.

Water Standard 2: Maintain concentrations of total sediment or chemical constituents within state standards.

Alternative 1 would likely maintain sediment or chemical concentrations at their present levels, above state water quality standards.

Alternatives 2 and 3 would decrease sediment or chemical concentrations, though not to within state standards. Several factors beyond the control of the Forest Service contribute to elevated sediment or chemical constituents, however the reduction in roads known to deliver sediment to streams, combined with the road reconstruction designed to improve drainage and limit surface erosion, will likely lead to improvements in water quality in at least the tributaries of Beaver Creek.

Water Standard 3: Implement project level standards and guidelines for water quality contained in the BMPs (IPNF Forest Plan - Appendix S), including those defined by State regulation and agreement between the State and Forest Service such as: Idaho Forest Practices Rules, Rules and Regulations and Minimum Standards for Stream Channel Alterations, and BMPs for Road Activities.

Alternative 1 would not implement any project activities and therefore project level standards and guidelines for water quality as part of this project are not necessary. Foreseeable actions may

include additional road maintenance activities as part of the IPNF regularly scheduled road maintenance program, but without additional reconstruction activities designed to modify drainage in specific locations, roads in Beaver Creek will likely continue to contribute sediment to streams.

Alternatives 2 and 3 would implement all project level standards and guidelines for water quality as part of this project as necessary (see Appendix E – Design Features).

Water Standard 4: Cooperate with the states to determine necessary instream flows for various uses. Instream flows should be maintained by acquiring water rights or reservations.

Instream flows will not be modified as part of any alternative.

Water Standard 5: Manage public water system plans for multiple uses by balancing present and future resources with public water supply needs. Project plans for activities in public water systems will be reviewed by the water users and the State.

There is at least one surface water right for drinking water in Carpenter Creek, and likely many others for groundwater along Beaver Creek itself. Alternatives 1, 2, or 3 would not alter access to any water right, nor would it alter present or future resources for public water supply needs.

Water Standard 6: 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. BMPs (Forest Plan Appendix S), Appendix 0, and riparian guidelines will be used to accomplish this objective.

There would be no activities planned within non-fishery, first and second order streams as a result of Alternative 1. Existing road conditions would continue to exist and in some cases, continue to be detrimental to aquatic biota in those streams

Activities are planned in several subwatersheds containing non-fishery, first and second order streams in Alternative 2 and 3. Roads would be improved to the extent possible and result in decreased sediment contributions from roads to streams. Peak flow, however, could be increased in Prospect Gulch to the extent that existing stream conditions could be altered. However, riparian areas will not be modified as a result of Alternatives 2 and 3 and therefore the physical integrity stream habitat should also remain unchanged.

Water Standard 7: It is the intent of this plan that models 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.

Both the GRAIP and the equivalent clearcut area model were used as part of this analysis, as were field data and existing monitoring results.

Consistency with the Clean Water Act (including State of Idaho Implementation)

Alternative 1 does not include any activities that would lead to an inconsistency with the Clean Water Act, or the Idaho water quality standards. However, existing roads in Beaver Creek would not be improved and in some cases would continue to contribute sediment to streams in the Beaver Creek watershed until substantial drainage improvements are made.

Alternatives 2 and 3 do not include any activities that would lead to an inconsistency with the Clean Water Act, or the Idaho water quality standards. Many existing roads in Beaver Creek would be improved and in most cases sediment contributions to streams would be reduced.

Consistency with the Safe Drinking Water Act and Amendments of 1996 Act (including State of Idaho Implementation)

Alternatives 1, 2, and 3 would not change existing conditions regarding drinking water in Beaver Creek.

Consistency with the Idaho Forest Practices Act

Alternative 1 does not include any activities on National Forest System lands, and therefore would not lead to any inconsistency with the Idaho Forest Practices Act. Alternatives 2 and 3 would not lead to any inconsistency with the Idaho Forest Practices Act.

3.3.5. Effects Summary

The effects of the proposed actions on streams and water quality would include the reduction of sediment by roads, and the potential for small and localized effects to stream conditions through increased peak flows.

Water quality is expected to improve in several subwatersheds with both alternatives 2 and 3. Road density, sometimes used as a proxy for effects to stream environments, generally decreases compared to existing conditions in both alternatives. Roads found to be contributing sediment to streams also decrease in each alternative, as does the amount of sediment being delivered from roads to streams (Table 52). Alternative 1 would not address any of these roads, while Alternative 2 would leave slightly over 4 miles of road connected to streams but reduce sediment from roads by 65%. Alternative 3 would leave just over 3 miles of road connected to streams but reduce sediment by 75%. In each alternative, these proposed actions contribute to compliance with both the Forest Plan, as well as state water quality regulations.

Prospect Gulch would have the greatest amount of effectively harvested area as a result of Alternatives 2 and 3, potentially increasing the frequency of small to moderately sized peak flows. However, widespread changes to its condition are not expected as a result. The remaining subwatersheds all potentially incur small and unobservable increases in peak flow that would not affect stream environments.

Also refer to Table 11 in Chapter 2 for effects summary information for hydrology.

Table 52. Length of road connected to streams in each subwatershed, by alternative.

Watershed	Alternative 1 - Existing (miles)	Alternative 2 (miles)	Alternative 3 (miles)
Alder	0.27	0.00	0.00
Carpenter	0.43	0.27	0.27
Deer	1.18	0.02	0.02
Dudley	2.22	0.00	0.00
Ferguson	0.04	0.00	0.00
Moore	0.23	0.23	0.01
Pony	0.50	0.50	0.00
Potosi	1.88	0.00	0.00
Prospect	0.23	0.23	0.00
Trail	1.12	0.39	0.39
Unknown	0.09	0.02	0.02
White	0.67	0.00	0.01
Lower Beaver subwatersheds	1.74	0.11	0.13
Upper Beaver subwatersheds	1.49	0.92	0.92
Total (all of Beaver Creek)	13.67	4.26	3.35

Table 53. Relative amount of sediment delivered to streams by roads in each subwatershed, by alternative.

Watershed	Alternative 1 - Existing (percent reduction)	Alternative 2 (percent reduction)	Alternative 3 (percent reduction)
Alder	0.8	0.8	0.8
Carpenter	2.0	0.7	0.7
Deer	4.5	4.3	4.3
Dudley	7.8	7.8	7.8
Ferguson	0.1	0.1	0.1
Moore	0.8	0.0	0.8
Pony	7.9	0.0	7.9
Potosi	19.8	20.2	20.2
Prospect	4.8	4.8	4.8
Trail	24.6	10.7	10.5
Unknown	0.2	0.2	0.2
White	3.7	3.6	3.6
Lower Beaver Subwatersheds	10.0	9.5	9.5
Upper Beaver Subwatersheds	6.4	2.8	2.8
Total (all of Beaver Creek)	100.0	65.6	74.1

3.3.6. Hydrology References

Alila, Y, P.K. Kuras, M. Schnorbus, and R. Hudson. 2009. Forests and floods: A new paradigm sheds light on age-old controversies. Water Resources Research, 45. (PF. Doc AQ-R34).

Black, T.A., R.M. Cissel, and C.H. Luce. 2012. The Geomorphic Road Analysis and Inventory Package (GRAIP) Volume 1: Date Collection Method. Gen. Tech. Rep. RMRS-GTR-280WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 110 p. (PF Doc. AQ-R01).

Cissel, R., T. Black, and C. Luce. 2009. Legacy roads and trail monitoring project: road decommissioning in the Mill Creek watershed, Gallatin National Forest. USDA Forest Service. (PF Doc. AQ-R02).

Grant, Gordon E.; Lewis, Sarah L.; Swanson, Fredrick J.; Cissel, John H.; McDonnell, Jeffrey J. 2008. Effects of forest practices on peak flows and consequent channel response: a state-of-the-science report for western Oregon and Washington. Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p. (PF Doc. AQ-R08).

Hubbart, J.A., T.E. Link, J.A. Gravelle, and W.J. Elliot. 2007. Timber harvest impacts on water yield in the continental/maritime hydroclimatic region or the United States. Forest Science 53(2): 169-180. (PF Doc. AQ-R09).

Idaho Department of Environmental Quality. 2001. Subbasin Total Maximum Daily Loads of the North Fork Coeur d'Alene River(17010301). Online at: http://wwwdeq.state.id.us/water/data_reports/surface_water/tmdls/sba_tmdl_master_list.cfm. (PF Doc. AQ-R10).

Idaho Department of Environmental Quality. 2008. Department of Environmental Quality Working Principles and Policies for the 2008 Integrated (303[d]/305[b] Report. Idaho Department of Environmental Quality, Boise, ID. January 2008. (PF Doc. AQ-R11).

Kuras, P.K., Y. Alila, and M. Weiler. 2012. Forest harvesting effects on the magnitude and frequency of peak flows can incresase with return period. Water Resources Research, 48:1-19. (PF Doc. AQ-R12).

Luce, C. H. and T. A. Black. 1999. Sediment production from forest roads in western Oregon. Water Resources Research. 35(8):2561-2570. (PF Doc. AQ-R14).

Luce, C.H. 2002. Hydrological processes and pathways affected by forest roads: what do we still need to learn? Hydrological Processes. 16:2901-2904. (PF Doc. AQ-R13).

McFarland, A., A.M. Prussian, K. Stromberg. 2013. Beaver Creek Watershed Assessment (PF Doc. AQ-R15).

Nelson, N. R. Cissel, T. Black, and C. Luce. 2011. Monitoring road decommissioning in the Mann Creek watershed: post storm report, Payette National Forest. USDA Forest Service. (PF Doc. AQ-R18).

Overton, C.K., S.P. Wollrab, B.C. Roberts, and M.A. Radko. 1997. R1/R4 Fish and Fish Habitat Standard Inventory Procedures Handbook. General Technical Report INT-GTR-346. USDA Forest Service Intermountain Research Station. Ogden, UT. (PF Doc. AQ-R20).

Reid, L.M. 1993. Research and cumulative watershed effects. Gen. Tech. Rep. PSW-GTR-141. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 118 p. (PF Doc. AQ-R21).

Tonina, D., C.H. Luce, B. Rieman, J.M. Buffington, P. Goodwin, S.R. Clayton, S.M. Ali, J.J. Barry, and C. Berenbrock. 2008. Hydrological response to timber harvest in northern Idaho: implications for channel scour and persistence of salmonids. Hydrological Processes 22(7):3223-3235. (PF Doc. AQ-R25).

USDA Forest Service. 1987. Forest Plan, Idaho Panhandle National Forests, Northern Region. Coeur d'Alene, ID. (PF Doc. CR-R01).

USDA/USDI. 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins: Volume III. PNW-GTR-405. (PF Doc. AQ-R26).

USDA U.S. Forest Service. 1999. Dust Palliative Selection and Application Guide. (PF Doc. AQ-R33)

USDA U.S. Forest Service. 2005. Biophysical classification- Habitat type groups and descriptions of northern Idaho and northwestern Montana, Lower Clark Fork and adjacent areas. 17 p. (PF Doc. AQ-R27).

Wemple, B.C., Jones, J.A., Grant, G.E. 1996. Channel network extension by logging roads in two basins, western Cascades, Oregon. Water Resources Bulletin 32: 1195-1207. (PF Doc. AQ-R28).

3.4. Fisheries

3.4.1. Introduction

Beaver Creek is a tributary to the Coeur d'Alene River and is known to contain three salmonid species: westslope cutthroat trout, brook trout, and rainbow trout, as well as an unknown diversity of sculpin and other non-salmonid species. The mainstem of Beaver Creek is not known to contain a wide array of habitats for salmonids, and is recognized by the State of Idaho as having impaired water quality and habitat for aquatic organisms (MacFarland et al 2013). Still, fisheries appear to persist in many tributaries and are observed in the mainstem during surveys.

Both the Forest Service and Idaho Department of Environmental Quality (IDEQ) have performed stream habitat, water quality, and fisheries surveys in Beaver Creek and its tributaries in an effort to establish baseline conditions from which to evaluate projects and construct rehabilitation goals for regulatory purposes. According to both Forest Service and IDEQ surveys, fisheries composition and abundance varies between upper and lower Beaver Creek, with upper Beaver Creek containing a relatively abundant population of native and non-native species compared to lower Beaver Creek and a greater proportion of native westslope cutthroat trout to non-native species.

Habitat in the Beaver Creek mainstem was rated as 1 out of 3 in the IDEQ beneficial use reconnaissance program (BURP), though upper Beaver Creek generally contains a wider diversity of habitat types and available space than lower Beaver Creek. Upper Beaver Creek tends to be more constricted and slightly steeper than downstream areas, and Upper Beaver Creek contains more woody debris that lower Beaver Creek, as well as more abundant pools.

Tributaries to Beaver Creek tend to contain wide array of habitat types and are some of the least influenced habitat in the Beaver Creek watershed. Several tributaries, including Alder, White, Deer, Dudley, Pony, Unknown, and Prospect, each contain over 1 mile of productive habitat that allow adult fish to spawn and juvenile fish to rear in relative protection to disturbances or high flows. Because of the widespread and historic changes that have occurred in the Beaver Creek mainstem, it is likely that these tributaries are of critical importance to the persistence of fish and other aquatic organisms in Beaver Creek.

This analysis will describe the existing condition of aquatic resources in the Beaver Creek Resource Area, and will describe the known fish distribution and abundance in Beaver Creek and its tributaries, and how the proposed actions may influence both fisheries and their habitat. This will include a discussion of how replacing culverts that are currently barriers to fish migration may influence fisheries persistence and stream characteristics, and an analysis of how timber harvest and road reconstruction and decommissioning may affect instream habitat and existing fish community structure.

Finally, the resource analysis will conclude with determinations for species listed under the Endangered Species Act (bull trout and Designated Critical Habitat for bull trout) and viability determinations for Forest Service sensitive aquatic species (westslope cutthroat trout and western pearlshell mussel).

3.4.1.2. Overview of Issues and Issue Indicators

Two issues were addressed in the fisheries analysis.

Issue: Human-caused fish barriers in the Beaver Creek Resource Area exist on federal and private lands.

Issue Indicators: The indicator of effects is the number of proposed Aquatic Organism Passage (AOP) improvements and length of stream habitat that would be made available to fish occupying watersheds within the resource area.

Issue: Effects of proposed actions on downstream fish habitat and viability of westslope cutthroat trout.

Issue Indicator: The indicator of effects will include the quantitative influence of the proposed actions on water quality, as well as qualitative changes of key fish parameters addressed by the Inland Native Fish Strategy objectives (INFS).

3.4.2. Affected Environment and Existing Conditions

3.4.2.1. Overview

The project and cumulative effects area is defined as the Beaver Creek watershed and contains approximately 50 miles of fish-bearing, or potentially fish bearing streams in the Beaver Creek watershed. Fish species that inhabit streams in the Beaver Creek Resource Area include native populations of westslope cutthroat (*Oncorhynchus clarki lewisi*), longnose dace (*Rhinichthys cataractae*) and sculpin (*Cottus spp.*). Introduced fish species include populations of unspecified rainbow trout (*O. mykiss*), and eastern brook trout (*Salvelinus fontinalis*).

The analysis of direct, indirect, and cumulative effects to fish is based on effects to sensitive aquatic species and management indicator fish species (MIS). Under this concept, larger groups of organisms or communities are believed to be adequately represented by a subset of the group. The IPNF Forest Plan (1987; PF Doc. CR-001) identifies westslope cutthroat trout, bull trout, and rainbow trout as potential MIS for fisheries (Forest Plan Appendix L). Westslope cutthroat and rainbow trout are known to utilize streams within the project and cumulative effects area for spawning, rearing, and over-wintering and they have nearly similar habitat needs. Bull trout are not known to exist in the Beaver Creek Resource Area.

3.4.2.2. Threatened, Endangered, Sensitive, and Management Indicator Species

Guidance provided in the Forest Service Manual directs the agency to 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]). Additionally, the Manual directs the Forest Service to manage the habitat of species listed on the Regional Sensitive List to prevent further decline in their populations, which could lead to federal listings under the Endangered Species Act. Lastly, the Forest Plan (1987; PF Doc. CR-001) recognizes Management Indicator Species (MIS). These species are considered commonly hunted, fished, or trapped and represent important economic species that are of common public interest and are monitored by the Idaho Department of Fish and Game (IDFG). The species listed in this category are not a proxy for other species. IDFG is responsible for setting the harvest regulations for the species in this category. By having populations that support harvest levels, viability is not a concern for these species. The data source for monitoring these species comes from IDFG.

Aquatic species found on the IPNF that are classified as endangered, threatened, sensitive, or MIS are represented in Table 54. Only those species that are known to exist or have habitat designated as critical to the maintenance or recovery of the species under the Endangered Species Act (ESA) in the project area, or downstream of the project area that would be affected by this project, are considered in this analysis. Effects determinations of the proposed actions on threatened and endangered fish species can be found in the Fisheries Biological Assessment (Fisheries project file). Effects determinations of the proposed actions on sensitive fish species can be found in the "Summary of Effects" in the "Environmental Consequences" discussion of each alternative.

Table 54. Rationale of appropriate fisheries analysis for Threatened, Endangered, Sensitive, and Management Indicator Species (MIS).

Species	Preferred Habitat	Rationale for Appropriate Analysis
Bull Trout (Threatened and MIS)	Cold, clear streams with gravel/cobble substrate for spawning and lots of deep pools	Outside designated critical habitat and species not known to occupy the Beaver Creek or Coeur d'Alene River – Detailed analysis not needed.
Kootenai River White Sturgeon (Endangered)	Large lakes and rivers in the Kootenai River watershed	While found in the Kootenai River system, no suitable habitat is present within the project area – Detailed analysis not needed
Westslope Cutthroat Trout (Sensitive, MIS)	Cold, clear streams with rocky, silt-free riffles for spawning and deep pools for feeding and resting	Suitable habitat present and species documented in sampling efforts. Detailed analysis will occur.
Redband Trout (Sensitive)	Cool, clean, relatively low gradient streams, though preference varies with populations	Suitable habitat but species not present. Detailed analysis will not occur.
Burbot (Sensitive)	Large lakes and rivers. In Idaho, found only in the Kootenai River System.	While found in the Kootenai River system, no suitable habitat is present within the project area – Detailed analysis not needed.
Western Pearlshell Mussel (Sensitive)	Stable sand and gravel substrates in low gradient streams and rivers.	Species known to occur in the Coeur d'Alene River system, but not in Beaver Creek-detailed analysis will not occur.
Rainbow Trout (MIS)	Cold, clear streams with rocky, silt-free riffles for spawning and deep pools for feeding and resting	Suitable habitat present and species documented in sampling efforts. Introduced species and is similar in habitat requirements as WCT. Detailed analysis will not occur but will be reflected in the WCT analysis.

3.4.2.2.1. Westslope Cutthroat Trout (Sensitive and MIS)

Westslope cutthroat trout are listed as "sensitive" by Region 1 of the USDA Forest Service, and are considered a management indicator species (MIS) under the Forest Plan. Westslope cutthroat trout exists throughout the Beaver Creek Resource Area.

3.4.2.2.2. Western Pearlshell Mussel (Sensitive)

In February, 2011 the Regional Forester updated the Sensitive Species List to include the western pearlshell mussel (WPM) as a sensitive species on the Idaho Panhandle National Forest. The existence of WPM has not been documented on the Idaho Panhandle National Forest outside of the Coeur d'Alene, St. Joe, and St. Marie river drainages. However, it should also be noted that surveys to locate the mussels prior to being listed as a Region 1 sensitive species have not been widespread. Therefore, to better determine if the species may potentially exist in the project area, an extensive review of the Xerces Society for Invertebrate Conservation website (http://www.xerces.org/western-pearlshell/) was conducted. The distribution maps and reference

materials on this website were created from thousands of records from the published literature, museum collections, unpublished reports, and information provided by state, tribal, nonprofit, retired and amateur biologists.

The website, referencing surveys and distribution reviews by Frest and Johannes (1997; PF Doc. AQ-R07), Frest (1999; PF Doc. AQ-R06), and Stagliano et al. (2007; PF Doc. AQ-R17), indicates that the western pearlshell mussel is thought to be limited to the Clearwater, Selway, Lochsa, Lost, Coeur d'Alene, Little Salmon, Salmon, Pahsimeroi, and Blackfoot rivers. Further, a map of both current and historical distribution published on the website shows no evidence that the mussel has ever been located in the Beaver Creek Resource Area. Recently, the Montana Natural Heritage Department also published maps predicting the presence of WPM in northern Idaho, and WPM are predicted to occur in Beaver Creek (PF Doc. AQ-R30). However, recent stream surveys by the state and the Forest Service in lower Beaver Creek where they are predicted to occur have not resulted in any documentation of their presence. Therefore, while WPM may have occurred in Beaver Creek at one time, it is highly unlikely that they currently exist there today.

3.4.2.2.3. Rainbow Trout (MIS)

Rainbow trout have been introduced extensively throughout the Coeur d'Alene basin and are widely distributed across its tributaries. Because rainbow trout are a non-native species, and because its life history characteristics closely match those of westslope cutthroat trout, the effects of the proposed actions on rainbow trout will be considered similar to those of westslope cutthroat trout for the purposes of this analysis.

3.4.2.3. Existing Condition for Fisheries

3.4.2.3.1. Methodology

Fisheries habitat data was collected in the Beaver Creek Resource Area from fish-bearing streams in 2005-2012. Stream channel habitat and morphology were evaluated using modified R1/R4 stream survey methodologies (Overton et al. 1997; PF Doc. AQ-R20), as well as a modified version of the Iowa Department of Natural Resources' Rapid Assessment of Stream Conditions Along Length (RASCAL) survey method (PF Doc. AQ-R29). A modified version of Overton's R1/R4 stream survey protocol was used to sub-sample an identified monitoring reach and collect important fish habitat variables (e.g. LWD information; pool, riffle, and run habitat information; pool volume, etc.).

RASCAL is a modified version of the USDA Natural Resource Conservation Service Stream Visual Assessment Protocol (SVAP; USDA NRCS 1998; PF. Doc. AQ-R39), and data collection was accomplished with a GPS installed with the RASCAL program. Briefly, stream assessments were conducted at pre-determined segment lengths or wherever there were changes in channel characteristics such as changes in gradient, width, riparian cover or type, or substrate type. Parameters assessed included flow, channel condition, in-stream habitat diversity, substrate, riparian and bank conditions. Points of interest, such as log jams or stream crossings, were also noted. The RASCAL survey does not evaluate large woody debris, but did consider other general habitat conditions. Over 11 miles were surveyed across five tributaries of Beaver Creek, including Carpenter Gulch, Potosi Gulch, White Creek, Pony Gulch and Dudley Creek (refer to the Hydrology Section 3.3 for more information).

3.4.2.3.2. Existing Fisheries Conditions

In general, populations of westslope cutthroat trout in northern Idaho are thought to have declined over their historic distribution, with viable populations existing in only 36 percent of the original

Idaho range due to habitat degradation (Rieman and Apperson 1989; PF Doc. AQ-R22). A more recent status review in 2002 for westslope cutthroat trout in the United States indicated they currently occupy 59% of historical habitat where in Idaho, westslope cutthroat trout may currently occupy up to 95% of their historical habitat (Shepard et al. 2003, PF Doc. AQ-R24). However, introgression with rainbow trout and presence of non-native brook trout remain a range wide threat to the persistence of westslope cutthroat trout species as a result of competition.

Data collected from 17 streams in the Beaver Creek Resource Area between 2010 and 2012 indicate that westslope cutthroat trout and sculpin are widely distributed and relatively abundant (PF Doc. AQ-30 and AQ-33). westslope cutthroat trout and sculpin composed nearly 35% and 62% and over of the fish species collected, respectively (Figure 44). Brook trout appear to be most abundant in the upper reaches of Beaver Creek itself (Table 55), but were also found in several tributaries (PF Doc. AQ-30). Rainbow trout were less abundant in the surveys of lower and upper reaches of Beaver Creek in 2010 by DEQ, and were not found in Forest Service surveys.

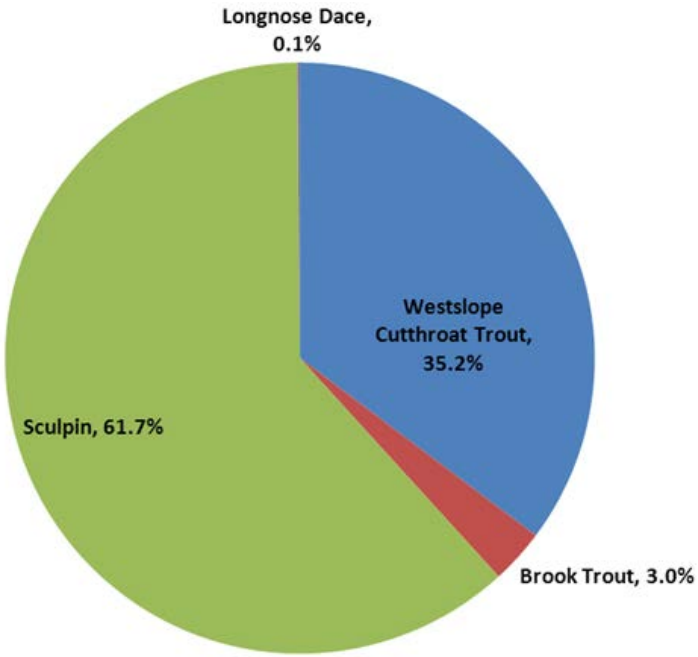


Figure 44. Relative abundance of fish species found in the Beaver Creek Watershed, 2005-2011.

Table 55. Abundance of fish found in the State of Idaho Department of Environmental Quality Beneficial Use Reconnaissance Program (MacFarland et al 2013).

Species	# of fish at Lower Beaver Creek Site	# of fish per 100m^2 at Lower Beaver Creek Site	# of fish at Upper Beaver Creek Site	# of fish per 100m^2 at Upper Beaver Creek Site
Westslope cutthroat trout	21	1.7	71	11.8
Sculpin	214	18	6	1
Brook trout	3	0.3	21	3.5
Rainbow trout	2	0.2	2	0.3

Abundance estimates indicate that westslope cutthroat trout populations range from 16 fish per mile in Fisheries surveys in Beaver Creek and its tributaries indicate that westslope cutthroat trout abundance is highly variable, and most areas contain far more juvenile-sized fish than what are believed to be adult-sized fish (Figure 2). Westslope cutthroat trout were far more abundant in

Pony Gulch than in other surveyed tributaries. Alder, Dudley, Deer, Ferguson, Potosi, and Prospect all contained similar abundances of westslope cutthroat trout, while Carpenter and Moore Creeks contained relatively few westslope cutthroat trout or brook trout.

Adult westslope cutthroat trout were only found in four tributaries as well as the lower mainstem of Beaver Creek (Table 56). Alder Creek had the highest ratio of adults to juveniles. Prospect Gulch also contained slightly more than the average density of juvenile westslope cutthroat trout in other tributaries of Beaver Creek, but no larger westslope cutthroat trout were found (Table 3). Carpenter Creek had extremely low densities of only westslope cutthroat trout, and may be explained by a culvert near its confluence with Beaver Creek that has been a complete barrier to fish for many years.

Larger brook trout were only found in Alder Creek, and in equal proportions to juvenile brook trout. Brook trout also appear to have made introgressions into some tributaries where culverts were either recently removed, as in Unknown Gulch, or washed out and were then replaced, as in Potosi Gulch (Table 56).

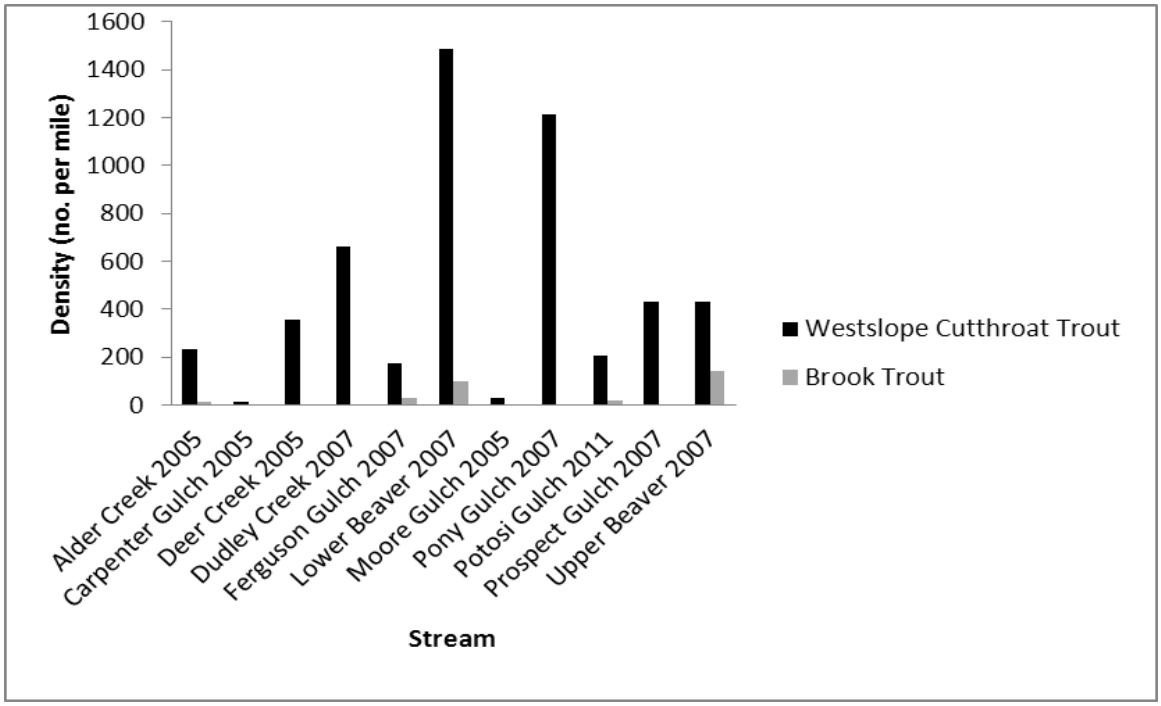


Figure 45. Population estimates for westslope cutthroat trout and brook trout in Beaver Creek and select tributaries (Forest Service data 2005-2012).

Table 56. Relative density of westslope cutthroat trout (WCT) and brook trout by juvenile (70-150mm) and adult (>150mm) size classes (fish per mile).

Site/Survey Year	WCT juveniles (fish per mile)	WCT adults (fish per mile)	Brook trout juveniles (fish per mile)	Brook trout adults (fish per mile)
Alder 2005	232	64	16	16
Carpenter 2005	16	0	0	0
Deer 2005	355	0	0	0
Dudley 2007	663	18	0	0
Ferguson 2007	175	0	33	0
Moore 2005	31	0	0	0
Pony 2007	1,214	124	0	0
Potosi 2007	0	21	0	0
Potosi 2011	209	0	21	0
Prospect 2007	429	0	0	0
Unknown 2007	0	0	0	0
Unknown 2012	23	0	138	92
White 2005	>0	>0	0	0
Lower Beaver 2007	1,484	86	101	0
Upper Beaver 2007	430	0	143	18

1 Density of fish in White Creek is unknown because of sampling error, however, only WCT were found during sampling.

3.4.2.3.3. Aquatic Organism Passage

Aquatic organism passage through a culvert is based primarily on: 1) a culvert's inlet or outlet elevation relative to the stream's surface, 2) a culvert's ability to accommodate high flows and not result in stream velocities within the culvert that exceed a fish's swimming ability, 3) gradient of the culvert. Culverts can also become plugged by sediment or woody material, or can become damaged in flood events or during regular road maintenance, thereby impeding passage. Any combination of these factors can result in a potential migration barrier depending on the species present or the life stage that it may affect.

In 2010-2012, Forest Service field technicians conducted surveys using Region 1 methodologies (Clarkin et al. 2003; PF Doc. AQ-R02) and identified 9 full barriers to fish migration and 3 partial barriers (Table 58). Currently, several culverts impede the passage of fish to nearly entire subwatersheds, including Carpenter, Missouri, Dudley, Hutchins, Cleveland, Unknown, and Prospect. Additional culverts in White, Deer, and Dudley Creeks would provide additional habitat to the uppermost reaches of the watershed allowing fish access to colder water as well as habitat that is less likely to be occupied by non-native species, increasing their survival during especially warm periods, or reducing competition or hybridization with non-native species.

Table 57. Proposed culvert replacement (Aquatic Organism Passage or AOP) projects to improve fish habitat distribution in Beaver Creek.

Stream/Site	Forest Road Location	Barrier class[1]	Length of additional stream under Alternative 2 (miles)	Length of additional stream under Alternative 3 (miles)
Carpenter Gulch	Road 2361	Full	2.5	2.5
Missouri Gulch	Road 933	Full	0.1	0.1
White Creek	Road 1586	Full	0.3	0.3
Deer Creek 1	Road 1586	Full	0.2	0.2
Deer Creek 2	Road 1586	Full	0.1	0.1
Dudley Creek tributary	Road 271	Full	0.3	0.3
Cleveland Gulch	Road 456	Partial	0.0	1.0
Hutchins Gulch	Road 456	Full	0.0	1.2
Prospect Creek	Road 456	Full	0.0	1.5
Unknown Gulch	Road 456	Partial	0.0	1.5
Dudley Creek 1	Road 271	Partial	1.0	1.0
Dudley Creek 4	Road 271	Full	0.2	0.2
Total blocked habitat			3.5	6.2
Total partially-blocked habitat			1.0	3.5

[1] Refers to barrier type (full blockage, partial blockage, or none).

3.4.2.3.4. Fish Habitat

The Inland Native Fish Strategy (INFS, 1995; PF Doc. CR-003) recommends objectives for a variety of in stream characteristics, including density of woody debris, pool frequency, width to depth ratio, and stream bank stability, collectively referred as riparian management objectives (RMOs). In general, these characteristics are most applicable in watersheds similar to the size of Beaver Creek or larger. However, for the purposes of this analysis, these RMOs are also extended to tributaries of Beaver Creek simply as a means of comparing characteristics widely believed to be influential on fisheries. In all cases, these surveys were done at the farthest downstream point in each tributary, and therefore are thought to generally represent overall conditions within each subwatershed.

In-stream habitat appeared to be in good condition throughout most tributaries of Beaver Creek. Dudley Creek and Pony Gulch, where large woody debris (LWD) densities, pool densities, pool depth, bank conditions, canopy cover, and overall habitat conditions tended to be the highest in both Forest Service and RASCAL surveys. An abundance of large woody debris is present in most fish-bearing streams throughout the Beaver Creek Resource Area, providing good fish cover and adequate sediment retention. Estimated large woody debris densities ranged from 249 pieces per mile in lower Beaver Creek to up to 1,144 pieces per mile in Ferguson Creek. Approximately 15% of the material observed was comprised of stable large woody debris (greater than 12 inches diameter and more than 35 feet in length). Densities of larger pieces of large woody debris were generally found in lower but adequate densities, ranging from 63 pieces per mile in Scott Gulch, to 242 pieces per mile in Dudley Creek.

Some tributaries contained very few pieces of moderate to large woody debris, and only Alder Creek contained any of the very largest pieces, though in extremely low densities (PF Doc. AQ-R34). Despite the lower densities of very large pieces, even a moderate-sized piece of wood is likely to influence stream channels in these smaller tributaries, and in general LWD abundance of those relatively large-sized pieces appeared to be adequate (Table 58).

Pool frequency and quality are also important for the persistence of most coldwater salmonid species, and pools were relatively frequent in most tributaries, though may not have meet the INFS objectives of 96 pools per mile. However, most tributaries are relatively small and confined, with steep channels of between 2 and 4% and therefore higher pool densities are not necessarily expected. Pool frequency in Beaver Creek and lower Beaver Creek, where INFS objectives are more relevant, were relatively low, while pool frequency in upper Beaver Creek appeared adequate.

Streambank stability is generally a measure of how much streambank appears to have exposed soils or is regularly scoured by high flows, and instability can result in sources of fine sediment that reduce food availability for fish, or result in loss of protective cover for. Alder, Carpenter, and Potosi Gulch all had streambank stabilities of less than the 80% stable INFS objective, and the RASCAL survey generally agreed with the INFS results in Carpenter and Potosi (it was not used in Alder; Table 59). Increased bank instability in Potosi Gulch is likely caused by historic and recent mining activities including placer and suction dredging use throughout Trail Creek and the lower reaches of Potosi Creek, and the effects of the road system in the Trail Creek subwatershed. Field reviews conducted in the fall of 2010 and 2011 indicated that this reach continues to be a popular area for recreational mining (MacFarland et al. 2013; PF Doc. AQ-R15), and reviews by Forest Service biologists found several areas of suction dredging along streambanks (A. Prussian, personal observation). Streambanks appeared to be the most stable and least erosive in Dudley, Deer, Ferguson, Unknown, Pony, and White Creeks (Table 58).

Wetted width to depth ratios at all sample sites exceeded the INFS objective of 10, ranging from 17 in Ferguson Creek to 37 in Carpenter Creek (Table 58). However it should be noted that the Riparian Management Objective of 10 is more applicable to larger streams and may have less relevance in these small tributaries, and less ability to be measured precisely due to the nature of small streams (Whitacre et al 2007, Roper et al 2008). Despite the apparently large disparity between these width to depth values, they may represent a measure of a stream's physical and biological integrity and capacity to resist large changes in flow or other disturbances within minimal changes in physical habitat or biological characteristics. Low width to depth ratios, tend to have greater variability in flow velocities and may allow them to absorb larger fluctuations in flow with minimal changes in their appearance or function, and have higher biological diversity and productivity because they offer a wider diversity of habitat conditions.

The RASCAL survey did not evaluate large woody debris, but did evaluate overall habitat conditions. Dudley Creek was found to have the most favorable channel conditions overall (Table 59). Dudley Creek also had 75% of the surveyed channel with at least 50% canopy cover and nearly 20% of the channel showed no streambank erosion.

Table 58. Key fish habitat parameters for subsampled fish-bearing streams in the Beaver Creek Resource Area. [1]

Stream	Mean Stream Width (feet)	Pools per Mile	Mean residual pool depth (feet)	LWD (pieces per mile)	bank stability (percent)	width/depth ratio
INFS RMO	NA	96	NA	>20 (>20"X35')	80	10
Alder Creek	5.7	73	0.8	52	75	23
BeaverCreek	12.2	59	1.2	76	40	25
Carpenter Creek	6.2	75	0.5	329	56	37
Deer Creek	8.0	135	0.9	124	98	25
Dudley Creek	6.4	110	0.6	55	93	26
Ferguson Creek	3.7	168	0.6	101	99	17
Lower Beaver	15.7	40	1.2	48	69	27
Moore Creek	4.3	109	0.6	43	88	18
Pony Gulch	4.9	52	0.4	172	80	22
Potosi Gulch	5.1	65	1.2	0	62	23
Scott Gulch	6.3	95	0.9	57	88	22
Unknown Creek	4.3	183	0.4	55	95	18
Upper Beaver Creek	9.7	103	1.2	142	40	20
White Creek	7.2	62	1.1	31	95	23

[1] Objectives for residual pool depth are not defined in the INFS, but the quality of summer and winter rearing habitat improves as the frequency of deep pools increases. Stable pieces are defined in INFS Riparian Management Objectives (RMOs) as LWD > 15 feet long and 24 inches in diameter. Desired pool frequency and depth conditions for streams less than 10 feet average width are > 96 pools per mile and mean RSPD > 1.5 feet in depth; streams between 10-20 feet in average width are > 56 and pools per mile and mean RSPD > 3 feet in depth. (Inland Native Fish Strategy, 1995, PF Doc. CR-003).

Table 59. Percent of stream length in each RASCAL survey category.

Survey/Category	All watersheds	Carpenter	Dudley	Pony	Potosi	White
Stream habitat						
Excellent	25	21	50	26	1	32
Average	66	54	44	74	92	68
Poor	9	26	6	0	6	0
Streambank stability						
Stable	19	14	43	43	11	0
Minor Erosion	45	38	34	34	47	68
Moderate Erosion	31	40	21	18	35	32
Severe Erosion	4	7	3	5	7	0
Streambank erosion						
None	13	14	19	32	5	0
Random	51	36	47	43	34	92
Alternate Banks	19	38	13	13	19	6
Both Banks	17	12	21	12	41	2
Canopy cover						
0 – 10%	0	1	0	0	0	0
10 – 25%	3	0	4	0	6	6
25 – 50%	26	30	21	10	33	30
50 – 75%	58	63	42	78	48	57
75 – 100%	13	6	33	11	13	7

Stream temperatures in Beaver Creek and its tributaries are also considered too warm to fully support cold water aquatic life during certain times of the year (MacFarland et al. 2013, PF Doc. AQ-R15). As such, the streams in the watershed have been listed on the 2010 Idaho 303d/305b Integrated Report as impaired due to temperature. They also flow into the North Fork Coeur d'Alene River, which is also listed as impaired due to temperature. A full description of the temperature results from the 2005 and 2007 monitoring can be found in the Beaver Creek Watershed Assessment (McFarland et al. 2013, PF Doc. AQ-R15).

3.4.3. Management Framework

The following regulations and policies governing management of watersheds and fisheries in Beaver Creek include, but are not limited to the:

- Idaho Panhandle National Forests Land and Resource Management Plan (Forest Plan)
- Inland Native Fish Strategy (INFS)
- National Forest Management Act (NFMA)
- Endangered Species Act (ESA) (PF Doc. AQ-R01)
- Clean Water Act (CWA)
- Executive Order 12962 Recreational Fishing (as amended by E.O. 13474)

The Idaho Panhandle National Forests Land and Resource Management Plan (hereforth referred to as the Forest Plan) guides all natural resource management activities and establishes management standards for the Idaho Panhandle National Forests. The Forest Plan states that "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." Also, "it is the intent of the plan that models 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." (IPNF Forest Plan p. II-33)

The Inland Native Fish Strategy (USDA 1995) amended the 1987 Idaho Panhandle National Forests Forest Plan regarding stream and fish habitat protection measures.

The National Forest Management Act (NFMA) requires that the Forest Service "insure that timber will be harvested from NFS lands only where soil, slope, or other watershed conditions will not be irreversibly damaged; and 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," (1976, Title16 USC §1604 NFMA §6 (g)(3)(e)(i) and (iii)).

The Endangered Species Act includes direction that federal agencies will consult with the U.S. Fish and Wildlife Service and 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 (USDI 2005).

Under authority of the Clean Water Act, the Environmental Protection Agency (EPA) and the States must develop plans and objectives that will not further harm, and eventually restore, streams that do not meet beneficial uses of the State. The Forest Service has developed Best

Management Practices as outlined in the Soil and Water Conservation Handbook (Forest Service Manual 2509.22), to meet the intent of the water quality standards of the State of Idaho.

Executive Order 12962 (06/07/1995 (amended 10/01/08)) 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.”

3.4.4. Environmental Consequences

3.4.4.1. Methodology

The effects analysis for the proposed actions on fisheries and fish habitat is based largely on the hydrologic analysis and the potential for the proposed actions to affect fish or their habitats, as well as the potential for increased available habitat by replacing migratory fish barrier culverts. For fisheries, the effects of the proposed actions on peak flows, water yield, and water in select subwatersheds were used to infer potential direct and indirect effects on streams and the potential to affect fisheries reproduction and persistence (see the Hydrology section, 3.3, for detailed information).

The analysis was done at the subwatershed scale (7th code HUC scale) for three primary reasons. First, the effects of forest harvest on peak flow and water yield is increasingly difficult to observe with increasing distance from where harvest is occurring. Changes in peak flow or water yield in Beaver Creek are also likely to be equal or less than that observed in tributaries because flow in Beaver Creek is a result of many factors across many other subwatersheds. Secondly, the smaller-scale analysis is more biologically relevant than evaluating effects only in Beaver Creek because native fish populations rely on small tributary streams during periods of their life history for refuge from large scale disturbances, avoidance from competition with non-native species, as well as spawning, rearing, and feeding. Finally, the smaller scale analysis isolates the effects of the proposed actions because nearly all of the tributaries are under the jurisdiction of the US Forest Service, while much of the mainstem is privately owned and subjected to a wide range of actions that affect habitat quality and fisheries persistence.

To determine the effects of the proposed actions on fish, recent fisheries population data and stream habitat data from 2005 to 2012 were used. Some surveys resulted in information that was not useful in developing population estimates and is represented only as presence/absence information.

To determine the effects of replacing fish migration barriers, access to available fish habitat was determined by estimating the length of stream upstream of known migratory culvert barriers on maps, and used contour lines to estimate the approximate location where streams became too steep likely contain westslope cutthroat trout.

3.4.4.2. Spatial and Temporal Context for Effects Analysis

The analysis of the proposed actions on fisheries and streams includes all streams within the Beaver Creek watershed. The hydrologic analysis for water yield included only the Beaver Creek watershed, while the peak flow analysis included several subwatersheds. The effects of water yield on streams and fisheries is likely most relevant at the Beaver Creek scale, while changes in peak flows are likely to be more relevant to fish and their habitat, and more likely to occur as a result of the proposed actions, in subwatersheds rather than in Beaver Creek itself.

The analysis of direct and indirect effects primarily includes short and long term effects on fisheries; generally those within 5 years, and those occurring for at least 50 years. This analysis also includes cumulative effects from previous actions. For instance, the analysis of peak flows on fisheries habitat attempts to determine whether immediate increases in peak flows will result in changes to streams, and how long those changes may last given previous harvest activities in the same subwatershed.

3.4.4.3. Alternative 1

3.4.4.3.1. Direct and Indirect Effects

Alternative 1 will not result in any increases to water yield or peak flows, and in fact may actually result in continued decreases in both factors as forest canopies continue to regenerate from the last large-scale harvest in the mid 1990's.

At the same time, Alternative 1 will result in continued and potentially increased sediment loads from road surfaces as road surfaces continue to deteriorate and are subject to sporadic maintenance and repairs only when drainage becomes compromised. Currently, roads are responsible for a substantial amount of sediment in Beaver Creek (see the Hydrology section, 3.3) and Alternative 1 would not result in additional maintenance or improved drainage of some roads. Finally, not taking action to reduce fuels in Beaver Creek could result in increased risk of widespread fire that could result in short term increases in sediment load and changes to stream habitats. Contemporary research has shown that the effects of large scale fire in riparian areas can be beneficial to streams by providing large wood, sediment, and organic materials (see Rieman et al 2010; PF Doc. AQ-R23). Effects from wildland fire are also likely to be less damaging to fisheries as long as access to habitats is not limited (Neville et al 2009; PF Doc. AQ-R19). Alternative 1 would not replace fish passage culverts with structures that allow passage to upstream habitats and should wildland fire occur in these subwatersheds, persistence of native fishes could be compromised in some subwatersheds.

3.4.4.4. Alternative 2

Briefly, Alternative 2 includes nearly 2,000 acres of vegetation harvest, and includes four types of harvest treatments. In addition, 29 miles of road would be reconstructed and 51 miles of road would be reconditioned to improve driving conditions for hauling timber and public use as well improving water quality conditions. Over 60 miles of road would be decommissioned to also improve water quality conditions.

Reconstruction and reconditioning activities may include noxious weed treatments, applying dust abatement to reduce erosion and improve driving safety, installation of additional waterbars or rolling dips, replacing culverts, or adding additional drainage culverts. Of the over 60 miles of road to be decommissioned, over 48 miles would be decommissioned through administrative actions that do not require mechanical treatment, and over 11 miles would require mechanical treatments to improve drainage and reduce both short and long term effects on water quality. Mechanical treatments may include obliterating and recontouring entire roads or segments of roads, or simply removing segments known to contribute sediment to streams. In some cases, small segments of stream channels at those crossings may require minor construction to restore the channels to their original gradient and condition.

Eight culverts are proposed to be replaced to improve aquatic organism passage (Figure 4). In most cases, these culverts are large enough to accommodate relatively large flow events, but their existing design may actually be detrimental to downstream conditions causing excessive streambed and bank erosion during high flows immediately downstream of the culvert, and they

do not fully allow upstream fisheries migration during critical times of the year such as during spawning or during low flow conditions. In each case, these culverts would be replaced with structures designed to simulate a natural stream channel through the structure and be designed to pass 100 year flows and have minimal effects on stream conditions both upstream and downstream of their location. These 8 culverts would increase available habitat to fisheries by 4.5 miles, including 3 culverts at the headwaters of White Creek and Alder Creek that would improve access to high value, cold upstream habitats that can be utilized during warm temperatures or during natural disturbance events lower in the drainage.

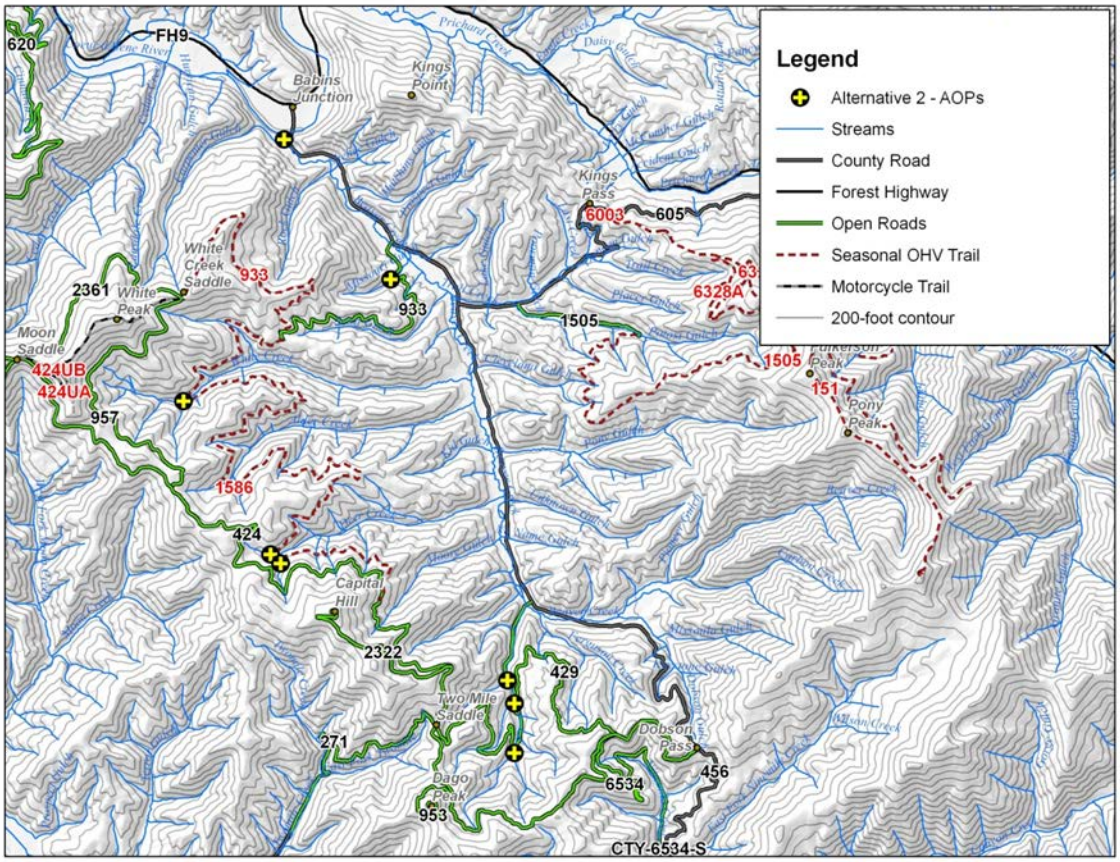


Figure 46. Map showing the location of aquatic organism passage (AOP) culverts proposed for replacement under Alternative 2.

3.4.4.4.1. Direct and Indirect Effects

Improving aquatic organism passage through culverts will improve the ability for westslope cutthroat trout to persist among ongoing and potential disturbances in the future, including wildfire, competition with non-native fish, and climate change. Improving passage for fish also includes improving access for non-native fish and could result in increased competition among westslope cutthroat trout and brook trout or rainbow trout in some streams (Fauch et al 2006; PF Doc. AQ-R05). However, it is becoming more widely accepted that improving passage results in population and species-specific benefits, including increased resilience to natural disturbances and improved ability to persist in the presence of non-native species (Neville et al 2009; PF Doc. AQ-R29).

Water quality would likely improve in many subwatersheds as roads are both reconstructed and improved, and decommissioned or placed into long term storage as a result of Alternative 2. A full

description of the proposed road reconstruction and decommissioning can be found in the Hydrology section (3.3). Over 65% of the sediment currently being contributed by forest roads in Beaver Creek could be removed by reconstruction and decommissioning, and range from between 0.1% in Ferguson Gulch, to over 20% in Potosi Gulch. It is unknown exactly how impaired water quality has affected the productivity and survival of westslope cutthroat trout and other fish, but reducing the amount of fine sediment, and the duration over which it may be delivered to streams, is likely to result in improved conditions for fish. Sediment from roads may be chronically introduced to streams during relatively small rain events throughout the year and may subject aquatic ecosystems to increased stress and overall lower productivity.

The effects of the proposed actions are unlikely to result in changes to water yield or peak flows in Beaver Creek or its tributaries by any observable amount. Water yield is not expected to increase by an observable amount, and would not have any perceptible effect on streams or aquatic organisms. Peak flows could be increased in up to two small tributaries of Beaver Creek, however both were found to be in stable condition and have characteristics believed to make them resilient to the effects of increased small to moderate peak flow events. One of those subwatersheds, Unknown Gulch, had a considerable amount of woody debris, frequent pools, and stable banks. Fish surveys in 2007 found an absence of any salmonid in Unknown Gulch, while surveys in 2012 found both westslope cutthroat trout and brook trout, indicating that a recent culvert barrier removal by Shoshone County likely allowed the immigration of both species into the watershed, and likely resulting in an overall beneficial effect to westslope cutthroat trout.

The other tributary, Prospect Gulch, contained more frequent pool-riffle and plane-bed areas susceptible to more frequent high flow events (Montgomery and Buffington 1997; PF Doc. AQ-R16, Grant et al 2008; PF Doc. AQ-R08), and appeared to be generally stable with moderate amounts of woody debris. It did, however, exhibit several localized areas of bank instability and sediment deposition not consistent with similar types of streams, and is likely more related to the adjacent 456UY road and both recent and historic minerals exploration. Fisheries surveys in 2007 found only westslope cutthroat trout in Prospect Gulch, which should not be affected by small increases in peak flows that would typically occur during winter or early spring since they spawn in late spring to early summer.

3.4.4.5. Alternative 3

Briefly, Alternative 3 includes over 1,600 acres of vegetation harvest with 5 types of harvest treatments. Nearly the same length of road would be reconstructed and reconditioned as in Alternative 2. Over 100 miles of road would also be decommissioned to improve water quality conditions.

Of the over 100 miles of road to be decommissioned, 58 miles would be through administrative actions that do not require mechanical treatments. An additional 36 miles would require mechanical treatments to improve drainage and reduce both short and long term effects on water quality. Mechanical treatments would be similar to those proposed in Alternative 2. Twelve culverts are also proposed to be replaced to improve passage of native fish to upstream habitats (Figure 47), and include four additional culverts on Road 456. Similar to Alternative 2, most of these culverts are large enough to accommodate relatively large flow events, but their existing design may actually be detrimental to downstream conditions and cause excessive streambed and bank erosion immediately downstream of the culvert during high flows, and they do not fully allow upstream fisheries migration during critical times of the year. Their replacement would be similar to those in Alternative 2.

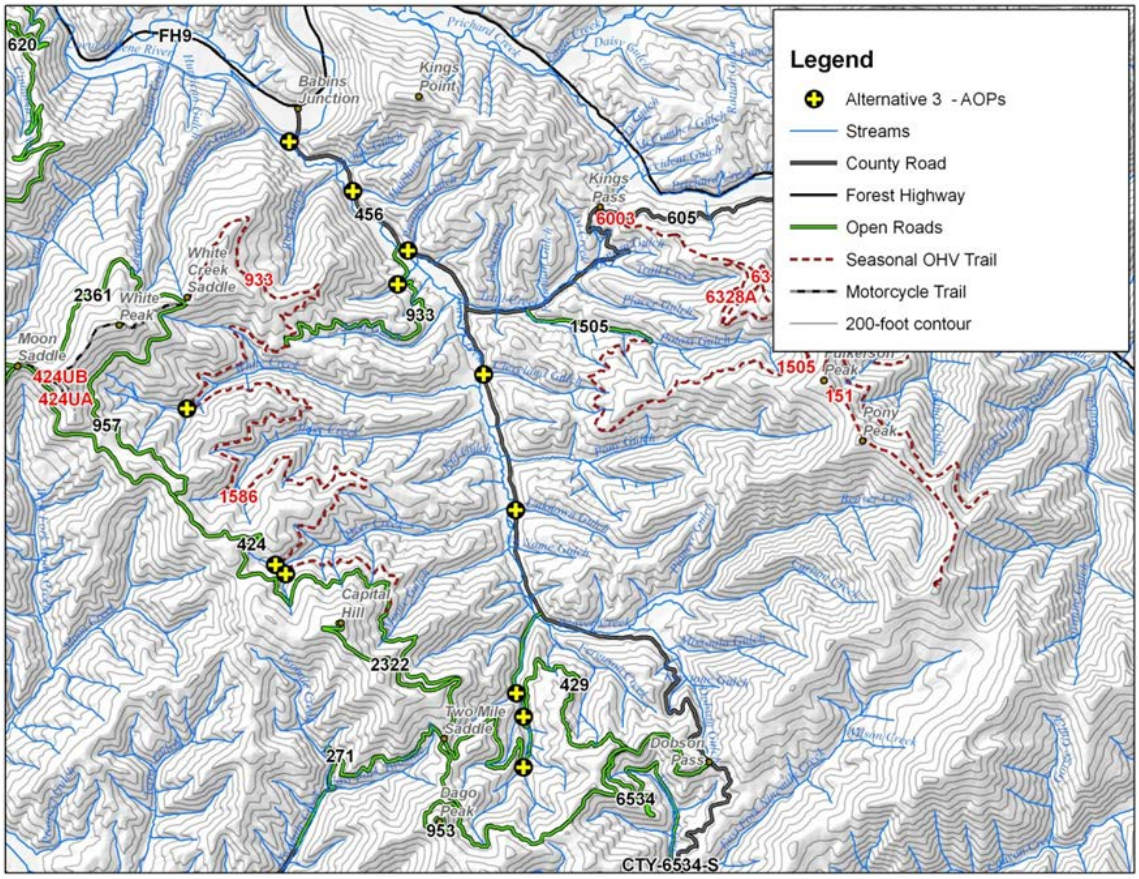


Figure 47. Map showing the location of aquatic organism passage (AOP) culverts proposed for replacement under Alternative 3.

3.4.4.5.1. Direct and Indirect Effects

Aquatic organism passage would also improve in Alternative 3 because 4 additional culverts are proposed for replacement. All of the additional culverts in Alternative 3 are located on streams near their respective confluences with Beaver Creek and improving passage at those locations would improve access by fish to entire subwatersheds. These additional replacements would also improve access to an additional 5 miles of habitat.

Similar to Alternative 2, these four additional culverts could also introduce non-native species to areas with only native species. However, like Alternative 2, allowing migration of all fish into these streams would have a beneficial effect on both population and species resilience.

Alternative 3 would also not likely result in observable changes in water yield, and only small to moderate increases in peak flow in two subwatersheds as a result of the proposed actions. Less harvest would occur in many subwatersheds and increased road decommissioning would ultimately result in more canopy and less effect on runoff. Effectively harvested area in Unknown Gulch would decrease to just under 15% as a result of Alternative 3, and because of its stable condition would be able to accommodate any observable changes in small-scale peak flow event. Forest harvest would not decrease in Prospect Gulch under Alternative 3, however most roads in the upper watershed would be decommissioned and be likely to attenuate any increases in peak flow.

Water quality would improve to a greater degree than in Alternative 2 as over 75% of the roads connected to streams and known to be delivering sediment would be removed through reconstruction or decommissioning. Known sediment delivery to streams could be nearly entirely removed in 7 of the 13 subwatersheds as a result of the road reconstruction and decommissioning actions in Alternative 3. In Pony Gulch, Alternative 2 would not reduce the length of any road known to deliver sediment to streams, while Alternative 3 would reduce the length of road known to deliver sediment to streams by 100%.

As in Alternative 2, existing stream and water quality conditions are not expected to change as a result of the forest harvest, and would likely improve as a result of road improvements and decommissioning.

3.4.4.6. Cumulative Effects

Effects from past, ongoing, and reasonably foreseeable activities including historic harvest, regulated and unregulated mining, historic mining and mine reclamation, private land development that includes loss of riparian vegetation and streambank modifications, firewood cutting in riparian areas, illegal use of roads and trails, and the combined effects from existing roads. It is widely accepted that large scale historic mining has resulted in impaired water quality in Beaver Creek, and in some cases reduced fisheries abundance. Historic timber harvest, including riparian harvest, has occurred in several subwatersheds and may have a localized effect on stream conditions. In Prospect Gulch, for instance, over 30% of its watershed area was harvested in the early 1990's, and combined with historic and recent mining activity, is likely having a localized and observable effect on stream conditions, though it is difficult to determine if any one activity is responsible for those observed conditions. Ongoing minerals activity also continues to affect stream conditions in Trail Creek, Potosi Gulch, and Pony Gulch.

3.4.4.7. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan

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.

Alternative 1: Culverts would not be replaced under the proposed action. Alternative 2: Culverts that are replaced would be designed and constructed to pass fish.

Alternative 3: Culverts that are replaced would be designed and constructed to pass fish.

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.

Alternative 1: Habitat improvement projects would not be implemented.

Alternative 2: INFS buffers will be applied throughout the project area, where applicable and will be coordinated with other resource activities. Replacement of stream crossings will provide access to additional habitat currently unavailable under Alternative 1.

Alternative 3: INFS buffers will be applied throughout the project area, where applicable and will be coordinated with other resource activities. Replacement of stream crossings will provide access to additional habitat currently unavailable under Alternative 1.

Fish Standard 6: Coordinate management activities with water resource concerns as described in MA 16, Appendix I, and Appendix O.

All alternatives would coordinate management activities with water resource concerns for any project occurring in Beaver Creek. Alternative 2 and 3 would specifically comply with this Forest Plan standard through the implementation of INFS standards, described below.

Inland Native Fish Strategy (INFS)

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 (USDA Forest Service 2005; PF Doc. AQ-R24). The amendment was implemented because the fry emergence objectives, standards and monitoring requirements that were in the IPNF Forest Plan did not contribute as well as INFS (1995; PF Doc. CR-003) objectives, standards, guidelines, and monitoring direction towards 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 of fry emergence success were accurate or precise.

There would be no actions proposed as part of Alternative 1, and therefore INFS standards and guidelines would not be implemented.

The following Standards apply regarding actions proposed in Alternative 2 and 3:

TM-1: Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas, except as described below.

- Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting in RHCA's only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other RMO's and where adverse effects can be avoided to inland native fish.
- Apply silvicultural practices for RHCA's to acquire desired vegetation characteristics where needed to attain RMO's. Apply silvicultural practices in a manner that does not retard attainment of RMO's and that avoids adverse effects on inland native fish.

Consistent with the INFS, no-harvest buffers are prescribed for all streams in the project area for each alternative.

RF-2: For each existing or planned road, meet the RMO's and avoid adverse effects to inland native fish by:

Initiating development and implementation of a Road Management Plan or Transportation Management Plan. At a minimum, address the following items in the plan:

- Road design criteria, elements, and standards that govern construction and reconstruction
- Road management objectives for each road.
- Criteria that govern road operation, maintenance, and management.
- Requirements for pre-, during-, and post-storm inspections and maintenance.

- Regulation of traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives.
- Implementation and effectiveness monitoring plans for road stability, drainage, and erosion control.
- Mitigation plans for road failures.
- Avoiding sediment delivery to streams from the road surface.
- Avoiding disruption of natural hydrologic flow paths
- Avoiding sidecasting of soils or snow.

Road design criteria, as well as operation and maintenance, are described in standard Forest Service handbook direction and apply to both alternatives. Road management objectives are described in the Transportation Analysis Process (TAPS). Sediment delivery from roads to streams, and the disruption of natural hydrologic flow paths will be addressed as part of the reconstruction and decommissioning actions proposed by the GRAIP analysis (see the Hydrology section 3.3, for more information). Sidecasting of material is addressed by standard best management practices.

RF-3: Determine the influence of each road on the RMO's. Meet RMO's and avoid effects to inland native fish by:

- Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, or that have been shown to be less effective than designed for controlling sediment delivery, or that retard attainment of RMO's.
- Prioritizing reconstruction based on the current and potential damage to inland native fish and their priority watersheds, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of RHCA's.
- Closing and stabilizing or obliterating, and stabilizing roads not needed for future management activities. Prioritize these action based on current and potential damage to inland native fish in priority watersheds, and the ecological value of the riparian resources affected.

The influence of each road on RMO's is described in the Hydrology section (3.3). Most roads known to be affecting RMO's and potentially damaging to inland native fish are planned to be reconstructed or decommissioned in both alternatives.

RF-4: Construct new, and improve existing, culverts, bridges, and other stream crossings to accommodate a 100 year flood, including associated bedload and debris, where those improvements would/do pose a substantial risk to riparian conditions. Substantial risk improvements include those that do not meet design and operation maintenance criteria, or that have been shown to be less effective than designed for controlling erosion, or that retard attainment of RMO's, or that do not protect priority watersheds from increased sedimentation. Base priority for upgrading on risks in priority watersheds and the ecological value of the riparian resources affected. Construct and maintain crossings to prevent diversion of stremflow out of the channel and down the road in the event of crossing failure.

Only one known stream crossing culvert that currently affects drivability is proposed to be reconstructed, as are most of the culverts known to impede fish passage. Most headwater stream culverts known to be undersized to accommodate a 100-year flow event, or otherwise are of a higher risk for failure, are not planned for replacement as part of Alternative 2 or 3. The culverts

proposed to restore fish passage will be designed and constructed to accommodate a 100-year flow event.

RF-5: Provide and maintain fish passage at all road crossings of existing and potential fish bearing streams.

Eight culverts are proposed to be replaced to provide fish passage in Alternative 2, with 12 culverts proposed for replacement under Alternative 3. Alternative 2 accounts for all of the culverts on known and potential fish streams in Beaver Creek that may currently impede fish passage on entirely Forest Service-maintained roads. Alternative 3 includes culverts on Road 456, which is currently maintained by Shoshone County under agreement with the Forest Service.

FM-1: Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of RMO's, and to minimize disturbance of riparian ground cover and vegetation.

Fuel treatments, including prescribed fires, as well as fire suppression techniques will follow all relevant best management practices. Fuel treatments are not planned in Riparian Habitat Conservation Areas, though prescribed fires may be allowed into Riparian Habitat Conservation Areas on a limited basis. Prescribed fires shall not be ignited within Riparian Habitat Conservation Areas, but may move into those areas occasionally. Typically, prescribed fires in Alternative 2 or 3 will occur away from streams and riparian areas.

FM-4: Design prescribed burn projects and prescriptions to contribute to the attainment of the RMO's.

Prescribed burning will follow all applicable best management practices for burning, and is not planned to occur in Riparian Habitat Conservation Areas.

WR-1 Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and contributes to the attainment of RMO's.

Watershed restoration projects that include road reconstruction and decommissioning, and fish passage improvements, will be done in a way that promotes long term integrity of ecosystems by reconstruction roads to be more durable, improve drainage and remove sediment contributions from streams, and improve the passage of fish through culverts to promote the genetic integrity of native species.

National Forest Management Act (NFMA)

The National Forest Management Act (NFMA) requires that the Forest Service protect streams, lakes, 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 (1976, Title16 USC §1604 NFMA §6 (g)(3)(e)(i) and (iii)). The Forest Plan, Inland Native Fish Strategy, and best management practices provide several forms of protection from timber harvest or road construction activities for stream resources that would be applied to all alternatives. Furthermore, NFMA requires the development of a Forest Plan that contains standard protection for stream resources where timber harvest is considered.

Endangered Species Act (ESA)

A biological assessment will be completed upon the signing of a decision notice. However, there would be no effect to bull trout regardless of the chosen alternative because Beaver Creek, nor its

tributaries, are considered to be occupied by bull trout, or critical to their recovery. Proposed actions in both alternatives would also not affect habitat in the Coeur d'Alene River, the nearest stream with designated critical habitat, because changes in water yield or peak flows are not expected to be observable in Beaver Creek, and because sediment contributions from roads are expected to decrease as a result of both alternatives.

Clean Water Act

Under authority of the Clean Water Act, the Environmental Protection Agency (EPA) and the States must develop plans and objectives that will not further harm, and eventually restore, streams that do not meet beneficial uses of the State. The Forest Service has developed Best Management Practices as outlined in the Soil and Water Conservation Handbook (Forest Service Manual 2509.22), to meet the intent of the water quality standards of the State of Idaho.

Alternative 1 does not include any activities that would lead to an inconsistency with the Clean Water Act, or the Idaho water quality standards. However, existing roads in Beaver Creek would not be improved and in some cases would continue to contribute sediment to streams in the Beaver Creek watershed until substantial drainage improvements are made. Therefore roads in Beaver Creek would continue to contribute to the

The proposed actions in Alternative 2 and 3 associated with road reconstruction and decommissioning would substantially reduce sediment inputs by roads to Beaver Creek, and potentially begin to reduce sediment loads associated with TMDL requirements. It does not appear as though timber harvest would generate any additional sediment or other pollutants to Beaver Creek.

Recreational Fishing (Executive Order 12962, as amended by Executive Order 13474)

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 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 proposed action will not result in any obstruction to recreational fishing nor will it limit the quantity, function, or productivity of fisheries within the project area. The proposed activities in Alternative 2 and 3 would most likely improve recreational fishing opportunities in Beaver Creek and the Coeur d'Alene River drainage by improving water quality and fisheries access to upstream habitats.

3.4.5. Effects Summary

Effects of replacing up to 12 culverts to improve aquatic organism passage would result in improved resilience of westslope cutthroat trout, but could lead to increased competition or hybridization among native and non-native species, though those effects are expected to be small. Road reconstruction and decommissioning is expected to decrease both the length of road known to influence streams, and the amount of sediment delivered to streams, by between 65 and 75%, resulting in improved water quality.

Timber harvest is expected to result in effectively harvested areas of up to nearly 30% in one small tributary, and between 4 and 20% in remaining subwatersheds. Water yield is not expected to increase by any observable amount. Increased peak flows that might be observable in up to two

small tributaries to Beaver Creek are not expected to substantially alter stream conditions or affect fisheries composition or abundance.

Also refer to Table 11 in Chapter 2 for effects summary information for fisheries.

3.4.6. Fisheries References

Abbott, A.M. 2000. Land management and flood effects on the distribution and abundance of cutthroat trout in the Coeur d' Alene River Basin, Idaho. Master's Thesis. University of Idaho, Moscow. (PF Doc. AQ-R31)

Clarkin, K., A. Conner, M. Furniss, B. Gubernick, M. Love, K. Moynan, and S.W. Musser. 2003. National Inventory and Assessment Procedure: For Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings. USFS San Dimas Technology and Development Center. (PF Doc. AQ-R02)

Dunnigan, J.L., 1997. The spatial distribution of westslope cutthroat trout in the Coeur d' Alene River Basin. Master's Thesis. University of Idaho, Moscow. (PF Doc. AQ-R04)

Fausch, K.D., B.E. Rieman, M.K. Young, J.B. Dunham. 2006. Strategies for conserving native salmonid populations at risk from nonnative fish invasions: tradeoffs in using barriers to upstream movement. Gen. Tech. Rep. RMRS-GTR-174. Fort Collins, CO. USDA, Forest Service, RMRS. 44 p. (PF Doc. AQ-R05)

Frest, T.J., and E.J. Johannes. 1997. Land snail survey of the lower Salmon River drainage, Idaho. Idaho Bureau of Land Management Technical Bulletin 97-18. 142 pp. + appendices. (PF Doc. AQ-R07)

Frest, T.J. 1999. A Review of the land and freshwater Mollusks of Idaho. Final report to the Idaho Conservation Data Center, Idaho Department of Fish and Game, 600 South. Walnut, P.O. Species Profile: Western Pearlshell (Margaritifera falcata) 18 Box 25, Boise, Idaho 83707. 281 pp. plus appendices. (PF Doc. AQ-R06)

Grant, Gordon E.; Lewis, Sarah L.; Swanson, Fredrick J.; Cissel, John H.; McDonnell, Jeffrey J. 2008. Effects of forest practices on peak flows and consequent channel response: a state-of-the-science report for western Oregon and Washington. Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p. (PF Doc. AQ-R08).

Hubbart, J.A., T.E. Link, J.A. Gravelle, and W.J. Elliot. 2007. Timber harvest impacts on water yield in the continental/maritime hydroclimatic region or the United States. Forest Science 53(2): 169-180. (PF Doc. AQ-R09)

Idaho Department of Environmental Quality. 2001. Subbasin Total Maximum Daily Loads of the North Fork Coeur d'Alene River (17010301). (PF Doc. AQ-R10)

McFarland, A., A.M. Prussian, K. Stromberg. 2013. Beaver Creek Watershed Assessment (in prep). (PF Doc. AQ-R15).

Montomery, D.R., and J.M. Buffington. 1997. Channel-reach morphology in mountain drainage basins. Geological Society of America Bulletin. 109(5):596-611. (PF Doc. AQ-R16)

Neville, H., J. Dunham, A. Rosenberger, J. Umek, B. Nelson. 2009. Influences of wildfire, habitat size, and connectivity on trout in headwater streams revealed by patterns of genetic diversity. Trans. Am. Fish. Soc. 138:1314-1327. (PF Doc. AQ-R19)

Rieman, B.E., P.F. Hessburg, C. Luce, and M.R. Dare. 2010. Wildfire and management of forests and native fishes: conflict or opportunity for convergent solutions? Bioscience 60(6) 460-468. (PF Doc. AQ-R23)

Rieman, B. and K. Apperson. 1989. Status and analysis of salmonid fisheries: westslope cutthroat trout synopsis and analysis of fishery information. Job performance representative. Idaho Department of Fish and Game. Project F-73-R-11, Subproject No. 11 Job No. 1. Boise, Idaho. 113 pp. (PF Doc. AQ-R22)

Roper, B.B., J.M. Buffington, E. Archer, C. Moyer, and M. Ward. 2008. The role of observer variation in determining Rosgen stream types in northeastern Oregon mountain streams. Journal of the American Water Resources Association. 44(2):417-427.

Shepard, B.B., B.E. May, W. Urie, C. Corsi, K. McDonald, R. Snyder, T. Unterwegner, J. Uehara and K. Walker. 2003. Status of Westslope Cutthroat trout (Oncorhynchus clarki lewisi) in the United States: 2002, 94 pgs. (PF Doc. AQ-R24)

Stagliano, D.M., G.M. Stephens, and W.R. Bosworth. 2007. Aquatic invertebrate species of concern on USFS northern region lands. Report to USDA Forest Service, Northern Region. Region. Montana Natural Heritage Program, Helena, Montana and Idaho Conservation Data Center, Boise, Idaho. 95 pp, plus appendices. (PF Doc. AQ-R17)

Overton, C.K., S.P. Wollrab, B.C. Roberts, and M.A. Radko. 1997. R1/R4 Fish and Fish Habitat Standard Inventory Procedures Handbook. General Technical Report INT-GTR-346. USDA Forest Service Intermountain Research Station. Ogden, UT. (PF Doc. AQ-R20).

USDA Forest Service. 1987. Forest Plan, Idaho Panhandle National Forests, Northern Region. Coeur d'Alene, ID. (PF Doc. CR-R001).

USDA Forest Service. 1995. Inland Native Fish Strategy Environmental Assessment: Decision Notice and Finding of No Significant Impact. Idaho Panhandle National Forest, Coeur d'Alene, ID. (PF Doc. CR-R003).

USDA Natural Resource Conservation Service. 1998. Stream Visual Assessment Protocol (SVAP). National Water and Climate Center, Technical Note 99-1. 36 p.

USDI Fish and Wildlife Service. 2009. Update of Forest- and District-wide species list, Endangered, Threatened, Candidate and Species of Concern within the Idaho Panhandle National Forests. SP# 1-9-03-SP-002. October 2, 2002. Spokane, Washington. (PF Doc. AQ-R38)

Tonina, D., C.H. Luce, B. Rieman, J.M. Buffington, P. Goodwin, S.R. Clayton, S.M. Ali, J.J. Barry, and C. Berenbrock. 2008. Hydrological response to timber harvest in northern Idaho: implications for channel scour and persistence of salmonids. Hydrological Processes 22(7):3223-3235. (PF Doc. AQ-R25)

Whitacre, H.W., B.B. Roper, J.L. Kershner, 2007. A Comparison of protocols and observer precision for measuring physical stream attributes. Journal of the American Water Resources Association. 43(4):923-937. (PF Doc. AQ-R36)

3.5. Soils

3.5.1. 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. The purpose of this analysis is to investigate and disclose the potential of effects of the proposed action on the soil resource.

3.5.1.1. Overview of Issues Addressed

The proposed activities (primarily ground-based yarding systems) associated with the Beaver Creek project may result in detrimental disturbance and, when added to the existing detrimental disturbance, may exceed either the Regional or Forest Plan Standards for soil quality.

Protecting soil quality under forest management is important for long-term productivity. All soils issues revolve around meeting Regional soil quality standards (USDA Forest Service, 1999c; PF Doc. Soil-R-58) and Forest Plan Soil Quality Standards (USDA Forest Service, 1987; PF Doc. CR-002). These specify a maximum 15% (Regional Standard) and 20% (Forest Plan Standard) allowable detrimental disturbance for all treatment units having ground-disturbing activities. This includes landings, skid trails, harvest units, and roads. Skyline systems generally have low disturbance and helicopter systems have even less disturbance, since there is no machine ground contact. Helicopter landings however, are counted in evaluating detrimental disturbance.

The primary issue lies generally with ground-based machinery, such as tractors, skidders, clippers, feller/bunchers and harvesters. Previous harvest in some of the proposed activity areas has resulted in detrimental disturbance that may influence cumulative effects, that becomes a concern if it is over the 15% Regional Standard or the 20% Forest Plan Standard. Both standards acknowledge the effects of previous harvest and require that proposed management meet the existing standards.

In areas where less than 15 % detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 %. In areas where more than 15% 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.

3.5.1.2. Issue Indicator

The issue indicator is whether or not the proposed activities, including the Design Features described in Appendix E, will meet the Regional and Forest Plan Standards for detrimental disturbances within each of the activity areas.

3.5.2. Affected Environment and Existing Conditions

3.5.2.1. Existing Conditions

3.5.2.1.1. Geology and Soils

The resource area encompasses numerous large tributaries that flow directly into Beaver Creek and then into the North Fork of the Coeur d'Alene River. These tributaries are situated between a series of northerly subsidiary ridges descending from an accordant main ridge with well-incised dry to wet drainages. Drainages are moderate to steeply sided. Valley fills in lower to mid Beaver Creek and lowest portions of some of the major tributaries are Quaternary age alluvial sediment (Figure 48). The bedrock of the major tributaries is comprised of Precambrian Belt Supergroup metasedimentary geology of the Middle Proterozoic period that was uplifted as part of an early delta depositional feature. This mature landscape had major periods of aggradations, which have left the steep V-shaped valleys and eroded the pre-existing weathered soils, thus new parent material became partially weathered to non-weathered and evolved into the present day geomorphology.

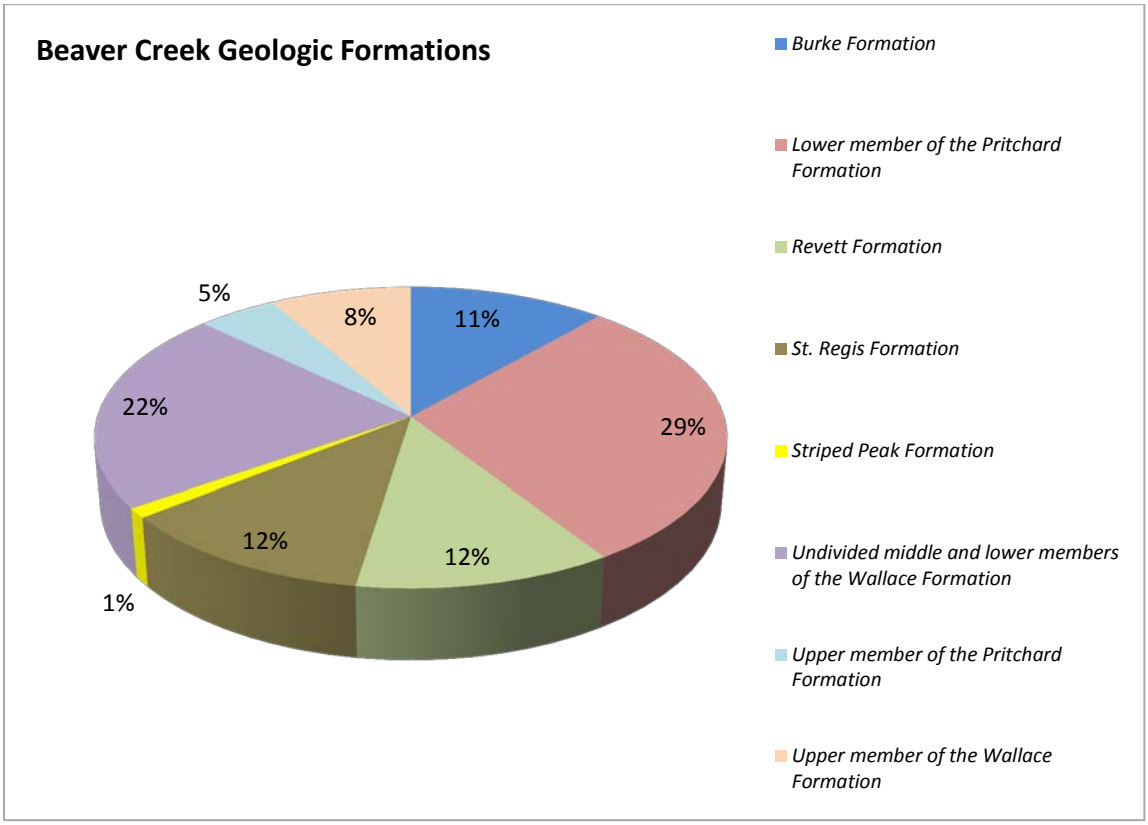


Figure 48. Geologic Composition of the Beaver Creek Resource Area.

Ridge tops in the resource area are generally broad with shallow soils that can be skeletal (rocky) in nature and exhibit a volcanic ash surface layer (6 to 12 inches deep). The deepest soils are located on the side slopes, in the draws and basin depression area where the ash-capped soils can attain a depth of 40+ inches. The ash-cap's soil texture is a silt loam with rock fragments found throughout the profile, averaging 10 to 45%. Subsoil and substratums are developing in fractured parent rock (Belt metasediments) and have sandy to gravelly loam textures. Rock fragments increase with depth and can average 40 to 60%. As the parent rock fractures, the soil has

migrated down through the parent rock's interstices, which facilitates water percolation. Outcrops of parent rock are usually situated as isolated features along the mid to upper slopes in conjunction with subsidiary benches having southerly aspects.

Throughout the resource area, the soil has developed in a mosaic pattern as dictated by topographic relief, vegetation, and aspect. An elevation difference of just over 3,900 feet is attained between the lowlands along the Coeur d'Alene River and the Idaho-Montana divide and consists of a mostly steep sided and weak to moderately incised topography with tributary stream courses. Under the predominant timber stands a silt loam textured, ash capped soil has developed. The volcanic material accumulated from several of the Cascade volcanic eruptions with most of the ash originating from Mt. Mazama (Crater Lake) in Oregon about 7,700 years ago (Figure 49). The uppermost part of the ash is usually enriched with organic matter that is incorporated into this part of the soil and has a high water- and nutrient-holding capacity, both of which are important for soil productivity, while the subsoil's are not as fertile.

On some of the open slopes with scattered trees and light ground cover, the soil is ash influenced but not capped. In these locations, the soil texture is more of a sandy to gravelly loam and skeletal because of higher rock fragment content due to the close proximity of bedrock.

Figure 49. Satellite photo of Mt. Mazama, now known as Crater Lake, in Oregon.

Along the broader valley bottoms, the upper riverine terraces exhibit moderately deep ash capped silt loam soils. On the lower alluvial flats that are influenced by fluvial events, the soil can be shallow and not well developed. These areas are not ash capped but have silt to coarse sandy loam textures. On some lower benches, an aggraded river cobble cap can be encountered that represent abandoned stream and river courses. Here the soil can be moderately thick with a loam or clay loam texture and is ash influenced.

Soils in the resource area are generally weakly weathered and have moderate to moderately high timber production potential except in portions of lower Beaver Creek which is comprised of the Revett supergroup and small intrusions of Striped Peak formations which are rated poor for timber production. The ash cap soils are of a silt loam texture and are light to moderate brown in color with a rock fragment content of 10 to 35 percent and depths of 6 to 14 inches. On the

poorly vegetated slopes, usually on south aspects and steep ridge crests, soils are shallow (3 to 6 inches deep) and skeletal because of the high rock fragment content (30 to 60 percent) and are ash influenced with a brown to light brown color and silt loam to sandy loam texture. On the lower gradient drainages where the ash capped soils have pooled, their depths are moderately deep (12 to 18 inches).

The subsoil is more influenced by the underlying bedrock with a light brown color and sandy loam texture. Rock fragments in the subsoil can range between 30 and 65 percent. On a few subsidiary benches where subsoil is exposed in a road cut, its depth can be greater than 2 feet. Bedrock outcroppings are found close to some steep ridge crests, along steeply incised drainages. These are usually indicative of drier habitats, especially on the more southerly aspects.

3.5.2.1.2. Soil Resources

Four criteria were used to assess existing conditions for soil resources:

- Landtypes and hazard ratings of the Idaho Panhandle National Forests;
- Soils and productivity;
- Wildfire and severely burned soils;
- Existing site conditions and past activities.

Landtypes and Hazard Ratings

Under Alternative two and three there are sixteen landtypes that have been identified in commercial harvest units and twenty-two landtypes in the burn only fuel treatments. Detailed descriptions and characteristics of each are located in the soils section of the project file (PF Doc. Soil-1). Hazard ratings have also been compiled and are broken into subcategories of mass failure, sediment delivery potential, productivity, surface erosion, subsurface erosion, and landtype sensitivity (PF Doc. Soil-2-4, and 9-15); each is rated as low, moderate, or high for a particular landtype (Table 61 through Table 65).

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. Within proposed treatment areas all but 6 acres of soils have a low to moderate mass failure potential for both Alternatives (Table 61; PF Doc. Soil-2-4 and 10). Based on the IPNF soils survey (1999, PF Doc. Soil-1), none of the proposed harvest treatment or road construction are located in potential high mass failure areas. The six acres of high mass failure within Burn Unit F-13 is located high on a ridge-top on gentle slopes, and is not expected to produce any movement of soil material.

Removal of forest canopy and cover from either clearcutting or wildland fire increases landslide occurrence (Megahan and others 1978, PF Doc. Soil-R-38; and Gray and Megahan 1981, PF Doc. Soil-R-22). This is primarily due to root decay, soil disturbance, increased snow accumulation, altered melting rates, and soil water increases from reduced interception and transpiration. Megahan and others (1978, PF Doc. Soil-R-38) found that landslide occurrence increased only slightly when overstory canopy was reduced from 100% to 11%, but increased dramatically when canopy closure went below 11%. They also found that crown cover from shrubs affected landslide occurrence after 80% crown removal and indicated that landslide occurrence is more sensitive to shrub removal than tree crown removal.

Mass Failure Potential is the relative probability of down-slope movement of masses of soil material. Besides natural failure, landslides or slumping can be triggered by a number of mechanisms including harvest activities, severe burning, and related road building.

Table 60. Mass Failure Potential for harvest and burn-only areas under Alternatives 2 and 3.

Activity Area/Rating	Alternative 2 Treatment Acres	Alternative 3 Treatment Acres	Alternative 2 Percent of total treatment acres	Alternative 3 Percent of total treatment acres
Harvest areas				
Low potential	1,355	1,118	69	67
Moderate potential	613	542	31	33
High potential	0	0	0	0
Burn-only areas				
Low potential	704	704	34	34
Moderate potential	1,385	1,385	66	66
High potential	6	6	<1	<1

The landtypes that exhibit moderate to high sediment potential are situated at low- to mid-elevation on mid- to lower side slopes and adjacent to incised drainages. Because drainage courses and riparian zones are buffered and will not be entered or logged, the potential for increased sediment delivery from the moderately to high rated landtype units is minimal.

There are approximately 307 acres under Alternative 2 and 286 acres under Alternative 3 on landtypes in the harvest treatment areas that are rated as having a high sediment delivery potential to stream channels (Table 61; PF Doc. Soil-2, Soil-3 and Soil-11). All of the activity units are skyline yarding and located on Belt geology. As part of project planning, all stream bottoms have an INFS-designated buffer zone that would not be entered by any proposed harvest activities. With established buffer zones, the potential sediment increases to streams from fuel or timber management work is minimal.

The acres of fuel treatment that fall on landtypes rated high for sediment delivery (Table 61; PF Doc. Soil-4 and Soil-11) would all have buffers that are outside of the ignition zones. The proposed fuel treatment is to burn in the less densely vegetated areas outside of the buffers. If fire enters the buffers, increased fuel moisture would slow or stop spread and reduce the potential of sediment reaching any live water.

Sediment Delivery Potential is a rating of the probability of eroded soil reaching a stream channel. By using slope gradient, slope shape, and distance to channel, a rating of low, moderate, or high potential is determined.

Table 61. Sediment Delivery Potential for harvest and burn-only areas under Alternatives 2 and 3.

Activity Area/Rating	Alt. 2 (acres)	Alt. 3 (acres)	Alt. 2 (percent)	Alt. 3 (percent)
Harvest areas				
Low potential	1,355	1,118	69	67
Moderate potential	306	256	15	15
High potential	307	286	16	18
Burn-only areas				
Low potential	689	689	33	33
Moderate potential	813	813	39	39
High potential	593	593	28	28

Within the proposed treatment area under both alternatives, soil productivity is primarily moderate to moderately high (Table 62). A higher percentage of lower productivity sites (Table 62, PF Doc.Soil-4 and Soil-12) are found in both Alternatives in the burn only areas, this is largely due to the higher percentage of dry sites that are being treated. Soil productivity can be tied to an important duff and litter layer that protects soil, provides nutrients, reduces erosion potential, and maintains soil moisture. Litter prevents the breakdown of soil aggregates and reduces the velocity of any overland flow, thereby reducing the erosion potential (Beschta and others 2004, PF Doc. Soil-R-5). On some drier sites, however, fires may consume at a severity level that removes all of the protective duff and litter layers, even under managed fire conditions.

Soil Productivity Potential is a rating of the relative capacity or ability of a soil to produce and sustain biomass. Low productivity areas a generally associated with shallow, rocky steep slopes on southerly aspects.

Table 62. Soil productivity potential for harvest and burn-only areas under Alternatives 2 and 3.

Activity Area/Rating	Alternative 2 activity acres	Alternative 3 activity acres	Alternative 2 % total activity acres	Alternative 3 % total activity acres
Harvest areas				
Low-moderate potential	170	151	9	9
Moderate potential	1,258	1,037	64	62
Moderate-high potential	540	472	27	29
High potential	0	0	0	0
Burn-only areas				
Low-moderate potential	1,196	1,196	57	57
Moderate potential	704	704	34	34
Moderate-high potential	195	704	9	9
High potential	0	0	0	0

Within proposed harvest and fuel treatment areas under both alternatives, soils have a low to moderate surface and subsurface erosion potential (Table 63 and Table 64; PF Doc. Soil- 2 through Soil-4, Soil-13 and Soil-14). All new system and temporary roads are proposed on landtypes considered to have low to moderate surface and subsurface erosion potential (PF Doc. Soil-22).

Roads are currently the primary source of erosion and sediment production in the project area. The dominant processes in roaded portions are surface erosion from bare soil areas of roads, including the cutslope, fillslope, and travelway. Revegetation of cutslopes and fillslopes is often difficult due to lack of soil moisture, organic material, low productivity potential, and desiccation of seeds and seedlings, especially on south-facing slopes. On moist slopes, revegetation efforts are more successful since growing conditions are more favorable.

Road erosion and sediment yield usually decline after construction (Jones 2000, PF Doc. Soil-R-30; Switalski and others 2004, PF Doc. Soil-R-56) but can provide a chronic, long-term source of sediment to streams within the project area. Periodic large pulses of erosion may occur during intense water yield and overland flow events in interaction with road drainage systems.

***Surface* Erosion Potential** is a rating of the relative susceptibility of exposed soils to sheet and rill erosion.

***Subsurface* Erosion Potential** is a rating of the relative susceptibility of exposed sheet and rill erosion of the subsoils exposed during road construction.

Table 63. Surface Erosion Potential for harvest and burn-only areas under Alternatives 2 and 3.

Activity Area/Rating	Alternative 2 activity acres	Alternative 3 activity acres	Alternative 2 % total activity acres	Alternative 3 % total activity acres
Harvest areas				
Low potential	1,968	1,660	100	100
Moderate potential	0	0	0	0
High potential	0	0	0	0
Burn-only areas				
Low potential	2,095	2,095	100	100
Moderate potential	0	0	0	0
High potential	0	0	0	0

Table 64. Subsurface Erosion Potential for harvest and burn-only areas under Alternatives 2 and 3.

Activity Area/Rating	Alternative 2 activity acres	Alternative 3 activity acres	Alternative 2 % total activity acres	Alternative 3 % total activity acres
Harvest areas				
Low potential	1,559	1,285	79	77
Moderate potential	409	375	21	23
High potential	0	0	0	0
Burn-only areas				
Low potential	1,513	1,513	72	72
Moderate potential	582	582	28	28
High potential	0	0	0	0

Within the proposed harvest treatment areas, the majority of soils are rated low and moderate for landtype sensitivity potential (Table 65; PF Doc. Soil-2, Soil-3 and Soil-15). The 307 acres under Alternative 2 and 286 acres under Alternative 3 that are rated high for landtype sensitivity are all within skyline units that past monitoring has shown causes low ground disturbance. Roads are considered a potential source for sediment delivery, especially near streams, and are analyzed in greater detail in the Hydrology section (3.3).

Within the burn only activity areas under both Alternatives, 593 acres fall on landtypes with high sensitivity ratings (Table 65; PF Doc. Soil-4 and Soil-15). These activity areas have a lower risk of producing sediment due the lack of ground disturbing activities such as road construction or ground-based skidding and are usually found along the breaklands where ignition is uncommon.

Landtype Sensitivity is a rating that incorporates mass failure, surface erosion, sediment delivery potentials, and average slope gradient to determine a rating of low, moderate, or high sensitivity for landtypes.

Table 65. Landtype sensitivity for harvest and burn-only areas under Alternatives 2 and 3.

Activity Area/Rating	Alternative 2 Acres	Alternative 3 Acres	Alternative 2 Percent	Alternative 3 Percent
Harvest areas				
Low potential	1,355	1,118	69	67
Moderate potential	306	256	15	15
High potential	307	2860	16	18
Burn-only areas				
Low potential	689	689	33	33
Moderate potential	813	813	39	39
High potential	593	593	28	28

Soils and Productivity

The most productive part of the soil occurs near the surface at the contact between the forest litter and the mineral soil. This layer is frequently only a few inches thick but it contains most of the soil nitrogen, potassium, additional nutrients, and mycorrhizae that must be present for a site to be productive.

Underneath this organic horizon is volcanic ash that occurs as the surface layer of the mineral soil. The volcanic material accumulated from several Cascade volcano eruptions with most of the ash originating from Mt. Mazama (Crater Lake) in Oregon about 7,700 years ago (Figure 49). The top part of the ash is usually enriched with organic matter that is incorporated into this part of the soil. The ash has a high water- and nutrient-holding capacity, both of which are important for soil productivity, while the lower part of the volcanic ash contains less organic matter and is not as fertile. Below the volcanic ash, the subsoils and substratum tend to be medium to coarse textured and often contain a very high amount of rock fragments.

The generally young and poorly developed soils found in the Beaver Creek Resource Area can also experience long-term deficiencies when biologically essential elements, like organic matter and coarse woody debris, are not sufficiently available. Soil wood loss may alter processes of forest regeneration and growth, favoring species requiring lower soil moisture and lower nutrient levels, and provide for a greater potential for soil erosion. Potential loss or reduction of organic

matter can lead to a decline in several key soil and foliar nutrients (Powers 2005, PF Doc. Soil-R-80). Further effects also include a reduction 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.

Wildfire and Severely-burned Soils

Wildfire is a natural component in forests and commonly influences soils and watershed processes. However, as a result of fire suppression during the last century, natural fire regimes do not exist anywhere in northern Idaho today (Smith and Fisher 1997, PF Doc. Soil-R-54).

Depending on the intensity of the fire and the severity of its effects, wildfire can alter watershed soils by consuming the erosion-limiting litter layer at the top of soils and the binding organics within the soil (Ice 2003, PF Doc. Soil-R-27). Condensation of volatized organics on soil surfaces often result in water-repellant (hydrophobic) soil conditions (DeBano 1981, PF Doc. Soil-R-10, Doerr and others 2000, PF Doc. Soil-R-11, Dyrness 1976, PF Doc. Soil-R-13) that can contribute to overland flow and increased in-channel failures (Ice 2003, PF Doc. Soil-R-27).

Wildfires have occurred in the Beaver Creek Resource Area, with the most recent fire occurring in 1889 in which the majority of the watershed was burned. Over the years several lightning strikes have resulted in some small localized burns that have been suppressed, but otherwise no larger scale fires have occurred since then. These records of historic burns enforce the potential for future wildfire, especially with a general climate change suggesting a warming trend in the future (Mazza 2008, PF Doc. Soil-R-84).

Many of the nutrients present in surface organics and large woody debris can also be lost to the atmosphere through volatilization and removed from the site in fly-ash (DeBano 1991, PF Doc. Soil-R-9); (Amaranthus 1989, PF Doc. Soil-R-1). Burn ashes are usually grey or reddish in color, indicating that much of the carbon is oxidized by fire.

Depending on fire severity and plant characteristics, many plants will survive and re-initiate growth soon after a fire. However, the ability of surviving plants to reestablish, thrive, and reseed in subsequent years will be greatly affected by the presence of invasive plants and weeds (Goodwin and Sheley 2001, PF Doc Soil-R-81). Burned areas can contain high initial nutrient levels, exposed ground surfaces, and low shade with high light conditions which all directly favor colonization of new and remaining invasive plants. Survival coupled with disturbances produced by fire can cause rapid and expanded invasive plant growth. As a result, values such as soil productivity, wildlife habitat, watershed stability, and water quality often deteriorate.

When soils turn hydrophobic, water infiltration is reduced. Though hydrophobicity is a naturally occurring phenomenon that can be found on the mineral soil surface, it is greatly amplified by increased burn severity (Huffman and others 2001, PF Doc. Soil-R-25). The heat of a fire vaporizes hydrophobic compounds in the organic matter and moves them into the soil layer where they condense and form a water repellant coating on the soil particles. Soil hydrophobicity usually returns to pre-burn conditions in no more than six years (DeBano 1981, PF Doc. Soil-R-10; Dyrness 1976, PF Doc. Soil-R-13) and other studies have documented a much more rapid recovery of one to three years (Huffman and others 2001, PF Doc. Soil-R-25). However, before infiltration improves, increased overland runoff and sediment movement can be expected. No long-term impacts to soils from past fires have been associated with the Beaver Creek Resource Area.

Existing Site Conditions and Past Activities

In 2011 and 2012 the proposed units were field checked and data was recorded to estimate the degree of soil disturbance (PF Doc. Soil-17-19). Onsite assessment followed guidelines in the (Northern Region Soil Disturbance Monitoring Protocol 2009, PF Doc. Soil-R-75a and 75b) which included random shovel tests to determine soil characteristics, compaction, organic matter depth, and coarse-woody debris content of proposed activity areas (PF Doc. Soil-17). Transects were supplemented by visual observation during the walk-through (PF Doc. Soil-18).

Soils in the resource area are generally weakly weathered and have moderate to moderately high timber production potential. The ash cap soils are of a silt loam texture and are light reddish brown to brown in color with a rock fragment content of 5 to 30 percent and depths of 6 to 14 inches. On the poorly vegetated slopes, usually on south aspects and steep ridge crests, soils are shallow (3 to 6 inches deep) and skeletal because of the high rock fragment content (30 to 60 percent) and are ash influenced with a brown to light brown color and silt loam to sandy loam texture. On the lower gradient drainages where the ash capped soils have pooled, their depths are moderately deep (12 to 18 inches).

Site visits have been made to all proposed units in order to assess existing conditions and to field check the data records (PF Doc. Soil-17-19). Only 5 of the proposed activity areas have existing detrimental soil disturbance (Table 68 and Table 69). In two of the units mining exploration trails and test pits accounted for a small percentage of soil disturbances and in two units tractor yarding was the cause of the disturbance. The last activity area has had on harvest activities; however a single trail from an adjacent area passes through the upper portion to a haul road. In general, impacts were found to be localized and limited to small areas within each of the 5 units.

Some of the units have had road side salvages, logged between 2000 and 2008 with very little evidence of disturbance remaining. Some helicopter yarding salvages have occurred in Potosi Gulch in which no disturbance was evident. Only two of the proposed activity areas has had previous ground-based yarding in part of the area and is proposed to be skyline yarded with this proposal.

The distribution of coarse-woody debris is fairly uniform throughout the majority of the activity areas (PF Doc. Soil-8 and 23). The exceptions present themselves in areas of high mortality in the lodgepole pine in which coarse woody debris is abundant and may have to be reduced from a hazardous fuel standpoint. There are a few activity areas with naturally occurring low coarse woody debris levels that are below recommended levels and will be increased during harvest activities. Most of these sites are on drier south and west facing aspects with less canopy cover.

Organic matter content varies throughout the activity areas (PF Doc. Soil-6) but is generally optimum for most surveyed units, which are primarily found on north and east facing slopes. Localized variability and depths are natural and usually correlate to habitat type and aspect with excessive needle cast often decreasing the establishment of a more herbaceous ground cover, especially in moister habitat sites found in the Beaver Creek Resource Area.

3.5.3. Management Framework for Soils

The regulatory framework providing direction for protecting a site's inherent capacity to grow vegetation comes from the following principle sources:

- Organic Administration Act of 1897
- Bankhead-Jones Act of 1937
- Multiple Use-Sustained Yield Act of 1960
- National Forest Management Act of 1976 (NFMA)
- FSM 2500 – Chapter 2550 – Soil Management
- Forest Plan and Regional Soil Quality Standards (2554.03-R1 Suppl. 2500-99-1)

The Organic Administration Act of 1897 (16 U.S.C. 473-475) authorizes the Secretary of Agriculture to establish regulations to govern the occupancy and use of National Forests and "…to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States."

The Bankhead-Jones Act of 1937 authorizes and directs a program of land conservation and land utilization, in order thereby to correct maladjustments in land use, and thus assist in controlling soil erosion, preserving natural resources, mitigating floods, conserving surface and subsurface moisture, protecting the watersheds of navigable streams, and protecting the public lands, health, safety, and welfare.

The Multiple Use-Sustained Yield Act of 1960 directs the Forest Service to achieve and maintain outputs of various renewable resources in perpetuity without permanent impairment of the land's productivity.

The National Forest Management Act of 1976 (NFMA) charges the Secretary of Agriculture with ensuring research and continuous monitoring of each management system to safeguard the land's productivity. To comply with NFMA, the Chief of the Forest Service has charged each Forest Service Region with developing soil quality standards for detecting soil disturbance and indicating a loss in long-term productive potential. These standards are built into Forest Plans.

The FSM 2500 Chapter 2550 Soil Management directive establishes the framework for sustaining soil quality and hydrologic function while providing goods and services outlined in forest and grassland land management plans.

The Forest Plan objective for soils (Forest Plan p. II-8) is to manage the soil resource to maintain long-term productivity. The objective is that management activities on forest lands will not significantly impair the long-term productivity of the soil or produce unacceptable levels of sedimentation resulting from soil erosion.

3.5.3.1. Forest Plan Soil Standards

3.5.3.1.1. Forest Plan Soil Standard #1

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.

3.5.3.1.2. Forest Plan Soil Standard #2

Projects should strive to maintain sufficient large woody debris to maintain site productivity. Large woody debris is essential for maintenance of sufficient micro-organism populations.

3.5.3.1.3. Forest Plan Soil Standard #3

In the event of whole tree logging, provision for maintenance of sufficient nutrient capital should be made in the project analysis.

3.5.3.2. Regional Soil Standards

The Regional Soil Quality Standards (R-1 Supplement 2500-99-1 - USDA FS 1999, PF Doc. Soil-R-58) were revised in November 1999. Manual direction recommends maintaining 85% of an activity area's soil at an acceptable productivity potential with respect to detrimental impacts, including the effects of compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movement.

3.5.4. Environmental Consequences to Soils

3.5.4.1. Methodology

3.5.4.1.1. Methods Used

Soil resource existing conditions were determined using past records, aerial photography, GIS data, and on-the-ground-visits. Landtypes and hazard ratings were gathered from landtype descriptions and characteristics described in the Idaho Panhandle National Forests Land Systems Inventory (PF Doc. Soil-1-4, 9-15).

All proposed commercial activity areas with previous harvest treatments that involved ground based or skyline yarding systems were field checked in the summer of 2011 and 2012 by the District's soil specialist or qualified field personnel. The data from these findings were recorded to estimate the degree of soil disturbance (PF Doc. Soil-17 and 18), and documented in Field Reports (PF Doc. Soil-19). Onsite assessment of these activity areas with past timber harvest activities followed guidelines from the R1 Soil Quality Monitoring Protocol (USDA FS, 2009, Volumes I and II, PF Doc. Soil-R-75a and R-75b), and included shovel tests on random transects to determine compaction, organic matter depth, and coarse-woody debris content.

In areas with no recorded past harvest activities, transects were also supplemented by visual observations and photos during the walk-throughs. R1 Soil Quality monitoring guidelines (USDA FS, 2009, Volumes I and II, PF Doc. Soil-R-75a and R-75b), guidelines of verification by qualified field personnel that no prior visible evidence of disturbance occurred within these units. If visual observations determined that disturbance was present, transects were conducted along with shovel tests to determine the amount of disturbance present.

This analysis includes potential effects from proposed logging systems, system and temporary roads, landings, and prescribed burning on soils. To determine whether proposed activities would detrimentally impact or have cumulative effects on soils, the IPNF Soil NEPA Analysis Process (Niehoff 2002, PF Doc. Soil-R-44) was used. For each alternative, the detrimentally-disturbed acres were calculated using coefficients based on past IPNF soil monitoring data, (Niehoff 2002, PF Doc. Soil-R-44), (USDA FS, 2011, PF Doc. Soil-R-106) and (USDA FS 2011, PF Doc Soil-R-114).

The coefficients were developed as an average soil disturbance level and equated to harvest equipment; time of year (summer vs. winter logging), fuel treatment methods, and the time of year fuel treatment took place (Table 66). Since the coefficients are based on an average, the areas that have had prior harvest activities could have soil disturbance levels lower or greater than the coefficient's average. This monitoring information is contained in Forest Plan Monitoring and Evaluation Reports and is summarized in the IPNF Soil NEPA Analysis Process (Niehoff 2002, PF Doc.Soil-R-44). Calculations incorporated the acres and types of proposed logging, burning, and roads/landings constructed for direct and indirect effects.

The 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 there because equipment would re-use existing skid trails and move on slash mats whenever possible.

Direct effects on soils from proposed activities were estimated, based on past monitoring data, by analyzing the effects of compaction, erosion, burning, rutting, and displacement on the soil surface that is the most productive layer and also the easiest to disturb through activities. Compaction, rutting, displacement, and severe burning can affect the soil's physical, chemical, and biological properties, which indirectly can affect the growth and health of trees and other plants. Compaction and rutting reduces soil permeability and infiltration, which can cause soil erosion. Displacement reduces plant growth where topsoil and organic matter are removed. Severely burned soils can become hydrophobic (water repellent) and lead to increased erosion, runoff, and/or reduced productivity.

Potential impacts are based on the type of logging system and fuel treatments used. Ground-based, skyline, and skyline/mechanical felling logging systems would be utilized under the action alternatives and the coefficients used for proposed logging systems are displayed in the table below.

Table 66. Potential detrimental disturbance coefficients used for various logging and prescribed fire scenarios.

Harvest/Yarding Method	Detrimental Disturbance Coefficients (percent)
Ground-based harvest with grapple piling or underburning	13
Aerial Harvest	
Skyline with underburning	0 - 2
Skyline with grapple piling	8
Escaliner Swing	2-7[1]

[1] Disturbance associated with this yarding system is variable and dependent on the length of the skid trail, skyline yarding, and the number of set-up areas with landings.

Two different accounting methods were used for roads within activity areas:

- The Forest Plan Standard activity areas include proposed new system and temporary roads and existing system roads within proposed harvest units.
- The Region 1 Soil Quality Standard activity areas include only temporary roads and those non-system roads within proposed harvest units.

For road calculations, an average 35-foot road width that includes a 14-foot wide running surface and cut and fills slopes was used for all new system roads. For temporary roads, the engineer's estimate was used, which may vary by topography and calculated to apply to all units in which the road services. Landing sites are usually one-half to one acre in size and receive the most impact from ground-based equipment that processes and transports the logs. Roads and landings that are to remain on the landscape for future use can cause detrimental effects on productivity as those lands become "dedicated" lands.

Generally, detrimental effects on soils are not permanent and depend primarily on soil texture, parent material, aspect, and level of disturbance, i.e. compaction. Vegetative recovery time is approximately ±30 to 70 years as the second growth timber becomes established around the disturbed areas and develops enough crown foliage to intercept and evapotranspirate moisture (Dykstra and Curran 2002, PF Doc. Soil-R-12); (Froehlich and McNabb 1983, PF Doc. Soil-R-83); (Froehlich and others 1983, PF Doc. Soil-R-86); (Froehlich and others 1985, PF Doc. Soil-R-16).

Indirect effects may include the loss of site productivity due to the removal of vegetation and nutrients. Large woody debris is essential for maintenance of sufficient microorganism populations and long-term site productivity.

Design features are incorporated into the activities to manage large woody debris and organic matter as detailed in the research guidelines contained in (Graham and others 1994, PF Doc. Soil-R-21: PF Doc. Soil-R-21; PF Doc. Soil-22). These recommendations emphasize tons per acre and are defined as any woody residue larger than three inches in diameter.

Cumulative effects include the combination of direct and indirect effects from past, present, and reasonably foreseeable activities. Direct, indirect, and cumulative effects on soils are measured within each activity area although adjacent land outside of the activity area is considered as well in regards to slope stability. New system roads are discussed to provide extent of impacts but essentially are considered dedicated lands.

3.5.4.1.2. Soils and Productivity

Soil productivity is the inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities (USDA Forest Service 2009, Northern Region Soil Disturbance Monitoring Protocol PF Doc. Soil-R-75a and 75b). In order to estimate detrimental impacts and their effects to site productivity the distribution, duration, extent, and degree of disturbance is considered.

The practice of timber management can have long-lasting impacts on the soil resource if precautions are not taken. The following three design and management criteria relate to soil productivity.

Detrimentally-disturbed Soil within Activity Areas (Harvest Units)

Detrimental soil impacts are defined as the proportion of an activity area that may be subjected to displacement, compaction, rutting, erosion, or severe burning due to a particular management activity (such as harvest or fuels treatment), exclusive of dedicated resources (such as system roads). The soils in an activity area are considered detrimentally disturbed when the following soil conditions exist as a result of forest practices:

- For volcanic ash-influenced surface soils, compaction results in a 15% or more increase in bulk density, or a 50% reduction in water infiltration rates. Soil compaction reduces the

supply of air, water, and nutrients to plants. Roads, ground-based yarding, and dozer piling are the major contributors to compaction.

- Detrimental displacement is the removal of 1 or more inches (in depth) of any surface soil horizon, usually the A horizon, from a continuous area greater than 100 square feet.
- Surface erosion is indicated by rills, gullies, pedestals, and soil deposition and should be kept within tolerable limits by retaining enough ground cover, depending on site characteristics.
- Rutting consists of wheel ruts at least 2 inches deep in wet soils.
- Burns that create very high temperatures at the soils surface when surface soil moisture content is low, result in almost complete loss of surface and upper soil horizon organics. Hydrophobic (water-repellent) conditions may also reduce water infiltration, promote overland flow, and increase erosion. Many of the nutrients stored in these organics can also be volatilized and removed from the site in fly-ash (Amaranthus 1989 PF Doc. Soil-R-1); (DeBano 1991, PF Doc.Soil-R-9); (Garrison and Moore 1998, PF Doc. Soil-R-17).

Existing conditions were determined during on-the-ground field observations to verify impacts and extent of past soil disturbing activities in the areas identified for treatment and to determine if soil quality standards are met (Table 68 and Table 69; PF Doc. Soil-17 and 18). Soil quality standards were developed by selecting soil indicators that are visual aids for evaluating the effects of management activities on soil productivity. Soil quality standards provide benchmark values that indicate when changes in soil properties and soil conditions could result in significant change or impairment of soil quality based on available research and Regional experience (Page-Dumroese and others 2000, PF Doc. Soil-R-109).

Current understanding is that site quality will be maintained if less than 15% of an area is detrimentally impacted after disturbance (Dumroese and others 2000, PF Doc. Soil-R-109; Powers and others 1998, PF Doc. Soil-R-77). When more than 15% of the soil resources are in low quality or non-functional condition, additional negative effects may become difficult to mitigate or restore.

Findings from the Long Term Soil Productivity (LTSP) study show that soils respond to and recover from density impacts at different levels and that tree growth without understory competition are unaffected by compaction (Powers and others 2005, PF Doc. Soil-R-80). Further, evaluations of current conditions on the IPNF suggest soil recovery on hundreds of monitored units that were harvested since the turn of the 20th century where almost three quarters showed impacts of only 0 to 5% (USDA Forest Service 2011, Soil Monitoring for Existing Condition, draft, PF Doc. Soil-R-114). This implies that management activities meet the requirements of the MUSYA (16 USC 531) to maintain soils “without impairment of the productivity of the land” and NFMA (16 USC 1604 (g)(3)(E)(i)) to prevent irreversible damage.

Low Potassium Sites (Sites Containing Geologic Formations Naturally Deficient in Potassium-bearing Minerals)

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 and others 2003, PF Doc. Soil-R-20) and a possible link between potassium deficiency and the lack of tree resistance to root disease (Garrison-Johnston and others 2003, PF Doc. Soil-R-18). Research (Garrison-Johnston 2003, PF Doc. Soil-R-18; Garrison-Johnston and others 2004, and 2007, PF Doc. Soil-R-19 and Soil-R-69; Moore and others 2004a, PF Doc. Soil-R-40; Shen and others

2001, PF Doc. Soil-R-53) suggests a complex balance between underlying geology and the natural deficiency of potassium in northern Idaho. Derived primarily from underlying geologic formations, potassium is a product of slow weathering processes in comparison to soil nitrogen, which can be replenished more rapidly through nitrogen fixation or atmospheric deposition.

Whole-tree yarding and removal of treetops can lead to the direct loss of potassium (Morris and Miller 1994, PF Doc. Soil-R-42). On some sites, ±43 percent of the available potassium is retained 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, PF Doc. Soil-R-17; Moore and others 2004b, PF Doc. Soil-R-41). It is therefore vital to recycle as many nutrients as possible before removal, which can be done by leaving small-scale debris to leach out potassium (Baker and others 1989, PF Doc. Soil-R-2; Barber and Van Lear 1984, PF Doc. Soil-R-3; Edmonds 1987, PF Doc. Soil-R-14; Garrison and Moore, 1998, PF Doc. Soil-R-17; Laskowski and others 1995, PF Doc. Soil-R-32; Palviainen and others 2004, PF Doc. Soil-R-46).

Under most natural circumstances, potassium returns to the soil when the tree dies. Unlike many other soil nutrients, potassium is derived primarily from the underlying geology that, for the Beaver Creek Resource Area, includes: 77% metasedimentary Belt series Upper and Lower Prichard, Burke and Revett Formations, 6% unconsolidated sediments, and 4% basalts and granitic rock (Figure 48; PF Doc. Soil-15).

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, PF Doc. Soil-R-39 Shaw 2005, PF Doc. Soil-R-52; Garrison-Johnston and others 2007, PF Doc. Soil-R-69). 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 Design Features (Appendix E - Features Designed to Protect Soils, and PF Doc. Soil-20).

Maintenance of Coarse Woody Debris and Organic Matter

The third soil productivity criterion relates to the management of coarse woody debris and organic matter and follows the research guidelines contained in Graham and others (1994, PF Doc. Soil-R-21). Retaining coarse woody debris and organic matter is important to maintaining the soil's most productive layer. Coarse woody debris is defined as material derived from tree limbs, boles, and roots greater than three inches in diameter and in various stages of decay (Graham and others 1994, PF Doc. Soil-R-21). It performs many physical, chemical, and biological functions in forest ecosystems and is also a key habitat component for many wildlife species and for stream ecology. Because coarse woody debris is such a valuable part of a functioning ecosystem, a portion of the material must be maintained to ensure that organic matter is recycled for long-term productivity. Nevertheless, in natural systems organic matter fluctuates with forest growth, mortality, fire, and decay.

The average optimum level of fine organic matter is 21 to 30 percent (Graham and others 1994, PF Doc. Soil-R-21), which equates to 1 to 2 inches of surface litter and humus. Optimum levels of fine organic matter relate to ectomycorrhizae fungus, which is a good indicator of healthy forest soil. In moist western hemlock and cedar habitat types, strong levels of ectomycorrhizae exist when organic levels exceed 30 percent.

3.5.4.1.3. Analysis Area

Soil quality standards are applied to “activity areas” or individual harvest units (USDA FS 1999 R1 Soil Quality Standards PF Doc. Soil-R-58). The activity area is considered an appropriate geographic unit for assessing direct and indirect soil environmental effects because soil productivity is a site-specific attribute of the land and is not dependent on the productivity of an adjacent area. Similarly, if one acre of land receives soil impacts – i.e. reduced soil porosity, water holding capacity, aeration, long-term productivity etc. – and a second management activity is planned for that same site, then soil cumulative effects are possible. One exception that requires a closer look at the adjacent terrain outside of activity areas would be the evaluation of slope stability to determine if cumulative effects from management activities and roads are adverse.

Selecting geographical boundaries involves several factors, including the scope of the project considered and the features of the land. However, evaluation of cumulative effects to soil productivity does not require an 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 direct, indirect, and cumulative effects on soil resources encompasses all land within individual treatment areas and landings. Existing classified National Forest system roads and trails are considered dedicated lands for other purposes and, as such, soil quality standards do not apply. However, system roads are considered when determining if Forest Plan Standard #1 within activity areas would be met.

Commercial treatment would be conducted on approximately 1,973 acres for Alternative 2 and 1,662 acres for Alternative 3, occurring at an elevation of 2,900-4,600 feet on varying slopes ranging from about 20% to greater than 70%. There are 95 units ranging in size from 1 acre to 67 acres for Alternative 2 (Table 68) and 87 units ranging in size from 1 to 67 acres in Alternative 3 (Table 69). Harvest activities would be accomplished using ground-based, cable and skyline logging followed by various fuels treatments (Table 67).

This analysis reflects the acres and miles available during the time of analysis but they may be reduced. Disturbance to soils could therefore be less than what is displayed in this analysis.

The analysis also considers how much area has been devoted to resources where soil quality standards do not apply, such as system roads on National Forest System lands in the Beaver Creek Resource Area. Land outside of the analysis area described above are not considered because direct and indirect effects to soils are site specific and would not occur beyond these areas. Cumulative effects to soils are those effects that overlap in time and space, so there would be no cumulative effect where there are no direct or indirect effects.

Table 67. Comparison of Proposed Activities, by Alternative.

Proposed Activity	Alternative 1	Alternative 2	Alternative 3
Timber Harvest (acres)	0	1,973	1,662
Ground-based yarding (acres)	0	230	212
Skyline yarding (acres)	0	1,495	1,197
Escaliner swing yarding (acres)	0	238	217
Cable yarding (acres)	0	10	36
Road Construction (miles)	0	2.7	0
System	0	1.2	0
Temporary	0	1.5	0

3.5.4.1.4. Analysis Timeframe

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 or decades. 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.

The temporal scales can be defined as long and short-term. For this evaluation, short-term effects are those that occur approximately within the first 10 years following proposed management activities. Long-term effects are those that occur approximately after 10 years or more following proposed management activities.

3.5.4.2. Effects Common to All Alternatives

3.5.4.2.1. Effects of a Wildfire under All Alternatives

Given the absence of fire over numerous decades and increased fuel loads in most parts of the project area, the chance of a wildfire occurring could be enhanced if an ignition starts in an untreated areas during extreme dry weather conditions (Heyerdahl and others 2007, PF Doc. Soil-R-87). The proposed vegetation 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, PF Doc. Soil-R-94). See the Fire/Fuels section (3.2).

The probability of a high-severity fire is not certain to occur within the project area during a given timeframe. The fact, however, is that when a fire breaks out, the chances for high-severity fire effects on soils can be much higher in untreated areas with increased fuel loads compared to those that have successfully completed treatment, including post-harvest logging slash (Certini 2005, PF Doc. Soil-R-65; Cram and others 2006, PF Doc. Soil-R-66; Graham and others 2004, PF Doc. Soil-R-21; Gorman 2003, PF Doc. Soil-R-64; Keane and others 2002, PF Doc. Soil-R-67).

Vegetation and fuel treatments would reduce the chance that a wildfire could have as severe of an effect on soils in treated areas as it could in untreated areas because there would be a reduction in the tons per acre of fuels on treated sites.

The continued accumulation of dead and down fuel loads contributes to an increased potential for locally severe fire effects on soil and soil productivity in severely burned areas. High-intensity burns that create high soil surface temperatures, particularly when soil moisture content is low, can result in a complete loss of soil microbial populations, woody debris, and the protective duff and litter layer over mineral soil (Erickson and White 2008, PF Doc. Soil-R-88; Hungerford 1991, PF Doc. Soil-R-26; Neary and others 2005, PF Doc. Soil-R-43). 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, PF Doc. Soil-R-9; Amaranthus and others 1989, PF Doc. Soil-R-1).

Additional deteriorating effects of wildfires on soils usually include a reduction of water infiltration (Wells and others 1979, PF Doc. Soil-R-57) that contributes to the risk of soil erosion which increases proportionally with fire intensity (Megahan 1990, PF Doc. Soil-R-37). Fire-induced soil hydrophobicity (Figure 50) is presumed to be a primary cause of the observed post-fire increases in runoff and erosion from forested watersheds (Huffman and others 2001, PF Doc.

Soil-R-25). Though hydrophobicity is a naturally occurring phenomenon that can be found within the mineral soil surface, it is greatly amplified by increased burn severity (Doerr and others 2000, PF Doc. Soil-R-11; Huffman and others 2001, PF Doc. Soil-R-25; Neary and others 2005, PF Doc. Soil-R-43).

Soil hydrophobicity usually returns to pre-burn conditions in no more than six years (DeBano 1981, PF Doc. Soil-R-10). Dyrness (1976, PF Doc. Soil-R-13) and other studies have documented a much more rapid recovery of one to three years (Huffman and others 2001, PF Doc. Soil-R-25). 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 breakdown (DeBano 1981, PF Doc. Soil-R-10). This variability means that post-fire impacts on watershed conditions are difficult to predict and to quantify.

If a wildfire occurred in the Beaver Creek Resource Area, consequent resource damage from mechanized suppression activities and burn severity could range from negligible to severe, depending on location, size, severity of burn, and subsequent administrative activities. They are impossible to predict at this time, but minimum impact suppression tactics would be used to suppress fires. Risks for erosion and mass failure would primarily be from steep slopes, and associated roads, especially at stream crossings in the event of debris flows. Loss of soil productivity could be extended depending on burn severity, location, and post-fire climate characteristics. Following a severe fire, rehabilitation efforts to mitigate the fire's effects on erosion and sediment delivery could occur and reduce potential negative effects.

Figure 50. Fire-induced soil hydrophobicity.

3.5.4.3. Alternative 1 (No Action)

3.5.4.3.1. Direct and Indirect Effects

No new management-induced detrimental direct and indirect impacts would occur in the Beaver Creek Resource Area. There would be no compaction or displacement beyond the currently existing levels. Nutrients would continue to cycle, build up at current rates, and not be subject to removal due to harvest and fuel treatment activities.

Fuel buildup would continue to contribute to the risk of high-intensity wildfires. The introduction of weeds and unwanted flora following a fire could lead to higher competition between less desirable and native vegetation. Weeds can increase erosion, reduce soil moisture, and deplete nutrient levels (DiTomaso 2000, PF Doc. Soil-R-89). Because the roots of many noxious weeds are deeper than native grasses, they also contribute less organic matter near the soil surface.

3.5.4.3.2. Cumulative Effects

No cumulative effects to soils would take place as no harvest, and fuel treatments would be added. With no new activities, no new management-induced detrimental cumulative impacts would occur in the Beaver Creek Resource Area.

3.5.4.4. Alternatives 2 and 3

The discussion for Alternatives 2 and 3 are combined to avoid repetition because effects described for timber harvest, fuel treatments, organic matter, coarse woody debris, nutrients and soil movement would be the same or less for Alternative 3 (Table 68 and Table 69).

Alternatives 2 and 3 would meet Region 1 soil quality standards and IPNF Forest Plan Standards because long-term detrimental disturbance is not expected to exceed 13% and 19% respectively in any proposed activity area (Table 68 and Table 69). Full productivity potential would be maintained on at least 87% under the Regional and 81% under the Forest Plan Standards in every activity area.

Under regional soil quality standards, potential detrimental disturbance could affect up to 81 acres of the 1,973 acres proposed for treatment in Alternative 2 (Table 68; PF Doc. Soil-5) and 67 acres out of the 1,662 acres proposed under Alternative 3 (Table 69; PF Doc. Soil-6). Under Forest Plan standards, potential detrimental disturbance could affect up to 96 acres of the 1,965 acres proposed for treatment in Alternative 2 (Table 68; PF Doc. Soil-5) and 82 acres out of the 1,663 acres proposed in Alternative 3 (Table 69; PF Doc. Soil-6).

Alternative 3 differs from Alternative 2 because it has a reduced risk of potential road related mass failure and erosion with 2.7 fewer miles of road construction than Alternative 2 and less timber harvest (Table 67). With Alternative 3 there is 298 fewer acres of skyline, 18 fewer acres of ground-based and 21 fewer acres of track line machine. The only increase (26 acres) is in the cable yarding which is due to the reduced miles of road construction in the two alternatives.

Disturbance from roads are accounted for differently between the Regional and Forest Plan Soil Quality Standards. Under the Regional Standard, only non-system and temporary roads are counted towards the activity area's detrimental disturbance while system roads are classified as “dedicated land.” Under Forest Plan Standards, disturbance from all roads within an activity area are included.

Coarse woody debris would be maintained at recommended levels in all units so that preservation of ecological function is expected. Using Regional guidance for coarse woody debris retention

would also comply with the Forest Plan Standard to maintain sufficient microorganism populations for site productivity. While the yarding of longer logs is not restricted, design features, including nutrient management recommendations, would ensure compliance with the standards to maintain sufficient nutrient capital by leaving at a minimum all breakage of tops and branches in all units and all tops in the majority of the regeneration units.

A comparison of existing conditions and potential impacts of management activities is provided in Table 68 (Alternative 2) and Table 69 (Alternative 3); differences in acres may be due to rounding. Analysis followed the R1 and Forest Plan Soil Quality Standards. Total acres include existing conditions and disturbance from existing and proposed roads and units.

Refer to Table 66 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 there because equipment would re-use existing skid trails and move on slash mats whenever possible.

Abbreviations used in the soil analysis tables are displayed below.

Abbreviations Used in Tables 68 and 69

Fuels Treatments	UB	Underburn
	GP	Grapple pile
	JP	Jackpot burn
	YT	Yard tops
Harvest Treatments	CT	Commercial thin
	IM	Improvement cut
	SW	Shelterwood
Yarding Methods	GB	Ground based
	S	Skyline
	E/S	Escaliner swing
	C	Cable

Table 68. Existing conditions and potential impacts of management activities under Alternative 2.

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
1	7	IM	S	YT/UB	0	0.14	0	0	0.14	0.14	2	2
2	41	IM	S	JP/UB	0	0.82	0	0	0.82	0.82	2	2
4	39	SW	S	YT/UB	0	0.78	1.74	0	0.78	0.78	2	7
6	42	CT	S	YT/No Burn	0	0.84	0.93	0	0.84	0.84	2	4
7	17	SW	S	UB	0	0.34	0	0	0.34	0.34	2	2
8	35	SW	S	UB	0	0.70	0	0	0.70	0.70	2	2
9	25	IM	S	YT/UB	<1	0.50	0.86	0	0.75	0.75	3	6
10	41	SW	S	UB	0	0.82	0	0	0.82	0.82	2	2
10a	13	SW	GB	UB	0	1.69	0	0	1.69	1.69	13	13
12	21	CT	S	JP/UB	0	0.42	0	0	0.42	0.42	2	2
13	48	SW	S	YT/UB	0	0.96	1.39	0	0.96	0.96	2	5
14	35	CT	S	YT/UB	0	0.70	0.69	0	0.70	0.70	2	4
14b	20	SW	S	UB	0	0.40	0	0	0.40	0.40	2	2
15	53	SW	S	UB	0	1.06	0	0	1.06	1.06	2	2
15a	14	SW	GB	UB	0	1.82	0	0	1.82	1.82	13	13
16	18	IM	S	YT/UB	0	0.36	0	0	0.36	0.36	2	2
16T	12	SW	GB	UB	0	1.56	0	0	1.56	1.56	13	13
17	36	ST	S	JP	0	0.72	1.39	0.86	1.58	1.58	4	6
18	18	ST	GB	Masticate	0	2.34	0	0	2.34	2.34	13	13
20	21	CT	S	YT/UB	0	0.42	0.72	0	0.42	0.42	2	5
21	8	SW	S	UB	0	0.16	0	0	0.16	0.16	2	2
22	8	CT	S	YT/UB	0	0.16	0	0	0.16	0.16	2	2
23	12	CT	S	YT/UB	0	0.24	0	0	0.24	0.24	2	2
24	23	CT	S	YT/UB	0	0.46	0	0	0.46	0.46	2	2
25	3	ST	S	UB	0	0.6	0	0	0.06	0.06	2	2
25a	1	ST	GB	UB	0	0.16	0	0	0.16	0.16	13	13
26	7	CT	C	UB	0	0.14	0	0	0.14	0.14	2	2
27	45	SW	S	UB	0	0.90	0	0	0.90	0.90	2	2
27a	7	CT	GB	UB	0	0.91	0	0	0.91	0.91	13	13

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
27b	23	CT	S	UB	0	.046	0	0	0.46	0.46	2	2
28	4	CT	GB	YT/UB	0	0.52	0	0	0.52	0.52	13	13
29	25	ST	S	UB	0	0.50	0	0.54	1.04	1.04	4	4
30	32	SW	S	UB	0	0.64	0	0	0.64	0.64	2	2
31	26	SW	S	UB	0	0.52	0	0.99	1.51	1.51	7	7
32	13	SW	S	YT/UB	0	0.26	0	0	0.26	0.26	2	2
33	32	SW	S	UB	1	0.64	0	0.41	1.44	1.44	5	5
34	15	CT	E/S	YT/UB	0	1.11	0	0	1.11	1.11	7	7
34a	7	SW	GB	UB	0	0.91	0	0	0.91	0.91	13	13
37	10	IM	E/S	YT/UB	<1	0.90	0.81	0	0.97	0.97	10	18
38	18	SW	GB	UB	0	2.08	0.91	0	2.08	2.08	13	19
39	26	SW	GB	UB	0	3.38	0	0	3.38	3.38	13	13
40	19	SW	S	UB	0	0.38	0	0.45	0.83	0.83	4	4
41	7	CT	GB	YT/UB	0	0.91	0	0	0.91	0.91	13	13
42	29	CT	S	YT/UB	0	0.58	0	0	0.58	0.58	2	2
43	10	SW	S	UB	0	0.20	0	0	0.20	0.20	2	2
44	14	SW	S	YT/UB	0	0.28	0	0	0.28	0.28	2	2
45	7	CT	GB	YT/UB	0	0.78	0	0	0.78	0.78	13	13
46	24	CT	S	YT/UB	0	0.48	0.40	0	0.48	0.48	2	4
46a	0	CT	C	YT/UB	0	0	0	0	0	-	-	-
47a	3	ST	C	UB	0	0.06	0	0	0.06	0.06	2	2
48	7	ST	S	YT/UB	0	0.14	0	0	0.14	0.14	2	2
49	13	ST	S	YT/UB	0	0.26	0	0	0.26	0.26	2	2
50	8	ST	GB/C	UB	0	1.04	0	0	1.04	1.04	13	13
51	39	IM	E/S	YT/UB	0	3.13	0	0	3.13	3.13	13	13
52	10	ST	S	YT/UB	0	0.20	0	0	0.20	0.20	2	2
53	7	IM	S	YT/UB	0	0.14	0	0	0.14	0.14	2	2
54	28	IM	S	YT/UB	0	0.56	0	0	0.56	0.56	2	2
55	22	SW	S	YT/UB	0	0.44	0	0	0.44	0.44	2	2
55a	16	SW	GB	UB	0	2.08	0.51	0	2.08	2.59	13	13
56	11	SW	S	UB	0	0.22	0	0	0.22	0.22	2	2

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
57	60	IM	S/ES	YT/UB	0	1.91	0	0	1.91	1.91	3	3
58	11	IM	GB	YT/UB	0	1.43	0	0	01.43	1.43	13	13
59	16	SW	S	UB	0	0.32	0	0	0.32	0.32	2	2
60	38	ST	S/ES	UB	1	1.54	0	0	1.92	1.92	4	4
60a	4	ST	GB	UB	0	0.52	0	0	0.52	0.52	13	13
61	32	SW	S	UB	0	0.64	0	0	0.64	0.64	2	2
62	2	SW	GB	UB	0	0.26	0	0	0.26	0.26	13	13
63	25	SW	S	UB	0	0.50	0	0	0.50	0.50	2	2
63a	19	SW	GB	GP	0	2.47	0	0	2.47	2.47	13	13
64	68	IM	S	UB	0	1.36	1.85	0	1.36	1.36	2	5
65	17	SW	S	GP/UB	0	1.02	0	0	1.02	1.02	6	6
65a	16	SW	GB	GP	0	2.08	0	0	2.08	2.08	13	13
66	21	SW	S	YT/UB	0	0.42	0.44	0	0.42	0.86	2	4
67	16	SW	S	UB	0	0.32	0	0	0.32	0.32	2	2
68	55	SW	S	UB	0	1.10	0	0	1.10	1.10	2	2
69	54	SW	S	UB	0	1.08	2.78	0	1.08	3.86	2	7
69a	0	SW	C	UB	0	0	0	0	0	-	-	-
70	40	IM	E/S	YT/UB	0	2.89	0	0	2.89	2.89	7	7
71	31	IM	S	YT/UB	0	0.62	0	0	0.62	0.62	2	2
72	15	IM	S/ES	YT/UB	0	0.79	0	0	0.79	0.79	5	5
73	14	CT	S	YT/UB	0	0.28	0	0	0.28	0.28	2	2
74	29	SW	S	UB	4	0.58	1.56	0	1.74	3.30	6	11
75	21	SW	S	UB	0	0.42	0	0	0.42	0.42	2	2
75a	7	IM	GB	YT/UB	0	0.91	0	0	0.91	0.91	13	13
76	23	IM	S	YT/UB	0	0.46	0.48	0	0.48	0.96	2	4
77	28	IM	S	YT/UB	0	0.58	0	0	0.58	0.58	2	2
78	36	ST	S	YT/UB	0	0.72	0	0	0.72	0.72	2	2
79	27	ST	S	UB	0	0.54	0	0.99	1.53	0.54	6	2
80	16	IM	S/ES	YT/UB	0	0.32	0	0.54	0.86	0.86	5	5
81	4	IM	S	YT/UB	0	0.08	0	0	0.08	0.08	2	2
82	7	ST	S	UB	0	0.14	0	0	0.14	0.14	2	2

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
82a	5	ST	GB	UB	0	0.65	0	0	0.65	0.65	13	13
83	14	IM	S	YT/UB	0	0.28	0	0	0.28	0.28	2	2
84	15	ST	S	UB	0	0.30	0	0	0.30	0.30	2	2
84a	8	ST	GB	UB	0	1.04	0	0	1.04	1.04	13	13
Total	1,973					73.4	17.5	4.8	80.5	95.5		

Table 69. Existing conditions and potential impacts of management activities under Alternative 3.

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
1	7	IM	S	YT/UB	0	0.14	0	0	0.14	0.14	2	2
2	41	IM	S	JP/UB	0	0.82	0	0	0.82	0.82	2	2
4	39	SW	S	YT/UB	0	0.78	1.74	0	0.78	0.78	2	7
6	42	CT	S	YT/No Burn	0	0.84	0.93	0	0.84	0.84	2	4
7	17	SW	S	UB	0	0.34	0	0	0.34	0.34	2	2
8	35	SW	S	UB	0	0.70	0	0	0.70	0.70	2	2
9	25	IM	S	YT/UB	<1	0.50	0.86	0	0.75	0.75	3	6
10	41	SW	S	UB	0	0.82	0	0	0.82	0.82	2	2
10a	13	SW	GB	UB	0	1.69	0	0	1.69	1.69	13	13
12	21	CT	S	JP/UB	0	0.42	0	0	0.42	0.42	2	2
13	48	SW	S	YT/UB	0	0.96	1.39	0	0.96	0.96	2	5
14	35	CT	S	YT/UB	0	0.70	0.69	0	0.70	0.70	2	4
14b	20	SW	S	UB	0	0.40	0	0	0.40	0.40	2	2
15	53	SW	S	UB	0	1.06	0	0	1.06	1.06	2	2
15a	14	SW	GB	UB	0	1.82	0	0	1.82	1.82	13	13
16	18	IM	S	YT/UB	0	0.36	0	0	0.36	0.36	2	2
16T	12	SW	GB	UB	0	1.56	0	0	1.56	1.56	13	13
17	22	ST	S	JP	0	0.44	0.90	0	0.44	1.34	2	6
18	18	ST	GB	Masticate	0	2.34	0	0	2.34	2.34	13	13
20	21	CT	S	YT/UB	0	0.42	0.72	0	0.42	0.42	2	5
21	8	SW	S	UB	0	0.16	0	0	0.16	0.16	2	2

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
22	8	CT	S	YT/UB	0	0.16	0	0	0.16	0.16	2	2
23	12	CT	S	YT/UB	0	0.24	0	0	0.24	0.24	2	2
24	23	CT	S	YT/UB	0	0.46	0	0	0.46	0.46	2	2
25	3	ST	S	UB	0	0.6	0	0	0.06	0.06	2	2
25a	1	ST	GB	UB	0	0.16	0	0	0.16	0.16	13	13
26	8	CT	C	UB	0	0.16	0	0	0.16	0.16	2	2
27	0	SW	S	UB	0	0	0	0	-	-	-	-
27a	0	CT	GB	UB	0	0	0	0	-	-	-	-
27b	0	CT	S	UB	0	0	0	0	-	-	-	-
28	4	CT	GB	YT/UB	0	0.52	0	0	0.52	0.52	13	13
29	17	ST	S	UB	0	0.34	0	0	0.34	0.34	2	2
30	32	SW	S	UB	0	0.64	0	0	0.64	0.64	2	2
31	5	SW	C	UB	0	0.10	0	0	0.10	0.10	2	2
32	13	SW	S	YT/UB	0	0.26	0	0	0.26	0.26	2	2
33	17	SW	S	UB	1	0.34	0	0	0.34	0.34	2	2
34	15	CT	E/S	YT/UB	0	1.11	0	0	1.11	1.11	7	7
34a	7	SW	GB	UB	0	0.91	0	0	0.91	0.91	13	13
37	10	IM	E/S	YT/UB	<1	0.90	0.81	0	0.97	0.97	10	18
38	18	SW	GB	UB	0	2.08	0.91	0	2.08	2.08	13	19
39	26	SW	GB	UB	0	3.38	0	0	3.38	3.38	13	13
40	0	SW	S	UB	0	0	0	0	-	-	-	-
41	7	CT	GB	YT/UB	0	0.91	0	0	0.91	0.91	13	13
42	29	CT	S	YT/UB	0	0.58	0	0	0.58	0.58	2	2
43	10	SW	S	UB	0	0.20	0	0	0.20	0.20	2	2
44	3	SW	C	YT/UB	0	0.09	0	0	0.09	0.09	2	2
45	0	CT	GB	YT/UB	0	0	0	0	-	-	-	-
46	10	CT	S	YT/UB	0	0.20	0	0	0.20	0.20	2	2
46a	3	CT	C	YT/UB	0	0.06	0	0	0.06	0.06	2	2
47a	3	ST	C	UB	0	0.06	0	0	0.06	0.06	2	2
48	7	ST	S	YT/UB	0	0.14	0	0	0.14	0.14	2	2
49	13	ST	S	YT/UB	0	0.26	0	0	0.26	0.26	2	2

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
50	8	ST	GB/C	UB	0	1.04	0	0	1.04	1.04	13	13
51	39	IM	E/S	YT/UB	0	3.13	0	0	3.13	3.13	13	13
52	10	ST	S	YT/UB	0	0.20	0	0	0.20	0.20	2	2
53	7	IM	S	YT/UB	0	0.14	0	0	0.14	0.14	2	2
54	28	IM	S	YT/UB	0	0.56	0	0	0.56	0.56	2	2
55	22	SW	S	YT/UB	0	0.44	0	0	0.44	0.44	2	2
55a	16	SW	GB	UB	0	2.08	0.51	0	2.08	2.59	13	13
56	11	SW	S	UB	0	0.22	0	0	0.22	0.22	2	2
57	60	IM	S/ES	YT/UB	0	1.91	0	0	1.91	1.91	3	3
58	11	IM	GB	YT/UB	0	1.43	0	0	01.43	1.43	13	13
59	16	SW	S	UB	0	0.32	0	0	0.32	0.32	2	2
60	38	ST	S/ES	UB	1	1.54	0	0	1.92	1.92	4	4
60a	4	ST	GB	UB	0	0.52	0	0	0.52	0.52	13	13
61	32	SW	S	UB	0	0.64	0	0	0.64	0.64	2	2
62	2	SW	GB	UB	0	0.26	0	0	0.26	0.26	13	13
63	25	SW	S	UB	0	0.50	0	0	0.50	0.50	2	2
63a	19	SW	GB	GP	0	2.47	0	0	2.47	2.47	13	13
64	68	IM	S	UB	0	1.36	1.85	0	1.36	1.36	2	5
65	17	SW	S	GP/UB	0	1.02	0	0	1.02	1.02	6	6
65a	16	SW	GB	GP	0	2.08	0	0	2.08	2.08	13	13
66	21	SW	S	YT/UB	0	0.42	0.44	0	0.42	0.86	2	4
67	16	SW	S	UB	0	0.32	0	0	0.32	0.32	2	2
68	55	SW	S	UB	0	1.10	0	0	1.10	1.10	2	2
69	43	SW	S	UB	0	0.86	2.07	0	0.86	2.93	2	7
69a	3	SW	C	UB	0	0.06	0	0	0.06	0.06	2	2
70	40	IM	E/S	YT/UB	0	2.89	0	0	2.89	2.89	7	7
71	31	IM	S	YT/UB	0	0.62	0	0	0.62	0.62	2	2
72	15	IM	S/ES	YT/UB	0	0.79	0	0	0.79	0.79	5	5
73	14	CT	S	YT/UB	0	0.28	0	0	0.28	0.28	2	2
74	29	SW	S	UB	4	0.58	1.56	0	1.74	3.30	6	11
75	4	SW	C	UB	0	0.08	0	0	0.08	0.08	2	2

Unit	Activity Area (acres)	Proposed Treatment	Proposed Logging System	Proposed Fuels Treatment	Existing % Disturbance	Potential Disturbance (acres)	Proposed System Road Disturbance (acres)	Proposed Temporary Road Disturbance (acres)	Total Disturbance – Regional Standard (acres)	Total Disturbance – Forest Standard (acres)	Total % Unit Disturbance – Regional Standard	Total % Unit Disturbance – Forest Standard
75a	0	IM	GB	YT/UB	0	0	0	0	-	-	-	-
76	23	IM	S	YT/UB	0	0.46	0	0	-	-	-	-
77	28	IM	S	YT/UB	0	0.58	0	0	0.58	0.58	2	2
78	36	ST	S	YT/UB	0	0.72	0	0	0.72	0.72	2	2
79	0	ST	S	UB	0	0	0	0	-	-	-	-
80	0	IM	S/ES	YT/UB	0	0	0	0	-	-	-	-
81	2	IM	C	YT/UB	0	0.04	0	0	0.04	0.04	2	2
82	2	ST	C	UB	0	0.04	0	0	0.04	0.04	2	2
82a	5	ST	GB	UB	0	0.65	0	0	0.65	0.65	13	13
83	0	IM	S	YT/UB	0	0	0	0	-	-	-	-
84	3	ST	C	UB	0	0.06	0	0	0.06	0.06	2	2
84a	10	ST	GB	UB	0	1.30	0	0	1.30	1.30	13	13
Total	1,973					65.2	15.4	0	67.3	82.32		

3.5.4.4.1. Direct and Indirect Effects

Detrimental Soil Disturbance

Design features to protect soil and site productivity (PF Doc. Soil-20: EA Chapter II ,Design Features to protect soils) would also be implemented as part of the action alternatives to ensure that activities are consistent with Forest and Regional standards in terms of soil compaction, displacement, and nutrient retention.

The effects of the action alternatives on the soil resource were assessed based on their potential to create detrimental impacts and to affect soil productivity. Table 68 and Table 69 show soil disturbance levels for Alternatives 2 and 3. Standard and site-specific best management practices and soil and conservation practices (as described in the Soil and Water Conservation Practices Handbook - Forest Service Handbook 2509.22, USDA 1988, PF Doc. Soil-R-72) are included as design features and would be applied during timber harvest and road decommissioning, construction, maintenance, and reconstruction to minimize soil erosion and maintain acceptable soil productivity (Appendix F - Application of Soil and Water Conservation Practices). The Soil and Water Conservation Handbook (USDA 1988, PF Doc. Soil-R-72) outlines best management practices that protect the soil and water resources at a higher level than do existing Idaho Forest Practices rules and regulations, thereby incorporating all Idaho State standards.

Best management practices and post-harvest monitoring is conducted annually by the IPNF to validate the implementation and effectiveness of best management practices and design criteria associated with land management activities (USDA Forest Service IPNF 1997-2009, PF Doc. CR-013 through CR-040). Monitoring results are used to adapt future management actions where improvements in meeting objectives are indicated and show that acceptable productivity potential is maintained.

The best management practices techniques and their effectiveness are documented in several publications (Seyedbagheri 1996, PF Doc Soil-R-51; Lynch and Corbett 1989 and 1990, PF Doc. Soil-R-33 and 34; Idaho DEQ 2001, PF Doc. Soil-R-28). The best management practices would have a high effectiveness in minimizing soil compaction and displacement, address seeding of disturbed areas, limit operations when soil moistures are high, and address conduct of logging.

Timber Harvest

Timber harvest activities that may affect soils include approximately 1,973 acres for Alternative 2 and 1,662 acres for Alternative 3 using a combination of ground-based, skyline, cable and escaliner swing yarding systems (Tables 68 and 69; PF Doc. Soil-5 and 6). These vegetation management activities have the potential to cause detrimental soil disturbance, such as compaction and displacement, by reducing productivity on an estimated 81 acres under the Regional and 96 acres under the Forest Plan Standards for Alternative 2 (Table 68; PF Doc. Soil-5) and 67 acres under the Regional Standard and 82 acres under the Forest Plan in Alternative 3 (Table 69; PF Doc. Soil-6).

All landings associated with skyline and ground-based harvest would be located along existing or new system and temporary roads. There would be no equipment on the high banks above the cut slopes of roads. Tables 68 and 69 display harvest units and their assigned logging prescription for Alternatives 2 and 3. All of the proposed harvest units under either alternative would meet Regional soil quality and Forest Plan standards.

The level of soil disturbance increase depends primarily 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 contain a network of already existing skid trails (Table 68 and Table 69). Existing skid trails would be used for the proposed harvest (Appendix E - Design Features; PF Doc. Soil-20). Proposed skyline units that were previously yarded with the same logging system have little to no additional impacts because existing corridors are generally reused.

Soil compaction effects can last for decades but are reversible. Recovery processes vary greatly with soil texture, clay content, and their interaction with climatic processes such as cycles of freezing-thawing and wetting-drying (Dykstra and Curran 2002, PF Doc. Soil-R-12; Landsberg and others 2003, PF Doc. Soil-R-91). 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 decompact the soil (Cromack and others 1979, PF Doc. Soil-R-92; Froehlich and McNabb 1983, PF Doc. Soil-R-83; Froehlich and others 1985, PF Doc. Soil-R-16). Soil displacement that mixes or removes the volcanic ash surface layer however, reduces soil moisture holding capacity and associated productivity.

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 smaller diameter fuels and that would be less likely to support crown fires (see Fire/Fuels Section 3.2).

The proposed action includes post-harvest monitoring of some units after completion of harvest and fuel treatment activities. Proposed activities on units are expected to meet Forest and Regional soil quality standards but monitoring is included to verify expected results.

Road Decommissioning

Sixty-six miles under Alternative 2 and 104 miles under Alternative 3 of system road would be decommissioned (Road Management Rx D; Table 71). This would include decompaction and some recontouring with the goal of restoring site productivity. Assuming 4.2 acres per mile of road, approximately 277 acres under Alternative 2 and 437 acres under Alternative 3 of National Forest System land would be on the path to recovery towards a productive land base (Table 71).

Road Construction

Alternative 2 proposes approximately 1.2 miles of new system road and 1.5 miles of temporary road; Alternative 3 proposes no new road construction; all harvest would be from the existing road system (Table 67). Those activities under Alternative 2 would cause soil compaction, displacement, and effects to site productivity on approximately 11 acres.

After all sale activities have ended, the temporary roads would be recontoured, seeded with native grasses, and organic material would be redistributed over the surface. Road decommissioning and soil restoration would contribute to a reduction in compaction, thus improving infiltration and reducing surface runoff (Switalski and others 2004, PF Doc. Soil-R-56).

Road Maintenance

No additional soil impacts would occur from proposed road maintenance activities such as blading, drainage improvements, and surfacing on existing dedicated roads.

Fuel Treatments

Activity-fuel treatments that may affect soils under both alternatives include; underburning, jackpot burning and grapple piling followed by pile burning. See Table 68 and Table 69 for a list of fuel treatments by unit under Alternatives 2 and 3.

Design features also require piling machinery to utilize existing trails and stay on slopes less than 35 percent to prevent soil disturbance in excess of guidelines. Design features for grapple piling require operation of equipment over slash mats whenever enough material is available, preferentially re-using existing skid trails if present. Forest Plan monitoring and research (Eliasson and Wästerlund 2007, PF Doc. Soil-R-93; Han 2006, PF Doc. Soil-R-60; Niehoff 2002, PF Doc. Soil-R-44; USDA Forest Service 2001b, 2002-2004, PF Doc. CR-017, 018, 022 and 026) indicates reduced soil disturbance if equipment is operated on a slash mat.

Only areas that could be reasonably accessed would be treated and none of the trails would be excavated to facilitate access. The residual logging debris that would be lopped and scattered or that could not be grapple piled and burned could increase potential fire intensity and severity for a few years until snow could compress the debris and the fine organics would decompose.

Severe burning and ground disturbance could create bare soils and encourage noxious weed infestation. The above mentioned design features are therefore incorporated to lessen disturbance impacts in activity areas in order to prevent long-term impacts to the soil resource.

Road Storage

Roads proposed for storage (19 miles under Alternative 2 and .5 miles under Alternative 3) would have similar work as the roads that will be decommissioned. Roads that are put into long term storage would start a slow recovery trend, however they could be returned to service as needed for future projects.

AOP (Aquatic Passage)

Under Alternative 2 eight culverts and Alternative 3 twelve culverts are proposed to be upgraded. The effect of upgrading road crossings to pass fish is a short term increase in fine sediment. No detrimental disturbance above the existing levels is anticipated with the majority of the work occurring within the confines of the existing road prism. Upgrading road crossings will improve water quality in the long term by accommodating flood flows through culverts, decrease erosion and sedimentation and allow uninhibited access to fish.

3.5.4.4.2. Organic Matter, Coarse Woody Debris, and Nutrient Levels

Timber Harvest

Harvesting the tree bole (and bark) would remove approximately 43 percent of the tree's potassium (Garrison-Johnston and others 2004, PF Doc. Soil-R-19) which may cause indirect effects to vegetation as nutrient sources are removed from site. In the majority of the regeneration units in alternatives, tops, limbs and breakage would remain on site until fuel reduction activities occur. Further sub-merchantable material between 3 to 6 inches would either be slashed or left

standing adding to the available coarse woody debris after fuel reduction activities are accomplished.

Harvest activities are not expected to reduce soil organic matter within the proposed units because existing material would be not be removed from the forest floor. Harvest activities may actually increase organics that would contribute to the surface layer through limbs and tops left on-site. Existing organic matter would not be diminished by harvest activities, but organic matter recruitment would likely be less in those units identified for regeneration harvest (Table 68 and Table 69). Those units in Alternatives 2 and 3 that have commercial thinning or improvement prescriptions would leave a residual stand that would still benefit from the leave trees as some die and fall the ground, though the process would be slower.

Current levels of coarse woody debris, (PF Doc. Soil-8 and 23) allows for some removal in some of the treatment areas while still meeting the design features and recommended coarse woody debris levels based on (Graham and others 1994, PF Doc. Soil-R-21) and would provide protection against soil erosion as well as a long-term source of nutrients and organic matter (Brown and others 2003, PF Doc. Soil-R-6). Coarse woody debris recommendations for different sites are displayed in Table 70.

Table 70. Recommended coarse woody debris retention.[1]

Site Conditions	Coarse Woody Debris1
Dry sites	7-13 tons/acre
Moist sites	17-33 tons/acre

1 Based on Graham and others, 1994 (PF Doc. Soil-R-21).

Fuel Treatment

There could be a reduction in the current existing coarse woody debris levels in some areas as a result of fuel reducing activities. The amount of coarse woody debris would likely be kept at the lower end of the recommendations in several locations near main roads in order to meet fuels reduction requirements and objectives. The majority of harvest units currently display a mix of satisfactory coarse woody debris levels though presently some units are on the lower end of the recommendations (PF Doc. Soil-8 and 23).

No long-term measurable negative effects on organic matter and coarse woody debris are anticipated from post-harvest prescribed fire when soil moisture in the upper surface inch of mineral soil has a moisture content of 25% or more by weight or 60 to 100 percent duff moisture (Niehoff 1985 and 2002, PF Doc. Soil-R-44). 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, PF Doc. Soil-R-4; Erickson and White 2008, PF Doc. Soil-R-88; Frandsen and Ryan 1985, PF Doc. Soil-R-15; Hungerford and others 1991, PF Doc. Soil-R-26; McNabb and Cromack 1990, PF Doc. Soil-R-36).

Burning small slash piles would have limited detrimental effects when executed in the late fall/winter or early spring. However, when burn piles are large, nutrient losses from heat and volatilization could be considerable. In some cases, burning of the slash piles may create localized patches of hydrophobic soils for a short period (as much as one to two years) but the areas are generally not large or extensive enough to alter slope hydrologic responses or long-term soil productivity (de Dios Benavides-Soloria and McDonald 2005, PF Doc. Soil-R-95; Ice 2003, PF Doc. Soil-R-27; Robichaud 2000, PF Doc. Soil-R-50; Swanson 1981, PF Doc. Soil-R-55).

On an unpredictable site-specific basis, some drier sites may burn at a severity level that removes all of the protective 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. Direct effects of prescribed burning could potentially remove woody debris that would otherwise provide long-term nutrients to the soil as the decay process occurs (Page-Dumroese and others 2006a, PF Doc. Soil-R-29). In south- and southwest facing units, the prescribed burns would have limited detrimental effects when executed in the spring.

Nutrient levels are not expected to decline sufficiently to irreversibly impair soil productivity because slash would be left over-winter (except where the fire risk is high such as along main travel routes or adjacent to private land). This would allow for leaching of nutrients from slash into the soil (Garrison and Moore 1998, PF Doc. Soil-R-17). In those units in which tops would be left other fuel treatments, such as lopping and scattering, jackpot burning, or grappled piling and burning would occur after over-wintering.

3.5.4.4.3. Soil Movement (Erosion, Mass Failure)

Timber Harvest

Harvest activities are proposed on landtypes rated low for surface erosion potential in both Alternative 2 and Alternative 3 of the proposed activity areas. Soil erosion is not expected because of residual canopy and ground cover, operation of mechanical equipment on a slash mat when available combined with other BMPs, and the overall low risk of surface erosion.

No harvest activities are proposed on landtypes rated with high mass failure potential in either of the alternatives. Proposed units are outside stream buffers or away from any streams with surface flow. No change in mass failure potential is expected from the proposed harvest activities (Megahan and King 2004 p. 207, PF Doc. Soil-R-101) because of low and moderate mass failure potential ratings in the activity areas (Table 60; PF Doc. Soil-2, Soil-3, Soil-11 and Soil-12) and residual stocking.

No ground-based harvest activities are proposed on landtypes rated with high sediment delivery potential, (Appendix E - Soil Design Features and PF Doc. Soil-20). As part of project planning, all drainage courses and riparian zones would also have an INFS-designated buffer zone that would have no harvest activities. With established buffer zones, the potential of sediment increases from fuel or timber management work is minimal.

Road Construction

New system and temporary road construction is proposed for 2.7 miles under Alternative 2 with no new road construction under Alternative 3. None of the newly proposed road segments are located on landtypes with high hazard ratings (PF Doc. Soil-9-11, 13-15 and 22). Megahan and King (2004 p. 209, PF Doc. Soil-R-101) attribute roads as having the greatest effect on mass failure of all practices associated with forest management.

Fuel Treatments

Eight of the proposed burn units have a high percentage (over 25%) of the area on landtypes rated high for sediment delivery potential (Table 61, PF Doc. Soil-4) in both Alternatives 2 and 3. The majority of these landtypes fall on stream breaklands that are generally steep, and can have shallow rocky soils. High intensity fires on these landtypes could result in loss of soil microbial populations, woody debris, the protective duff and litter layer and create hydrophobic conditions leading to loss of soil productivity and soil erosion.

Design criteria listed in Appendix E - Design Features and PF Doc. Soil-20 should be followed for all of the burning activities with special attention to those units that fall on these landtypes.

Adherence to the design features should minimize the potential for high fire severity fires, which in turn would reduce the risk of sedimentation on these landtypes. The potential for sediment to reach live water remains low with no ignition within stream buffers and the moist conditions associated with the valley bottoms.

3.5.4.5. Cumulative Effects of Alternatives 2 and 3

Cumulative effects include the combination of direct and indirect effects from past, present, and reasonably foreseeable activities added to the direct and indirect effects of the proposed activities. Since direct and indirect effects on soils are measured within the activity areas, the cumulative effects analysis area for the soil resource consists of the cumulative impacts within each of activity the areas.

Few cumulative effects are anticipated in the proposed activity areas because the majority of units have had little to no past disturbance. None of the activity areas currently exceed either the Regional or Forest Plan Soil Standards for detrimental disturbance associated with past harvest (Table 68 and Table 69, PF Doc. Soil-17 through Soil-19).

Combining the existing and predicted detrimental impacts of activities, long-term cumulative soil impacts may affect no more than 13% of the activity areas in both Alternative 2 and Alternative 3 therefore meeting Region 1 Soil Quality Standards. When existing system roads are incorporated, cumulative soil impacts would affect no more than 19% (the majority less) of the activity areas in both Alternative 2 and Alternative 3, therefore meeting Forest Plan Soil Quality Standards in both Alternatives. There are no current or reasonably foreseeable future activities beyond what is proposed with this project that would affect soils in the proposed treatment units (see Section 2.10 – Past, Ongoing and Reasonably Foreseeable Activities).

3.5.4.5.1. Past Activities

Timber Harvest and Related Activities

The resource area has been influenced by past harvest activities (PF Doc. Soil-21) and could be affected by present and future land management. The majority of previous logging occurred in the early 1990's. Other recorded harvest activities consisted of road side salvages of dead and dying timber that was scattered throughout Beaver Creek. All of proposed skyline, Escaliner and ground-based activity areas associated with both alternatives are currently well below both the Regional and Forest Plan Standard limits for detrimental disturbance (Table 68).

In each of the action alternatives there are only five units that have past disturbances caused by mineral exploration or past harvest activities. The disturbances associated with those past activities are slowly recovering in areas where mineral exploration and ground-based yarding occurred or have recovered with little evidence to show harvest had occurred except for the decaying stumps left behind. All the units with past disturbance are either skyline (3) or a combination of skyline/Escaliner swing (2) type of yarding. Past monitoring of skyline yarding operations have found disturbance is very localized and tends to recover in a very short period of time (Niehoff 2002, PF Doc. Soil-R-44; PF Doc. Soil-19-20; Forest Plan Monitoring, 2005 through 2009, PF Doc. CR-038 and 040).

Slope Stability

Units 6, 38, 71 and 78 fall either downslope or upslope of existing harvest units however, unit 78 has landtypes that are rated low to moderate for landtype sensitivity or mass failure (PF Doc. Soil-2 and 3). Units 6 and 38 are above previously harvested area with a high rating for landtype

sensitivity and unit 71 is situated below a previously harvested area with a high landtype sensitivity rating.

Slope gradient, soil depth, and water content are all important factors in influencing landslide hazards (Megahan and others 1978, PF Doc. Soil-R-38). Soil water, a major contributor to higher landslide potential, increases from ridge top to stream bottom, hence the landslide potential varies with slope position. Slides are infrequent at or near ridge tops and become more common with the increase in drainage area.

Another factor related to slope stability is the length of recovery of the past harvest treatments. The most common occurrences of landslides occur within 4 to 10 years after harvest and by 20 years they are back to pre-disturbance levels (Megahan and others 1978, PF Doc. Soil-R-38). All past harvest treatments upslope or downslope of proposed activity units occurred in the mid 1980's to the mid-1990s and are nearing pre-disturbance levels with vegetative recovery. These units are on high to midslope locations in proximity to past timber harvest that is nearing recovery and have small drainage areas leading to a low potential for slope instability.

Wildfire

Large wildfires have not been common for over a century within the project area. The cumulative impacts of this project on wildfire are an overall reduction in risk to soils.

Road Construction

Past road construction on National Forest System lands has resulted in the removal of soils from the productive land base. Approximately 1,000 acres of National Forest System lands within the Beaver Creek Resource Area are dedicated to 238 miles of system roads. The area affected by existing system roads was estimated using 4.2-acres per mile (35-foot road width that includes a 14-foot wide running surface and cut and fill slopes).

3.5.4.6. Ongoing and Reasonably Foreseeable Activities

Timber Harvest

No timber activities beyond the Beaver Creek timber sale are proposed or ongoing in the reasonably foreseeable future in any of the activity areas proposed in this analysis.

Wildfires

Wildfires have been common in the past and most likely will occur in the future. Salvage opportunities would be considered if a wildfire should occur within the project area. However, it is unfeasible at this time to predict if, when, where, or how that would be proposed. Additional analysis and a separate decision would be required.

Successful fire suppression actions would reduce the chance of detrimental effects to soil productivity. Most hand fireline construction would have only minor disturbance to the soil resource. On small wildfires, impacts from fire suppression activities are usually limited to hand tools and most hand fire-line construction has only minor (insignificant) impacts to the soil resource. As needed, closed roads would be reopened for access and be incorporated as part of the fireline construction. As part of post-fire work, the areas of disturbance would be rehabilitated and the roads would be returned to their previous status. It is unfeasible at this time to predict when, where, or how wildfires would be suppressed.

Road Maintenance

Road maintenance typically can improve drainage, and decreases erosion from water channeling down the road surface. This management activity is ongoing and will extend into the reasonably foreseeable future. No additional roads are planned to be constructed beyond what is proposed with the Beaver Creek Project. For additional information on roads, see the Hydrology section (3.3).

Noxious Weed Treatment

Areas of disturbed soil provide an optimal location for weed establishment and subsequent invasion (Sheley and others 2002, PF Doc. Soil-R-62). Weeds establish quickly and can increase erosion, deplete soil moisture, and alter nutrient levels (DiTomaso 2000, PF Doc. Soil-R-89). Because the roots of noxious weeds are deeper than native grasses, they also contribute less organic matter near the soil surface (Sperber and others 2003, PF Doc. Soil-R-102). Refer to the Noxious Weeds section in Appendix B for additional details.

Noxious weed monitoring and treatment would therefore occur as needed and would follow guidelines established in the Coeur d'Alene Environmental Impact Statement and Record of Decision (USDA 2000, PF Doc. CR-028). Effects to soil resources were analyzed in the document and its adaptive strategy. No additional effects to soils beyond what was analyzed for and disclosed in the environmental impact statement are expected to occur.

Recreation and Other Activities

Some roads in the project area are open for general motorized use which allows for hunting, fuel wood gathering, collection of miscellaneous forest products, outfitter and guide uses, dispersed camping, and motorized touring. Recreational activities are expected to increase over time as more people visit the national forests for recreation. This may contribute to localized, small-scale disturbances.

Activities such as berry picking, personal Christmas tree removal, and driving on open roads are not expected to affect the soil resource because these activities do not cause substantial changes to soil conditions.

3.5.4.6.1. Proposed Activities

The proposed activities that would affect soils and would occur where effects from past, present, and reasonably foreseeable activities are still evident include timber harvest, fuels treatment, system and temporary road construction, and system road decommissioning.

Timber Harvest and Fuel Treatment

The cumulative result of Alternative 2 would reduce productivity on approximately 96 acres under the Forest Plan and 81 acres under the Regional Standard of National Forest System land in the Beaver Creek Resource Area (Table 68). This is approximately 5% of the 1,973 acres of proposed activity area under the Forest Plan and approximately 4% of the 1,973 acres under the Regional Standard. Under Alternative 3, approximately 82 acres under the Forest Plan Standard and 67 acres under the Regional Standard would be affected (Table 69). This is approximately 5% on the 1,662 acres under the Forest Plan and approximately 4% of the 1,662 acres under the Regional Standard that would have reduced productivity.

Under Alternatives 2 and 3, all proposed units are expected to meet Regional and Forest Plan requirements after harvest, site-prep and mitigation activities are concluded (Table 68 and Table 69; PF Doc Soil-5 and Soil-6).

System Road Construction

When existing and proposed system roads are incorporated, cumulative soil impacts would affect no more than 19% of any activity area, therefore meeting Forest Plan standards (PF Doc. Soil-5 and Soil-6). R1 Soils Quality Standards do not include system roads.

Within the entire resource area, approximately 1.2 miles of new system road and 1.5 miles of temporary road would be constructed under Alternative 2 (Table 67; PF Doc. Soil-5, Soil-6 and Soil-22). That equates to approximately 5 acres of land dedicated to system roads where soil productivity would not be maintained, and 6.3 acres that would be reclaimed at the conclusion of harvest activities.

Under Alternative 3, no new system or temporary road would be constructed. Roads and landings that are to remain on the landscape for future use have detrimental effects on productivity, as those lands become "dedicated" lands. A detailed analysis of roads and their effects is available in the Hydrology Section 3.3.

Cumulative Effects on Productive Land Base

The cumulative effects of road construction and system road decommissioning on the productive land base in the project area are shown in Table 71. Approximately 5.0 acres would be removed from the productive land base under Alternative 2 for the proposed new construction of 1.2 miles of system road with no new acres removed from the productive land base under Alternative 3. Approximately 269 acres under Alternative 2 and 433 acres for Alternative 3 would be on the path of recovery towards a productive land base from road decommissioning (Prescription D).

Table 71. Summary comparison of land not in the productive land base under Alternatives 2 and 3.

Designated Use	Alternative 2 (acres)	Alternative 3 (acres)	Alternative 2 (miles)	Alternative 3 (miles)
Existing system roads	1,000	1,000	238	238
Additional system roads	5	0	1.2	0
Recovery trend towards the productive land base as a result of road decommissioning (Road Prescription D)[1]	-2,771	-4,371	-66	-104
Total land dedicated to other uses (soil quality standards do not apply)	728	563	173.2	134

[1] Road decommissioning efforts (ripping, incorporation of woody material etc.) would not instantly rehabilitate all 277 acres under Alternative 2 or 437 acres under Alternative 3 but would initiate a long-term recovery sequence for soil productivity.

3.5.4.7. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

3.5.4.7.1. Forest Plan

Forest Plan Soil Standard #1

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.

Alternative 1 would comply with this standard because no new management-induced detrimental direct and indirect impacts would occur in the Beaver Creek Resource Area.

Alternatives 2 and 3 would comply with this standard because all proposed activity areas would be below soil quality limits for disturbance and would maintain the acceptable productivity potential for managed vegetation. Including system roads within harvest units, the proposed activities have the potential to disturb a total of 96 acres with Alternative 2 (Table 68; PF Doc. Soil-5) and 82 acres with Alternative 3 (Table 69; PF Doc. Soil-6).

Forest Plan Soil Standard #2

Projects should strive to maintain sufficient large woody debris to maintain site productivity. Large woody debris is essential for maintenance of sufficient micro-organism populations.

Alternative 1 would comply with this standard as existing levels of large wood would be retained on site and increase through time as mortality from insect and disease gradually thin the existing canopy and they fall to the ground.

Alternatives 2 and 3 would comply with this standard because none of the existing coarse woody debris would be removed during harvest activities. Along with leaving existing coarse woody debris, tops would be left in the majority of the regeneration units and several of the commercial thinning and improvement harvest units. Logging slash from tree limbs and un-merchantable pieces and breakage would remain within all harvest units adding to the existing coarse woody debris. Large woody debris retention would follow the research guidelines of Graham and others (1994; PF Doc. Soil-R-21) to ensure the maintenance of site productivity.

Forest Plan Soil Standard #3

In the event of whole tree logging, provision for maintenance of sufficient nutrient capital should be made in the project analysis.

Alternative 1 would comply with this standard because no harvest would occur.

The majority of the commercial thinning and improvement harvest along with a few of the regeneration harvest are planned for whole tree yarding for fuels reduction. Alternatives 2 and 3 would comply with this standard by leaving all breakage of tops and limbs, all existing down coarse woody debris along with unmerchantable smaller diameter trees and all snags. Also in the commercial thinning and improvement units a residual stand of 60 to 90 trees per acres would be available for future recruitment as some eventually die and fall to the ground. Design Features (Appendix E; PF Doc. Soil-20) for over-wintering of the majority of proposed treatment areas will allow nutrients time to leach into the soil before fuel activities begin.

3.5.4.7.2. Region 1 Soil Quality Standards

All alternatives would comply with Region 1 soil quality standards.

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

The proposed activities would comply with Regional Soil Quality Standards (USDA 1999) related to detrimentally disturbed soils (Table 68 and Table 69). All alternatives would comply with this standard because none of the proposed units are expected to surpass disturbance limits of 15%.

The proposed activities have the potential to disturb a total of 81 acres with Alternative 2 (Table 68; PF Doc. Soil-5). The greatest impacts are expected to be approximately 13% in either Alternative 2 or Alternative 3, which means that at least 87% of the activity areas in either alternative would retain their full productivity potential. The remaining units would maintain equivalent or more area in conditions with full productivity potential due to fewer impacts from logging.

Organic matter layer thickness would be retained as appropriate for local conditions.

All alternatives would comply with this standard because the currently satisfactory levels of local organic matter would be maintained. Harvest activities may actually increase material that would contribute to the organic surface layer through limbs and tops left on-site. Existing organic matter would not be diminished by harvest activities, but organic matter recruitment would likely be less in those units that will have regeneration harvest.

Large woody debris would be maintained at recommended volumes (Graham and others 1994) in each proposed activity area.

Alternatives 2 and 3 would comply with this standard because none of the existing coarse woody debris would be removed during harvest activities. Along with leaving existing coarse woody debris, tops would be left in the majority of the regeneration units and several of the commercial thinning and improvement harvest units. Logging slash from tree limbs and un-merchantable pieces and breakage would remain within all harvest units adding to the existing coarse woody debris. Large woody debris retention would follow the research guidelines of Graham and others (1994; PF Doc. Soil-R-21) to ensure the maintenance of site productivity.

3.5.5. Soils References

Amaranthus, M. P.; J. M. Trappe, and R. J. Molina. 1989. Long-term forest productivity and the living soil. *In*: Maintaining the long-term productivity of Pacific northwest forest ecosystems. D. A. Perry, ed. pp. 36-49. *(PF Doc. Soil-R-01)*

Baker, T.G., G.M. Will, and G.R. Oliver. 1989. Nutrient release from silvicultural slash: leaching and decomposition of *Pinus radiata* needles. For. Ecol. and Mgmt, 27:53-60. *(PF Doc. Soil-R-02)*

Barber, B.L., and D.H. Van Lear. 1984. Weight loss and nutrient dynamics in decomposing woody Loblolly pine logging slash. Soil Sci. Soc. Am. J. 48:906-910. *(PF Doc. Soil-R-03)*

Barnett, D. 1989. Fire effects on coast range soils of Oregon and Washington and management implementation: a state-of-knowledge review. R6 Soils Tech. Rep., 66 pp. *(PF Doc. Soil-R-04)*

Beschta, R.L., J.J. Rhodes, J.B. Kaufman, and others. 2004. Post-fire management on forested public lands of the western United States. Cons. Biol. 18(4):957-967. *(PF Doc. Soil-R-05)*

Brown, J.K., E.D. Reinhardt, and K.A. Kramer. 2003. Coarse woody debris: managing benefits and fire hazard in the recovering forest. Gen. Tech. Rep. RMRS-GTR-105, July, 16 pp. *(PF Doc. Soil-R-06)*

Certini, G. 2005. Effects of fire on properties of forest soils: a review. Oecologia 143:1-10. *(PF Doc. Soil-R-65)*

Cram, D., T. Baker, and J. Boren. 2006. Wildland fire effects in silviculturally treated vs. untreated stands of New Mexico and Arizona. Research Paper RMRS-RP-55. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 28 pp. *(PF Doc. Soil-R-66)*

Cromack, K., Jr., F.J. Swanson, and C.C. Grier. 1979. A comparison of harvesting methods and their impact on soils and environment in the Pacific Northwest. *In*: Youngberg, C.T., ed., Forest soils and land use, Proc. 5th North Am. For. Soils Conf., Aug. 6-9, 1978. CO State Univ., p. 449-476. *(PF Doc. Soil-R-92)*

DeBano, L.F. 1991. The effect of fire on soil properties. *In:* Proceedings--Management and Productivity of Western Montane Forest Soils. Harvey, A and L. Neuenschwander, compilers. Gen. Tech. Rep. INT-280. USDA, Forest Service, Intermountain Research Station. pp. 151-155. *(PF Doc. Soil-R-09)*

DeBano, L.F. 1981. Water repellant soils: a state-of-the-art. Gen. Tech. Rep. PSW-46, Pacific Southwest Forest and Range Exp. Stn., USDA Forest Service, Berkeley, CA. 21 pp. *(PF Doc. Soil-R-10)*

de Dios Benavides-Soloria, J., and L.H. MacDonald. 2005. Measurement and prediction of post-fire erosion at the hillslope scale, Colorado Front Range. Int. J. of Wildland Fire 14:457-474. *(PF Doc. Soil-R-95)*

DiTomaso, J.M. 2000. Invasive weeds in rangelands: species, impacts, and management. Weed Science 48:255-265. *(PF Doc. Soil-R-89)*

Doerr S.H., R.A. Shakesby, and R.P.D. Walsh. 2000. Soil water repellency: its causes, characteristics, and hydro-geomorphological significance. Earth-Sci. Rev. 51:33-65. *(PF Doc. Soil-R-11)*

Dykstra P. and M. Curran. 2002. Skid road recontouring in British Columbia: 7-year tree growth results. Res. Br. B.C. Min. For. Victoria, B.C. Tech. Rep. 001. *(PF Doc. Soil-R-12)*

Dyrness C.T. 1976. Effect of wildfire on soil wettability in the high Cascades of Oregon. Res. Pap. PNW-202. 18 pp. *(PF Doc. Soil-R-13)*

Edmonds, R.L. 1987. Decomposition rates and nutrient dynamics in small diameter woody litter in four ecosytems in Washington, USA. Ca. J. For. Res. 17: 449-509. *(PF Doc. Soil-R-14)*

Eliasson, L., and I. Wästerlund. 2007. Effects of slash reinforcement of strip roads on rutting and soil compaction on a moist fine-grained soil. For. Ecol. and Mgmt. 252:118-123. *(PF Doc. Soil-R-93)*

Entry, J.A., K. Cromack Jr., G. Kelsey, and N.E. Martin. 1991. Response of Douglas-fir to infection by *Armillaria ostoyae* after thinning or thinning plus fertilization. Phytopathology 81:682-689. *(PF Doc. Soil-R-97)*

Erickson, H.E., and R. White. 2008. Soils under fire: soils research and the Joint Fire Science Program. Gen. Tech. Rep. PNWGTR- 759. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 pp. *(PF Doc. Soil-R-88)*

Frandsen, W.H., and K.C. Ryan. 1985. Soil moisture reduces belowground heat flux and soil temperatures under a burning fuel pile. Can. J. For. Res. 16:244-248. *(PF Doc. Soil-R-15)*

Froehlich H.A., D.W.R. Miles, and R.W. Robbins. 1985. Soil bulk density recovery on compacted skid trails in Central Idaho. Soil Sci. Soc. Am. J. 49:1015-1017. *(PF Doc. Soil-R-16)*

Froehlich, H.A., and D.H. McNabb. 1983. Minimizing soil compaction in Pacific Northwest forests. In E.L. Stne (Ed.) Forest Soils and Treatm. Impacts, Proc. of 6th North Am. For. Soils Conf., U of TN Conf., 2016 Lake Ave. Knoxville, TN, June, pp. 159-192. *(PF Doc. Soil-R-83)*

Froehlich, H.A., R.W. Robbins, D.W.R. Miles, and J.K Lyons. 1983. Soil Monitoring project report on Payette National Forest and Boise Cascade lands. Payette NF, McCall, ID. 58 pp. Monitoring recovery of compacted skid trails in central Idaho. *(PF Doc. Soil-R86)*

Garrison, M.T., and J.A. Moore. 1998. Nutrient management: a summary and review. In: Intermountain Forest Tree Nutrition Cooperative Supplemental Report 98:5, 45 pp. *(PF Doc. Soil-R-17)*

Garrison-Johnston, M.T., R. Lewis, and L.R. Johnson. 2007. Northern Idaho and Western Montana nutrition guidelines by rock type. IFTNC, Univ. of ID, Moscow, ID. 109 pp. *(PF Doc. Soil-R-69)*

Garrison-Johnston, T.M. Shaw, L.R. Johnson, and P.G. Mika. 2004. Intermountain Forest Tree Nutrition Cooperative, Presentation at the Potassium Meeting, IPNF, Coeur d'Alene, ID, April 23. *(PF Doc. Soil-R-19)*

Garrison-Johnston, M. 2003. Geologic controls on tree nutrition and forest health in the Inland Northwest. Presented at GSA Ann. Mtng, Seattle, WA. 9 pp. *(PF Doc. Soil-R-20)*

Garrison-Johnston, M., J.A. Moore, S.P. Cook, and G. J Niehoff. 2003. Douglas-fir beetle infestations are associated with certain rock and stand types in the Inland Northwestern United States. Env. Entomology, 32(6):1364-1369. *(PF Doc. Soil-R-18)*

Goodwin, K, and R. Sheley. October 2002. Revegetation Guidelines for Western Montana. Draft, MSU – Bozeman. *(PF Doc. Soil-R-81)*

Gorman, J. 2003. How a forest stopped a fire in its tracks. New York Times article, July 22, 2003. *(PF Doc. Soil-R-64)*

Graham, R.T., A.E. Harvey, M.F. Jurgenson, T.B. Jain, J.R. Tonn and D.S. Page-Dumroese. 1994. Managing coarse woody debris in forests of the Rocky Mountains. USDA Forest Service Intermountain Research Station. Research paper INT-RP-477. *(PF Doc. Soil-R-21)*

Graham, R.T, S. McCaffrey, T.B. Jain, 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity. USDA Forest Service Intermountain Research Station. General Technical Report RMRS-GTR-120. *(PF Doc. Soil-R-68)*

Gray, D.H., and W.F. Megahan. 1981. Forest vegetation removal and slope stability in the Idaho batholith. Res. Paper INT-271. May. 23 pp. *(PF Doc. Soil-R-22)*

Han, H.S., D. Page-Dumroese, S.K. Han, and J. Tirocke. 2006. Effect of slash, machine passes, and soil wetness on soil strength in a cut-to-length harvest. USDA FS Gen. Tech. Rep. PSW-GTR-194. 10 pp. *(PF Doc. Soil-R-60)*

Heyerdahl, E.K., P. Morgan, and J.P. Riser II. 2007. Multi-season climate synchronized widespread historical fires in dry forests (1650-1900), Northern Rockies, USA. In press in the J. of Ecol as of 7/6/2007.19 pp. *(PF Doc. Soil-R-87)*

Huffmann, E.L., L.H. MacDonald, and J.D. Stednick. 2001. Strength and persistence of fire-induced soil hydrophobicity under ponderosa and lodgepole pine, Colorado Front Range. Hydrol. Process. 15: 2877-2892. *(PF Doc. Soil-R-25)*

Hungerford, R.D., M.G. Harrington, W.H. Frandsen, K.C. Ryan, and G.J. Niehoff. 1991. Influence of fire on factors that affect site productivity. *In*: Proceedings – Mgtmt. And productivity of western montane forest soils. USDA FS Gen. Tech. Rep. INT-280. p. 32-50. *(PF Doc. Soil-R-26)*

Ice, G.G. 2003. Effects of wildfire on soils and watershed processes. In Conf. on post-fire restoration & salvage harvesting: applying our knowledge and experience, Cent. OR Soc. of Am. For., Deschutes NF, OR Dept. of For., Bend, OR, Oct. 21-23. *(PF Doc. Soil-R-27)*

IDEQ 2001. Idaho's 2000 Forest Practices Water Quality Audit. Final Report. Idaho Department of Environmental Quality. Boise, Idaho. *(PF Doc. Soil-R-28)*

Johnston, M. 2009. Potlatch Slash Leaching Trial. Preliminary Branch and Soil Result.

Jones, J.A. 2000. Hydrologic processes and peak discharge response to forest removal, regrowth, and roads in 19 small experimental basins, western Cascades, Oregon. Wat. Resources Res. 36:2621-2642. *(PF Doc. Soil-R-30)*

Keane, R.E., K.C. Ryan, T.T. Veblen, and others. 2002. Cascading effects of fire exclusion in the Rocky Mountain ecosystems: a literature review. General Technical Report. RMRSGTR-91. Fort Collins, CO: U.S. Dept. of Agr., Forest Service, Rocky Mountain Research Station. 24 pp. *(PF Doc. Soil-R-67)*

Krag, R. 1991. Options for reducing soil disturbance during timber harvesting. *(PF Doc. Soil-R-31)*

Landsberg, J.D., R.E. Miller, H.W. Anderson, and J.S. Tepp. 2003. Bulk density and soil resistance to penetration as affected by commercial thinning in northeastern Washington. USDA FS Res. Paper PNW-RP-551. *(PF Doc. Soil-R-91)*

Laskowski, R., B. Berg, M, Johansson, and C. McClaugherty. 1995. Release pattern for potassium from decomposing forest needle and leaf litter. Long-term decomposition in a Scots pine forest. Ca. J. Bot. 73:2019-2027. *(PF Doc. Soil-R-32)*

Lynch, J.A., and Corbett, E.S. 1989. Effectiveness of BMP's in Controlling Nonpoint Pollution from Silvicultural Operations. *(PF Doc. Soil-R-34)*

Lynch, J.A., and Corbett, E.S. 1990. Evaluation of best management practices for controlling nonpoint pollution from silvicultural operations. Water Resour. Bull. 26: 41–52. *(PF Doc. Soil-R-33)*

Maurer, D. 2007. The effects of vegetation treatments on fire behavior during the Vincent fire on the Black Mesa Ranger District. USDA white paper, Apache-Sitgraves NF, Black Mesa RD, AZ. 6 pp. *(PF Doc. Soil-R-94)*

Mazza, R. 2008. Changing with the climate. USDA - PNW Res. Sta. Science Update, Issue 17. 12 pp. *(PF Doc. Soil-R-84)*

McIver, J.D. and L. Starr. 2000. Environmental effects of postfire logging: literature review and annotated bibliography. USDA Forest Service Pacific Northwest Res. Sta. Gen. Tech. Rep. PNW-GTR-486. *(PF Doc. Soil-R-35)*

McNabb, D.H., and K. Cromack, Jr. 1990. Effects of prescribed fire on nutrients and soil productivity. *In*: Natural and prescribed fire in Pacific Northwest forests. Walstad, J. D. and others, Corvallis, OR, OR State Univ. Press, pp. 125-142. *(PF Doc. Soil-R-36)*

Megahan, W.F., and J.G. King. 2004. Erosion, sedimentation, and cumulative effects in the northern Rocky Mountains. Pg. 201-222 in G.G. Ice and J.D. Stednick, eds. A century of forest and wildland watershed lessons. Soc. of Am. For., Bethesda, MD. 21 pp. *(PF Doc. Soil-R-101)*

Megahan, Walter F. 1990. Erosion and site productivity in western-Montana forest ecosystems. *In: Proceedings, Management and Productivity of Western-Montana Forest Soils.* Gen. Tech. Rep. INT-280. USDA, Forest Service, Intermountain Research Station. pp. 146-150. *(PF Doc. Soil-R-37)*

Megahan, W.F., N.F. Day, and T.M. Bliss. 1978. Landslide occurrence in the western and central northern Rocky Mountain physiographic province in Idaho. In: Forest soils and land use, Proc. 5th North Am. For. Soils Conf., Ft, Collins, CO, Aug. p. 116-139. C.T. Youngberg, ed., CO St. Univ., Ft. Collins. *(PF Doc. Soil-R-38)*

Mika, P. 2005. The Forest Health/Nutrition Experiment: Eight-year Growth and Mortality Results, Univ. of Idaho. Preliminary study, Annual meeting, Intermountain Forest Tree Nutrition Coop., Moscow, ID. *(PF Doc. Soil-R-39)*

Moore, J.A., D.A. Hamilton, Jr., Y. Xiao, and J. Byrne. 2004a. Bedrock type significantly affects individual tree mortality for various conifers in the inland Northwest, USA. Can. J. For. Res. 34:31-42. *(PF Doc. Soil-R-40)*

Moore, J.A., P.G. Mika, T.M. Shaw, and M.I. Garrison-Johnston. 2004b. Foliar Nutrient Characteristics of Four Conifer Species in the Interior Northwest United States. West. J. Appl. For. 19(1):13-24. *(PF Doc. Soil-R-41)*

Morris, L.A., and R.E. Miller. 1994. Evidence for long-term productivity change as provided by field trials. In: Dyck W.J., D.W. Cole, and N.B. Comerford, comps. Eds., impacts of For. Harvesting on Long-Term Site Prod., London, Chapman and Hall, 41-80. *(PF Doc. Soil-R-42)*

Neary, D.G., K.C. Ryan, and L.F. DeBano, eds. 2005. Wildland fire in ecosystems: effects of fire on soils and water. Gen. Tech. Rep. RMRS-GTR-42-vol.4. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 250 pp. *(PF Doc. Soil-R-43)*

Niehoff, G.J. 2002. Soil NEPA analysis process and source of soil disturbance model coefficients. Unpublished IPNF technical guide. *(PF Doc. Soil-R-44)*

Niehoff, G.J. 1985. Technical guide to determine potential soil damage by prescribed burning and wildfire. 7 pp. *(PF Doc. Soil-R-45)*

Page-Dumroese, D. M. Jurgensen, A. Abbott, and others. 2006a. Monitoring changes in soil quality from post-fire logging in the Inland Northwest. USDA FS Proc. RMRS-P-41, p. 605-614, Fort Collins, CO. *(PF Doc. Soil-R-96)*

Page-Dumroese, D. M. Jurgensen, W.Elliot, T.Rice, J.Nesser,T.Collins, R.Meurisse, 2000. Soil quality standards and guidelines for forest sustainability in Northwestern America. *(PF Doc. Soil-R-109)*

Palviainen, M., L. Finer, A. Kurka, H. Mannerkoski, S. Piirainen, and M. Starr. 2004. Release of potassium, calcium, iron and aluminum from Norway spruce, Scots pine and silver birch logging residues. Plant and Soil 259:123-136. *(PF Doc. Soil-R-46)*

Powers, R.F. 2006. Long-term soil productivity: genesis of the concept and principles behind the program. Can. J. For. Res. 36:519-528. *(PF Doc. Soil-R-79)*

Powers, R.F., D.A. Scott, F.G. Sanchez, R.A. Voldseth, D. Page-Dumroese, and J.D. Elioff. 2005. The North American Long-Term Soil Productivity experiment: findings from the first decade of research. For. Ecol. and Mgmt. 220:31-50. *(PF Doc. Soil-R-80)*

Powers, R. F., A.E. Tiarks, and J.R. Boyle. 1998. Assessing soil quality: practical standardsfor sustainable forest productivity in the United States. In: The contribution of soil science to the development and implementation of criteria and indicators of sustainable forest management. SSSA Spec. Publ. 53. Madison, WI: SSSA: 53-80. *(PF Doc. Soil-R-77)*

Reid, L. M., and S. Hilton. 1998. Buffering the buffer. USDA Forest Service PSW-GTR-168, pp. 71-80.

Robichaud, P.R. 2000. Forest fire effects on hillslope erosion: what we know. RMRS. http://watershed.org/news/win_00/2_hillslope_fire.htm*(PF Doc. Soil-R-50)*

Rone, G. 2011. Soil monitoring report: 30 years of soil monitoring on the IPNF. *(PF Doc. Soil-R-08)*

Seyedbagheri, K.A. 1996. Idaho Forestry Best Management Practices: Compilation of Research on their Effectiveness. USDA Forest Service, Intermountain Research Station Gen. Tech. Rep. INT-GTR-339. pp. 7-9. *(PF Doc. Soil-R-51)*

Shaw, T. 2005. Final Results from the Forest Health Experiment *Armillaria ostoyae* Root Disease Inoculation Project, Univ. of Idaho. Intermountain Forest Tree Nutrition Coop., Moscow, ID. *(PF Doc. Soil-R-52)*

Sheley, R., M. Manoukian, and G. Marks. 2002. Preventing noxious weed invasion. Montguide #199517. Montana State University Extension Serv., Bozeman, MT. 3 pp. *(PF Doc. Soil-R-62)*

Shen, E., J.A. Moore, and C.R. Hatch. 2001. The effect of nitrogen fertilization, rock type, and habitat type on individual; tree mortality. For. Sci. 47(2):2-3-213. *(PF Doc. Soil-R-53)*

Switalski, T.A., J.A. Bissonette, T.H. DeLuca and M.A. Madej. 2004. Benefits and Impacts of Road Removal. Front. Ecol. Env. 2(1): p. 21-28. *(PF Doc. Soil-R-56)*

USDA Forest Service. 2009. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report for 2007-2009. Coeur d'Alene, ID. *(PF Doc. CR-040)*

USDA Forest Service. 2008. Northern Region Soil Disturbance Monitoring Protocol. March version, draft. R1, Missoula. 54 p. *(PF Doc. Soil-R-74)*

USDA Forest Service. 2006. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report for 2005-2006. Coeur d'Alene, ID. *(PF Doc. CR-038)*

USDA Forest Service. 2004. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID. *(PF Doc. CR-026)*

USDA Forest Service. 2003. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID. *(PF Doc. CR-022)*

USDA Forest Service. 2002. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID. *(PF Doc. CR-018)*

USDA Forest Service. 2001a. Guide to noxious weed prevention practices. Version 1.0. Available online at http://fsweb.sanjuan.r2.fs.fed.us/range/fsweedprevention_070.doc. *(PF Doc. Soil-R)*

USDA Forest Service. 2001b. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID. *(PF Doc. CR-017)*

USDA Forest Service. 2000. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID. *(PF Doc. CR-016)*

USDA Forest Service. 1999a. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID. *(PF Doc. CR-015)*

USDA Forest Service. 1999b. Roads analysis: Informing decisions about managing the National Forest transportation system, misc. reports FS-643. 48 pp.

USDA FS. 1999c. Region 1 Soil Quality Standards. 2554.03-R1 Suppl. 2500-99-1. 6 pp. *(PF Doc. Soil-R-58)*

USDA Forest Service. 1998. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID. *(PF Doc. CR-014)*

USDA, 1988c. Soil and Water Conservation Practices Handbook. FSH 2509.22 R1/R4 5/88. *(PF Doc. Soil-R-72)*

Wells, C.G., R. Campbell, L. DeBano, C. Lewis, R. Fredriksen, E.C. Franklin, R. Froehlich, and P. Dunn. 1979. Effects of fire on soil. USDA General Technical Report WO-7. 34 pages. *(PF Doc. Soil-R-57)*

3.6. Wildlife

3.6.1. Introduction

This section details the analysis and discloses the potential effects on focal wildlife species as a result of implementing each of the proposed alternatives in the Beaver Creek Resource Area. A complete narrative of the project, including specific location and alternative descriptions, can be found in detail in Chapter 2.

3.6.2. Affected Environment

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 suitable habitat below) as well as disturbance (fire, windthrow, landslide, and insect outbreaks) types and frequencies. 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, PF Doc. WL-R399). 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. Given the often-conflicting habitat requirements of many species, a sound strategy for management is to maintain a complex pattern of forest types and age classes across the landscape that encourages biodiversity and emulates the historic patterns.

Ecological disturbances 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, directing wildlife abundance and composition. In addition to altering habitat due to direct impacts (i.e. 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.

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 successional stages.

3.6.3. Characterization of Habitats

The Beaver Creek project is located entirely within Shoshone County, Idaho, approximately 15 miles northwest of Wallace, Idaho in the southeastern portion of the Coeur d'Alene River Ranger District. The Beaver Creek Resource Area (approximately 28,200 acres in size) currently contains 69 percent mature and old-growth forest (refer to the Forest Vegetation Section 3.1). The majority of the project area is characterized by moist conifer forest consisting of Douglas-fir, grand fir, and hemlock; however, some mature dry-site ponderosa pine exist.

The Beaver Creek project was initiated to develop sustainable forest conditions, reduce hazardous fuels, and improve water quality and aquatic habitats. The area is characterized by moderate and steep terrain. Due to human influenced and non-human influenced past activities in the area, the

species composition that now exists contains many short-lived and fire prone tree species. As a result, the landscape has become less resilient to insects, disease, fire, and drought.

3.6.4. Organization

The analysis and discussion of existing condition and project effects on various wildlife species is organized as follows:

- Habitat Relationships: This section describes the natural history, status and distribution of wildlife species analyzed in detail that have been identified as species of concern within the area and could potentially be affected by proposed activities. It also describes the current conditions 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.
- Affected Environment: The resource information provided, especially as it relates to habitat analysis, includes past actions and events that have influenced vegetative changes to what is now part of the existing condition. An important concept in the existing condition descriptions and analysis is the difference between capable habitat and suitable habitat. 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 (such as stand age, cover type or stand density) may not currently provide the necessary attributes to support a species, 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 meeting a given species' habitat requirements. Variable attributes change over time and may include stand age, cover type, stand density, tree size, or canopy cover. Suitable habitat may be identified based on its ability to currently provide suitable habitat for a limiting factor such as nesting habitat. Since it can be difficult to determine if currently unoccupied habitat contains all attributes necessary to meet a species' requirements (some of which may be difficult to measure, are not easily discernible, or are previously undocumented by research), stands that appear to contain the necessary habitat components based on habitat validation surveys are labeled as *potentially* suitable.
- Methodology: 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 references the following documents and uses a variety of information including scientific literature, resource inventories, and sighting records:
    - Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin (PF Doc. CR035)
    - Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho (PF Doc. WL-R78)
    - Idaho Panhandle National Forests Land and Resource Management Plan and Amendments (PF Doc. CR-002)

  - Toward an Ecosystem Approach: An Assessment of the Coeur d'Alene River Basin (PF Doc. CR025)
  - The Transportation Analysis Process for the project and the District Travel Plan (PF Doc. TRAN-01)
  - Available Conservation Assessments and Strategies for wildlife species

- The "Methodology" subsection for each species describes the process used in isolating individual habitat components that may be limiting on the landscape or at risk from management activities and how these elements were determined based on literature review. IPNF personnel conducted site visits on a substantial portion of representative habitat for potentially affected species in the analysis area, with emphasis placed on proposed treatment areas. In some cases, habitat information collected in the field was supplemented by queries of the stand components (FSVEG) and activities (FACTS) databases, or with aerial photograph interpretation. This section also outlines the methodology for assessing the effects of the alternatives on individuals or habitat of the species.
- Direct and Indirect Effects: This section displays and discusses the effects on those wildlife species identified in the preceding section that may be affected by the various alternatives. Effects discussions include direct effects (effects caused by the action occurring at the same time and place) and indirect effects (effects caused by the action that are later in time or removed in distance, but still reasonably foreseeable), any of which may have positive or negative consequences. Information presented in this section is based on scientific literature, wildlife databases, professional judgment, field surveys, and habitat evaluations.
- Cumulative Effects: Cumulative effects discussions include other ongoing and reasonably foreseeable actions, regardless of the source, that overlap the proposed action(s) in time and space and may incrementally add to the effects. As discussed above, the effects of past activities and disturbances have been incorporated into the existing condition, and are discussed in the "Affected Environment" subsection. Those ongoing or reasonably foreseeable activities that may be measurable or consequential at the project scale are discussed in this section.
- Conclusion: This section summarizes the findings from the analysis and the conclusion of the Wildlife Biologist about the project effects on the wildlife species being discussed.

3.6.5. Management Framework

The management framework providing direction for the management of wildlife habitat most pertinent to this analysis comes primarily from the following sources:

- 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, as amended
- IPNF Forest Plan (USDA Forest Service 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 on the IPNF.

3.6.5.1. Threatened, Endangered, and Proposed Species

The National Forest Management Act (NFMA) provides for balanced consideration of all resources. It 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 Forest Service 1987, PF Doc. CR-002).

The Endangered Species Act requires the Forest Service to assist in recovery of threatened, endangered, and proposed species and the ecosystems upon which they depend. Section 7 of the Endangered Species Act directs federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat. The IPNF is required to consult with the U.S. Fish and Wildlife Service if a proposed activity may affect individuals 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 individuals of threatened or endangered animals.

On February 11, 2009, the U.S. Fish and Wildlife Service issued a list of threatened and endangered species, along with designated critical habitat that may be present on the IPNF (USDI Fish and Wildlife Service 2009a, PF Doc. WL-R425). Endangered species on the list included woodland caribou (*Rangifer tarandus caribou*) and gray wolf (*Canis lupus*). Threatened species include grizzly bear (*Ursus arctos*) and Canada lynx (*Lynx canadensis*). No critical habitat for wildlife species was designated on the IPNF at the time the list was issued.

On March 27, 2009, the U.S. Fish and Wildlife Service designated critical habitat for Canada lynx, which included a small portion on the IPNF (USDI Fish and Wildlife Service 2009b, PF Doc. WL-R400). Effective May 5, 2011, the Northern Rockies Distinct Population Segment of gray wolves was delisted (USDI Fish and Wildlife Service 2011a, PF Doc. WL-R401). On November 28, 2012, the U.S. Fish and Wildlife Service designated critical habitat for the southern Selkirk Mountains population of woodland caribou (USDI Fish and Wildlife Service 2012, PF Doc. WL-R402). Finally, on February 4, 2013 they issued a proposed rule to list the Northern Rockies Disjunct Population Segment of North American wolverine as a threatened species (USDI Fish and Wildlife Service 2013, PF Doc. R403). Wolverine will be evaluated as a "proposed" species per USDA Region 1 direction (Swisher 2013, PF Doc. WL-R397).

3.6.5.2. 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.

Effective May 27, 2011 the Regional Forester updated the sensitive species list for the Northern Region. Since the Northern Rockies Disjunct Population Segment of North American Wolverine is now a proposed threatened species, it will no longer be evaluated as a sensitive species. There were no changes from the previous (2004) list on the IPNF. Additionally, gray wolf has automatically been placed on the list for a minimum of five years, at which time the status of this species will be reviewed by the Forest Service.

3.6.5.3. Management Indicator Species

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. The Management Indicator Species Considerations for the Idaho Panhandle National Forests white paper (Madison and Kertis 2011, Appendix H) discusses the process for analysis of these species on the IPNF. Selection of management indicator species included three categories: (1) Threatened or endangered species on federal or state lists; (2) Species commonly hunted, fished, or trapped which have special habitat needs that are affected by planned management activities, and (3) Other species whose population changes are believed to indicate effects of management activities on a major biological group or on water quality. This category will be referred to as “Indicator Species" and includes northern goshawk and pileated woodpecker. Management indicator species relevant to the Coeur d’Alene River Ranger District are northern goshawk, pileated woodpecker, marten, and elk.

3.6.5.4. Other Wildlife Species

Marten are identified as a species commonly hunted, fished, or trapped. Marten are ranked G5 globally and S5 in Idaho, which is defined as “Secure: common, widespread, and abundant” (IDFG 2005, PF Doc. WL-R331). Current marten information based on trapping success from the Idaho Department of Fish and Game indicates the species is declining statewide, however in counties bounded by the IPNF; populations are on the rise (IDFG 2012b, PF Doc. WL-R426). Based on their population status and their identification as a species commonly hunted, fished or trapped, viability is not a concern for marten. The effects of the project on marten are discussed at the appropriate level in relation to the potential impacts and the management of their habitat will continue to be addressed where appropriate. Based on DNA and on remote camera surveys conducted over the past seven years in North Idaho (e.g. over 400 verified marten detections), marten appear to be abundant and well-distributed across the Forest.

The Migratory Bird Treaty Act, as amended, made the taking, killing or possessing of migratory birds unlawful. Executive Order 13186 of 2001 clarified the responsibilities of federal agencies regarding migratory bird conservation and directed Federal agencies to evaluate the effects of federal actions on migratory birds with an emphasis on species of concern. The Executive Order also directed federal agencies to develop a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service regarding their role with respect to the Migratory Bird Treaty Act. In December 2008, the Forest Service entered into a Memorandum of Understanding with the Fish and Wildlife Service that further clarified the responsibility of the Forest Service to protect migratory birds (USDA Forest Service and USDI Fish and Wildlife Service 2008, PF Doc. WL-R404). In the Memorandum of Understanding, the Forest Ervice agreed to consider the most up-to-date list of Birds of Conservation Concern (USDI Fish and Wildlife Service 2008, PF Doc. R405) when developing or amending land management plans, and to evaluate the effects of agency actions on migratory birds within the NEPA process, focusing first on species of management concern along with their priority habitat and key risk factors. For the IPNF, the bird species of management concern are those species designated as sensitive and management indicator species. Consequently, the IPNF is in compliance with the Memorandum of

Understanding by analyzing the potential effects to these bird species and their habitat at the project level, such as in this document.

Forest Service policy (Forest Service Manual 2670.32) requires a documented review or biological evaluation of Forest Service programs or activities in sufficient detail to determine how an action may affect threatened, endangered, proposed, or sensitive species. This document serves as the primary biological evaluation for sensitive species.

Effects to species listed under the Endangered Species Act are addressed separately in a biological assessment. The biological assessment will be completed based on the alternative selected for implementation, with review and concurrence by the U.S. Fish and Wildlife Service if required due to a determination of "may affect, *not likely* to adversely affect" or "may affect, *likely* to adversely affect." A copy of the biological assessment will be included in the project files for the Beaver Creek EIS.

3.6.6. Environmental Consequences

3.6.6.1. Methodology

There is some level of uncertainty associated with any analysis methodology: habitat associations are complex, some variables may be unknown or not described, and available data may not be as specific as that used in the scientific literature. However, this analysis is based on the most applicable scientific literature and uses the best available data. This information was validated, updated, and augmented by field reviews, habitat surveys, interpretation of aerial imagery, and reasonable assumptions based on present management conditions, professional judgment, and the combined knowledge of people from various sources (e.g. other Forest Service employees, public input, public and private land management entities). The methodology is commensurate with the existing knowledge, existing data, and the risks associated with the proposal. The analysis allows for a comparison of potential effects by alternative and a decision based on environmental consequences.

The Council on Environmental Quality (40 CFR 1502.2) directs that impacts be discussed in proportion to their significance. Some wildlife species require a detailed analysis and discussion to determine effects. Others may not be impacted, impacted at a level that is inconsequential, or impacts are adequately mitigated through the design of the project. Generally, these elements do not require a detailed discussion and analysis.

Past actions and events including timber harvest, wildfire, road and trail construction, fire suppression, and insect/disease outbreaks on the Coeur d'Alene River Ranger District have influenced the existing availability and distribution of wildlife habitat. All past, present, and reasonably foreseeable actions listed below were reviewed for their relevancy to the wildlife analysis and their potential effects on wildlife (Appendix A – Past, Ongoing and Reasonably Foreseeable Activities). Those actions vary in their potential for impacts on wildlife, the consequences of potential impacts, the measurability of effects, and how they are measured. Some actions may have impacts, but any measurable effects on wildlife are already factored into the analysis (for example, road maintenance is a present and reasonably foreseeable action that may contribute to disturbance levels, but is a part of the impacts measured by miles and density of motorized routes). Also, some actions occur at a level that does not have a measurable effect (such as cutting Christmas trees for personal use) or can't be quantified for measurement because of their stochastic nature and the inability to predict their extent (e.g. access for fire suppression).

Finally, activities such as past timber harvest, wildfire and fire suppression, and insect/disease infestations may have substantially affected wildlife habitat, but these effects have resulted in the

current stand structure/composition and are incorporated into the discussion of current conditions (see "Affected Environment" subsection for each species). Since these effects have already been factored in, they would not incrementally add to the effects of the proposed action(s) in a measurable way. As a result, these past actions and events do not receive detailed discussion in the analysis of cumulative effects.

For some species, management of roads has the potential to affect habitat. Although there are a majority of roads on the landscape that are not legally open to the public, illegal access by ATV, motorcycle, and occasionally vehicles often occurs. Some roads that are proposed for decommissioning are already impassable and some are accessed illegally. It is assumed then that roads proposed for decommissioning will result in a benefit for wildlife. However, it is difficult to determine if the vegetation on the road is currently classified as suitable habitat or not, therefore benefits are discussed generally. Roads that are proposed for storage are not currently open to the public and will be available for administrative use at some point in the future. These roads are not considered as a change in impact to wildlife species and their effects on wildlife are incorporated into the existing condition. Permanent construction of roads results in a permanent loss of habitat and increased access by administrative use and potential for illegal use by the public. Temporary construction of roads results in the same effects as permanent road construction, but only for the duration of project activities, up to 10 years. Temporary roads will be decommissioned at the end of the project.

More specific discussions regarding the analysis methodology can be found in the sections on individual species.

Table 72. Past, present and reasonably foreseeable actions cumulatively affecting wildlife.

Action	Past	Present	Reasonably Foreseeable Future	Discussed in Cumulative Effects	Comments
Mining activities	X	X	X	Yes	Effects of past mining are incorporated into existing condition. Future impacts discussed for potentially affected species
Railroads	X	X		No	Effects of railroads are incorporated into existing condition.
Pocket gopher control	X	X	X	Yes	Addressed in cumulative for applicable species
Travel plan implementation	X	X	X	No	Existing travel plan guidelines are incorporated into existing condition
Activities on Private Lands	X	X	X	No	The IPNF assumes no habitat contribution from private lands
Timber harvest and related activities	X	X		Yes	Effects on habitat (e.g. forest structure and composition) of past and present timber harvest are measured in existing condition.
Tree planting	X	X	X	No	Effects on habitat (e.g. forest structure and composition) are measured in existing condition. Proposed planting is addressed in direct/indirect effects.
Precommercial thinning and timber stand improvement	X	X	X	Yes	Effects of past pre-commercial thinning (PCT) on habitat (e.g. forest structure and composition) are measured in existing condition. Potential future PCT addressed in cumulative effects

Action	Past	Present	Reasonably Foreseeable Future	Discussed in Cumulative Effects	Comments
Prescribed burning for site preparation and fuels treatments	X	X	X	No	Effects of past prescribed burning are factored into the existing condition. Future activities are addressed under *Timber Harvest and Related Activities.*
Wildfires	X		Unknown	No	Effects of past wildfires on habitat have been factored into the existing condition.
Fire suppression	X	X	X	Yes	Effects on habitat (e.g. forest structure, composition and snag numbers) are factored into existing condition. Potential future fire suppression addressed in cumulative effects.
Wildlife burns	X			No	Incorporated into existing condition
Road construction	X			No	Effects on open roads and total road miles from past road construction are factored into existing condition.
Road decommissioning	X			No	Effects on open road miles from past road decommissioning are factored into existing condition.
Road maintenance	X	X	X	No	Potential effects are measured by open road miles.
Public Activities: firewood cutting/ gathering, use of motorized vehicles, camping, snowmobiling, hunting, hiking, berry picking, fishing, Christmas tree cutting, and bike riding	X	X	X	Yes	Addressed in cumulative effects.
In-stream fisheries habitat improvement projects	X		Unknown	No	Effects on habitat are incorporated into existing condition
Spraying herbicide	X	X	X	No	Addressed in Coeur d'Alene Weed EIS and potential effects to aquatic habitats are mitigated.

3.6.6.1.1. Species Not Analyzed in Detail

A preliminary analysis was conducted for each potentially affected wildlife species and their habitat to determine the scope of project analysis. The species listed in the following table: 1) do not have suitable habitat or are not regularly present or expected to be in or near the proposed activity; or 2) are affected at a level that does not increase risk to the species, or effects have been adequately mitigated by altering the design of the project. For these reasons, these species were not analyzed in detail. Refer to Appendix B (Concerns Addressed but Not Analyzed in Detail) for further documentation on these species.

Table 73. Wildlife species not analyzed in detail.

Species	Preferred Habitat	Rationale for Elimination from Detailed Analysis
Threatened and Endangered Species		
Woodland Caribou (*Rangifer tarandus caribou*)	Above 4,000 ft. in Engelmann spruce/subalpine fir and western red cedar/western hemlock forests.	No probability of occurrence on the Coeur d'Alene River Ranger District. The project area is outside of the Woodland Caribou Recovery Zone, contains no suitable caribou habitat and is not within proposed critical habitat for caribou.
Grizzly Bear (*Ursus arctos horribilis*)	Habitat generalist. Denning areas isolated and remote from human development.	No probability of occurrence on the Coeur d'Alene River Ranger District. The project area is outside of the Grizzly Bear Recovery Zone, contains no suitable grizzly bear habitat and is not within proposed critical habitat for grizzly bear.
Canada Lynx (*Lynx canadensis*)	Higher elevation spruce/ fir forests with adequate prey base of snowshoe hares, its primary food.	The project is not within designated Lynx Analysis Units (LAUs) and does not potentially affect lynx habitat.
Proposed Species		
North American Wolverine (*Gulo gulo*)	Far-ranging omnivorous habitat generalist.	No suitable maternal denning habitat near activity areas. No decrease in prey densities or increased access to remote areas.
Sensitive Species		
American Peregrine Falcon (*Falco peregrinus anatum*)	Open habitats near cliffs and mountains. Nesting cliffs near an adequate prey base.	No suitable habitat exists in the project area for this species.
Bald Eagle (*Haliaeetus leucocephalus*)	Normally nest and forage near large bodies of water. Winter visitors and yearlong residents of northern Idaho.	No nesting, winter roosting or foraging habitat present within one-third mile of proposed treatments.
Black Swift (*Cypseloides niger*)	Builds nest behind or next to waterfalls and wet cliffs.	No impacts to suitable nesting habitat, stream flows or vegetative diversity.
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	Caves, mines, and abandoned buildings.	Suitable roosting habitat near proposed treatment areas but not affected by activities.
Common Loon (*Gavia immmer*)	Large, clear lakes below 5,000 ft. in elevation with at least a partially forested shoreline.	No suitable habitat exists in the project area for this species.
Harlequin Duck (*Histrionicus histrionicus*)	Shallow, swift streams in forested areas.	No impacts to streams with potential breeding habitat.
Coeur d'Alene Salamander (*Plethodon vandykei idahoensis*)	Springs, seeps, spray zones.	Suitable habitat may exist in the project area, but would not be affected.
Northern Bog Lemming (*Synaptomys borealis*)	Bogs, fens and, wet alpine and sub-alpine meadows.	No probability of occurrence. No suitable habitat exists in the project area for this species.

3.6.6.1.2. Species Analyzed in Detail

The following table summarizes the wildlife species and wildlife habitat components analyzed in more detail, the rationale for analysis (and conditions that influence the scope of analysis), and a brief description of their habitats.

Table 74. Wildlife species analyzed in detail.

Species	Preferred Habitat	Rationale for Detailed Analysis
Sensitive Species		
Fisher (*Martes pennanti*)	Mesic mature forest habitats	Capable denning and foraging habitat potentially affected.
Flammulated Owl (*Otus flammeolus*)	Mature or old growth ponderosa pine and Douglas-fir forest.	Capable nesting and foraging habitat potentially affected.
Pygmy Nuthatch (*Sitta pygmaea*)	Ponderosa pine habitat, especially mature and old growth stands.	Capable nesting and foraging habitat potentially affected.
Fringed Myotis (*Myotis thysanodes*)	Caves, mines, and abandoned buildings; large snag habitat in dry-site forest.	Mines capable of providing roosting habitat potentially affected. Capable foraging habitat potentially affected.
Black-backed Woodpecker (*Picoides arcticus*)	The presence of bark-beetle outbreaks and post-fire areas in forested habitats.	No immediate post-fire habitat or areas of extensive insect infestation proposed for treatment.
Gray Wolf (*Canis lupus*)	A 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.	No reduction in prey densities, increase in public motorized access, or disturbance to dens and rendezvous sites.
Western Toad (*Bufo boreas*)	Adults occur in a variety of uplands. Breed in shallow ponds, lakes, or slow moving streams.	Suitable habitat may exist in the project area and may be potentially affected
Management Indictor Species		
Northern Goshawk (*Accipiter gentilis*)	Mature to old growth forest with relatively closed canopies for nesting, variety of forested habitats for foraging.	Potentially suitable habitat for goshawk nesting and foraging is present and may be impacted within the analysis area.
Pileated Woodpecker (*Dryocopus pileatus*)	Forests with tall, large diameter dead or defective trees for nesting; variety of forested habitats for foraging.	Potentially suitable nesting and foraging habitat is present and may be impacted within the analysis area.
Rocky Mountain Elk *(Cervus elaphus nelsoni)*	Roadless areas that provide hiding and thermal cover along with areas that provide forage	Elk security and habitat potential potentially affected.
Other Wildlife Species - Species Commonly Hunted, Fished, or Trapped		
American Marten (*Martes americana*)	Moist forest types, mature spruce-fir forest conifer stands generally at higher elevations with greater winter snow depths.	Species abundant and widespread throughout the planning area. Project would not result in effects that increase risk to the species.

3.6.6.1.4. Issue Indicators

Potential effects, by relevant species, were identified and categorized as discussed in the "Analysis Methods" section above based on habitat relationships, scientific literature on effects associated with vegetation management, and the proposed alternatives. Measurement criteria are based on the types of potential effects, scientific literature, the nature of the proposal, and applicable data. The table 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 measurable effects (positive or negative) to the species. For most species being analyzed, appropriate habitat parameters were measured to distinguish potentially suitable habitat (specific parameters for individual species are discussed in the "Methodology" subsection for each species analyzed). A discussion of the changes in potentially suitable habitat for each relevant species and the effects on species are disclosed in the "Environmental Consequences" subsections.

Table 75. Issue indicators used to measure effects.

Species	Indicator
Fisher	Acres of suitable denning habitat, changes to mature forest habitat, effects on large diameter snags, road management
Flammulated Owl	Acres of suitable habitat – mature ponderosa pine forests
Pygmy Nuthatch	Acres of suitable habitat – mature ponderosa pine forests
Fringed Myotis	Acres of suitable habitat – Ponderosa pine forests. Modification and disturbance of abandoned mines, caves, and buildings.
Gray Wolf	Road density/security and Elk Habitat Potential (EHP)
Black-backed Woodpecker	Acres of suitable habitat – stands that are post-fire or have insect and disease outbreaks, loss of snags
Western Toad	Changes to breeding habitat – shallow ponds, lakes, slow-moving streams and acres of mesic forest
Northern goshawk	Acres of suitable nesting and foraging habitat and effects on forest structural stages
Pileated woodpecker	Acres of suitable habitat and mature forest habitat
Rocky Mountain Elk	Road density/security and Elk Habitat Potential (EHP)
Marten	Acres of suitable habitat and mature forest

As mentioned previously, road management has an affect for some species, particularly when new road construction will take place in currently suitable habitat. Furthermore, permanent and temporary construction increases disturbance by administrative. Table 7shows the proposed road actions for each alternative and will be referred to throughout this document under relevant species.

Table 76. Miles of road proposed for decommissioning and miles of road proposed for construction (permanent and temporary) under all alternatives.

Proposed Activity	Alternative 1 (miles)	Alternative 2 (miles)	Alternative 3 (miles)
Decommissioning	0	66	104
Permanent Construction	0	1.2	0
Temporary Construction	0	1.5	0

Aggregate retention is proposed in Alternative 3 in response to public comments. Aggregates are patches of trees greater than one-half acre in size that are excluded from all activities associated with harvest and remain in an undisturbed condition. Retention patches are centered around mature or old-growth trees and provide increased access to corridors and cover near large open forage areas for certain species such as elk. Retention patches were spatially distributed on the landscape in order to maximize the benefit of wildlife corridors by increasing the cover to open area ratio, particularly where proposed harvest is adjacent to recent harvest units (less than 25 years ago). Patches are greater than 150 feet wide which is the distance recommended by IDFG (PF Doc. WL-109)

3.6.6.2. Spatial and Temporal Context for Effects Analysis

3.6.6.2.1. Spatial

The geographic scope of potential effects on wildlife for this analysis was determined based on the spatial extent of proposed federal actions. The proposed activities would take place in the Beaver Creek watershed 6th level hydrologic unit, which is approximately 28,200 acres in size.

The appropriate scale or geographic bounds for wildlife effects analysis varies on a species by species basis and may include review at multiple scales. Besides the Beaver Creek 6th level hydrologic unit watershed (about 28,200 acres), varying scales that were considered include the, the Coeur d'Alene River Ranger District (approximately 805,994 acres), the Idaho Panhandle National Forests (2.5 million acres), and the Northern Region of the Forest Service (approximately 25 million acres). For elk and wolves, elk habitat units (varying in size) are used to describe cumulative effects. Only for elk, individual timber compartments (acres vary) are used to describe project-level direct and indirect effects. For a more detailed description of elk habitat units and how they are used, please refer to the elk analysis (Section 3.6.6.3.9). The Beaver Creek Resource Area is within Wallace Elk Habitat Unit (WEHU) 5, which is approximately 88,008 acres in size; approximately 55,144 acres of those are National Forest System lands. Individual compartments where activities are proposed are Compartment 187 (a portion of the 6,115 acres), Compartment 188 (6,664 acres), Comparment 189 (6,085 acres), Compartment 190 (5,128 acres), and Compartment 191 (5,820 acres).

Direct, indirect, and cumulative effects were considered for each of the wildlife species and their associated habitat in order to arrive at a final determination of effects. For those species that are unaffected by the proposal, additional analysis of cumulative effects was not necessary. The species' status, habitat conditions and population trends across the appropriate scales were reviewed in order to consider the potential effects from the project in concert with larger scale trends as well as Forest and Regional goals.

For all other species analyzed except elk, National Forest System lands within the Beaver Creek (6th level HUC) watershed were used as the cumulative effects analysis area. A small portion (2,655 acres) within the boundary of the Beaver Creek Resource Area is privately owned, with an additional 665 acres under the Bureau of Land Management. Since other ownerships are highly susceptible to adverse habitat modifications, the presence of suitable habitat on non-National Forest System lands cannot be relied upon over time. As a result, the IPNF assumes no habitat contribution for wildlife species analyzed from this source.

Table 77. Wildlife analysis scales used for analyzing direct, indirect and/or cumulative effects.

Species	Cumulative Effects Analysis Area
Elk	WEHU 5, including compartments 187 (partial), 188, 189, 190, and 191
Gray Wolf	WEHU 5, including compartments 187 (partial), 188, 189, 190, and 191
All other species	NFS lands within the Beaver Creek watershed

The area within the project boundary is approximately 28,200 acres, and is large enough to accommodate multiple home ranges for highly mobile species such as goshawks (approximately 5,000 acres), fisher (10,000-22,000 acres), and pileated woodpeckers (up to 1,000 acres), or to sustain the complete life cycle of most non-migratory wildlife as well as breeding/nesting habitat for migrating birds. As discussed above, non-National Forest System lands within the project boundary are not expected to make long-term contributions to suitable habitat.

3.6.6.2.2. Temporal

The temporal scope of the analysis is a function of the nature of the proposal, the geographic scope of the analysis, ongoing management goals/actions, and natural events. The analysis assesses effects based on both existing conditions at the time of the analysis and potential conditions (e.g. capable habitat that may or may not be currently suitable) at some undetermined time in the future. The analysis will provide a representation of effects until – at some point in time – future unforeseeable actions or events result in appreciable change. The temporal scope of the analysis will be influenced by the location and nature of future management actions and natural events. The time period that project-related disturbance may be present is expected to be up to 10 years based on the timber sale contract and additional post-sale fuel treatments. The effects of vegetation management from this project may be still apparent 50 or more years beyond this, barring other natural or artificial disturbance in the area.

3.6.6.3. 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.

Effective May 27, 2011 the Regional Forester updated the sensitive species list for the Northern Region. There were no changes from the previous (2004) list on the IPNF. Additionally, gray wolf has automatically been placed on the list for a minimum of five years, at which time the status of this species will be reviewed by the USFS. Wolverine will be evaluated as a “proposed” species per USDA Region 1 direction (Swisher 2013, PF Doc. WL-R397).

3.6.6.3.1. Fisher

Habitat Relationships

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, PF Doc. WL-R86). 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, PF Doc. WL-R253). Large-diameter snags and logs are used for denning and foraging. This species prefers forests with greater than 80 percent canopy closure and avoids areas with less than 50 percent (Powell 1982, PF Doc. WL-R42). Forests within or adjacent to riparian areas are particularly important to fishers (Heinemeyer and Jones 1994, PF Doc. WL-R253). In his study in north-central Idaho, Jones (1991, PF Doc. WL-R29) found that during the summer, 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.

Affected Environment

Fishers historically occupied much of the forested habitats in the northern United States (Heinemeyer and Jones 1994, PF Doc. R253). Populations declined in the early 20th century, due mainly to over-trapping and poisoning. Habitat loss as a result of human settlement in low-lying areas likely contributed to population declines as well (USDI Fish and Wildlife Service 2011c, PF Doc. WL-R406). In the western United States, fishers have remained at low numbers or absent from portions of their former range (Heinemeyer and Jones 1994, PF Doc. R253). Population trend information for fishers in northern Idaho is unavailable, but based on sighting information fishers are currently uncommon.

Alteration of forest structure due to natural and human-caused disturbances (i.e. fire, timber harvesting, disease, loss of large tracts of white pine) can negatively impact habitat for fisher, particularly when it affects late seral mesic forest types and forested riparian areas. The change in dominance of tree species to Douglas-fir and grand fir has increased the prevalence of insect and disease, resulting in higher levels of tree mortality. In root disease pockets and areas affected by insects, higher levels of snags are present. However, these snags are generally small and degenerate more quickly than snags from longer-lived, healthier trees. Shade-tolerant Douglas-fir trees replace these dead trees and in time perpetuate the cycle of disease, creating snags in the smaller size classes. Forest structure has been shaped by a mix of past harvest activity, wildfire, fire suppression, white pine blister rust, and natural succession. Also, white pine blister rust has had a profound effect on forest composition compared to pre-settlement conditions. Today's landscape contains only remnant examples of white pine, while historically this species would have dominated much of the moist forest habitat (Harvey et al. 2008, PF Doc. WL-R427).

Past logging activities in the Coeur d'Alene River Ranger District deteriorated some fisher habitat by removing forest canopy, snags, and current and future dead and down material. Although fisher may use early seral stands for foraging, mature stands are preferred for denning. While most fisher habitat (both current and historic) in the western United States is under Forest Service management, timber harvest on NFS lands is unlikely to have contributed to fisher population declines in any considerable way: fisher populations declined precipitously in the 1920s, but the balance of forested habitat (outside of dry-forest types) in Idaho and Montana showed little or no logging activity before 1940 (USDI Fish and Wildlife Service 2011c, PF Doc. WL-406).

Most studies have found fishers tolerant of moderate degrees of human activity including roads, although Heinemeyer and Jones (1994) hypothesized that roads may indirectly lead to increased

trapper access (PF Doc. WL-R253). Fisher cannot be legally trapped in Idaho, but are occasionally caught in sets intended for other species (such as marten).

Recently (since 2003) fisher presence has been documented from hair-snare surveys at a number of locations on the Coeur d'Alene River Ranger District (PF Doc. WL-29, WL-31). This includes six fisher detections on the District, with one detection in the Beaver Creek Resource Area.

The approximately 28,200 acre analysis area contains about 10,831 acres of potentially suitable denning/resting habitat (see "Methodology" subsection, below). Potentially suitable habitat is well distributed throughout the analysis area. The entire potentially suitable habitat is interconnected by mature and immature forest. Field reviews by the biologist validated fisher habitat (PF Doc. WL13). Currently, 38 percent of the analysis area is comprised of potentially suitable fisher summer habitat.

Methodology Used in the Fisher Analysis

Fisher habitat was evaluated based on habitat requirements documented in published literature, with emphasis placed on those habitat components thought to be most limiting to this species. Since summer habitat use encompasses a smaller subset of available habitats than winter (Jones 1991, PF Doc. WL-R29) and resting/denning habitat includes a smaller range of attributes than foraging habitat (Jones 1991; PF Doc. WL-R29, Powell and Zielinski 1994;PF Doc. WL-R43), the analysis focused on availability of summer resting/denning habitat. Other habitats are less limiting on the landscape (foraging) and are available for a larger portion of the year (summer and winter). Potential denning/resting habitat was identified from habitat validation surveys as forested stands with canopy closure greater than 40 percent, all forest types except ponderosa pine, and average stem diameter in the primary overstory layer greater than 14 inches DBH (10 inches DBH in lodgepole pine, aspen or birch stands). In addition, stands were only considered potential denning/resting habitat if they contained either large (greater than 14 inches dbh) snags or large-diameter down woody debris (preferably both) (PF Doc. WL-55).

Canopy closure of 40 percent or greater is based on Jones (1991, PF Doc. WL-R29) finding that fishers in his study area preferred stands with canopy cover greater than 60 percent, avoided stands with canopy cover less than 40 percent, and used stands with 41-60 percent canopy cover in proportion to availability when selecting resting sites. The use of 14 inches or greater average diameter in the primary overstory layer is a proxy for what Jones (1991, PF Doc. WL-R29) described as "mature forest" and "old-growth" stands in his study area (size classes that were not avoided by his study animals selecting resting sites). This diameter limit was lowered for lodgepole pine, aspen and birch to acknowledge that older stands of these species generally reach smaller diameters; but the required presence of large snags or down wood eliminates younger, less structurally complex stands as suitable habitat. Although Jones (1991) found most resting sites to be in the canopies of live trees, large snags and down logs were preferred as maternal dens.

Using the information from these habitat validation surveys, along with information contained in FSVEG, stands were analyzed individually to determine if they contained the habitat parameters necessary to be considered potentially suitable fisher habitat.

Environmental Consequences

The table below shows the amount of potentially suitable summer fisher habitat that would exist under each alternative. The change in habitat is a result of proposed road decommissioning and both permanent and temporary road construction (see Table 7 in Chapter 2).

Table 78. Amount of potentially suitable summer fisher habitat remaining after each alternative and percent of loss from existing.

	Alternative 1 (acres/percent)	Alternative 2 (acres/percent)	Alternative 3 (acres/percent)
Summer Fisher Habitat	10,831 (0%)	9,978 (-8%)	10,259 (-5%)

Alternative 1: Direct and Indirect Effects

The No-Action Alternative would provisionally preserve currently suitable denning habitat for fisher, and may bring some stands into suitable denning condition more rapidly than treatment would in the absence of large disturbances. 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 up to 100 years. Mean patch size under the existing alternative is 3,873 acres. While the No-Action Alternative may provide somewhat better habitat than the action alternatives in the near future (38 percent), there is a risk of denning habitat loss in the long term. Furthermore, no road decommissioning would occur under this alternative, potentially allowing for illegal access that may cause disturbance and occasional administrative use. No new road construction would occur under this alternative. Since this alternative would not authorize any activities in fisher habitat, it would have no direct effects on this species, although it would have the indirect effects discussed above.

Alternative 2: Direct and Indirect Effects

Alternative 2 proposes timber harvest on 1,150 acres within the fisher analysis area, including approximately 142 acres of seed tree harvest (regeneration), 563 shelterwood harvest (regeneration), 280 acres improvement cut (selection harvest), and 165 of commercial thinning (selection harvest). Regeneration harvest would reduce canopy cover enough that it would no longer be considered potentially suitable summer habitat for fisher. Selectively harvested stands would likely have large snags and woody debris reduced to some extent, but would maintain some of these habitat features and adequate canopy cover (at least 40 percent) to remain potentially suitable. The total effect on denning habitat would be a reduction of approximately eight percent of the potentially suitable denning/resting habitat in the analysis area.

Regeneration harvest would affect about 705 acres of suitable denning/resting habitat, similarly setting it back to an earlier successional stage. Regenerated stands would probably require between 50 and 100 years (depending upon how many residual green trees remain after harvest) to reach suitable condition. Infrequently, stands may reach suitable condition more rapidly if left untreated (see “Alternative 1” discussion, above). However, treated stands would have considerably higher proportions of long-lived seral species, and subsequently would remain in suitable condition (once attained) for a longer period of time as they would be more resistant to insects and disease, weather events, and fire.

Stands that are suitable fisher summer habitat and are proposed for selection harvest (approximately 445 acres in the analysis area) would retain at least 40 percent continuous canopy cover after treatment, so they would still offer cover for hunting and occasional resting sites for fisher. Improvement cut prescriptions, a type of selective harvest (280 acres) would result in patchier, more discontinuous overstory canopy that may be less desirable in summer for hunting

and resting by fisher, but would retain sufficient cover so that they would not resemble large openings that fisher would be hesitant to travel through. Treatment may or may not accelerate the trajectory of these stands toward suitable condition but, similar to regenerated stands, they would be more resilient in the face of disturbance and would remain in suitable condition for a longer period of time once achieved.

Large openings within a matrix of forest cover have the potential to fragment habitat for species, such as fisher, that prefer continuous overstory canopy. There are two potential places, Unknown Gulch and the ridge between Alder and Deer Creek, where connectivity for fishers could be affected (PF Doc. WL94, WL95). Under Alternative 2, the mean patch size for the mature structural class in the Beaver Creek Resource Area would be 2,022 acres (See Vegetation Report). This patch size continues to exceed the minimum recommended size of 80 acres for fisher (Heinmeyer and Jones 1994, PF Doc. WL-R253).

Post-harvest fuels treatments (burning and piling) would have relatively minor effects on fishers. The species is not particularly sensitive to disturbance, and regenerated units are unlikely to be utilized by this species following harvest. Grapple piling is generally avoided in units where the amount of coarse woody debris is a concern, however if grapple piling does occur in units, it does have the potential to reduce coarse down woody debris. Additionally, approximately one slash pile per five acres would be left in most piled units to provide habitat for snowshoe hares and other small mammals that fishers prey upon (see Appendix E - Design Features).

Although generally tolerant of human activities, fishers may be more sensitive to disturbance in the vicinity of den sites during the kit-rearing period (approximately mid-March through early July) (Heinemeyer and Jones 1994, PF Doc. WL-R253). Activities within denning habitat would take place near the periphery of large blocks of interconnected denning habitat, and so are less likely to be in close proximity to actual den sites than in the interior of these stands.

Under Alternative 2, prescribed burning would occur on 1,037 acres of suitable summer fisher habitat. Prescribed burning is anticipated to remain in the understory of stands, therefore the effect on canopy closure should be minimal. Canopy may be reduced slightly due to passive crown fire that may occur that would result in patches of mortality (See Fire/Fuels Section 3.2). This is expected to occur on about 15 percent maximum area of the burn units and would result in these areas no longer being suitable for fisher habitat. This would result in a loss of fisher habitat of approximately 156 out of 1,037 acres proposed for burning. There is the potential to remove down wood; however, the creation of snags will create more down wood.

Utilizing several miles of currently restricted and reconstructed roads as haul routes would temporarily increase drivable road miles during implementation, but is not expected to increase mortality risk to the species since these roads would not be made available for public use. Following implementation, 66 miles of roads will be decommissioned, minimizing potential disturbances to fishers and eventually potentially resulting in more available fisher habitat.

Approximately 1.2 miles of new road construction would occur in suitable fisher habitat under Alternative 2 with 0.75 miles being permanent and 0.44 miles temporary. New road construction would result in a loss of 2.3 acres of fisher summer habitat, availability of snag habitat, and increase the probability that illegal motorized access would occur. After activities are completed (post activity), the 0.44 miles of temporary road would be decommissioned thus reducing the probability of illegal motorized access and administrative use; however, potentially suitable habitat would take up to 100 years to be replaced.

Alternative 3: Direct and Indirect Effects

Approximately 1,006 acres would be harvested under Alternative 3 in potentially suitable fisher denning/resting habitat, including approximately 62 acres of seed tree harvest (regeneration), 354 shelterwood harvest (regeneration), 233 acres improvement cut (selection harvest), and 143 of commercial thinning (selection harvest). The same amount of acres are proposed for burning under this alternative and loss of habitat would be the same as Alternative 2 (156 acres). This, coupled with the 416 acres of regeneration harvest, represents approximately a five percent reduction of the potentially suitable habitat in the analysis area. Effects to forest structure and habitat are as described in Alternative 2, but of a smaller magnitude.

Similar to Alternative 2, all of the potentially suitable denning areas would remain interconnected by continuous mature and immature (greater than 10 inches DBH) forest. Under Alternative 3, the mean patch size for the mature structural class in the Beaver Creek Resource Area is 2,047 acres (See Vegetation Report). This patch size exceeds the minimum recommended size of 80 acres.

Additionally, fewer acres of potentially suitable habitat would be treated in this alternative, further decreasing the potential for disturbance. Fewer impacts to connectivity in fisher habitat would be anticipated under this alternative due to different harvesting techniques being proposed in the Unknown Gulch and ridge between Alder and Deer Creek area (PF Doc. WL94, WL96).

Under Alternative 3, no new road construction (permanent or temporary) would take place. Following implementation, 104 miles will be decommissioned, minimizing potential disturbances to fishers by administrative use of roads and illegal access from the public.

Cumulative Effects Common to All Alternatives

Mining Activities – From 1800 - present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. The loss of snags and disturbance in riparian areas could potentially negatively affect fisher habitat, although it would be very localized and temporary.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This activity would not affect vegetation or suitable habitat of fishers and has a low probability of affecting other species (PF Doc. WL-R387).

Timber Harvest and Related Activities – The effects of past timber harvest are incorporated into the existing condition. Historical timber harvest, large scale fires, and insect and disease has altered species composition of present day forests and resulted in loss of habitat. Logging activity that resulted in large openings would likely have temporarily displaced use in those areas since fisher prefer some canopy in the overstory.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. If this occurs in suitable fisher habitat, it may temporarily displace during activities, but eventually would improve not diminish habitat.

Fire Suppression – Fire suppression activities are generally good for fisher habitat in the short term (5-10 years), 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. However, this activity can also slow the development of quality late-successional habitat where it does not currently exist by encouraging growth of higher densities of smaller-diameter

shade-tolerant species and contributing to higher incidences of insects and disease, and subsequently results in fuel loading that may cause larger, hotter future wildfires. As a result, fire suppression may benefit this species in the short term by helping preserve mature forest cover – although the longer-term effect may ultimately be a deterioration of habitat quality and quantity.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) – Personal-use firewood gathering is anticipated to continue along seasonally and yearlong open roads, potentially reducing snags within 200 feet of such roads. Currently there is one mile of road open to the public per square mile in the project area. This results in 2,200 acres where snags have the potential to be cut in the project area; not all this area is considered to be suitable fisher habitat. Although it is unlikely to disrupt normal fisher use patterns, firewood cutting can deteriorate habitat in these roadside areas by removing large snags that represent future dead and down wood denning opportunities. Various recreation activities are unlikely to impact fishers, with the exception of motorized snow travel that can provide access for trappers. The effects of motorized snow travel, as well as of trapping itself, are characterized by the analysis of changes in motorized route miles. Decommissioning portions of currently drivable roads would both preserve future snags along these routes that otherwise could potentially be removed by woodcutters, and reduce mortality risk over time by eliminating routes that can provide trapper access. Other public recreation activities are unlikely to impact fishers.

Conclusion

The action alternatives would authorize timber harvest on between 1,150 and 1,006 acres in the 28,200-acre analysis area, including regeneration harvest on 705 acres (Alternative 3) and 416 acres (Alternative 2) of the potentially suitable denning/resting habitat. Selective harvest and regeneration harvest in unsuitable stands may or may not move these stands into suitable condition more rapidly than lack of treatment would, but either way treated stands would be more resilient to disturbance and would remain in suitable condition for a longer time period than untreated stands would. Both action alternatives would leave a large amount of the Beaver Creek Resource Area in mature or immature (greater than 10 inches DBH) forest stages, providing connectivity between patches of potential denning/resting habitat. Several contiguous potential denning/resting stands of more than 100 acres would remain under all alternatives.

Both action alternatives would slightly reduce the risk of trapping mortality by reducing drivable road miles in the analysis area, and by not making restricted and reconstructed roads available for public use during implementation.

The level of timber harvest is insignificant in the Northern Region (Region 1). In 2009, harvest occurred on 11,995 of the 22,351,312 acres in the region (0.05 percent of the forested landscape) and on 1,362 of the 2,470,394 forested acres on the IPNF (0.85 percent). For the 10 year period from 2000-2009, harvest occurred on approximately 189,404 acres in Region 1 (0.85 percent) and on 37,973 acres on IPNF (1.54 percent) (USDA 2012). Given the high incidence of mature (more than 100 years old) forest on the IPNF, fisher habitat is likely being created at a much greater rate than it is being lost, since the Forest has not conducted timber harvest or other management that removed allocated old growth stands for nearly 20 years (and the amount of old growth lost through wildfire or other natural disturbances has been minimal) (USDA Forest Service 2010; PF Doc. WL-R428). This trend has generally been repeated across the IPNF, and harvest has further declined since 2002 (USDA 2012). Riparian areas which represent potentially suitable habitat and important travel corridors would remain intact through implementation of INFS standards and exclusion of activities within riparian habitat conservation areas (see Hydrology Section 3.3), and no reductions in allocated old growth would result from this action.

Bush and Lundberg (2008, PF Doc. WL-R181) estimate that the IPNF currently contains approximately 520,404 acres of fisher summer habitat and approximately 1,193,766 acres of fisher winter habitat. Samson (2006b, PF Doc. WL-R154), citing Smallwood (1999, PF Doc. WL-R409), asserts that the threshold habitat level to maintain a viable fisher population is 100,078 acres, or about one-fifth of the available habitat on the IPNF. Given this information, the small change to fisher habitat under the action alternatives is unlikely to result in a loss of viability of this species. As a result, adequate habitat to maintain viable fisher populations would remain on the IPNF after project implementation.

Analysis of Forest Inventory and Analysis (FIA) data reveals an average of 1.4 snags per acre greater than 20 inches DBH across the IPNF (USDA Forest Service 2010, PF Doc. WL-408). Additionally, there is an estimated 11.8 percent of forested lands allocated as old growth on the IPNF (USDA Forest Service 2010, PF Doc. WL-408). Based on these estimates, old growth and large snag presence is being maintained on the IPNF.

There is no existing research that designates habitat thresholds for fisher within a home range. However, the proposed alternatives would affect a relatively small proportion of potential denning habitat in an area that has relatively large, interconnected amounts of this habitat component. The Fish and Wildlife Service determined that "the best commercial and scientific information available does not indicate that current or future forest management practices and timber harvest threaten the fisher now, or in the foreseeable future" (USDI Fish and Wildlife Service 2011c, PF Doc. WL-406). Consequently, the action alternatives in conjunction with the past, present and reasonably foreseeable actions ***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

All alternatives are consistent with Wildlife Standard 9 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 Forest Service, 1987, p. II-28, PF Doc. CR-002). Neither of the action alternatives would affect more than eight percent of potentially suitable fisher habitat in the analysis area, and would affect inconsequential amounts of habitat available Forest-wide, which includes more than five times the amount of habitat estimated to be necessary to maintain a viable population. In addition, the Beaver Creek project would remain consistent with Forest Plan direction for old-growth habitat management (see Vegetation Report "Old Growth" section). As a result, this proposal is not expected to affect the species at the population level.

3.6.6.3.2. Flammulated Owl, Pygmy Nuthatch, and Fringed Myotis

Habitat Relationships

Flammulated Owl

Flammulated owls are seasonal migrants to northern latitudes during the spring and summer. Nesting habitat of owls is associated with relatively open, dry, mature forests featuring ponderosa pine and Douglas fir, with 35-65 percent canopy closure (Goggans 1986; PF Doc. WL-R17, Howie and Ritcey 1987; PF Doc. WL-R410, Reynolds and Linkhart 1992; PF Doc. WL-R45). The majority of flammulated nests recorded in North America have been found in stands with ponderosa pine present, if not the dominant species (Reynolds and Linkhart 1992; PF Doc. WL-R45). Flammulated owls depend on pileated woodpeckers and flickers to excavate the cavities in which they nest. Consequently, snags and other defective trees are an important component of

their breeding habitat. Nest trees are typically 14 inches or more in diameter (McCallum 1994; PF Doc. WL-R271). Flammulated owl's preference for ponderosa pine and Douglas fir can also be linked to prey availability (primarily moths, beetles, crickets). Reynolds and Linkhart noted a stronger correlation between prey availability and ponderosa pine and Douglas fir, than with other common western conifers (1992, PF Doc. WL-R45). Flammulated owls generally reoccupy the same territory each year (Hayward and Verner 1994, PF Doc. WL-R430).

Flammulated owls appear tolerant of some human disturbances, as this species has been known to nest in campgrounds and other areas of human activity with no apparent adverse effects (Hayward and Verner 1994, PF Doc. WL-R430). Because flammulated owls require tree cavities for nesting, loss of snags from timber harvest or firewood gathering can impact nesting habitat for flammulated owls.

Pygmy Nuthatch

Pygmy nuthatches are sedentary, year round residents of ponderosa pine forests (Ghalambor 2003, PF Doc. WL-R102). They rely heavily on the foliage of live, larger ponderosa pines as foraging habitat and on larger ponderosa pine snags for nesting and roosting cavities (McEllin 1979, PF Doc. WL-R431). Their almost exclusive association with ponderosa pine, particularly mature stands that are fairly open (less than 70 percent canopy closure), leads to a patchy distribution of the pygmy nuthatch as they mirror ponderosa pine's distribution (Kingery and Ghalambor 2001; PF Doc. WL-R432, Engle and Harris 2001; PF Doc. WL-R433). Pygmy nuthatch abundance is directly correlated with snag density and foliage volume (Ghalambor 2003, PF Doc. WL-R102). They generally excavate their own nest cavity, but at times are a secondary cavity nester and locate their nest cavities in dead trees or in dead sections of live trees (Ghalambor 2003, PF Doc. WL-R102). Their diet consists mainly of insects during the breeding season, and in some areas they forage almost exclusively on pine seeds in the non-breeding season (Ghalambor 2003, PF Doc. WL-R102).

The main threats to the species are the loss of ponderosa pine dominated forests and low snag densities (Ghalambor 2003, PF Doc. WL-R102). There has been a substantial decline of mature ponderosa pine forests in recent years in the interior Columbia Basin (Wisdom et al. 2000; PF Doc. WL-R434). This decline is largely due to fire suppression, which has replaced natural regimens of frequent, low intensity fires that maintained relatively open ponderosa stands and has allowed for a marked increase in the density of shade-tolerant tree species (i.e. Douglas-fir), thereby reducing the availability of habitat for the pygmy nuthatch. The encroaching shade tolerant species are also shorter-lived and more susceptible to insect and disease, increasing the amount of ladder fuels and the probability of a stand-replacing fire, which again could lead to the loss of mature ponderosa pine habitat (Wisdom et al. 2000; PF Doc. WL-R434). In addition, studies have shown that reduction of the number of snags greatly diminishes pygmy nuthatch densities by decreasing the availability of suitable nest and roost cavities (Scott 1979; PF Doc. WL-R435).

Fringed Myotis

Fringed myotis are members of the group of bats referred to as the "long-eared" bats. Fringed myotis use a fairly broad range of habitats represented by open areas (e.g. grasslands) interspersed with mature forests (usually ponderosa pine, pinion-juniper or oak) at mid-elevations that contain suitable roosts sites and are near water sources (Keinath 2004; PF Doc. WL-R104). They are relatively slow but highly maneuverable flyers, and are most active the first two hours following sunset (O'Farrell and Studier 1980; PF Doc. WL-R436). Fringed myotis feed on insects during flight and glean insects off of vegetation, usually near the top of the forest canopy,

with beetles and moths making up the majority of their diet (Keller 2000; PF Doc. WL-R437, O'Farrell and Studier 1980; PF Doc. WL-R436, Wisdom et al. 2000; PF Doc. WL-R155).

Fringed myotis use caves, mines, buildings and rock crevices as day, night, maternity, and/or hibernation roost sites (Ellison et al. 2004; PF Doc. WL-R438). They also roost underneath sloughing bark and inside cavities of snags, particularly larger ponderosa pine and Douglas-fir snags in medium stages of decay (O'Farrell and Studier 1980; PF Doc. WL-R436, Rabe et al. 1998; PF Doc. WL-R439, Weller and Zabel 2001, Rasheed et al. 1995; PF Doc. WL-R138). Fringed myotis only roost in snags from mid-April to through September, the active months, not for hibernation (Keinath 2004; WL-R104). Generally, snags used as roost sites are in somewhat open microsites within otherwise contiguous forest (Weller and Zabel 2001; PF Doc. WL-R440). Bats roosting in snags require a high density of snags because they often use multiple snags as roosts (Weller and Zabel 2001; PF Doc. WL-R440, Rabe et al. 1998; PF Doc. WL-R439).

The main risks to fringed myotis are the loss of suitable habitat for foraging or roosting and human disturbance of roost sites. Fringed myotis, like many bat species, are very sensitive to disturbance or habitat modification and any change in conditions altering the microclimate (e.g. airflow, thermal regime) close to roosts can have a substantial impact (Keinath 2004; PF Doc. WL-R104). Fringed myotis are perhaps more vulnerable to alterations of mature or old growth forest conditions than most bat species because of their close association with those forests that contain abundant, large snags for roosting (Keinath 2004; PF Doc. WL-R104). According to Rabe et al. (1998; PF Doc. WL-R439), the use of multiple snags by roosting bats and the short-term nature of snags in the early decompositional stages of decay suggest that bats require higher densities of snags than birds. In addition, indirect mortality is possible from disturbance at maternity colonies before young can fly on their own, or disturbance at hibernacula leading to burning of fat reserves needed for overwinter survival (Rasheed et al. 1995; PF Doc. WL-R138). Finally, riparian areas should be managed to retain natural stream hydrology and healthy riparian vegetation to allow for sufficient water sources and to promote use by emergent insects. Therefore, management activities should: 1) manage for the retention and recruitment of large diameter snags at relatively high densities, particularly in late-successional forests; 2) protect known roost sites to prevent human disturbance or habitat alteration of microsite conditions, and; 3) maintain and improve riparian areas (Wisdom et al. 2000; PF Doc. WL-R434).

Affected Environment

Ponderosa pine forests historically had greater occurrence on the IPNF. Primary factors that have contributed to the loss of older ponderosa pine/Douglas-fir forests include fire suppression and past forest management. Fire suppression has led to the advancing succession of shade-tolerant 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. Past regeneration timber harvest, as well as historic overstory removal ("high-grading") generally reduced suitable dry-site habitat. These past timber harvest activities, in combination with active fire suppression in unlogged stands, have contributed to the lack of habitat for this species currently throughout portions of its range.

As discussed above, mature, open-grown, dry-site forests are considered the most critical and limiting habitat feature for flammulated owls, pygmy nuthatches, and fringed myotis. Stands in the drier habitat types (ponderosa pine, Douglas-fir, and dry grand fir) are considered capable habitat for this species. Within these habitats, stands with a canopy closure between 35 and 65

percent, average DBH greater than 15 inches in the primary canopy layer, and the presence of large (greater than 15 inches) snags, were considered suitable.

Approximately 3,820 acres (14 percent of the Beaver Creek Resource Area) of flammulated owl, pygmy nuthatch, and fringed myotis habitat potentially exists in the Beaver Creek Resource Area (PF Doc. WL-59, WL-72). Habitat field validation and aerial photo interpretation confirms suitability of the habitat (PF Doc. WL-5, WL-6, WL-10, WL-13).

Flammulated owl surveys in 2011 and 2012 revealed no positive owl responses (PF Doc. WL-10). No surveys were done specific to pygmy nuthatches or fringed myotis due to the difficulty of surveying these species.

In addition to large snags in mature open-grown dry-site stands, the affinity for old mines as roost sites (maternity and hibernacula) by fringed myotis also requires consideration. Adits exist in the Beaver Creek Resource Area near Dobson Gulch, Missoula Gulch and Deer Creek drainages, and all have been closed with a bat accessible gate. Timing restrictions are in place for prescribed burning proposed near adits (see Appendix E - Design Features).

Methodology

Flammulated owl, pygmy nuthatch, and fringed myotis habitat within the cumulative effects analysis area was evaluated using habitat data in the FS VEG and FVS timber stand database. These data sources were reviewed and updated to reflect changes in conditions resulting from wildlife surveys, field walk-through exams, and aerial photo interpretations conducted for this project over the last two years to insure that they reflect current conditions as accurately as possible. These data sources were then queried to determine the stands that met the following basic habitat requirements for the three species:

- All of habitat Group 1 (Warm and Dry), Group 2 (Moderately Warm and Dry) and Group 3 (Moderately Warm and Moderately Dry)
- Habitat in Group 4 (Moderately Warm and Moist) with south, southwest or west aspect where the elevation is below 3,000 feet

The project wildlife biologist, evaluated stands that met the above criteria on a stand-by-stand basis to assess the tree size and age class, species composition, stand structure, incidence of insect and disease, canopy closure and snag availability. The Dry Site Habitat Classification system, created to evaluate habitat for dry site-associated wildlife species, was then used to categorize the stands based on their existing attributes and the level of management that would be necessary to trend the stand toward suitability (PF Doc. WL-59 and WL-97).

The potential effects on flammulated owl, pygmy nuthatch, and fringed myotis and their habitat were determined by evaluating the change and trends in habitat suitability that would result from each alternative. The following assumptions and/or research findings were used to aid in the assessment of effects:

- Flammulated owls are associated with mature and late successional ponderosa pine and Douglas-fir forests (Reynolds and Linkhart 1992; PF Doc. WL-R441). Reynolds and Linkhart (1992) reported that all published North American records of flammulated owl nesting, except one, came from forests in which ponderosa pine was at least present, if not dominant.
- Pygmy nuthatches are associated with mature and late successional ponderosa pine and Douglas-fir forests (Kingery and Ghalambor 2001; PF Doc. WL-R432, Engle and Harris 2001; PF Doc. WL-R442).

- Fringed myotis roost underneath sloughing bark and inside cavities of snags, particularly larger ponderosa pine and Douglas-fir snags in medium stages of decay (O'Farrell and Studier 1980; PF Doc. WL-R436, Rabe et al. 1998; PF Doc. WL-R439, Weller and Zabel 2001; PF Doc. WL-R440, Rasheed et al. 1995; PF Doc. WL-R138).

Environmental Consequences

The following table identifies the amount of vegetation harvest and prescribed burning activities proposed within flammulated owl suitable nesting habitat under each alternative; refer to Table 7 in Chapter 2 for the amount of proposed road management activities.

Table 79. Proposed activities occurring in flammulated owl suitable nesting habitat.

Proposed Treatment	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Harvest promoting habitat	0	229	189
Harvest that is considered a long term (25-100 year) loss of habitat	0	337	132
Total harvest treatment in suitable habitat	0	566	321
Prescribed burn in suitable habitat	0	760	760
Remaining suitable habitat after treatment	3,820	3,254	3,499

Alternative 1: Direct and Indirect Effects

Approximately 14 percent (3,820 acres) of the Beaver Creek Resource Area is potentially suitable nesting habitat for flammulated owls, habitat for pygmy nuthatches, and summer roosting habitat for fringed myotis. Under Alternative 1, no changes to habitat would occur since no proposed activities would occur. Over time, current ponderosa pine stands will deteriorate and encroachment of other species into the overstory canopy will change the character of these stands resulting in a trend toward decline of suitable habitat. Without the presence of fire, fire-intolerant species will continue to encroach upon ponderosa pine stands increasing inter-species competition and reducing the open characteristics of the stand that allows for understory vegetation such as grasses that support key prey species for flammulated owls and fringed myotis. No road decommissioning would occur under this alternative therefore administrative use could still occur on certain roads and the potential for illegal motorized access would exist.

Alternative 2: Direct and Indirect Effects

Under Alternative 2, vegetation harvest would occur on 15 percent (566 acres) of suitable dry site habitat in the Beaver Creek Resource Area. Approximately 229 acres harvested would be intended to improve the ponderosa pine habitat. The remaining 337 acres harvested would result in a long-term loss of suitable habitat. A reduction of nine percent suitable habitat in the Beaver Creek Resource Area is expected to occur under this alternative. Prescribed burning will occur on 20 percent of suitable habitat in the Beaver Creek Resource Area (PF Doc. WL-64). This would promote the restoration of more open grown, older forests of ponderosa pine/Douglas-fir in these stands and promote the recruitment of larger diameter, longer-lived snags that would trend the acres toward suitable habitat and enhance the long-term stability of flammulated owls and other dry site associated species. No loss of flammulated owl habitat is expected to occur as a result of prescribed burning.

Wildlife tree retention and live tree replacement guidelines would mitigate potential impacts to snags by retaining trees and snags that represent the largest diameter class available in the stand

to simulate what would be expected under periodic fire regimes or insect/disease occurrences that were within the natural range of variation (see Appendix E - Design Features). In addition, although prescribed burning activities are designed to allow for a minimal amount of live tree mortality, some additional snags are likely to be created as a result of the burn.

Under Alternative 2, 66 miles of road decommissioning would occur, along with 1.2 miles of permanent road and 1.5 miles of temporary road construction (Table 7). Road decommissioning that would occur in dry site habitat would result in fewer disturbances by prohibiting administrative use and reducing the potential for illegal access. Miles of new road (temporary and permanent) construction in dry site habitat is approximately 0.81 miles, resulting in a loss of one acre of suitable habitat. Approximately 0.45 miles would be decommissioned post activity.

Alternative 3: Direct and Indirect Effects

Under Alternative 3, less vegetation harvest would occur, only 8 percent (321 acres), on suitable dry site habitat in the Beaver Creek Resource Area. Acres harvested for improvement of dry site habitat is 189 acres. A three percent (132 acres) loss in suitable habitat would occur under this alternative. Prescribed burning will occur on 20 percent of suitable habitat in the Beaver Creek Resource Area (PF Doc. WL-73). This would promote the restoration of more open grown, older forests of ponderosa pine/Douglas-fir in these stands and promote the recruitment of larger diameter, longer-lived snags that would trend the acres toward suitable habitat and enhance the long-term stability of dry site associated species. No loss of habitat is expected to occur as a result of prescribed burning.

Wildlife tree retention and live tree replacement guidelines would mitigate potential impacts to snags by retaining trees and snags that represent the largest diameter class available in the stand to simulate what would be expected under periodic fire regimes or insect/disease occurrences that were within the natural range of variation (see Appendix E - Design Features). In addition, although prescribed burning activities are designed to allow for a minimal amount of live tree mortality, some additional snags are likely to be created as a result of the burn.

Cumulative Effects Common to All Alternatives:

Mining Activities – From 1800 - present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. The loss of snags has the potential to negatively affect these three species. If future mining prospects are proposed in suitable habitat, measures will be taken to protect snags from being removed. Abandoned mines provide roosting habitat for fringed myotis; bats typically do not use active mines. If an abandoned mine is discovered, measure to protect potential habitat by installing a bat-accessible gate are taken.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This activity would not affect vegetation or suitable habitat and has a low probability of affecting other species. Pocket gophers are not a prey species for flammulated owls so the potential for secondary ingestions does not exist (PF Doc. WL-R387).

Timber Harvest and Related Activities – The effects of past timber harvest is incorporated into the existing condition. Historical timber harvest, particularly mature ponderosa pine, has altered species composition of present day forests and resulted in loss of habitat. Logging activity that resulted in large openings would likely have temporarily displaced use in those areas since flammulated owls prefer some canopy in the overstory. Timber harvest is expected to occur on private lands; however the IPNF assumes no contribution of habitat from private lands.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. If this occurs in suitable habitat, it would likely improve not diminish habitat.

Fire Suppression - Continued fire suppression would not noticeably impact these species populations. Fire is considered a natural part of the ecosystem in dry site habitat.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) – Personal-use firewood gathering is anticipated to continue along seasonally and yearlong open roads, potentially reducing snags within 200 feet of such roads. Currently there is one mile of road open to the public per square mile in the project area. This results in 2,200 acres where snags have the potential to be cut in the project area; not all this area is considered to be suitable dry site habitat. Although it is unlikely to disrupt normal wildlife use patterns, firewood cutting can deteriorate habitat in these roadside areas by removing large snags that represent future dead and down wood denning opportunities. Public activities, excluding off-road motorized use, would not markedly impact flammulated owl, pygmy nuthatch, and fringed myotis populations. These activities would not impact suitable habitat, and potential modifications to forested habitat would be inconsequential because canopy cover would be essentially unchanged as relatively few snags are cut.

Conclusion

The effects of the proposed harvest treatments would, although minor, trend toward a loss of suitable flammulated owl, pygmy nuthatch, and fringed myotis habitat in the short term (less than 25 to 50 years). However, the majority of the actions proposed, vegetation harvest and prescribed burning combined, are designed to promote this particular type of habitat. The potential for disturbance of this species by project activities is minor. Additionally, treatment would not interrupt the trend of capable stands toward suitable condition, since the current structure and composition of these stands make it unlikely they would reach suitability in the absence of a stand-replacing event.

In addition, Samson (2006 b; PF Doc. WL-R154) concluded the following with regard to the short-term viability of the flammulated owl in the Northern Region of the Forest Service:

- No scientific evidence exists that the flammulated owl is decreasing in numbers.
- Increases in the extent and connectivity of forested habitat have occurred since European settlement.
- Well-distributed and abundant flammulated owl habitat exists on today's landscape.
- Level of timber harvest in the Northern Region (21,204 acres of 22,351,312 acres or 0.09 percent of the forested landscape) is insignificant.

Consequently, the implementation of the action alternative, in conjunction with the past actions, ongoing activities and reasonably foreseeable actions discussed above, would have an inconsequential or discountable negative effect on the species. Therefore, the implementation of either alternative ***may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.***

Consistency with Forest Plan

Both 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 Forest Service 1987; PF Doc. CR-002). Therefore, these actions would also be consistent with the National Forest Management Act requirements to provide for the diversity of plant and animal communities across the Forest.

3.6.6.3.3. Black-backed Woodpecker

Habitat Relationships

The black-backed woodpecker occurs in montane and pine forests, where it is confined mostly to burned areas (Montana Partners in Flight 2000; PF Doc. WL-R418). In the absence of burns, this woodpecker will forage in areas with diseased trees (Hillis et al. 2002; PF Doc. WL-R58), or small patches of dead trees resulting from disturbances such as wind throw and ice damage (Bonn et al. 2007; PF Doc. WL-R148). Black-backed woodpeckers tend to flourish in early (three to five years) post-fire habitat (Hutto 1995; PF Doc. WL-R443). 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; PF Doc. WL-R443). 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.

Affected Environment

The black-backed woodpecker is a year-round resident that occurs in various forest types over a wide elevation range. They are considered forest specialists because they are mostly restricted to early post-fire habitat (Hutto 1995; PF Doc. WL-R443) and experience local population increases and temporary range extensions resulting from fire or insect and disease outbreaks that increase populations of wood-boring insects. While black-backed woodpeckers can be found in unburned forests and in areas of insect outbreaks, they tend to occur at low densities in these areas and viability may not persist over time without sufficient post-fire habitat (O'Connor and Hillis 2001; PF Doc. WL-R41). The abundance of wood-boring insects begins to decline after about three years after a fire and the value for large numbers of woodpeckers appears to significantly decline after five to six years (Pilliod et al. 2006; PF Doc. WL-R444). Black-backed woodpeckers have been shown to select smaller diameter snags (i.e., 15 inches DBH) than other cavity nesters (Saab et al. 2006; PF Doc. WL-R146).

While black-backed populations are most responsive to beetle outbreaks connected to recent fires, source habitats can include late-seral forests that contain patches of insect-infested trees (Wisdom et al. 2000; PF Doc. WL-R434). These forests may provide adequate habitat to support baseline populations of black-backed woodpeckers when burned areas are not available (Montana Partners in Flight 2000; PF Doc. WL-R418). Insect-killed forests support lower wood-boring beetle abundance than burned forests, even though insect-killed forests may consist of a comparable number of snags as burned forests (Wisdom et al. 2000; PF Doc. WL-R434).

Historically, ecosystems in north Idaho were shaped by disturbance patterns that altered the size and distribution of forest structure across the landscape. Forest succession, wind damage, fire, insects, and diseases created snags in areas that ranged in size from individual trees or small

patches, to entire drainages. As a result, snag densities varied substantially across the landscape. Before human influences, forests in different structure classes and successional stages, including post-fire habitat, were randomly distributed across the landscape. Consequently, post-fire habitat available for black-backed woodpeckers was maintained by these random disturbances. However, there have also been no major fires within the cumulative effects analysis area within the past decade.

The change in dominance of tree species to Douglas-fir and grand fir has increased the prevalence of insect and disease, resulting in higher levels of tree mortality. In root disease pockets and areas affected by insects, higher levels of snags are present. However, these snags are generally small and degenerate more quickly than snags from longer-lived, healthier trees. Shade-tolerant Douglas-fir trees replace these dead trees and in time perpetuate the cycle of disease, creating snags in the smaller size classes.

Suitable black-backed woodpecker habitat likely exists within the project area as a result of small scale insect infestations and other tree mortality (PF Doc. WL-30). There are no recently burned areas in the Beaver Creek Resource Area and approximately 5,000 acres exist on the entire Coeur d'Alene River Ranger District (PF Doc. WL-34). In addition, Samson (2006 b; PF Doc. WL-R154) estimated that the amount of bark beetle infested habitat on the IPNF in 2003 was approximately 304,099 acres. These figures indicate that there is more than adequate beetle-infested habitat on the IPNF to meet the 30,000 acre recommendation to maintain a minimum viable population in the Region (Samson 2006b; PF Doc. WL-R154) or in the Ecological Province.

Although surveys revealed no documented sightings within the Beaver Creek Resource Area, due to the presence of insect-killed trees and the absence of disturbance, such as a large-scale fire, black-backed woodpeckers likely occur at low levels within the project area (PF Doc. WL-9). Black-backed woodpeckers have been historically sighted on the Coeur d'Alene River Ranger District (PF Doc. WL-2). However, the project area is unlikely to represent high quality foraging or nesting habitat due to the lack of post-fire habitat.

Methodology

The potential effects on the black-backed woodpecker and other snag-dependent species were determined by estimating the change in distribution and quality of snag habitat that would result from implementation of the alternatives. In addition, the analysis applies Samson's (2006 b) habitat threshold analysis, which concludes that 30,000 acres is the critical habitat estimate needed in the Northern Region to maintain a minimum viable black-backed woodpecker population.

Environmental Consequences

No salvage logging is proposed in the Beaver Creek Resource Area. All harvesting in the Beaver Creek Resource Area will adhere to the Region 1 Snag Management Protocol (USDA 2000, PF Doc. WL-R54), and snag guidelines developed in association with the Upper Columbia River Basin (UCRB EIS as described in Bull et. al. 1997, UCRB EIS, Appendix K; PF Doc. WL-R52). Seed tree harvesting has the greatest potential to minimize black-backed woodpecker habitat as it retains the fewest snags and live trees. Under both alternatives, prescribed burning is proposed on 2,086 acres. Prescribed burning would take place mostly dry site habitat consisting of ponderosa pine and dry grand fir. In addition, there are two burn units that are proposed in dead lodgepole pine stands. This would create prime habitat for black-backed woodpeckers in the project area.

Alternative 1: Direct and Indirect Effects

No immediate changes in snag habitat would occur as a result of implementing the No-Action Alternative. Habitat conditions would change over time in response to natural events. 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 stands with a low risk of insect and disease.

In high-risk stands, the prevalence of insect and disease damage would be expected to increase under this alternative, resulting in higher levels of tree mortality. These forests that contain perpetual patches of beetle-infested trees would continue to support baseline populations of black-backed woodpeckers when burned forest is not available. However, high fuel accumulations resulting from elevated tree densities, as a result of this alternative, would lead to a higher risk of a large-scale, stand-replacing wildfire. If a stand-replacing fire were to occur, it would create a temporary flush of habitat for black-backed woodpeckers.

Alternative 2: Direct and Indirect Effects

Alternative 2 would harvest trees on approximately 1,973 acres that contain some form of snag habitat (PF Doc. WL-66 through WL-69). In the long term (more than 80 years in regeneration units and 20 to 50 years in commercial thin units), Alternative 2 would increase the occurrence of quality snags (longer lived, seral tree species such as western larch and ponderosa pine) by converting areas at high risk of insect and disease (i.e., Douglas-fir and grand fir) to more resilient, longer-lived species.

However, Alternative 2 would likely represent an overall decrease in snags in the short term, as tree cutting may remove small snags and result in stand conditions with lower levels of small snag recruitment. Removal of young Douglas-fir and to a lesser extent grand fir, and the subsequent open stand conditions would result in reduced susceptibility to disease. Habitat loss due to tree removal would be compensated by snag retention and live-tree replacement guidelines where opportunities exist to help to ensure that snags persist at a level and distribution that would support snag-dependent species (see Appendix E - Design Features). Also, although prescribed burning activities are designed for a minimal amount of live tree mortality, some snags would likely be created as a result of underburning, thereby creating additional snag habitat on approximately 1,825 acres.

Although the proposed action would reduce the quantity of available small snag habitat within the treatment areas, approximately 93 percent of the National Forest System lands within the analysis area would remain untreated under the proposed harvest and would therefore continue to contain some degree of insect and disease infestation. In addition, even within treatment areas, not all occurrences of insects and disease would be eliminated. As a result, tree mortality would continue to persist in and adjacent to the treated areas allowing black-backed woodpeckers to persist at their likely current low level. Furthermore, prime black-backed woodpecker habitat will be created as a result of the 2,086 acres of prescribed burning that is occurring not associated with timber harvest.

Alternative 3: Direct and Indirect Effects

Fewer acres are proposed for harvesting under Alternative 3 compared to Alternative 2 (1,662 acres). The proposed harvest would also take place in areas that contain some form of snag habitat. Similar to Alternative 2, occurrence of quality snags (longer lived, seral tree species such as western larch and ponderosa pine) would increase by converting areas at high risk of insect and disease (i.e., Douglas-fir and grand fir) to more resilient, longer-lived species over the long term.

Alternative 3 would likely represent an overall decrease in snags in the short term, as tree cutting may remove small snags and result in stand conditions with lower levels of small snag recruitment. Removal of young Douglas-fir and to a lesser extent grand fir, and the subsequent open stand conditions would result in reduced susceptibility to disease. Habitat loss due to tree removal would be compensated by snag retention and live-tree replacement guidelines where opportunities exist to help to ensure that snags persist at a level and distribution that would support snag-dependent species (see Appendix E - Design Features). Also, although prescribed burning activities are designed for a minimal amount of live tree mortality, some snags would likely be created as a result of underburning, thereby creating additional snag habitat on approximately 1,528 acres.

The majority of the project area (94 percent of National Forest System lands) would remain untreated under the proposed harvest and would therefore continue to contain some degree of insect and disease infestation. In addition, even within treatment areas, not all occurrences of insects and disease would be eliminated. As a result, tree mortality would continue to persist in and adjacent to the treated areas allowing black-backed woodpeckers to persist at their likely current low level. Furthermore, prime black-backed woodpecker habitat will be created as a result of the 2,086 acres of prescribed burning that is occurring not associated with timber harvest.

Cumulative Effects Common to All Alternatives

Mining Activities – From 1800 - present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. Only the loss of snags would the potential to negatively affect pygmy nuthatches. If future mining prospects are proposed in suitable habitat, measures will be taken to protect snags from being removed.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This activity would not affect vegetation or suitable habitat and has a low probability of affecting other species. There would be no impact to black-backed woodpeckers as they do not forage near the ground (St. Joe Gopher Control BE, PF Doc. R387).

Timber Harvest and Related Activities – The effects of past timber harvest is incorporated into the existing condition. Historical timber harvest, particularly mature Ponderosa pine, has altered species composition of present day forests and resulted in loss of habitat. Timber harvest is expected to occur on private lands; however, the IPNF assumes no contribution of habitat from private lands. Consequently, National Forest lands have become an important source of habitat and the implementation either action alternative would maintain the ability of the cumulative analysis area to support the population at low levels, such as currently exists.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. Snag habitat would be retained.

Fire Suppression - There is a history and ongoing policy of fire suppression within the analysis area for approximately 80 years, which has led to an increase in tree density caused by the encroachment of shade tolerant species within dry site habitat. This has resulted in a more homogenous vegetative species composition and structure that produces smaller, shorter-lived snags. Consequently, there is a lack of fire burned snags, which supports larger numbers of insects and black-backed woodpeckers than areas of insect infestation alone. The implementation

of the action alternative would help decrease the negative effects on black-backed woodpecker habitat from fire suppression.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) -Firewood cutting and gathering is anticipated to continue within 200 feet of open Forest roads and motorized trails within the analysis area. These areas are considered to be deficit in snags from past firewood gathering and therefore do not currently provide habitat for black-backed woodpeckers. The implementation of the action alternative would not increase the amount of open roads and consequently there would be no change in the potential removal of snags for firewood. Other public activities listed above are expected to have no impact on black-backed woodpecker habitat.

Conclusion

The proposed actions, in conjunction with the snag and live tree retention guidelines, would maintain the ability of black-backed woodpeckers to persist at low endemic levels, such as currently exists, and maintain their current distribution within the analysis area because 1) they are closely tied to post fire habitat, which is absent within the project area; 2) the influence of insect and disease would continue on the landscape; and 3) source habitat (e.g. late-seral forests) would be largely unaffected by the proposed action. In addition, there would continue to be a great deal more than the 30,000 acres of beetle-infested habitat to meet the 30,000 acres of habitat for black-backed woodpeckers recommended within the Ecological Province (USDA Forest Service, unpublished report2) and the Region (Samson 2006b) to maintain a viable population.

In addition, Samson (2006) concluded the following with regard to the short-term viability of the black-backed woodpecker in the Northern Region of the Forest Service:

- No scientific evidence exists that the black-backed woodpecker is decreasing in numbers.
- Increases in the extent and connectivity of forested habitat have occurred since European settlement.
- Increases in 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 salvage timber harvest in the Northern Region (in 2004, 2,990 acres of 5,625,571 acres or 0.05 percent) or overall timber harvest (in 2006 – 16,991 acres of 22,351,312 acres or 0.08 percent of the forested landscape) and IPNF (3452 acres of 2,470,394 forested acres or 0.14 percent) is insignificant.

Consequently, the implementation of either of the action alternatives, in conjunction with the past actions, ongoing activities and reasonably foreseeable actions discussed above, ***may impact individuals or habitat, but would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.***

Consistency with Forest Plan

Both alternatives would meet or exceed the Forest Plan goals and objectives for managing snag habitat (USDA Forest Service 1987; PF Doc. CR-002). All alternatives are consistent with 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 Forest Service 1987, p. II-28). Therefore, these actions would also be consistent with the National Forest Management Act requirements to provide for a diversity of plant and animal communities.

3.6.6.3.4. Gray Wolf

Habitat Relationships

Gray wolves are the largest wild members of the dog family (Canidae), and typically prey on medium and large mammals. Prey species in the Northern Rockies include white-tailed and mule deer, moose, elk, woodland caribou, bighorn sheep, mountain goat, beaver, and snowshoe hare, with small mammals, birds, and large invertebrates sometimes being taken (USDI Fish and Wildlife Service 2003; PF Doc. WL-R445). Opportunistic feeders, they will also prey on carrion when it is available. Habitat can include forests of all types, rangelands, brush land, steppes, agricultural lands, wetlands, deserts, tundra, and barren ground areas.

Wolves are highly social animals requiring large areas to roam and feed. They exhibit no particular habitat preference relative to vegetative structure and composition. Rather, high prey densities (particularly big game) and isolation from human disturbance characterize quality wolf habitat. Other important habitat features for wolves include den and rendezvous sites (Hansen 1986; PF Doc. WL-R446).

Affected Environment

The northern Rocky Mountain wolf (a subspecies of the gray wolf) was listed as endangered in 1973. However, based on enforcement problems and a trend to recognize fewer subspecies of wolves, the full species was listed as endangered throughout the entire lower 48 states, except Minnesota, in 1978 (USDI Fish and Wildlife Service 1987; PF Doc. WL-R133). In the past, substantial declines in numbers of wolves resulted from control efforts to reduce livestock and big game depredations. By the 1940's, the Rocky Mountain wolf was essentially eradicated from its range. In 1994, final rules in the Federal Register made a distinction between Idaho wolves that occur north of Interstate 90 and wolves that occur south of Interstate 90. Gray wolves occurring north of Interstate 90 were listed as endangered species and received full protection in accordance with provisions of the Endangered Species Act. By 2002, gray wolves had exceeded recovery goals in the Northern Rockies, but remained listed until May 5, 2011 (USDI Fish and Wildlife Service 2011a; PF Doc. WL-R389).

Historically, wolves were distributed throughout most of Idaho in unknown populations. Wolf packs of four to ten animals appear to have ranged widely in the mountains of northern and central Idaho. A decline of native ungulates, control programs designed to eradicate wolves and conflicts with livestock and humans caused the decline of wolf populations and led to the absence of a breeding population in Idaho (Hansen 1986; PF Doc. WL-R446).

The Beaver Creek Resource Area supports populations of moose, elk, white-tailed and mule deer. IDFG conducts annual census of elk population and total elk observed (2,734) created a population estimate of 7,221 elk with a 90% confidence interval bound of 16.8% (IDFG 2011b; PF Doc. WL-R417). While no specific population numbers are available for other prey species within the project area, these species are common and provide ample prey base for wolves. Although there are a substantial number of existing roads in the area, the open road density has been limited by restricting, closing, or decommissioning many existing roads.

Wolf activity has been reported in the Beaver Creek Resource Area (PF Doc. WL-3). The Coeur d'Alene River Ranger District is known to have a least four documented packs (PF Doc. WL-32).

The Beaver Creek Resource Area is not known to contain any rendezvous or denning areas, although the potential is high given the size of the project area.

Methodology

An estimate of elk habitat is one indicator of the ability of the project area to support an adequate prey base for wolves. Project effects to elk were analyzed using Elk Habitat Potential (EHP) and elk security (please see Section 3.6.6.3.9 for more on Rocky Mountain elk). The elk habitat potential is largely determined by open road density and amount of security available within individual elk habitat units (EHUs) in the analysis area.

The elk habitat unit WEHU5 was used to evaluate the available prey base for wolves in the Beaver Creek Resource Area. In 1993, the Forest Service and Idaho Department of Fish and Game established a target of 55 percent elk habitat potential for WEHU 5, to meet the Forest Plan goal of 52 percent elk habitat potential on the former Wallace Ranger District on the eastern half of the Coeur d'Alene River Ranger District. The Beaver Creek Resource Area lies within WEHU 5 which is approximately 88,008 acres, of which 51,144 acres are National Forest System (NFS) lands. The Beaver Creek Resource Area occurs on 28,200 acres of WEHU 5.

Human disturbance as measured by open road densities within the analysis area is also used to disclose potential effects in this analysis. Human caused mortality, rather than human disturbance itself, can affect the ability of an area to support wolves. The potential for mortality is related to the open road density and the amount of secure habitat, so these factors are also used to analyze effects on wolves. Elk security can be defined as an area equal to or more than 250 acres at least one-half mile from a motorized road and/or trail (PF Doc. WL-R78, Leege 1984). A minimum goal of 20 percent elk security is desired for each EHU (PF Doc. WL-R78, Leege 1984). However, Hillis et al. (1991) states that 30 percent security is necessary if the area is going be used by elk (PF Doc. WL-R452). Elk security in WEHU 5 increases during the hunting season due to seasonal motorized trail closures on the west side of the Beaver Creek Resource Area. These closures result in an increase from 7,104 acres (14%) to 10,649 acres (20%) from September 7 until December 15 (PF Doc. WL-25). Calculations for elk habitat potential and elk security do not incorporate this temporary increase in elk security, however, it is important to note as the hunting period is typically when elk are most vulnerable to mortality.

Environmental Consequences

The tables below summarize the existing condition and the effects of the proposed activities on elk habitat potential and elk security in WEHU 5, and therefore gray wolves, by alternative. WEHU 5 has a goal of 55 percent elk habitat potential and a goal of 20 percent security. Elk security values do not reflect the increase in acres provided by seasonal closures during hunting season.

Table 80. Calculated Elk Habitat Potential (EHP) for Wallace Elk Habitat Unit (WEHU) 5 during and after completion of activities.[1]

Elk Analysis Area	Alternative 1 No Action (percent)	Alternative 2 During Activities (percent)	Alternative 2 Post Activities (percent)	Alternative 3 During Activities (percent)	Alternative 3 Post Activities (percent)
WEHU 5	50	**43**	48	45	50

[1] *EHP values that drop more than 5 percent from existing conditions are in* ***bold.*** *The goal for EHP in WEHU 5 is 55 percent.*

Table 81. Security for National Forest System lands in Wallace Elk Habitat Unit (WEHU) 5.[1]

Elk Analysis Area	Alternative 1 No Action	Alternative 2 During Activities	Alternative 2 Post Activities	Alternative 3 During Activities	Alternative 3 Post Activities
NFS Lands in WEHU 5	7,104 acres (14%)	4262 acres (8%)	7,104 acres (14%)	4262 acres (8%)	7,104 acres (14%)

[1] *The goal for elk security in WEHU 5 is 25 percent.*

Alternative 1: Direct and Indirect Effects

There would be no direct effects to elk under the no-action alternative, and therefore no effects to wolves. No commercial harvest, prescribed burning or road decommissioning would occur under the no-action alternative. The amount of open roads and trails would remain unchanged, maintaining the amount of secure habitat available for elk (14 percent). There would be no new road construction, however no storage or decommissioning of roads would take place, and the elk habitat potential for WEHU 5 would remain the same (50 percent). Population trends for elk would remain stable (PF Doc. WL-R407, IDFG 2012).

Indirectly, foraging habitat may decline over time as fire suppression continues and current shrub fields age and die off. Mid-age and mature stands which are currently providing hiding and thermal cover may decline as stands age and also due to insects and disease. As conifers in existing harvest openings grow, stand density and canopy cover increase. This could potentially increase cover and decrease forage over time.

Alternative 2: Direct and Indirect Effects

Alternative 2 proposes harvest on approximately 1,973 acres of the 28,200 acres of the Beaver Creek Resource Area. Harvest proposed would eventually increase forage availability in the Beaver Creek Resource Area, thus potentially increasing ungulate production. During project implementation which could last up to 10 years, ungulates could be displaced from the harvest areas, which may alter wolf movements and foraging opportunities. Approximately 1,973 acres will contain fuel treatment associated with vegetation harvest and 2,092 acres will contain fuel treatment activities not associated with vegetation harvest. Burning will improve forage availability for elk within 1-2 years after treatment. Road decommissioning will occur on approximately 66 miles and although this is beneficial for elk, calculation of the elk habitat potential would not change as roads proposed for decommissioning are typically already brushed and not used for motorized travel. Permanent road construction is proposed on 1.5 miles under Alternative 2 and this has a slight effect on elk habitat potential. In addition, 1.2 miles of temporary road are proposed during activities; however this would be decommissioned post activity. Elk habitat potential would still be affected because it reflects the presence of additional closed roads on the landscape.

Elk habitat potential in WEHU 5 is expected to drop seven percent during activities and increase five percent post activities, resulting in an elk habitat potential of 48 percent. Elk security would decrease during activities to eight percent from the existing 14 percent security and then return to the existing security post-activity.

In summary, proposed activities under Alternative 2 would trend toward a lower quality elk habitat, potentially negatively affecting wolves in the project area. Elk security is expected to drop to eight percent during activity which could potentially negatively affect elk, however post activity; security will increase to the current level of 14 percent. However, the drop in elk security could persist for several years, thereby negatively affecting local wolf population movements and foraging opportunities.

Alternative 3: Direct and Indirect Effects

Alternative 3 proposes the similar activities as Alternative 2 but with less vegetation harvest, only 871 acres, and no new construction of permanent or temporary roads. Since there are less acres being harvested, fuel treatments associated with harvest are also less (1,662 acres). Aggregate retention is proposed in Alternative 3 in response to public comments. Aggregates are patches of trees greater than one-half acre in size that are excluded from all activities associated with harvest and remain in an undisturbed condition. Retention patches are centered around mature or old growth trees, and potentially provide increased access to corridors and cover near large open forage areas for elk. Retention patches were spatially distributed on the landscape in order to maximize the benefit to elk by increasing the cover to forage ratio, particularly where proposed harvest is adjacent to recent harvest units (less than 25 years ago). Patches are greater than 150 feet wide, which is the distance recommended by Idaho Department of Fish and Game (PF Doc. WL-109). More roads are proposed for decommissioning (104 miles) under Alternative 3.

Elk habitat potential in WEHU 5 is expected to drop five percent during activities and increase five percent post activities, resulting in the existing elk habitat potential of 50 percent. Elk security would decrease during activities to eight percent from the existing 14 percent security and then return to the existing security post-activity, similar to Alternative 2.

In summary, proposed activities under Alternative 3 would retain the same quality elk habitat. Elk security is expected to drop to eight percent during activity which could negatively affect elk, however post activity; security will increase to the current level of 14 percent. However, the drop in elk security could persist for several years, thereby affecting wolves.

Cumulative Effects Common to All Alternatives

The following past, ongoing, and reasonably foreseeable actions were considered in a cumulative effects discussion for elk.

Mining Activities – From 1800 - present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. This activity would have no measurable impact to wolves besides the presence of humans in the immediate activity area.

Pocket Gopher Control – This activity may be done to control pocket gophers if needed to protect planted seedlings. This activity would not affect vegetation or suitable habitat and has a low probability of affecting other species. Elk are herbivores and would not be expected to come into contact with the bait placed in underground burrows. There should be no adverse effects from the potential gopher baiting activity on non-target wildlife species.

Timber Harvest and Related Activities – The effects of past and ongoing timber harvest is incorporated into the existing condition. Historical timber harvest has altered species composition of present day forests and resulted in loss of habitat. Logging activity that resulted in large openings would likely have temporarily displaced use in those areas. Timber harvest is expected to occur on private lands; however the IPNF assumes no contribution of habitat from private lands. Future timber harvest has the potential to negatively affect wolves from human disturbance.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. Although a temporary displacement during activities would occur, this activity would result in better forage opportunities for elk thereby increasing the prey availability for wolves.

Fire Suppression – Continued fire suppression would help retain forest cover, further contributing to reduction of foraging habitat for ungulates. However, the effects of fire suppression on ungulate habitat are difficult or impossible to quantify as some cover is required for thermoregulation and to reduce hunting vulnerability. This may have an impact on wolves but difficult to measure.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) –

Public activities such as firewood cutting and motorized vehicle use displace wildlife but these effects are incorporated into the existing condition for elk and therefore wolves. Illegal access of roads that are closed to the public have the potential to displace wolves and elk. Hunting of elk has an effect on wolves and is measured by elk security. Hunting of wolves has resulted in 425 deaths in Idaho during 2012, with human caused mortality comprising 98% of these mortalities (IDFG Wolf 2012; PF Doc WL-R447). This year is the first year that a decline in wolf populations occurred based on trapping mortality. The effects of snowmobiling, driving and potential hunting mortality are linked to the open road system and are addressed in the analysis of motorized route densities for elk habitat potential.

Conclusion

While wolves are likely present in the area, there is no confirmed evidence of recent reproduction, den sites and rendezvous sites near proposed treatments. There could potentially be temporary reductions in prey densities during activities but they are expected to resume to current, if not close to current levels. In the event that any den or rendezvous sites were discovered that could be affected by the action alternatives, temporal and/or spatial buffers would be implemented as needed (see Design Features). Both action alternatives are likely to result in post-implementation benefits to both wolves and the ungulates that they feed on through increased forage production and reduction of motorized access following implementation. Due to the ability of gray wolves to thrive under a variety of land uses, successful wolf recovery in the northern Rocky Mountains does not depend on land-use restrictions, with the possible exception of temporary restrictions around active den sites on federally managed lands (USDI Fish and Wildlife Service 2003; PF Doc. WL-R445). Other ongoing and reasonably foreseeable activities would not increase motorized access or negatively affect prey species. As a result, the action alternatives in conjunction with past, present and reasonably foreseeable actions ***may impact gray wolf 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

Both alternatives would meet or exceed the Forest Plan goals and objectives for managing snag habitat (USDA Forest Service 1987; PF Doc. CR-002). All alternatives are consistent with 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 Forest Service 1987, p. II-28; PF Doc. CR-002). Therefore, these actions would also be consistent with the National Forest Management Act requirements to provide for a diversity of plant and animal communities.

3.6.6.3.5. Western Toad

Habitat Relationships

Western toads are found in a wide variety of habitats 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 (Maxell 2000; PF Doc WL-R149). After the breeding season, young toads disperse from aquatic breeding habitat and travel up to 4 km (2.5 mi.) to a variety of upland habitat that include marshes, wet meadows, or mesic forested areas (Maxell 2000; PF Doc WL-R149). Adults can remain away from surface water for relatively long periods of time. Both adults and juveniles overwinter and shelter in underground caverns, rodent burrows, beaver dams, and slash piles that maintain high humidity and above-freezing temperatures (Loeffler 1998; PF Doc. WL-R448).

Affected Environment

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 a small proportion of suitable habitat (Maxell 2000; PF Doc WL-R149). As a result of these findings, the Regional Forester listed the boreal toad as a sensitive species in the Northern Region.

Reasons for the decline of the western toad have not been defined with any degree of certainty. However, habitat alterations from timber harvest, grazing, recreation, and water development would likely “not be beneficial to long-term enhancement of western toad habitats” (Loeffler 1998; PF Doc. WL-R448). One hypothesis explaining the western toad decline concerns mortality caused by disease or some other widespread agent, such as the Chytrid fungus (Maxell 2000; PF Doc WL-R149).

The primary risk factor for western toad populations 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. In the Beaver Creek area, potential breeding habitat is limited to small areas of standing water adjacent to springs, seeps and minor streams (including Beaver Creek). Steep road cuts can be a barrier to toads moving between seasonal habitats and also a direct source of mortality from vehicles. Juvenile toads are also vulnerable to being killed by motorized vehicles when they are dispersing from their natal ponds.

Western toads have been identified at five sites on the Coeur d’Alene River Ranger District (PF Doc. WL-18, WL-15), none of these occurring within the Beaver Creek Resource Area. There is no evidence of decline on the District; however, it is assumed that numbers were greater in the past than now primarily due to the loss of wetland habitat across various ownerships. An increase in roads, particularly in developed, low elevation areas, may also be a mortality factor. Potential breeding habitat is estimated by looking at any streams, marshes, seeps, springs, and wetlands in the Beaver Creek Resource Area.

In the Beaver Creek area, potential breeding habitat is limited to small areas of standing water adjacent to springs, seeps and minor streams. There are no known western toad breeding areas within the Beaver Creek Resource Area. Potential breeding habitat would be beaver ponds located in the Beaver Creek flood plain. Surveys for western toads in 2012 revealed no breeding western toads in this area.

Methodology

The potential effects on western toads were determined by predicting the change to breeding habitat (ponds, wetlands, streams) and terrestrial habitat resulting from the proposed actions.

Environmental Consequences

The action alternatives may impact individual toads during project implementation. Indirect effects could potentially occur if there was an increase in sediment delivery to wetlands and waterways as a result of tree removal, which could potentially degrade breeding habitat. However, this risk is considerably reduced by project design features, including timing restrictions, Inland Native Fish Strategy buffers and Best Management Practices, which require that protective measures be implemented to protect waterways and wetlands. Consistent with the project design, there would be no activities within Riparian Habitat Conservation Areas, other than the use of existing roads and stream crossings, and road maintenance activities. All streams and wetlands larger than one acre in size are buffered from activity by at least 150 feet. Smaller springs, seeps, and wetlands would be buffered by at least 75 feet if any are identified near harvest units. As a result, the potential for disturbance to breeding habitat and reproduction is discountable. While the action alternatives may affect individual toads to differing extents based on acres affected, they are not expected to be measurably different at the population level.

Certain types of vegetation harvest techniques have a greater potential to impact western toads. Although skyline harvest has the potential to directly impact western toads, it is an improvement over ground harvest methods because the method results in a decrease in skid trails. There is a possibility that western toads could be temporarily displaced or killed due to vehicles, tree removal, skid trails, roads, fuel breaks, and underburning. This disturbance would be relatively short term in nature, lasting only as long as project activities and western toad activity would resume in the area following project completion. Western toads use a variety of upland areas, so the change in vegetation structure should have no long-term effects beyond project activities. Research has indicated that western toads may benefit from fuel reduction treatments and that they appear to be attracted to recently disturbed areas (Pilliod et al. 2006; PF Doc. WL-R444).

Closing gates on roads with each vehicle passage will reduce mortality of western toads. Both project alternatives would ultimately result in a decrease in motorized access through decommissioning and storage of existing roads. This would reduce the risk of direct mortality from vehicles, as well as potentially reduce the spread of pathogens such as Chytrid fungus which has been suggested as a major element contributing to toad population declines (Maxell 2000; PF Doc. WL-R149).

Alternative 1: Direct and Indirect Effects

Under the No-Action Alternative, there would be no change to breeding habitat or terrestrial habitat within the project area because there would be no timber harvesting or associated fuels treatments. Consequently, there would be no direct or indirect effects to western toad from this alternative and since there would be no direct or indirect effects on boreal toad there would be no cumulative effects.

Alternative 2: Direct and Indirect Effects

Implementation of Alternative 2 may result in the temporary disturbance of western toads and their terrestrial habitat within the treatment areas. Approximately 1,973 acres would be harvested with associated fuel treatments and an additional 2,086 acres would have prescribed burning. Only 230 acres would be harvested using ground-based operations, which have the greatest potential to impact western toads. Of the remaining acres, the majority (1,495 acres) would be

harvested using a skyline system, 10 acres using a cable system, and 238 acres using escaliner swing.

Under Alternative 2, aquatic organism passage repair would occur on eight culverts. This action would be beneficial to western toads dispersing. In addition, 19 miles of road storage and 66 miles of road decommissioning would also occur and result in potential benefits to western toads from decreasing sediment run-off and direct mortality from vehicles.

Alternative 3: Direct and Indirect Effects

Implementation of Alternative 3 may result in the temporary disturbance of western toads and their terrestrial habitat within the treatment areas. Compared to Alternative 2, fewer acres are proposed for harvest and associated fuel treatments (1,662 acres), but with the same amount of prescribed burning (2,086 acres). Slightly fewer acres would be harvested with ground based operations (212 acres), which have the greatest potential to impact western toads. Of the remaining acres, the majority (1,197 acres) would be harvested using a skyline system, 36 acres using a cable system, and 217 acres using escaliner swing.

Under Alternative 3, more aquatic organism passage repair would occur (12 culverts). This action would be beneficial to western toads dispersing. Less road storage (0.5 miles) but more road decommissioning (104 miles) would occur under Alternative 3 compared to Alternative 2. These actions may result in potential benefits to western toads from decreasing sediment run-off and direct mortality from vehicles.

Cumulative Effects Common to All Alternatives:

Mining Activities – From 1800 - present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. These activities associated with past, ongoing and future mining in the Beaver Creek Resource Area have the potential to negatively affect aquatic habitat for the western toad.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This activity would not affect vegetation or suitable habitat and has a low probability of affecting other species. The remote possibility exists that a dispersing toad could overwinter in a pocket gopher burrow where bait was placed. However, the effect would be minor and have no impact on the population. Effects of gopher bait on amphibians are not known but there is potential to negatively affect western toads due to their permeable skin (PF Doc. WL-R387).

Timber Harvest and Related Activities - Since toads utilize a variety of forested habitats, historical timber harvest and associated road building is thought to have had some impacts on 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 surviving toads would have resumed normal activities afterward. Logging activity that resulted in large openings would likely have temporarily displaced use in those areas since toads have an affinity for forested cover in upland areas. However, these areas would have regenerated to the point where adequate cover and shade were provided within five to 10 years. Physical alteration of habitats (trampling) from off-road vehicle use likely has minor effects to this species since it uses a variety of upland habitats, but direct mortality from tires may take place here as well. Post-harvest fuels treatments, particularly broadcast burning during spring, may also present a risk of direct toad mortality. However, research indicates that western toads may benefit from fuels reduction treatments and appear to be attracted to recently disturbed areas (Pilliod et al.

2006). There is the potential risk to western toads from the use of chemical dust abatement. However, features are in place under INFS standards for the application of chemical dust abatement near aquatic environments.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. It would reduce hiding cover somewhat. This activity would originate from existing roads, so while it may cause a minor disturbance to western toads during implementation, there would be no long-term effects.

Fire Suppression - Continued fire suppression would not noticeably impact western toad populations. These activities are unlikely to impact breeding habitat (most fire suppression activities take place outside the breeding season), and potential modifications to upland forested habitat would be inconsequential since this species makes use of a variety of upland habitats. While there is a risk of mortality associated with fire suppression as a result of increased vehicular use of roads, these instances would be infrequent and isolated.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) – Public activities, excluding off-road motorized use, would not markedly impact western toad populations. These activities would not impact breeding habitat, and potential modifications to upland forested habitat (that toads may use) would be inconsequential because canopy cover would be essentially unchanged as relatively few snags are cut. While there is a risk of direct mortality associated with these activities as a result of vehicular use of roads, these instances would be infrequent and isolated because most public use occurs during the drier months when toads are less likely to be using open roadside habitat. Off-road motorized use has the potential for greater impacts to habitat; however, this activity is illegal under the Motorized Vehicle Use Map (MVUM) regulations.

Conclusion

The action alternatives may impact individual toads during project implementation. However, this risk is considerably reduced by project design features, including timing restrictions, Inland Native Fish Strategy buffers and Best Management Practices (see Appendix E - Design Features). All streams and wetlands larger than one acre in size are buffered from activity by at least 150 feet. Smaller springs, seeps, and wetlands would be buffered by at least 75 feet if any are identified near harvest units. As a result, the potential for disturbance to breeding habitat and reproduction is discountable.

The project also would ultimately result in a decrease in motorized access through decommissioning and storage of existing roads. This would reduce the risk of direct mortality from vehicles, as well as potentially reduce the spread of pathogens such as Chytrid fungus which has been suggested as a major element contributing to toad population declines (Maxell 2000; PF Doc. WL-R149). Other present and reasonable foreseeable activities within the analysis area (public activities, fire suppression**,** etc.) would not affect breeding habitat, and potential mortality to individual toads from traffic related to these activities would be minor and is accounted for by assessing motorized access.

While the action alternatives may affect individual toads to differing extents based on acres affected, they are not expected to be measurably different at the population level. Consequently, the Beaver Creek project in conjunction with past, present and reasonably foreseeable actions ***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

Because potential breeding habitat would be protected, both alternatives would comply with the Forest Plan direction to manage the habitat of species listed in the Regional Sensitive Species Lists to prevent further declines in populations, which could lead to federal listing under the Endangered Species Act.

3.6.6.3.6. Northern Goshawk

Based on the best available science summarized in the *Management Indicator Species Considerations for the Idaho Panhandle National Forests* (Appendix H – MIS Considerations), the northern goshawk population trend appears to be stable and their habitat is abundant and well-distributed across the Region. Additionally, the IPNF contains substantially more habitat distributed throughout the Forest than needed to support a minimum viable population of northern goshawk. Northern goshawks and active nest sites are documented across the Forest, including territories that have had multiple years of documented occupancy and reproductive success, and surveys periodically locate new territories and nest sites.

Habitat Relationships

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 (PF Doc. WL-R046, Reynolds et al. 1992). Throughout North America, goshawk nest sites have consistently been associated with the later stages of succession with moderate to high tree densities located near the bottom of hillsides on moderate slopes (Hayward and Escano 1990; PF Doc. WL-R449, Graham et al. 1999; PF Doc. WL-R450). 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 (PF Doc. WL-R36, Maj 1996, Squires and Kennedy 2006, Clough 2000, PF Doc. WL-R046, Reynolds et al. 1992). A Post-Fledging Area (PFA) surrounds the nest site and is used by the family group from the time the young fledge until they are no longer dependent on the adults for food. In general, the majority of a goshawk territory or home range (which includes the nest area, post-fledgling area and surrounding foraging area typically contains a more heterogeneous mix of forest age and structural components than the nest area itself (Reynolds et al. 1992; PF Doc. WL046).

Affected Environment

The northern goshawk has a home range size of 5,000 to 6,000 acres. The Beaver Creek Resource Area has sufficient nesting and foraging habitat to hypothetically support four home ranges, and therefore serves as the cumulative effects area (PF Doc. WL-39). The project area contains minimal amounts of old growth (i.e. 958 acres or 3.4 percent). Capable goshawk foraging, nesting, and post-fledgling habitat occurs in the project area (PF Doc. WL-27, WL-42, and WL-61). The project area contains approximately 5,221 of capable nesting habitat that is well distributed throughout the Beaver Creek Resource Area (PF Doc. WL-61, WL-76).

Forest structure has been shaped by a mix of past harvest activity, wildfire, fire suppression, white pine blister rust, and natural succession. Throughout the analysis area, variable canopy densities and stand age influence the size and distribution of suitable goshawk nesting habitat. Forest Vegetation Section 3.1 characterizes the processes and current condition of forested stands in the Beaver Creek Resource Area. Exclusion of wildfire in mature stands has often resulted in more congested stand conditions, particularly in the understory. As a result, stands that would have been dominated by widely spaced, large diameter trees with relatively open understories are now populated with greater numbers of smaller diameter, often shade-tolerant, tree species and

crowded understories. This effect is more pronounced in dry-site stands, but moist-site stands would have experienced occasional low- and mixed-severity fires as well (see Fire/Fuels Section 3.2 and the Silviculture Report, PF Doc. SR-01). Also, white pine blister rust has had a profound effect on forest composition compared to pre-settlement conditions. Today's landscape contains only remnant examples of white pine, while historically this species would have dominated much of the moist forest habitat (Harvey et al. 2008; PF Doc. WL-R451).

Reynolds et al. (1992) recommend analyzing a goshawk's home range based on the availability of habitat within six different vegetative structural stages to address the diversity of habitat needed by goshawk for foraging and nesting (PF Doc. WL-R046). These recommendations have been criticized in recent years (see, for example, PF Doc. WL-R141, Greenwald et al. 2005) for de-emphasizing the importance of mature and old growth forest, large trees and high canopy cover. However, Reynolds et al. (PF Doc. WL-R167, 2008) reviewed the 1992 management recommendations, as well as the studies cited by Greenwald et al. (2005; PF Doc. WL-R453) and other studies these authors had missed, and concluded that goshawks showed "extensive variation" in their use of vegetation types and forest structures. Reynolds et al. (2008) assert that the Greenwald et al. (2005) authors discounted this variation, and demonstrated a limited understanding of the effects of prey availability on goshawks and of the dynamic nature of forests. Reynolds et al. (2008) concluded that the 1992 recommendations were adequate and maximized the "sustainable amount of mature and old forests" in goshawk home ranges.

There are two historic goshawk nests in the Beaver Creek Resource Area that were discovered in the 90's (PF Doc. WL-7, WL-15). These nests were not surveyed on a regular basis, however, they were surveyed in 2011 and 2012 and they were not occupied. Two new active goshawk nests were discovered during surveys in 2011 and 2012 (PF Doc. WL-8, WL-39).

Methodology

The analysis for the Beaver Creek project uses the best available science to assess potential effects on both individuals and populations of northern goshawks. Data sources included scientific papers, research (both peer-reviewed and otherwise), Forest Service inventorying and monitoring information, various wildlife databases (NatureServe, Idaho Department of Fish and Game Conservation Data Center, Montana Natural Heritage Program, Forest Service Natural Resource Information System (NRIS), Partners in Flight, and U.S. Geological Survey (USGS) Breeding Bird Survey), aerial photographs, field reviews, public comments, timber stand examination data and professional judgment. The analysis spanned decreasing spatial scales (from global to the project level) and considered goshawk biology (population status, reproductive biology and habitat associations) as well as habitat abundance and potential project effects.

The IPNF employed a step-down process to assess northern goshawk population trends at various spatial scales (Appendix H – MIS Considerations). The analysis did not find evidence of current population declines of this species at the global (NatureServe 2009), regional (USDI Fish and Wildlife Service 1998; PF Doc. WL-R330, Partners in Flight 2007), or state (IDFG 2005; PF Doc. WL-R331, Montana Natural Heritage Program 2010) levels. Although population trends have not been established with high degree of accuracy at all spatial scales, it is noteworthy that at the regional (western United States) level there is no evidence that goshawk habitat is limiting the population, or that significant curtailment of the species' habitat or range is occurring; the species continues to be well-distributed throughout its historical range; and there are no significant areas of extirpation (USDI Fish and Wildlife Service 1998; PF Doc. WL-R330). Additionally, based on the results of surveys conducted across the USFS Northern Region in

2005, the frequency of goshawk presence in the accessible portions suggests they are relatively common and well distributed across the Region (Kowalski 2006; PF Doc. WL-R454).

In 2006, the Northern Region of the Forest Service released a conservation assessment providing a synthesis of the best available science regarding habitat and populations and to analyze the availability of habitat for northern goshawk across the region and on the individual Forests (updated estimates in Bush and Lundberg 2008; PF Doc. WL-R181; a summary can be found in Appendix H – MIS Considerations). The Conservation Assessment concluded, based on peer-reviewed literature, non-peer-reviewed publications (particularly master's theses and PhD dissertations), research reports, and Forest Service data, that to maintain a minimum viable population of the northern goshawk across the Northern Region, there would need to be a minimum of 30,147 acres of post-fledgling area habitat, based on a net effective population size of 110 individuals (55 pairs) using a 545-acre post-fledgling area per pair. Bush and Lundberg's (2008; PF Doc. WL-R181) updated results for northern goshawk habitat indicates that the North Rocky Mountain Ecological Province alone (comprised of the Idaho Panhandle, Clearwater, Flathead, Kootenai and Lolo National Forests) provides more than 13 times the amount of habitat needed for the entire Region to maintain a minimum viable population of the northern goshawk (PF Doc. WL-R181). Samson (2006b) also determined that suitable habitat for the northern goshawk was within the species-specific dispersal distance, indicating that well-distributed habitat is not an issue in the Northern Region (PF Doc. WL-R154).

As discussed in the MIS Considerations white paper (Appendix H), there is no evidence of population decline of northern goshawk at the National or Regional level, and the IPNF alone currently contains more than five times the amount of habitat needed to provide viable populations at the Regional level. Goshawk sightings and active territories have been documented throughout the Forest over the past ten years.

Goshawk habitat preferences are well-established in published literature (summarized in Brewer et al. 2009; PF Doc. WL-R328). While there may be disagreement over required habitat structure at the home range or post-fledgling area levels for populations to persist over time (see, for example, Greenwald et al. 2005; PF Doc. WL-R453 and Reynolds et al. 2008; PF Doc. WL-R456), the general structural makeup of nest stands is widely accepted: late-successional stands, multiple canopy layers, high (50 to 90 percent) overstory cover and relatively open understories, located on the lower one-third or bottom of the hill slope and in most cases in areas with less than a 40 percent slope. Other, ancillary components (snags or decadence, ground vegetation, prey availability, etc.) may be locally important, but are highly variable and/or difficult to quantify.

Determination of nesting habitat suitability was based on the attributes described above as well as professional experience of District personnel. Overstory canopy cover, tree size and density, number of canopy layers, presence of large woody debris and vegetative ground cover, and relative lack of congestion in lower canopy layers (seedling/sapling-sized trees and tall shrub) were all taken into consideration when assessing suitability. Those capable stands that, upon field inspection, lacked one or more of these structural attributes were not considered potentially suitable. Stands on slopes exceeding 40 percent were similarly not considered to be potentially suitable nesting habitat based on published literature (i.e. Hayward and Escano 1989; PF Doc. WL-R449, Maj 1996; PF Doc. WL-R457, and Clough 2000; PF Doc. WL-R458) and experience on the District. Spruce and subalpine fir stands have been used for goshawk nesting in the southwestern U.S. portions of the species' range (see Reynolds et al. 1992; PF Doc. WL-R441 and Graham et al. 1999; PF Doc. WL-R450, for example), but this use has not been documented in the Northern Rockies. Similarly, while lodgepole pine-dominated stands have been used for nesting elsewhere, this use has not been observed on the District. Individual lodgepole pines

have been used as nest trees on a few occasions, but these were in mixed-conifer stands dominated by Douglas-fir or other species.

The existing condition and potential project effects were also evaluated at the analysis area level. Potentially suitable nesting habitat was initially determined to be forested stands with overstory canopy closure greater than 60 percent, average tree size in the primary overstory layer greater than 10 inches dbh, and all forest types except subalpine fir and lodgepole pine. If stands contained excessive congestion in the understory layer of seedlings/saplings, or high densities of smaller diameter (less than 10 inches dbh) trees in the midstory layer they were determined not to be suitable nesting habitat. Some additional stands were determined not to be suitable when stand examination data from FSVEG and aerial photograph interpretation indicated they had been regeneration harvested within the last 30 years.

Two hypothetical post-fledgling areas of approximately 471 acres and 525 acres were delineated in the area surrounding the two active Beaver Creek goshawk nest stands (PF Doc. WL-42). Post-fledgling areas were delineated to include areas that would reasonably be utilized by fledging goshawks. Information used to determine vegetation structural stage was acquired from stand examination data queried through FSVEG, and corroborated with 2011 and 2012 field habitat validation data.

Existing nest stand, post-fledgling area and home range suitability were then compared to recommendations initially described by Reynolds et al. (1992; PF Doc. WL-R441) and modified based on findings in the Northern Region goshawk overview (Brewer et al. 2009; PF Doc. WL-R328). 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 alternate nesting habitat for goshawks on the landscape (Reynolds et al. 1992; PF Doc. WL-R441). In the Northern Region, nest stands should be at least 40 acres in size (Brewer et al. 2009; PF Doc. WL-R328). Reynolds et al. (1992; PF Doc. WL-R441) advise maintaining vegetation structural stage proportions within goshawk home ranges and post-fledgling areas of 10 percent each in vegetation structural stage 1 and 2, and 20 percent each in vegetation structural stage 3 through 6 to address the diversity of habitat needed by goshawk for foraging and nesting. These proportions also account for successional changes over time where some stands move into later seral stages suitable for nesting, while other stands revert to early successional stages through disturbance and provide for diverse foraging. When evaluating the effects of the action alternatives, the analysis assumes that any unit with proposed even-aged regeneration harvest initially reverts to vegetation structural stage 1, moving into vegetation structural stage 2 once regeneration is established. Acres with proposed selection harvest treatments would remain in their current size class, but with reduced canopy densities that may diminish nesting suitability.

Environmental Consequences

Vegetation structural stage quantities for the analysis area and the two post-fledgling areas are given in the tables below. All are weighted toward the older forest stands, particularly the Rock Gulch post-fledgling area, which has no vegetation below 10 inches DBH.

Table 82. Vegetation structural stage (VSS) percentages within the Beaver Creek Project's Northern Goshawk Analysis Area.

VSS	Size Class (Desired %)	Existing	Alternative 2	Alternative 3
1	20% in 0-5 inches diameter (shrub, forb, grass)	16% (835 acres)	21% (1,096 acres)	20% (1,044 acres)
2	20% in 5-10 inches diameter	15% (783 acres)	14% (731 acres)	14% (731 acres)
3	60% in larger than 10-inches diameter	69% (3,602 acres)	65% (3,393 acres)	66% (3,446 acres)

Table 83. Vegetation structural stage (VSS) percentages within the Alder Creek Northern Goshawk post-fledgling area (PFA) for the Beaver Creek Project.

VSS	Size Class	Existing	Alternative 2	Alternative 3
1	Shrub, Forb, Grass	0	6% (28 acres)	6% (28 acres)
2	0-5"	17% (80 acres)	17% (80 acres)	17% (80 acres)
3	5-10"	0	0	0
4	10" +	83% (391 acres)	77% (363 acres)	77% (363 acres)

Table 84. Vegetation structural stage (VSS) percentages within the Rock Gulch Northern Goshawk post-fledgling area (PFA) for the Beaver Creek Project.

VSS	Size Class	Existing	Alternative 2	Alternative 3
1	Shrub, Forb, Grass	0	0	0
2	0-5"	0	0	0
3	5-10"	0	0	0
4	10" +	100% (525 acres)	100% (525 acres)	100% (525 acres)

Alternative 1: Direct and Indirect Effects

Initial field habitat investigation resulted in approximately 5,221 acres of potentially suitable nesting habitat being identified in the analysis area (or 19 percent of the project area). Potentially suitable habitat was generally well distributed throughout the Beaver Creek Resource Area except for the southeastern corner. Several contiguous blocks meets the Reynolds et al. (1992) and Brewer et al. (2009; PF Doc. WL-R328) recommendations for nesting habitat in an individual home range, far exceeding the minimum of 240 suitable acres described in Brewer (2009; PF Doc. WL-R328) and arranged in such a way that eight or more individual 40-acre suitable stands could be delineated (PF Doc. WL-61).

As discussed above, a number of capable nest stands in the analysis area are unsuitable either because the understory is congested by a high density of smaller stems, or because they have high densities of stems in the 8-10 inches DBH size class congesting the mid-story and impeding flight. Even-aged stands generally make poor nest stands in this portion of the IPNF because they grow in dense concentrations of stems that are vulnerable to disease, insect infestations, or stand-replacing fire before they can attain a structure of large, open-spaced stems preferred by goshawks. In the absence of large disturbance events, individual trees would succumb to various mortality factors and other species such Douglas-fir, grand fir, cedar, and hemlock would slowly take over the stands. These mixed-conifer stands may reach suitable nesting conditions over time

(80-100 years), but they may also develop the same congested understory conditions currently preventing some of the mixed-conifer stands in the area from providing suitable habitat. In the absence of disturbance, the time required for even-aged stands to reach suitable nesting structure would be considerable, if it happened at all.

Over time, some mixed-conifer stands would mature or increase overstory canopy and potentially become suitable, while other mature stands would move further away from suitability due to increasing understory congestion. Deteriorating stand health would result in large, uniformly-spaced stems being replaced by more numerous, densely-packed smaller stems. The high amount of ladder fuels in these stands reduces the likelihood that low intensity fire would clear out this understory. Instead, a large stand-replacing fire would be more likely to occur and reset the vegetational structural stage to favor foraging habitat. The presence of long-lived seral species would continue to decline in the stands, potentially reducing nesting habitat as well.

Since this alternative would not authorize any activities in goshawk habitat, it would have no direct effects on this species, although it would have the indirect effects discussed above.

Alternative 2: Direct and Indirect Effects

Alternative 2 proposes timber harvest on approximately 791 acres and landscape burning on 124 acres of suitable goshawk nesting habitat. Approximately 97 acres would be seed tree harvested (regeneration), 437 acres shelterwood harvested (regeneration), 201 acres commercially thinned, and 56 acres harvested by improvement cut methods. Commercially thinned and improvement cut stands are not expected to alter suitable nesting habitat as these methods will retain a sufficient amount of large diameter trees and adequate canopy cover. Approximately 658 acres of suitable nesting habitat would be removed under this alternative due to regeneration harvest and landscape burning which would leave stands no longer suitable for goshawk nesting. This would still retain 4,563 acres of suitable goshawk in the Beaver Creek Resource Area (16 percent), largely in contiguous blocks greater than Reynolds et al. (1992; PF Doc. WL-R441) and Brewer et al. (2009; PF Doc. WL-R328) recommendations for nesting habitat within the home range (PF Doc. WL-90).

Effects to the vegetation structural stage groups in the analysis area are shown in Table 82 through Table 84. Most of the regeneration harvest would take place in the mature/large sawtimber category, with smaller amounts of immature/medium sawtimber being affected. Proposed harvests would still retain well in excess of the recommended 60 percent for the analysis area of stands greater than 10-inches DBH. Alternative 2 would increase the total amount of nesting habitat in the 0 to 5-inch DBH category, slightly above the desired level of 20 percent. The pole-size category (5 to 10 inches DBH) is currently underrepresented in the analysis area compared to the Reynolds et al. (1992; PF Doc. WL-R441) guidelines of 20 percent, and would continue to be under-represented in all alternatives.

Approximately 38 acres of regeneration harvest would take place in Alder Creek post-fledgling area. The Alder Creek post-fledgling area is heavily weighted toward the larger size class size of trees (10 inches or more in diameter), with the 0 to 5-inch DBH class coming in second, and no amount in the 5 inches or less category. Timber harvest would improve the vegetation structural stage distribution in the post-fledgling area by adding acres to the smaller size classes that are currently underrepresented, although the 5 to 10-inch DBH class would continue to be insufficient in this area. Harvest unit 4 would have timing restrictions imposed in order to not disturb an active nest (see Appendix E - Design Features). No commercial thinning or landscape burns would take place in the Alder Creek post-fledgling area. Harvest Unit 8 and landscape burn Unit F18 are located within one-half mile of the active nest. Timing restrictions would ensure that activities would not affect nesting success (see Appendix E - Design Features).

There is no proposed regeneration harvest or landscape burns within or near the Rock Gulch post-fledgling area. The Rock Creek post-fledgling area is entirely weighted toward the larger size class size of trees (more than 10 inches diameter). Under this alternative, the shrub, forb, and grass category, 0 to 5 inches, and 5 to 10 inches diameter category would all remain at zero which is below the Reynolds et al. (1992; PF Doc. WL-R441) guidelines.

Regeneration harvest would revert affected stands back to an early successional stage where it would be at least 80 years before they can be expected to achieve suitable nesting conditions. However, in the absence of treatment or some other stand-replacing event, some of these stands would require an even longer time period to achieve this stage. Increasing the percentage of long-lived seral species (i.e., ponderosa pine, western larch, and white pine) in treated areas and decreasing the percentage of short-lived species like Douglas-fir, grand fir, and lodgepole pine would result in stands that are more resilient in the face of disturbance, and would lead to long-term habitat stability for northern goshawks. Commercially thinning in stands would improve these sites' future potential as goshawk nesting habitat as the trees that are retained develop larger bole diameters and regenerating conifers and shrubs that are contributing to understory congestion are cleared away. In almost every case, thinning would trend affected stands in the analysis area toward suitable condition faster than no action would.

Tree harvest and follow-up treatments (piling, burning and tree planting) could be a source of disturbance to nesting goshawks in the area. To minimize potential disturbance, no mechanized off-road activities would be allowed within approximately one-half mile of an occupied nest during the nesting season (April 15 to August 15) unless the District Wildlife Biologist has determined the nest site is inactive or unsuccessful (see Appendix E - Design Features). Given the current nest location and configuration, this would apply to timber harvest Units #4 and 8, as well as landscape burn unit F18. The units potentially affected by the timing restrictions could change based on the location of the active nest during the year of implementation. No timber harvest would take place within the 40-acre nest stand itself, and a contiguous area of at least 433 acres (Alder Creek) and 525 acres (Rock Gulch) acres of potentially suitable nesting habitat would remain intact following implementation. The goshawks utilizing these nests are evidently tolerant of some level of motorized disturbance, since there is an open road less than 0.5 miles from the nest.

Thinning young, small diameter trees and future underburning would be designed to 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/storage may have short-term impacts on goshawks through disturbance, but would have long-term benefits by reducing human access/disturbance (storage of currently drivable roads) and increasing potential habitat acres (revegetation of previously cleared roadbeds). Timing restrictions would also be applied to precommercial thinning and road decommissioning/storage activities near active nests (see Appendix E – Design Features).

Alternative 3: Direct and Indirect Effects

The effects of Alternative 3 would be similar to those of Alternative 2, except fewer acres would be affected. This alternative would harvest approximately 620 acres of potentially suitable nest habitat including 77 acres of seed tree (regeneration), 193 acres of shelterwood (regeneration), 168 acres commercially thinned, and 30 acres of improvement cut. The same amount of landscape burning would occur, 124 acres in suitable nesting habitat. Proposed actions under this alternative would reduce suitable nesting goshawk habitat by 394 acres, retaining 4,827 acres of

suitable goshawk nesting habitat in the Beaver Creek Resource Area (17 percent), largely in contiguous blocks greater than Reynolds et al. (1992; PF Doc. WL-R441) and Brewer et al. (2009; PF Doc. WL-R328) recommendations for nesting habitat within the home range (PF Doc. WL-90). Similar to Alternative 2, the vegetation structural stage distribution in the analysis area and post-fledgling area would change (acres currently in the immature and mature sawtimber classes would be converted to smaller size classes), but to a lesser extent. Since fewer acres would be impacted, the potential for disturbance of nesting goshawks would be reduced. The effects of harvest prescription and landscape burning individual stands would be similar to those described above in the Alder Creek and Rock Gulch post-fledgling areas.

As in Alternative 2, the post-harvest condition would continue to meet Reynolds et al. (1992) and Brewer et al (2009) recommendations for goshawk nesting habitat. However, while the potential disturbance associated with implementation of this alternative would be somewhat reduced compared to Alternative 2, the long-term (50-100 years) improvements to habitat would also be reduced.

Cumulative Effects Common to All Alternatives

Mining Activities – From 1800 - present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. This is unlikely to affect goshawks unless a proposed claim was close to a nest.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This is not a known prey species for goshawks. This activity would not affect vegetation or suitable habitat of goshawks and has a low probability of affecting non-target species (PF Doc. WL-R387).

Timber Harvest and Related Activities – The effects of past timber harvest are incorporated into the existing condition. Historical timber harvest has altered species composition of present day forests and resulted in loss of habitat. Logging activity that resulted in large openings would likely have temporarily displaced use in those areas since goshawks prefer some canopy in the overstory. Timber harvest is expected to occur on private lands; however, the IPNF assumes no contribution of habitat from private lands.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. If this occurs in suitable goshawk habitat, it may temporarily displace during activities, but eventually would improve not diminish habitat.

Fire Suppression – Continued fire suppression has mixed effects on northern goshawks. While suppression efforts may protect 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. The amount of future fire and level of successful suppression cannot be predicted but would generally result in the effects described above.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) – Firewood cutting is anticipated to continue along seasonal and yearlong open roads. There is some potentially suitable nesting habitat that could be affected by this activity, assuming snag removal up to 200 feet from road's edge. While this activity has the potential to simplify foraging habitat (through removal of snags that provide habitat for prey species), these areas are unlikely to be utilized for nesting because of their close proximity to an open road. Other public activities also have the

potential to disturb nesting goshawks, but these would be of an ephemeral and infrequent nature, and are unlikely to result in considerable impacts to the species.

Conclusion

The action alternatives would improve vegetation structural stage proportions, although the vegetation structural stage distribution in the goshawk analysis area would continue to be weighted toward mature/large size class under all alternatives. Similarly, size class distribution in the post-fledgling area would contain a similar vegetation distribution. Alternative 2 would result in a 13 percent reduction and Alternative 3 would result in an 8 percent reduction of suitable goshawk nesting habitat in the Beaver Creek Resource Area.

No timber harvest would take place in the Alder Creek active nest area itself, however a harvest unit is proposed in the post-fledgling area and timing restrictions would be implemented. The Reynolds et al. (1992; PF Doc. WL-R441) and Brewer et al. (2009; PF Doc. WL-R328) recommendations for nesting habitat within the home range would still be met under all alternatives.

Treatment, or lack thereof, would have a range of effects on unsuitable habitat. Some areas are unlikely to mature into suitable habitat absent a stand-replacing event, while others may eventually reach this stage if left untreated, although this is unlikely given current stand conditions. Both action alternatives would improve size class distribution, trend most treated stands toward suitable habitat conditions in less time, and result in more long-term (50-100 years) habitat stability compared to the No-Action Alternative.

The action alternatives have the potential to generate disturbance during implementation for goshawks that may be nesting in the area. However, timing restrictions and a no-activity buffer around known nesting areas should minimize these potential impacts.

Based on his review of the pertinent literature and synthesis of the best available science, as well as his habitat assessments, Samson (2006a; PF Doc. WL-R459) concluded that short-term viability of the goshawk in the Northern Region and IPNF is not an issue because:

- No scientific evidence exists that the northern goshawk is decreasing in numbers.
- Increases in the extent and connectivity of forested habitat have occurred since European settlement.
- Well-distributed and abundant northern goshawk habitat exists on today's landscape.
- Level of timber harvest is insignificant in the Northern Region (in 2009 – 11,995 acres of 22,351,312 acres or 0.05 percent of the forested landscape) and 1,362 acres or 0.85 percent of 2,470,394 forested acres on the IPNF. For the 10 year period from 2000-2009 –189,404 acres in R1 (0.85 percent) and 37,973 acres on IPNF (1.54 percent). (http://www.fs.fed.us/r1/forest_range/timber_reports/timbersales.shtml).

In 1998 FWS (USDI Fish and Wildlife Service 1998; PF Doc. WL-R330) concluded that the northern goshawk was not warranted for listing as threatened or endangered in the western US because, based on best available knowledge:

- There was no evidence of a declining population trend for goshawks in the western United States.
- 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.

The analysis area would maintain adequate conditions within the home range and post-fledgling area with adequate nesting habitat, and would continue to support the same general distribution and population numbers of northern goshawks. As a result, the action alternatives in conjunction with the past, present and reasonably foreseeable actions ***may impact northern goshawk at a local level, but would not likely indicate a local or regional change in habitat quality or population status.***

Consistency with Forest Plan

The IPNF Forest Plan (USDA Forest Service 1987; PF Doc. CR-002) selected the northern goshawk as a management indicator species of old growth habitats and established guidance for managing old growth in part to provide for viable populations of this species. It states, "*Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations of old growth dependent and indicator management species.*" Although it has been shown since the 1987 Forest Plan that northern goshawks are not old growth dependent, old growth is addressed to illustrate continued compliance with the Forest Plan. To obtain the desired distribution, each designated old growth unit is managed to maintain approximately five percent old growth where it exists. The IPNF is meeting and exceeding the Forest Plan standard that calls for maintaining 10 percent of the forested portion of the IPNF as old growth (USDA Forest Service 2010; PF Doc. WL-R428). Forest Inventory and Analysis (FIA) data and stand-level allocated old growth also provides evidence that the old growth is well distributed across the IPNF (USDA Forest Service 2010; PF Doc. WL428).

Standard 7.a. directs the IPNF to "maintain at least minimum viable populations of management indicator species distributed throughout the Forest." Based on the best available science discussed in the *Management Indicator Species Considerations for the Idaho Panhandle National Forests* (Appendix H), the IPNF contains substantially more than enough habitat distributed throughout the Forest to support a minimum viable population of northern goshawk. In addition, the best available science suggests that the goshawk population is, at a minimum, stable if not increasing slowly, and there has been no scientific evidence that the goshawk population is in decline.

3.6.6.3.7. Pileated Woodpecker

Based on the best available science summarized in the *Management Indicator Species Considerations for the Idaho Panhandle National Forests* (Appendix H), the pileated woodpecker population trend is increasing and their habitat appears to be abundant and well-distributed across the Region. The IPNF contains far more large-snag habitat than is required by the Forest Plan and recommended by the scientific literature to support a minimum viable population of pileated woodpeckers (PF Doc. WL-R54). Pileated woodpeckers and their foraging sign are commonly seen and documented across the Forest.

The pileated woodpecker was originally designated as a Management Indicator Species because it was generally regarded as an old growth indicator due to its need for large dead trees (snags) for nesting (Bull et al. 1990; PF Doc. WL-R355). Pileated woodpeckers are no longer considered to be a good indicator of old growth, although the importance of large snags remains a key component of their habitat regardless of stand age.

Habitat Relationships

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; PF Doc. WL-R443). 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, and nest trees are usually over 25 inches in diameter (Bull et al. 1990; PF Doc. WL-R355, Bull and Holthausen 1993; PF Doc. WL-R459). Live or dead western larch, and dead ponderosa pine, aspen, or black cottonwood are preferred nest tree species in the northern region Aney and McClelland (1990; PF Doc. WL-R2). At Coram Experimental Forest in northwestern Montana, McClelland and McClelland (1999; PF Doc. WL-R187) found that pileated woodpeckers preferred western larch and ponderosa pine over Douglas-fir.

Most foraging occurs in logs and dead trees at least six inches in diameter, although large diameter (i.e., greater than 12 inches) dead wood is used most frequently (Bull et al. 1990; PF Doc. WL-R355). Since foraging habitat occurs in a wider ecological range of forest age structures, nesting habitat is considered the more limiting feature for pileated woodpeckers. The species uses large dead trees for nesting and dead woody material (standing and downed) for foraging, and consequently may be impacted by intensive timber management that does not retain adequate levels of these habitat components (Bull et al. 1990; PF Doc. WL-R355).

Affected Environment

The availability of nesting habitat for pileated woodpeckers has likely been reduced from historic (pre-settlement) levels. Changes in forest composition as a result of 100 years of fire suppression, along with past harvest practices and firewood collection, has slowly and methodically replaced long-lived seral species (such as ponderosa pine, white pine or western larch, depending upon habitat type) across the forest and inhibited the production and sustainability of large snags. Consequently, snag production has shifted from larger, longer-lived species to smaller, shorter-lived species, which affects the long-term stability and persistence of snag habitat in the project area. As a result, large snag habitat available to pileated woodpeckers within the analysis area is currently abundant, but may be on a declining trend.

Some of the past timber harvest on National Forest System lands in Beaver Creek area likely reduced snag densities in logged stands, particularly prior to implementation of the Forest Plan in 1987 when standards for snag retention were adopted. The long-term impact of these past 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 from historic logging practices through increased emphasis on snag retention and greater use of selective (versus regeneration) harvest. In general, historic timber sales that involved regeneration logging or overstory removal reduced pileated woodpecker nesting habitat, while sales that involved thinning from below preserved or improved habitat. Although large diameter green trees and snags remain throughout portions of the analysis area, understory crowding in dense stands of lodgepole pine has led to a condition in which a high-intensity fire stand replacing event becomes more likely.

Pileated woodpeckers occur throughout the Coeur d'Alene River Ranger District. During woodpecker drumming surveys in 2011 and again during drumming and habitat validation surveys in 2012, wildlife personnel documented multiple occurrences of live pileated woodpeckers and foraging sign in the Beaver Creek area (PF Doc. WL-6). Foraging by this species is detectable through larger rectangular shaped excavation sites where they forage on ants and other insects, and cannot be mistaken for any other species. During drumming surveys in 2012, pileated woodpecker pairs were observed at six different locations (likely at least two

different pairs) in the vicinity of proposed activities (PF Doc. WL-6). Based on anecdotal information, pileated woodpeckers or their sign have often been observed, but infrequently reported, across the IPNF. Lack of historic documented observations is less a function of species rarity than of the fact that it is considered by many employees to be so common as to not merit reporting. Increased emphasis on reporting occurrences of this species in recent years have resulted in a higher frequency of documented sightings. Pileated woodpecker surveys conducted in several locations across the IPNF Central Zone in spring 2011 and 2012 detected multiple pileated woodpeckers in every area surveyed (PF Doc. WL-6).

As discussed in the MIS white paper, Samson (2006b; PF Doc. WL-R154) determined that a viable pileated woodpecker population across R1 would require at least 95,382 acres of habitat, based on the needs of 90 pairs using about 1,005 acres per pair. The IPNF currently contains approximately 430,932 acres of nesting habitat. This alone is about 4.5 times the amount estimated to be necessary to maintain viability at the Regional level.

Forest Inventory and Analysis data reveals an average of 1.4 snags per acre greater than 20 inches dbh across the IPNF. Additionally, there is an estimated 11.8 percent of forested lands allocated as old growth on the IPNF (USDA Forest Service 2010; PF Doc. WL-R428). Since pileated woodpeckers use a variety of forest types, they generally make poor old growth "indicators." However, it can reasonably be assumed that old growth stands of preferred forest types are providing adequate large snags or live trees to support pileated woodpecker nesting.

National Forest System lands within the pileated woodpecker analysis area (Beaver Creek Resource Area) contain approximately 13,655 acres of suitable nesting habitat; approximately 48 percent of the project area (see Methodology below). According to Bull et al. (1980; PF Doc. WL-R460), mature unmanaged stands generally have adequate numbers of snags for resident woodpeckers.

There is no reason to believe that pileated woodpecker populations are decreasing at any spatial scale in the U.S. The species is common, widespread and abundant nationally; and is apparently secure in Idaho. As discussed in the MIS Considerations white paper (Appendix H), the USGS Breeding Bird Surveys show a consistent, increasing population trend for pileated woodpeckers in the Northern Rockies since 1968 (Sauer et al. 2011; PF Doc. WL-R461). A similar trend is reflected in USGS data for the state of Idaho as well. This offers convincing evidence that, at these scales, habitat management by the Forest Service over this time period has effectively maintained viable populations of this species.

Methodology

The analysis methodology for determining potential effects on pileated woodpeckers involved mapping suitable nesting habitat in the pileated woodpecker analysis area, then estimating the change and distribution, quantity and quality of large snag habitat that could result from the implementation of the alternatives. Potential nesting habitat was determined from habitat validation surveys and Forest Vegetation Simulator queries for stands of grand fir, Douglas-fir, hemlock, western cedar, ponderosa pine, or western larch containing at least one snag per acre greater than 15 inches DBH (PF Doc. WL-55, PF doc. R139, WL62). As discussed above, snag habitat for nesting is considered more limiting than foraging habitat. Foraging can take place within a wide range of habitats, structural stages, and elevations. 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 mature forests.

The decision to exclude spruce/fir-dominated stands as potential nesting habitat is somewhat subjective: pileated woodpeckers have not been observed nesting in these forest types on the

District, but limited nest surveys have been conducted in higher-elevation stands (although foraging activity has been documented in these). Aney and McClelland (1990; PF Doc. WL-R02) describe nesting habitat as "generally below 5,000 feet in elevation," but it is unclear if this preference is due more to elevation or preferred tree species and forest structure. None of the literature consulted cited nesting in spruce- or subalpine fir-dominated stands in the western U.S., and preferred nest habitats in published literature are generally associated with lower elevations: black cottonwood and ponderosa pine in Montana (McClelland and McClelland 1999; PF Doc. WL-R187) or ponderosa pine and grand fir in Eastern Oregon (Bull and Holthausen 1993; PF Doc. WL-R459). One of the stands visited in the area did have large, old-growth western larch present in a subalpine fir-dominated stand, but no activities are proposed in this stand.

Project impacts on potentially suitable nesting habitat were determined based on the assumption that selective harvest would leave adequate canopy cover and large snag habitat (where it currently exists) in affected stands to remain suitable, while regeneration harvest (shelterwood, seedtree or clearcut) would remove at least portions of treated stands from suitability. Along with potential reduction of large snags, the analysis also addresses trends toward mature forest structure and future large snag recruitment as a result of the alternatives.

Environmental Consequences

Alternative 1: Direct and Indirect Effects

In capable pileated woodpecker habitat (outside subalpine fir habitat types), forests currently dominated by lodgepole pine would trend toward dominance of Douglas-fir, grand fir, cedar and hemlock as the mature lodgepole slowly dies off from pine beetle and other causes. This would result in a decrease of long-lived seral tree species (particularly western larch) that are more likely to attain larger sizes and provide future nesting opportunities. Similarly, in mixed conifer stands there would be a continued decrease in the percent composition of western white pine, western larch and ponderosa pine and an increase in species such as Douglas-fir and grand fir that are more susceptible to insect and disease problems (see Vegetation Report). Although grand fir has been identified as an important nest tree species in other portions of pileated woodpecker range (such as eastern Oregon - Bull and Holthausen 1993; PF Doc. WL-R459), it is less commonly used in the northern Rockies (McClelland and McClelland 1999; PF Doc. WL-R187) – perhaps because this tree species rarely reaches large diameter in this part of its range, and produces relatively "soft" snags that decompose and fall down at a much faster rate than western larch or ponderosa pine snags.

This shift in species composition toward more mid- and late-successional species would also shift snag production away from these larger, longer-lived species, affecting the stability and persistence of large snag habitat in the area. Consequently, habitat for species associated with large snags would remain, but a slow decline is expected as numerous smaller trees compete for resources with larger trees. Additionally, high fuel accumulations and a dense intermediate canopy from overcrowding in the mid-story would lead to a higher risk of stand-replacing fires. If a stand-replacing fire were to occur in the 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 to nest in.

Since this alternative would not authorize any activities in pileated woodpecker habitat, it would have no direct effects on this species, retaining the 13,655 acres of habitat for the immediate future, although it would have the indirect effects discussed above.

Alternative 2: Direct and Indirect Effects

Alternative 2 proposes timber harvest in approximately 1,567 acres of pileated woodpecker nesting habitat. This includes about 973 acres of regeneration harvest (shelterwood and seedtree), or about seven percent of suitable pileated habitat that occurs in the Beaver Creek Resource Area. It is anticipated that all 973 of these acres would lose suitable nesting structure for some indeterminate amount of time, although this is a conservative (from a habitat standpoint) approach based on the anticipated loss of large snags in regenerated units). Required design criteria are provided to minimize the loss of large snags (see Appendix E - Design Features). No snags larger than 14 inches DBH would be removed during implementation – although they may be inadvertently knocked over or intentionally felled to reduce safety risks during harvest operations, incidentally destroyed during post-harvest burning, or knocked over by increased winds during weather events once protection from surrounding tree canopy is removed. Prescribed underburning can also recruit "new" snags by fire-killing residual green trees. The approximately 792 acres of shelterwood harvest may re-attain suitability even sooner, since at least 20 percent canopy cover would remain in these stands.

This alternative would also selectively harvest (commercial thin and improvement cut) approximately 594 acres of pileated woodpecker habitat, about 4 percent of suitable pileated woodpecker habitat that occurs in the Beaver Creek Resource Area. Timber harvest is not expected to remove these stands from potentially suitable condition since residual canopy cover would remain suitable. Irregular tree removal and leaving unharvested clumps in these units greatly increases the probability that large snags would remain in units. Additionally, these units would be grapple piled, so fewer snags would be intentionally felled (to increase safety for personnel during burning operations) or inadvertently burned.

The temporary (20 years) reduction of up to 973 acres of pileated woodpecker nesting habitat represents approximately seven percent of the habitat designated as potentially suitable nest areas in the analysis area. Meanwhile, in both regenerated and selectively harvested areas, prescriptions are designed to trend treated areas toward higher densities of larger diameter, longer-lived trees including ponderosa pine and western larch (preferred pileated woodpecker nesting habitat). Prescriptions would also retain large-diameter trees of desired species where they currently exist. Foraging habitat would remain, to some extent, in nearly all treated areas. Outside of proposed units, tree mortality in lower risk stands would continue to advance, producing higher quantities of smaller snags, but not quality large snags required by pileated woodpeckers.

Thinning and underburning actions would help promote long-term stability of habitat conditions for pileated woodpeckers by increasing sizes and proportions of long-lived seral species that, ultimately, would result in greater availability of large-diameter snags of desired tree species.

Under alternative 2, approximately 2,086 acres not associated with timber harvest will be prescribed burned, including 1,233 acres in currently suitable pileated woodpecker habitat. The acres burned on currently suitable pileated nesting habitat are not expected to be a loss in habitat for the species, but rather snags used for nesting should become more available. However, passive crown fires could result in patches of mortality of up to 5 acres, but overall mortality would be limited to about 10-15% of the unit area. The acres that are burned not located in currently suitable pileated habitat have the potential to become suitable habitat through the creation of more snag habitat on the landscape.

Alternative 3: Direct and Indirect Effects

Alternative 3 proposes timber harvest on approximately 1,051 acres of capable pileated woodpecker habitat, including regeneration harvest of about 528 acres of potentially suitable nesting habitat. This represents temporary loss of four percent of the likely nesting habitat in the analysis area. Effects of timber harvest prescriptions would otherwise be as described under Alternative 2, but to a lesser extent (i.e. three percent less). Selective harvest would be limited to approximately 523 acres of capable habitat under this alternative and is not expected to be a loss of habitat for similar reasons as described under Alternative 2. While the immediate effects on potential pileated woodpecker nesting habitat would be less than those described under Alternative 2, the longer-term (20 years or more) benefits would also be reduced as many of the stands in the area would continue to be dominated by monotypic stands or mixed conifer stands with high proportions of small-diameter tree species at higher risk of mortality. Landscape burning under this alternative is the same as described under Alternative 2.

Cumulative Effects Common to All Alternatives

The following past, ongoing and reasonably foreseeable actions were considered in a cumulative effects discussion for pileated woodpecker:

Mining Activities – From 1800 to present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. Future prospects that are proposed in pileated nesting habitat can be mitigated by asking that large trees and snags remain.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This is not a known prey species for goshawks. This activity would not affect vegetation or suitable habitat of pileated woodpeckers and has a low probability of affecting non-target species (PF Doc. WL-R387).

Timber Harvest and Related Activities – The effects of past timber harvest are incorporated into the existing condition. Historical timber harvest has altered species composition of present day forests and resulted in loss of habitat. Logging activity that resulted in large openings would likely have temporarily displaced use in those areas since pileated woodpeckers prefer some canopy in the overstory. Timber harvest is expected to occur on private lands; however, the IPNF assumes no contribution of habitat from private lands.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. If this occurs in suitable pileated woodpecker habitat, it may temporarily displace during activities, but eventually would improve not diminish habitat.

Fire Suppression – Interrupting the periodic disturbances created by wildfires through continued fire suppression probably has mixed impacts on pileated woodpeckers. In some cases fire suppression would eliminate low intensity fires and the positive effect they have on maintaining the integrity of dry-site vegetation and developing large diameter ponderosa pine and larch stands favorable to pileated woodpeckers. However, this has also increased the potential for stand replacing fires through development of a dense understory of shade-tolerant species over the last 100 years. Thus, fire suppression may also have positive effects by protecting currently suitable stands from high intensity stand replacing fires. The amount of future fire and level of successful suppression cannot be accurately predicted, but the design of this proposal to increase presence of long-lived seral tree species that would ultimately increase nesting habitat as well as reduce the likelihood of stand replacing fires.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) – 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 200 feet of open and seasonally restricted roads. Because of this, it is generally assumed that these roadside areas do not provide sufficient habitat for snag dependent species. Other public activities are unlikely to have any impacts on pileated woodpeckers since they create an ephemeral disturbance and would not remove nesting or foraging habitat.

Conclusion

The No-Action Alternative would have no immediate impacts on habitat for pileated woodpecker in the analysis area, and availability of long-lived, early seral shade intolerant species (such as ponderosa pine and western larch) that provide nesting structures would continue to decline. The action alternatives could reduce nesting habitat in the analysis area in the short term (up to 20 years), but treatment would trend stands toward a larger size classes and older age classes of trees that would provide future nesting habitat for pileated woodpeckers. Under Alternative 2, as many as 973 acres of potentially suitable nesting habitat could be affected by regeneration harvest and no longer be suitable for nesting, representing approximately seven percent of the approximately 13,655 acres of validated nesting habitat in the Beaver Creek Resource Area. Under Alternative 3, fewer acres (528) would be temporarily lost due to regeneration harvest. This represents approximately four percent of the suitable nesting habitat in the Beaver Creek Resource Area. However, treatments are designed to maintain and/or favor development of larger tree size classes and older age classes of trees, providing long-term (beyond 20 years) habitat suitability for this species. No treatments are proposed that would reduce old growth structure or integrity. Landscape burning is not expected to represent an overall loss of habitat for this species as any patches that would be lost would likely be replaced by new habitat created by burning in areas that are not currently mapped as suitable pileated nesting habitat.

Based on his review of the pertinent literature and synthesis of the best available science, as well as his habitat assessments, Samson (2006a; PF Doc. WL-R461) found that both nest site habitat and winter foraging habitat for pileated woodpeckers are abundant and well distributed across the Northern Region by Ecological Province and Forest. In fact, the IPNF contains more nesting and winter foraging habitat than any of the other Northern Region forests, with winter habitat adequate to support 7,291 pileated woodpecker pairs. The temporary loss of up to 973 acres of suitable nesting habitat represents an inconsequential amount of the available nesting habitat on the IPNF. Samson (2006a; PF Doc. WL-R461) concluded that short-term viability of the pileated woodpecker in the Northern Region and on the IPNF is not an issue because:

- No scientific evidence exists that the pileated woodpecker is decreasing in numbers.
- Increases in the extent and connectivity of forested habitat have occurred since European settlement.
- Well-distributed and abundant pileated woodpecker habitat exists on today's landscape.
- Level of timber harvest is insignificant in the Northern Region (in 2009 – 11,995 acres of 22,351,312 acres or 0.05 percent of the forested landscape) and 1,362 acres or 0.85 percent of 2,470,394 forested acres on the IPNF. For the 10 year period from 2000-2009 –189,404 acres in R1 (0.85 percent) and 37,973 acres on IPNF (1.54 percent). (http://www.fs.fed.us/r1/forest_range/timber_reports/timbersales.shtml).

Given the abundance of pileated woodpecker habitat on the IPNF, the inconsequential amount of habitat that would be temporarily lost through treatment and the fact that treatments are designed to foster larger stem diameters of seral species pileated woodpeckers prefer for nesting, the proposed alternatives would not affect the viability of this species. Consequently, the action alternatives in conjunction with the past, present and reasonably foreseeable actions ***may impact pileated woodpeckers at a local level, but would not likely indicate a local or regional change in habitat quality or population status.***

Consistency with Forest Plan

The Forest Plan (USDA Forest Service 1987; PF Doc. CR-002) selected the pileated woodpecker as a management indicator species for old growth habitats and established guidance for managing old growth to provide for viable populations of this species. It states, "*Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations of old growth dependent and indicator management species*." Although it has been shown since the 1987 Forest Plan that pileated woodpeckers are not old growth dependent, old growth is addressed here to illustrate continued compliance with the Forest Plan. To obtain the desired distribution, each designated old growth unit would be managed to maintain approximately five percent old growth where it exists. The IPNF is meeting and exceeding the Forest Plan standard that calls for maintaining 10 percent of the forested portion of the IPNF as old growth (USDA Forest Service 2010; PF Doc. WL-R428). Forest Inventory and Analysis data and stand-level allocated old growth also provides evidence that the old growth is well distributed across the IPNF (USDA Forest Service 2010; PF Doc WL-R428).

Standard 7.a. – This standard directs the IPNF to "maintain at least minimum viable populations of management indicator species distributed throughout the Forest." Based on the best available science discussed in the *Management Indicator Species Considerations for the Idaho Panhandle National Forests* (Appendix H), the IPNF contains substantially more than the habitat necessary to support a minimum viable population of pileated woodpecker distributed throughout the Forest. Pileated woodpeckers and their foraging sign are also seen and documented on the IPNF. In addition, the best available science indicates that the pileated woodpecker population is likely increasing in the Northern Rockies and there has been no scientific evidence that the pileated woodpecker population is in decline.

Standard 7.b. – This standard instructs the IPNF on maintenance of cavity habitat by implementing the *IPNF Snag and Woody Down Timber Guidelines* (Appendix X of the Forest Plan). Based on the best available science discussed in the *Management Indicator Species Considerations for the Idaho Panhandle National Forests* (Appendix H), the IPNF contains substantially more large snags per acre than are recommended by the IPNF Snag and Woody Down Timber Guidelines for maintaining a minimum viable population of pileated woodpeckers.

3.6.6.3.8. Rocky Mountain Elk

The IPNF Forest Plan (Appendix L-4; PF Doc.CR-002) identifies elk as a Management Indicator Species because it is an ecological generalist potentially affected by management activities, particularly the management of roads and motorized trails. The effect of management activities on elk is one of the main issues the IPNF has identified through public involvement (IPNF, 1987; PF Doc. CR-001). Elk are important economically to the state of Idaho and are monitored by the Idaho Department of Fish and Game (IDFG). The Forest Plan directs that forest management for elk should be coordinated with the IDFG, and requires use of "Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho" (PF Doc. WL-R78, Leege 1984) to evaluate elk habitat potential. The Idaho Department of Fish and Game is responsible for setting the

harvest regulations for elk, and by having populations that support harvest levels; viability is not a concern for this species.

Habitat Relationships

Elk are ecological generalists occurring in a wide variety of habitats, such as meadows, shrub fields, and dense forests (PF Doc. WL-R078, Leege 1984). Throughout the seasons, elk depend on forage areas in addition to forested areas that provide thermal and hiding cover. Optimal thermal cover is defined as a stand containing trees more than 40 feet in height with 70 percent canopy cover, and hiding cover is defined as a forested stand that is able to hide 90 percent of an elk from 200 feet away (PF Doc. WL-R078, Leege 1984). Land management activities, particularly vegetation management and roads, have the potential to affect elk habitat use.

Elk can be classified as habitat generalists, but they still have certain basic habitat requirements; food, water, and, where hunted, hiding cover and security areas (blocks of elk habitat with limited access). Availability and distribution of these habitat components on each seasonal range ultimately determine the distribution and number of elk that may be supported. Access into elk habitat is a primary problem facing wildlife managers today. Roads and motorized trails built into elk habitat for timber management and other activities increase hunter access and often increase elk vulnerability to harvest. As a general rule, the problem is one of access; that is, of increasing the number of people in elk habitat. The effects of roads and motorized trails, apart from people, are mixed. On the negative side, elk may vacate otherwise suitable habitats to avoid human activity; the period of time before elk return to such areas depends on the severity and duration of the disturbance but may extend several years. Elk habitat is reduced not only by the amount of land taken by the roads themselves, but also because elk tend to avoid areas adjacent to such roads and motorized trails. On the positive side, timber harvest often associated with construction of roads may open “closed” stands of timber, creating additional forage for elk in some important ranges (IDFG 2012; PF Doc. WL-R417). The Forest Plan uses elk habitat potential (EHP) and elk security to quantify how vegetation and motorized access is impacting potential use by elk (PF Doc. WL-R78, Leege 1984).

Affected Environment

Past disturbances, forest succession, and present management of roads, all combine to affect existing quality of elk habitat. Elk numbers were very low in the Panhandle Zone around the early 1900s (IDFG 2012; PF Doc. WL-R417). Major landscape changes occurred as a result of stand-replacing fires beginning in 1910. Vast areas of timber were transformed into brush fields and early succession timber stands that provided ideal conditions for elk. Additionally, elk were imported from Yellowstone National Park by sportsmen in the 1940s and released in Game Management Units 1, 4, and 6. Elk populations increased, with periodic setbacks due to extreme winter conditions. While it is generally accepted that habitat conditions in traditional elk areas have declined in quality from better conditions in the 1950s and 1960s, pioneering of elk into new areas has allowed substantial growth. Elk habitat potential will likely decrease in the long term due to an absence of large-scale stand-replacing fire (IDFG 2012; PF Doc. WL-R417).

Much of the Panhandle Zone’s forested habitat experienced extensive timber harvest during the 1980s and 1990s. While this high level of timber harvest created additional elk forage, the more important impact was the construction of logging roads that allowed hunters easy access to elk and increased elk vulnerability. High road densities and threats to large areas of elk security continue to be a concern despite access management plans developed by land management agencies to address wildlife and watershed issues.

A portion of the project area (25 percent, 7,082 acres) is identified in the Forest Plan as big-game winter range, Management Area 4 (MA-4) (PF Doc. WL-41). The goal for this management area is to provide sufficient forage and cover for big game species. Elk do use big-game winter range throughout the year (PF Doc. WL-13). Forage habitat is supplied by past regeneration harvest units distributed throughout the area, riparian shrubfields, and open forested stands with a shrub component. Past vegetation management activities have resulted in adequate forage in the project area (PF Doc. WL-13). Cover is not considered a limiting factor in northern Idaho and the criterion for cover is directed mostly at the more naturally open elk habitat in central and southwestern Montana and southern Idaho where care must be taken to recognize and retain adequate coniferous cover at the landscape level (PF Doc. WL-R398, Christensen et al.). Areas that are typically used by wildlife, including elk, for travel include ridges, riparian areas, and saddles. Wildlife travel corridors in the project area have been mapped and considered in the development and design of the proposed action and alternatives (PF Doc. WL-94, WL-95, and WL-96). Travel corridor conditions are adequate within the project area (PF Doc. WL-94). Forested corridors exist in most locations; however there are a few spots where travel corridor quality and usefulness has been degraded by past activities.

Elk are common in the project area and numerous field reviews revealed signs of elk use, such as tracks, trails, pellets, rubs and browsed vegetation (PF Doc. WL-13). There is a good combination of forage openings and forested cover in the project area (PF Doc. WL-23). Elk continue to be commonly hunted in North Idaho. The Beaver Creek Resource Area is within Game Management Unit 4 of the Panhandle Zone and is currently meeting the objectives for cow and bull elk populations (PF Doc. WL-R399, IDFG 2012; PF Doc. WL-R417).

The presence and motorized use of roads and trails has the greatest influence on elk habitat effectiveness (PF Doc. WL-R398, Christensen et al.). Road density in the Beaver Creek Resource Area is high. Open motorized route density in the project area is 5.3 miles of road per square mile of area (miles/mile^2) with a higher density of closed routes that have the potential to be breached (District Travel Plan; PF Doc. WL-58). Some closed roads have gates, signs, barriers, or have become brushed in; others are closed by regulation only and have no barrier. There have been a series of road closures and obliterations in the resource area over the past years that improved elk habitat.

Methodology

To establish habitat management goals for the Forest, elk habitat units (EHUs) were delineated across the Forest. There are 18 elk habitat units on the Coeur d'Alene River Ranger District. The elk habitat unit serves as the cumulative effects area for elk. For the purpose of displaying effects from the proposed action and to display the differences between alternatives, the analysis area was broken into separate evaluation areas based on home range size. Smaller watershed drainages (timber compartments) within the elk habitat unit are used to provide a logical delineation of these individual elk analysis areas. The Beaver Creek Elk Habitat Unit Management Area Map (PF Doc. WL-108) shows the number and arrangement of timber compartments used for this project.

Elk habitat units are used to describe cumulative effects, and individual compartments are used to describe project-level direct and indirect effects. The Beaver Creek Resource Area is within WEHU 5 which is approximately 88,008 acres, of which 51,144 acres are National Forest System lands. The Beaver Creek Resource Area occurs on 28,200 acres of WEHU 5 and contains five compartments, including a portion of Compartment 187 (6,115 acres in size), Compartment 188 (6,664 acres), Compartment 189 (6,085 acres), Compartment 190 (5,128 acres), and

Compartment 191 (5,820 acres). Landscape burns are proposed in all compartments, however, vegetation harvest is only proposed in Compartments 188 through 191.

To disclose how the proposed action and alternatives would affect elk and potential elk use of habitat, The *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho* was used to quantify the existing condition and proposed alternative effects to elk (PF Doc. WL-R78, Leege 1984). The model evaluates factors affecting elk habitat quality, such as miles of road, acres of security, and amount of cover and forage. This rating is used to determine elk habitat quality expressed as a percent of potential elk use, or elk habitat potential (EHP). The model is a cumulative effects model as it incorporates changes from previous activities in the elk habitat unit and compartments. The existing elk habitat potential is a result of past, present and ongoing activities that affect elk habitat within a given elk habitat unit.

In 1993, the Forest Service and Idaho Department of Fish and Game established an elk habitat potential target of 55 percent for WEHU 5, to meet the Forest Plan goal of 52 percent for elk habitat potential on the former Wallace Ranger District on the eastern half of the Coeur d'Alene River Ranger District. The weighted average elk habitat potential of the individual elk habitat units is used to calculate the overall elk habitat potential for the Wallace portion of the Coeur d'Alene River Ranger District. Elk habitat potential targets are not assigned for the individual compartments within an elk habitat unit; however a higher compartment elk habitat potential provides a better chance that the overall unit will meet the target elk habitat potential value; changes to elk habitat potential at the compartment level reflect project-level effects to elk.

Since other ownerships are highly susceptible to adverse habitat modifications, the presence of suitable habitat on non-National Forest System lands cannot be relied upon over time. As a result, the IPNF assumes no habitat contribution for wildlife species analyzed from this source. These lands cannot be relied upon to provide habitat or security in the future, and are not under FS jurisdiction, and so are not used in calculations. Although elk may use adjoining private lands, for the purposes of this analysis they are not considered necessary to meet elk habitat requirements.

If all habitat factors were in optimum abundance and distribution, habitat would be rated at 100 percent. If the procedure calculates the habitat to be at 50 percent of potential, this indicates that the area can support 50 percent as many elk as it could if all factors were optimal. Optimum conditions are rarely met, especially if roads are present. The presence and motorized use of roads is a major impact on elk habitat potential (PF Doc. WL-R398, Christensen et al.). The elk habitat potential is largely determined by open road density and amount of security available in the analysis area. The WEHU 5 has a goal of 55 percent elk habitat potential.

Elk security can be defined as an area equal to or larger than 250 acres at least one-half mile from a motorized road and/or trail (PF Doc. WL-R78, Leege 1984). A minimum goal of 20 percent elk security is desired for each EHU (PF Doc. WL-R78, Leege 1984). Elk security in WEHU 5 increases during the hunting season due to seasonal motorized trail closures on the west side of the Beaver Creek Resource Area. These closures result in an increase from 7,104 (14 percent) to 10,649 (20 percent) acres from September 7 until December 15 (PF Doc. WL-25). Calculations for elk habitat potential and elk security do not incorporate this temporary increase in elk security, however, it is important to note as the hunting period is typically when elk are most vulnerable to mortality.

Environmental Consequences

The tables below summarize the existing condition and the effects of the proposed activities on elk habitat potential and elk security by alternative. WEHU 5 has a goal of 55 percent elk habitat potential. Elk security values do not reflect the increase in acres provided by seasonal closures during hunting season (PF Doc. WL-98, WL-99).

Table 85. Calculated Elk Habitat Potential (EHP) for WEHU 5.[1]

Elk Analysis Area	Alternative 1 No Action (percent)	Alternative 2 During Activities (percent)	Alternative 2 Post Activities (percent)	Alternative 3 During Activities (percent)	Alternative 3 Post Activities (percent)
WEHU 5	50	**43**	48	45	50
Compartment 187 (partial)	43	42	43	42	43
Compartment 188	34	**28**	29	33	34
Compartment 189[2]	47	**29**	**41**	**34**	48
Compartment 190	33	30	39	30	39
Compartment 191[2]	67	**49**	67	**51**	69

[1] *EHP values that drop more than 5% from existing condition are in* ***bold****. The EHP goal for WEHU 5 is 55%.*

[2] *Compartments located in MA-4 lands managed for big game winter range.*

Table 86. Elk security for National Forest System (NFS) lands in WEHU 5.[1]

Elk Analysis Area	Alternative 1 No Action	Alternative 2 During Activities	Alternative 2 Post Activities	Alternative 3 During Activities	Alternative 3 Post Activities
NFS lands in WEHU 5	7,104 acres (14%)	4262 acres (8%)	7,104 acres (14%)	4262 acres (8%)	7,104 acres (14%)

[1] *The elk security goal for WEHU 5 is 25%.*

Alternative 1: Direct and Indirect Effects

There would be no direct effects to elk under the no-action alternative. No commercial harvest, prescribed burning, or road decommissioning would occur under the no-action alternative. The amount of open roads and trails would remain unchanged, maintaining the amount of secure habitat available for elk (14 percent). There would be no new road construction, however no storage or decommissioning of roads would take place, and the elk habitat potential for WEHU 5 would remain the same (50 percent). Population trends for elk would remain stable (PF Doc. WL-R399, IDFG 2012).

Indirectly, foraging habitat may decline over time as fire suppression continues and current shrub fields age and die off. Mid-age and mature stands which are currently providing hiding and thermal cover may decline as stands age and also due to insects and disease. As conifers in existing harvest openings grow, stand density and canopy cover increase. This could potentially increase cover and decrease forage over time.

Alternative 2: Direct and Indirect Effects

Alternative 2 proposes harvest on approximately 1,973 acres of the 28, 200 acres of the Beaver Creek Resource Area. Types of harvest proposed are shelterwood, seed tree, commercial thinning, and improvement cut. Harvest units are located in compartments 188, 189, 190, and 191. Harvest proposed would eventually increase forage availability in the Beaver Creek Resource Area. During activities, which could last up to 10 years, elk could be displaced from the harvest areas. This alternative would result in a reduction in cover, particularly in elk winter range, since some harvest units proposed are adjacent to previous harvest units that are more than 25 years old and do not currently provide adequate cover. Approximately 1,973 acres will contain fuel treatment associated with vegetation harvest and 2,092 acres will contain fuel

treatment activities not associated with vegetation harvest. The landscape burning that will occur on 2,092 acres will occur in all compartments (Compartments 187 [partial] and 188-191). Burning will improve forage availability for elk within 1-2 years after treatment. Road decommissioning will occur on approximately 66 miles and although this is beneficial for elk by minimizing the potential for motorized travel by administrative use in the future, elk habitat potential does not change as roads proposed for decommissioning are typically already brushed and not used for motorized travel by the public. Permanent road construction is proposed on 1.5 miles under Alternative 2 and this has a slight effect on elk habitat potential. In addition, 1.2 miles of temporary road are proposed during activities; however this would be decommissioned post activity. Elk habitat potential would still be affected because it reflects the presence of additional closed roads on the landscape.

Harvest occurring in Compartments 189 and 191 would be located in big-game winter range (MA-4) lands (PF Doc. WL-41). During activities in compartment 189, elk habitat potential is expected to drop 18 percent and then increase 12 percent post-activity (i.e. in 10 years; see Table 85). This would result in a decrease from the existing elk habitat potential of 47 percent to 41 percent for compartment 189. During activities in compartment 191, elk habitat potential is expected to drop 18 percent and then increase 18 percent, back to the existing elk habitat potential (67 percent) post-activity. Elk security would decrease during activities to eight percent security from the existing 14 percent security and then return to the existing security post-activity.

Compartments 187, 188, and 190 occur in MA-1 areas which are primarily managed for timber production. In compartment 187, elk habitat potential will drop one percent during activity and increase one percent post-activity to the current elk habitat potential of 43 percent (Table 85). In compartment 188, elk habitat potential will drop one percent during activity and then increase one percent post-activity to the existing elk habitat potential of 34 percent. In compartment 190, elk habitat potential will drop three percent, and then increase nine percent post-activity to an elk habitat potential of 39 percent which is greater than the existing elk habitat potential of 33 percent.

In summary, out of the five compartments where activities are proposed, two compartments would ultimately be trending toward a lower quality elk habitat, two would remain stable, and the other would trend toward a higher quality habitat for elk than currently exists. Elk security is expected to drop to eight percent during activity which could potentially negatively affect elk, however post-activity, security will return to the current level of 14 percent (Table 86).

Alternative 3: Direct and Indirect Effects

Alternative 3 proposes the similar activities as Alternative 2 but with less vegetation harvest (only 871acres) and no new construction of permanent or temporary roads. Since there are less acres being harvested, fuel treatments associated with harvest are also less (1,662 acres). Aggregate retention is proposed in Alternative 3 in response to public comments. Aggregates are patches of trees less than one-half acre in size that are excluded from all activities associated with harvest and remain in an undisturbed condition. Retention patches are centered around mature or old growth trees, and potentially provide increased access to corridors and cover near large open forage areas for elk. Retention patches were spatially distributed on the landscape in order to maximize the benefit to elk by increasing the cover to forage ratio, particularly in compartments 189 and 191, where proposed harvest is adjacent to recent harvest units (less than 25 years). Patches are greater than 150 feet wide, the distance recommended by IDFG (PF Doc. WL-109). More roads are proposed for decommissioning (104 miles) under Alternative 3.

Harvest occurring in compartments 189 and 191 would be occurring in big game winter range, MA-4 (PF Doc. WL-41). During activities in compartment 189, elk habitat potential is expected

to drop 13 percent and then increase 14 percent post-activity (Table 85). This would result in a one percent increase from the existing elk habitat potential of 47 percent to 48 percent for compartment 189. During activities in compartment 191, elk habitat potential is expected to decrease 16 percent during activity and then increase 18 percent post-activity. This would result in a two percent increase from the existing elk habitat potential of 67 percent to 69 percent. Elk security would decrease during activity to eight percent security from the existing 14 percent and then return to the existing security post-activity.

Compartments 187, 188, and 190 occur in MA-1 areas which are primarily managed for timber production. In compartment 187, elk habitat potential will drop one percent during activity and increase one percent post-activity to the current elk habitat potential of 43 percent (Table 85). In compartment 188, elk habitat potential would drop one percent during activity and then increase one percent post-activity to the existing elk habitat potential of 34 percent. In compartment 190, elk habitat potential would drop three percent, and then increase nine percent post-activity to an elk habitat potential of 39 percent which is greater than the existing elk habitat potential of 33 percent.

In summary, three out of five compartments where activities are proposed would trend toward a higher quality elk habitat post-activity, the remaining two compartments would remain stable. Elk security is expected to drop to eight percent during activity which could potentially negatively affect elk, however post-activity, security would return to the current level of 14 percent (Table 86).

Cumulative Effects Common to All Alternatives

The following past, ongoing, and reasonably foreseeable actions were considered in a cumulative effects discussion for elk.

Mining Activities – From 1800 to the present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. Future prospects that are proposed in pileated nesting habitat can be mitigated by asking that large trees and snags remain.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This activity would not affect vegetation or suitable habitat and has a low probability of affecting other species. Elk are herbivores and would not be expected to come into contact with the bait placed in underground burrows. There should be no adverse effects from the potential gopher baiting activity on non-target wildlife species (PF Doc. WL-R387).

Timber Harvest and Related Activities – The effects of past timber harvest are incorporated into the existing condition. Historical timber harvest has altered species composition of present day forests and resulted in loss of habitat. Much of the Panhandle Zone's forested habitat experienced extensive timber harvest during the 1980s and 1990s. While this high level of timber harvest created additional elk forage, the more important impact was the construction of logging roads that allowed hunters easy access to elk and increased elk vulnerability. High road densities and threats to large areas of elk security continue to be a concern despite access management plans developed by land management agencies to address wildlife and watershed issues (IDFG 2012; PF Doc. WL-R417).

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. It would reduce hiding cover somewhat, and extend the length of time the treated stands may provide forage habitat.

This activity would originate from existing roads, so while it may cause a minor disturbance to elk during implementation, there would be no long-term effects.

Fire Suppression – Continued fire suppression would help retain forest cover, further contributing to reduction of foraging habitat for ungulates. However, the effects of fire suppression on ungulate habitat are difficult or impossible to quantify as some cover is required for thermoregulation and to reduce hunting vulnerability.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) – 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 200 feet of open and seasonally restricted roads. Roads are not to be considered habitat for elk and the effect of roads is incorporated into the existing condition. The effects of snowmobiling, driving and potential hunting mortality are linked to the open road system and are addressed by the analysis of motorized route densities.

Landscape Burning for Wildlife – Landscape burning associated with the Forest Service's Twomile project would continue in WEHU5 under all alternatives. This activity would improve availability of forage for elk in WEHU5. These changes in forage availability were incorporated into the calculated elk habitat potential for WEHU5.

Conclusion

Existing elk habitat conditions are a result of previous management activities and natural conditions. The project area encompasses approximately 55 percent of National Forest System lands in WEHU 5, with project activities occurring on only a small portion of that. The current elk habitat potential of WEHU 5, 50 percent, is not meeting the goal of 55 percent. Both alternatives result in a 10 year drop in elk habitat potential for the elk habitat unit (Table 85). Alternative 2 would result in a permanent two percent decrease in elk habitat potential post-activity from the existing condition, while elk habitat potential would return to the existing condition post-activity under Alternative 3. Under both alternatives elk habitat potential would continue to be below the goal of 55 percent for WEHU 5. Overall, the eastern half of the district is exceeding its goal of 52 percent elk habitat potential established by Idaho Department of Fish and Game and the Forest Service. Elk security for WEHU 5 would continue to be below the goal of 20 percent and would not change post-activity from the existing condition (Table 85).

In summary, Alternative 2 would result in a slight downward trend toward lower quality elk habitat while Alternative 3 would maintain the current quality of elk habitat in the area once treatments were completed. It is important to note that several compartments actually saw improvements post-activity; however, since they encompass a small area relative to the entire WEHU 5, these improvements are not detected at the elk habitat unit level. Design Features incorporated into Alternative 3 (i.e. aggregate retention) would minimize or improve the effect that vegetation management activities would have on elk habitat quality. The federal actions evaluated in this proposal are likely to not cause any adverse cumulative effects on elk populations in the EHU, district, or forest level. The alternatives may temporarily impact elk and elk habitat, but are not likely to result in persistent detrimental effects. Elk are expected to persist both in the project area and across the district, and population trends would remain stable (PF Doc. WL-R399, IDFG 2012).

Compliance with Forest Plan

The IPNF Forest Plan selected the elk as a management indicator species because it is a species commonly hunted, fished, or trapped which have special habitat needs that are affected by planned management activities (Appendix L-4; PF Doc.CR-002).

1. (a). Coordinate with the Idaho Department of Fish and Game Department to allocate the distribution of habitat potential.

IDFG participated in the allocation of elk habitat units and goals during the Forest Planning process, which is consistent with the standard.

1. (b). Identify and delineate existing and potential winter range for each elk habitat unit and establish goals for forage production suitable to support desired population levels, including such tools as designation of permanent forage areas, scheduling of timber harvest, and habitat movement.

The Forest Plan delineated winter range management areas. Approximately one quarter of the Beaver Creek Resource Area is in elk winter range. Forage areas are abundance in the project area and would be enhanced through vegetation management activities proposed.

1. (c). Utilize the "Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho" (Wildlife Bulletin No. 11, 1984, Idaho Department of Fish and Game) for evaluation of effects of proposed activities on elk habitat (Appendix Y, IPNF Forest Plan).

The analysis of potential effects on elk utilized this methodology.

1. (d). Include lands of all cooperators for habitat analysis where mixed ownership is within Elk Habitat Units.

Since other ownerships are highly susceptible to adverse habitat modifications, the presence of suitable habitat on non-National Forest System lands cannot be relied upon over time. As a result, the IPNF assumes no habitat contribution for wildlife species analyzed from this source. These lands cannot be relied upon to provide habitat or security in the future, and are not under Forest Service jurisdiction, and so are not used in calculations. Although elk may use adjoining private lands, for the purposes of this analysis they are not considered necessary to meet elk habitat requirements.

7. (a). – Maintain at least minimum viable populations of management indicator species distributed throughout the Forest.

Based on the best available science discussed in the Management Indicator Species Considerations for the Idaho Panhandle National Forests, the IPNF contains substantially more habitat than necessary to support a minimum viable population of elk throughout the Forest (PF Doc. WL-R360). Elk are commonly seen on the IPNF and the status of elk populations on the IPNF is stable (PF Doc. WL-R399, IDFG 2012).

3.6.6.4. Other Wildlife Species – Species Commonly Hunted, Fished or Trapped

3.6.6.4.1. American Marten

Habitat Relationships

Marten associate closely with late-successional stands of mesic conifers (Ruggiero et al. 1994, PF Doc. WL-R86). In the western United States martens are most abundant in mesic mature to over-mature spruce-fir forests where small mammal prey species are most abundant (Warren 1990, PF Doc. WL-R61). In general, marten prefer forest stands with greater than 30 percent tree canopy closure and with large, down logs, stumps, and lush shrub and forb vegetation (Clark et al. 1989, PF Doc. WL-R429). Use or selection of riparian zones by marten has also been reported in the literature (Ruggiero et al. 1994, PF Doc. WL-R86).

Suitable marten habitat encompasses a broader spectrum of habitats than fisher based on the scientific literature (Ruggiero et al. 1994; PF Doc. WL-R86, Samson 2006b; PF Doc. WL-R154), including stands with smaller diameter trees and a more open canopy. Additionally, marten have been shown to use higher elevation habitats and areas with more snow depth than are used by fisher (Ruggiero et al. 1994; PF Doc. WL86, N. Albrecht, pers. comm., 2009). Consequently based on their broader habitat associations than fisher, marten habitat is more abundant (Bush and Lundberg 2008; PF Doc. WL-R181) and does not appear to be limiting across the landscape.

Affected Environment

Marten are identified as a species that is commonly hunted, fished, or trapped on the Forest (Appendix H). Marten are ranked G5 globally and S5 in Idaho, which is defined as “Secure: common, widespread, and abundant” (IDFG 2005; PF Doc. WL-R331). Current marten information based on trapping success from the Idaho Department of Fish and Game indicates the species is declining statewide, however in counties bounded by the IPNF; populations are on the rise (IDFG 2011; PF Doc. WL-R426). It is unlikely that habitat is limiting for this species on the IPNF. The IPNF currently has about 11.8 percent of forested lands as allocated old growth. Additionally, the subalpine fir habitat type (preferred type by this species) contains a disproportionate amount of old growth on the IPNF, accounting for 18.9 percent of old growth but comprising 15.2 percent of the forested land base (USDA Forest Service 2010; PF Doc. WL-R428).

Based on DNA and remote camera surveys conducted over the past seven years in north Idaho (with over 400 verified marten detections), marten appear to be abundant and well-distributed across the Forest (This marten data was provided by the Coeur d’Alene Tribe as a courtesy and are not on file with the USDA Forest Service). Based on their population status and their identification as a species commonly hunted, fished or trapped, viability is not a concern for marten.

Methodology

Similar to fisher, denning/resting habitat is thought to be the more limiting habitat component for American marten populations because it encompasses a narrower range of conditions than foraging habitats. Potentially suitable denning/resting habitat for American marten was mapped based on comparing findings from habitat evaluation surveys with habitat requirements documented in published literature. The key elements of this habitat are relatively closed canopy (greater than 30 to 50 percent) mid- to late-successional conifer or mixed-conifer stands with complex structure on or near the ground (Ruggiero et al. 1994; PF Doc. WL-R86). Habitat evaluation surveys identified stands with at least 30 percent canopy closure, average stem

diameter in the primary overstory layer greater than 10 inches DBH, and presence of snags or down woody debris greater than 15 inches in diameter, as potentially suitable denning/resting habitat.

Approximately 14,989 acres (53 percent) of the 28,200-acre analysis area are potentially suitable denning/resting habitat. All potentially suitable habitat in the analysis area is interconnected by mature and immature (greater than 10 inches dbh) forest. In addition, approximately 500 acres of mature, unharvested stands in the analysis area were not surveyed, and likely are suitable marten denning/resting habitat.

Environmental Consequences

The table below summarizes the effects of the proposed actions on marten in the Beaver Creek Resource Area. Due to their importance in supplying suitable habitat and providing preferred travel corridors, the condition of riparian zones also affects marten habitat. The riparian buffers required to meet INFS guidelines would maintain this habitat during and after the proposed activities (See Appendix E - Design Features). All the action alternatives would treat some road within riparian areas to improve stream function. This project would restore more natural conditions to the streams and accompanying riparian vegetation by storing and decommissioning roads. This would begin the process of restoring and moving the riparian habitat closer to desired conditions, thereby improving habitat for marten in the long term. Table 7displays the amount of proposed road management for each alternative.

Table 87. Changes to suitable marten habitat in the Beaver Creek Resource Area for each alternative (PF Doc. WL-R181, WL-78, and WL-86).

	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)
Suitable marten habitat	14,989	13,735[1]	14,217[2]
Harvest in suitable marten habitat	0	1,740	1,476
Harvest affecting habitat	0	1,069	590
Burning predicted to affect habitat	0	182	182
Construction of new road affecting habitat	0	3	0

[1] *A loss of 9 percent.*
[2] *A loss of 5 percent.*

Alternative 1: Direct and Indirect Effects

The No-Action Alternative would provisionally preserve currently suitable habitat for marten, and may bring some stands into suitable condition more rapidly than treatment would in the absence of large disturbances. 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 up to 100 years. While the No-Action Alternative may provide somewhat better habitat than the action alternatives in the near future, there is a risk of habitat loss in the long term. Furthermore, no road decommissioning would occur under this alternative, potentially allowing for illegal access that may cause disturbance and occasional administrative use. No new road construction would occur under this alternative. Since this alternative would not authorize any activities in marten habitat, it would have no direct effects on this species, although it would have the indirect effects discussed above.

Alternative 2: Direct and Indirect Effects

Alternative 2 proposes timber harvest on 1,740 acres within the fisher analysis area, including approximately 209 acres of seed tree harvest (regeneration), 860 shelterwood harvest (regeneration), 372 acres improvement cut (selection harvest), and 299 of commercial thinning

(selection harvest). Regeneration harvest would reduce canopy cover enough that it would no longer be considered potentially suitable habitat for marten. Selectively harvested stands would likely have large snags and woody debris reduced to some extent, but would maintain some of these habitat features and adequate canopy cover (at least 40 percent) to remain potentially suitable. The total effect on habitat would be a reduction of approximately seven percent of the potentially suitable habitat in the analysis area.

Regeneration harvest would affect about 1,069 acres of suitable habitat, similarly setting it back to an earlier successional stage. Regenerated stands would probably require between 50 and 100 years (depending upon how many residual green trees remain after harvest) to reach suitable condition. Infrequently, stands may reach suitable condition more rapidly if left untreated (see the Alternative 1 discussion, above). However, treated stands would have considerably higher proportions of long-lived seral species, and subsequently would remain in suitable condition (once attained) for a longer period of time as they would be more resistant to insects and disease, weather events, and fire.

Stands that are suitable marten habitat and are proposed for selective harvest (approximately 671 acres in the analysis area) would retain at least 40 percent continuous canopy cover after treatment, so they would still offer cover for hunting and occasional resting sites for marten. Improvement cut prescriptions, a type of selective harvest (372 acres) would result in patchier, more discontinuous overstory canopy that may be less desirable for marten, but would retain sufficient cover so that they would not resemble large openings that marten would be hesitant to travel through. Treatment may or may not accelerate the trajectory of these stands toward suitable condition but, similar to regenerated stands, they would be more resilient in the face of disturbance and would remain in suitable condition for a longer period of time once achieved.

Post-harvest fuels treatments (burning and piling) would have relatively minor effects on marten. The species is not particularly sensitive to disturbance, and regenerated units are unlikely to be utilized by this species following harvest. Grapple piling in selective harvest units may reduce availability of coarse woody debris in some areas. Additionally, approximately one slash pile per five acres would be left in most piled units to provide habitat for snowshoe hares and other small mammals that fishers prey upon (see Appendix E - Design Features).

Under Alternative 2, prescribed burning would occur on 1,214 acres of suitable summer habitat. Prescribed burning is anticipated to remain in the understory of stands, therefore the effect on canopy closure should be minimal. Canopy may be reduced slightly due to passive crown fire that may occur that would result in patches of mortality (see Fire/Fuels Section 3.2). This expected to occur on about 15 percent maximum area of the burn units and would result in these areas no longer being suitable for marten habitat. This would result in a loss of fisher habitat of approximately 182 out of 1,214 acres proposed for burning. There is the potential to remove down wood; however, the creation of snags will create more down wood.

Utilizing several miles of currently restricted and reconstructed roads as haul routes would temporarily increase drivable road miles during implementation, but is not expected to increase mortality risk to the species since these roads would not be made available for public use. Following implementation, 66 miles will be decommissioned, minimizing potential disturbances to martens and eventually potentially resulting in more available marten habitat.

Approximately 2.06 miles of new road construction would occur in suitable marten habitat under Alternative 2 with 1.0 miles being permanent and 1.06 miles as temporary. New road construction would result in a loss of 3 acres of marten habitat, availability of snag habitat, and increase the probability that illegal motorized access would occur. Post activity the 1.06 miles of temporary road would be decommissioned thus reducing the probability of illegal motorized

access and administrative use; however, potentially suitable habitat would take up to 100 years to be replaced.

Alternative 3: Direct and Indirect Effects

Approximately 1,476 acres would be harvested under Alternative 3 in potentially suitable marten habitat, including approximately 110 acres of seed tree harvest (regeneration), 480 shelterwood harvest (regeneration), 315 acres improvement cut (selection harvest), and 248 of commercial thinning (selection harvest). The same number of acres are proposed for burning under this alternative and predicted loss of habitat would be the same as Alternative 2 (182 acres). This, coupled with the 590 acres of regeneration harvest, represents approximately a five percent reduction of the potentially suitable habitat in the analysis area. Effects to forest structure and habitat are as described in Alternative 2, but of a smaller magnitude.

Under Alternative 3, no new road (permanent or temporary) would take place. Following implementation, 104 miles will be decommissioned, minimizing potential disturbances to fishers by administrative use of roads and illegal access from the public.

Cumulative Effects Common to All Alternatives

Mining Activities – From 1800 - present, mining and prospecting has been prominent in the Beaver Creek area and may continue to result in tree removal and increased sedimentation to waterways. Tailings from older mines have been deposited downstream in waterways in the Beaver Creek area. The loss of snags and disturbance in riparian areas could potentially negatively affect marten habitat, although it would be very localized and temporary.

Pocket Gopher Control - This activity may be done to control pocket gophers if needed to protect planted seedlings. This activity would not affect vegetation or suitable habitat of fishers and has a low probability of affecting other species (PF Doc. WL-R387).

Timber Harvest and Related Activities – The effects of past timber harvest are incorporated into the existing condition. Historical timber harvest, large scale fires, and insect and disease has altered species composition of present day forests and resulted in loss of habitat. Logging activity that resulted in large openings would likely have temporarily displaced use in those areas since marten prefer some canopy in the overstory.

Precommercial Thinning and Timber Stand Improvement - Thinning young, small diameter trees would be designed to increase the overall health and vigor of the stands. If this occurs in suitable fisher habitat, it may temporarily displace during activities, but eventually would improve not diminish habitat.

Fire Suppression – Fire suppression activities are generally good for marten habitat in the short term (5-10 years), 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 marten prey upon. However, this activity can also slow the development of quality late-successional habitat where it does not currently exist by encouraging growth of higher densities of smaller-diameter shade-tolerant species and contributing to higher incidences of insects and disease, and subsequently results in fuel loading that may cause larger, hotter future wildfires. As a result, fire suppression may benefit this species in the short term by helping preserve mature forest cover – although the longer-term effect may ultimately be a deterioration of habitat quality and quantity.

Public Activities (Firewood Cutting/Gathering, Motorized Vehicle Use, Camping, Snowmobiling, Hunting, Hiking, Berry Picking, Fishing, Christmas Tree Cutting) – Personal-use firewood gathering is anticipated to continue along seasonally and yearlong open roads, potentially

reducing snags within 200 feet of such roads. Currently there is one mile of road open to the public per square mile in the project area. This results in 2,200 acres where snags have the potential to be cut in the project area; not all this area is considered to be suitable marten habitat. Although it is unlikely to disrupt normal marten use patterns, firewood cutting can deteriorate habitat in these roadside areas by removing large snags that represent future dead and down wood denning opportunities. Various recreation activities are unlikely to impact marten, with the exception of motorized snow travel that can provide access for trappers. The effects of motorized snow travel, as well as of trapping itself, are characterized by the analysis of changes in motorized route miles. Decommissioning portions of currently drivable roads would both preserve future snags along these routes that otherwise could potentially be removed by woodcutters, and reduce mortality risk over time by eliminating routes that can provide trapper access. Other public recreation activities are unlikely to impact marten.

Conclusion

The action alternatives would authorize between 1,476 and 1,740 acres of timber harvest in suitable marten habitat occuring in the 28,200-acre analysis area, including regeneration harvest on 1,069 acres (Alternative 2) and 590 acres (Alternative 3) of the potentially suitable denning/resting habitat. Selective harvest and regeneration harvest in unsuitable stands may or may not move these stands into suitable condition more rapidly than lack of treatment would, but either way treated stands would be more resilient to disturbance and would remain in suitable condition for a longer time period than untreated stands would. Both action alternatives would leave a large amount of the Beaver Creek Resource Area in mature or immature (greater than 10 inches DBH) forest stages, providing connectivity between patches of potential habitat. Several contiguous potential stands of more than 100 acres would remain under all alternatives.

Both action alternatives would slightly reduce the risk of trapping mortality by reducing drivable road miles in the analysis area, and by not making restricted and reconstructed roads available for public use during implementation.

The level of timber harvest is insignificant at the Northern Region (R1) scale (in 2009 – 11,995 acres of 22,351,312 acres or 0.05 percent of the forested landscape) and 1,362 acres or 0.85 percent of 2,470,394 forested acres on the IPNF. For the 10-year period from 2000 through 2009 – 189,404 acres were harvested in R1 (0.85 percent) and 37,973 acres on IPNF (1.54 percent) (USDA 2012). Given the high incidence of mature (more than 100 years old) forest on the IPNF, marten habitat is likely being created at a much greater rate than it is being lost, since the Forest has not conducted timber harvest or other management that removed allocated old growth stands for nearly 20 years (and the amount of old growth lost through wildfire or other natural disturbances has been minimal) (USDA Forest Service 2010; PF Doc. WL-R428). This trend has generally been repeated across the IPNF, and harvest has further declined since 2002 (USDA 2012). Riparian areas which represent potentially suitable habitat and important travel corridors would remain intact through implementation of INFS standards and exclusion of activities within RHCAs (see Hydrology Report), and no reductions in allocated old growth would result from this action.

Analysis of FIA data reveals an average of 1.4 snags per acre greater than 20 inches DBH across the IPNF (USDA Forest Service 2010, PF Doc. WL-408). Additionally, there is currently an estimated 11.8 percent of forested lands allocated as old growth on the IPNF (USDA Forest Service 2010, PF Doc. WL-408). Based on these estimates, old growth and large snag presence is being maintained on the IPNF.

Based on their population status and their identification as a species commonly hunted, fished or trapped, viability is not a concern for marten. DNA and remote camera surveys conducted in

recent years in North Idaho indicate marten are abundant and well-distributed across the Forest. Both action alternatives would slightly reduce the risk of trapping mortality by reducing drivable road miles in the analysis area, and not making restricted and reconstructed roads available for public use during implementation.

Up to 1,740 acres would be affected by timber harvest in the analysis area, including regeneration harvest on as many as 1,069 acres of potentially suitable marten denning/resting habitat. However, at least 49 percent (approximately 13,735 acres) of the analysis area would remain potentially suitable under all alternatives. Potentially suitable habitat treated by selective harvest is expected to retain characteristics consistent with suitable habitat following implementation. Bush and Lundberg (2008; PF Doc. WL-R181) estimate that the IPNF currently contains approximately 5,270 km^2 of marten habitat. Smallwood (1999; PF Doc. WL-R461) estimates of the minimum critical habitat threshold amount required for the American marten persistence is 70 square kilometers. Given the abundance of marten habitat on the IPNF, it is unlikely that habitat limits marten presence on the Forest.

The proposed alternatives, in conjunction with other ongoing and reasonably foreseeable activities in the Beaver Creek area, would affect a relatively small amount of marten habitat that is abundant throughout the IPNF at this time. Consequently, the action alternatives ***may impact*** American marten ***at a local level, but would not likely indicate a local or regional change in habitat quality or population status.***

Consistency with Forest Plan

All alternatives are consistent with *Wildlife Standard 9* 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 Forest Service1987 p. II-28, PF Doc. CR-002). Neither of the action alternatives would affect more than nine percent of potentially suitable marten habitat in the analysis area, and would affect inconsequential amounts of habitat available Forest-wide, which includes more than five times the amount of habitat estimated to be necessary to maintain a viable population. In addition, the Beaver Creek project would remain consistent with Forest Plan direction for old-growth habitat management (see Vegetation Report "Old Growth" in Section 3.1.2.4.2 – Existing Forest Structure). As a result, this proposal is not expected to affect the species at the population level.

3.6.6.5. Effects Summary

Based on the findings of this wildlife analysis, the cumulative effects of the alternatives on federally- listed species, sensitive species, management indicator species, and important wildlife habitats would not approach a threshold of concern. The project is expected to maintain favorable conditions that would support sustained wildlife populations and habitats.

3.6.7. Wildlife References

Albrecht, N. 2009. Coeur d'Alene Tribe Fish and Wildlife Biologist. Pers. comm. with J. Madison, 2009.

Allen, A.W. 1983. Habitat suitability index models: Fisher. USDI Fish and Wildlife Service. FWS/OBS-82/10.45. in Washington Department of Wildlife Management Recommendations for Priority Species: Fisher. PF Doc. WL-R1

Aney, W.C. and B.R. McClelland. 1990. Pileated woodpecker habitat relationships. Pp. 10-17 in Warren, N. (tech. ed.). Old growth habitats and associated wildlife species in the northern Rocky Mountains. Northern Region Report R1-90-42. USDA Forest Service, Missoula, MT. PF Doc. WL-R2

Arnett, E.B, J.P. Hayes. 2009. Use of Conifer Snags as Roosts by Female Bats in Western Oregon. Journal of Wildlife Management, 73(2):214-225.2009. The Wildlife Society. PF Doc. PF Doc. WL-R382

Behrens, P. Idaho Panhandle National Forests Certified Silviculturalist. Pers. comm. with B. Lyndaker, 2011.

Bergman, C.A. 1983. Flaming Owl of the Ponderosa. Audubon 85(6): 66-71in Dobkin, D.S. 1992. Neotropical Migrant Landbirds in the Northern Rockies and Great Plains. USDA FS Northern Region R1-93-34, Missoula, MT. PF Doc. WL-R4

Bollenbacher, B., R. Bush and R. Lundberg. 2009. Estimates of snag densities for Northern Idaho forests in the Northern Region. Region 1 Vegetation Classification, Inventory, and Analysis Report. 45 pp.

Bonn, J., B. Dixon, E. Kennedy, D. Pengeroth. 2007. Black-backed Woodpecker Northern Region Overview. USDA Forest Service. PF Doc. WL-R148

Brewer, L.T., R. Bush, J.E. Canfield, A.R. Dohmen. 2007. Northern Goshawk Northern Region Overview: Key Findings and Project Considerations. Northern Goshawk Working Group. 57pp. PF Doc. WL-R151

Brewer, L.T., R. Bush, J.E. Canfield, A.R. Dohmen. 2009. Northern Goshawk Northern Region Overview: Key Findings and Project Considerations. Northern Goshawk Working Group. PF Doc. WL-R328

Bull, E.L. and R.G. Anderson. 1978. in Notes on Flammulated Owls in northeastern Oregon. Murrelet 59:26-28. in Montana Bird conservation Plan. 2000: Flammulated Owl. PF Doc. WL-R6

Bull, E. L., A.D. Twombly and T.G. Quigley. 1980. Perpetuating snags in managed conifer forests of the Blue Mountains, Oregon. Pp. 325-336 in R.M. DeGraaf and N.G. Tilgham (comps.). Management of western forests and grasslands for nongame birds. Gen. Tech. Rep. INT-GTR-086. USDA Forest Service Intermountain Forest and Range Experiment Station / Rocky Mountain Forest and Range Experiment Station, Ogden, UT. PF Doc. WL-R460

Bull, E.L. 1986. Resource partitioning among woodpeckers in northeastern Oregon. PhD. Diss., Univ. Idaho, Moscow. PF Doc. WL-R76

Bull, E.L., A.L. Wright, M.G. Henjum. 1990. In Nesting Owls in Oregon. Journal of Raptor Research 24:52-55 in Montana Bird Conservation Plan: Flammulated Owl. PF Doc. WL-R8

Bull, E.L., R.S. Holthausen and M.G. Henjum. 1990. Techniques for monitoring pileated woodpeckers. Gen. Tech. Rep. PNW-GTR-269. Portland OR: U.S. D PF Doc. epartment of Agriculture, Forest Service, Pacific Northwest Research Station. 13p. WL-R355 PF Doc.

Bull, E.L. and R.S. Holthausen. 1993. Habitat use and management of pileated woodpeckers in Northeastern Oregon. J. Wildl. Manage.57:335-345. WL-R459

Bull, E.L., C.G. Parks, T.R. Torgersen. 1997. Appendix K of An Assessment of Ecosystem Components in the Interior Columbia Basin, "Trees and Logs Important to Wildlife in the Interior Columbia Basin". PNR-GTR-391. USDA Forest Service; USDI; BLM. PF Doc. WL-R52

Bull, E.L., N. Nielsen-Pinus, B.C. Wales, J.L.Hayes. 2007. The Influence of disturbance events on pileated woodpeckers in Northeastern OR, USDA Pacific Research Station, LaGrande OR. 11pp. PF Doc. WL-R188

Bush, Renate and Renee Lundberg. 2006. Estimates of Old Growth Percentages and Snag Density on the Idaho Panhandle National Forest. KIPZ Draft Comprehensive Report. RI USFS. 12pp. PF Doc. WL-R140.

Bush, R., R. Lundberg. 2008. Wildlife Habitat Estimate Updates for the Region 1 Conservation Assessment. Numbered Report 08-04-V1.0. 22pp. PF Doc. WL-R181

Callopy, M.W. and J.P. Smith. 1995 in Upper Columbia River Basin Draft EIS. USDA Forest Service, USDI, BLM. 1997. PF Doc. WL-R10

Cassirer, E. F. & C. R. Groves. August 1994. Coeur d'Alene Salamander Conservation Assessment, USDA Forest Service, R1. Idaho Fish and Game. Boise, Idaho. 54 pp. PF Doc. WL-R11

Clark, T.W., A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves (eds.). 1989. Rare, sensitive and threatened species of the greater Yellowstone ecosystem. Northern Rockies Conservation Cooperative, Montana Natural Heritage Program, The Nature Conservancy, and Mountain West Environmental Services. 153 pp. PF Doc. WL-R429

Clark, L. R. and R. N. Sampson. 1995. Forest ecosystem health in the inland west: A Science and Policy Reader. Forest Policy Center, Washington D.C. 37 pp.

Clough, L.T. 2000. Nesting habitat selection and productivity of northern goshawks in west-central Montana. Missoula, MT: University of Montana. M.S. Thesis. 87 pp. PF Doc. WL-R458

Davis, L.R. 2009. Denning Ecology and Habitat Use by Fisher (Martes pennant) in Pine Dominated Ecosystems of the Chilcotin Plateau. M.S. Department of Biological Sciences. Simon Fraser University. 122 pp. PF Doc. WL-R347

Department of Interior-US Fish and Wildlife Service. 2003. Federal Register: Final Rule to Reclassify and Remove the Gray Wolf from the List of Endangered and Threatened Wildlife in Portions of the Conterminous United States. Vol. 68, No. 62/ Tuesday, April 1, 2003/Rules and Regulations. 72pp. PF Doc. WL-R386

Dixon, Rita D. and Victoria Saab. 2000. Black Backed Woodpecker in the Birds of North America, No. 509. A Poole and F. Gill, eds. PF Doc. WL-R16

Ellison, L.E., M.B. Wunder, C.A. Jones, C. Mosch, K.W. Navo, K. Peckham, J.E. Burghardt, J. Annear, R. West, J. Siemers, R.A. Adams and E. Brekke. 2004. Colorado Bat Conservation Plan. Colorado Committee of the Western Bat Working Group. PF Doc. WL-R438

Engle, J.C. and C.E. Harris. 2001. Idaho species of special concern element state rankings reviews. Non-game and endangered wildlife program, Conservation Data Center, Idaho Department of Fish and Game, Boise, ID. PF Doc. WL-R442

Federal Register April 16, 2010. Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition to List a Distinct Population Segment of the Fisher in Its United States Northern Rocky Mountain Range as ndangered or Threatened with Critical Habitat. PF Doc. WL-R336

Ghalambor, C. 2003. Conservation Assessment of the Pygmy Nuthatch in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Rocky Mountain Region.. Black Hills, Custer, South Dakota. 55pp. PF Doc. WL-R102.

Ghalambor, Cameron K., Robert C. Dobbs. 2006. Pygmy Nuthatch (Sitta pygmaea): A Technical Conservation Assessment. Report prepared for USDA Forest Service, Rocky Mountain Region, Species Conservation Project. August 10, 2006. 45 p. PF Doc. WL-R276

Gibilisco, C., K.S. Heinemeyer, J.Jones, C. Mack. 1995. Idaho Department of Fish and Gameet. at. Habitat Conservation Assessment and Strategy for Forest Carnivores in Idaho. PF Doc. WL-R70

Goggans, R. 1986. Habitat use by Flammulated Owls in northeastern Oregon. M.S. thesis, Oregon State Univ., Corvallis. 54 p. in *Montana Bird Conservation Plan: Flammulated Owl*. PF Doc. WL-R17

Graham, R.T, R.L. Rodriquez, K.M. Paulin, R.L. Player, A.P. Heap, and R. Williams. 1999. The northern goshawk in Utah: habitat assessment and management recommendations. Gen. Tech. Rep. RMRS-GTR-22. USDA, Forest Service, Rocky Mountain Research Station, Ogden, UT. 48pp. PF Doc. WL-R450

Greenwald, D.N., D.C. Crocker-Bedford, L. Broberg, K.F. Suckling, and T. Tibbitts. 2005. A review of northern goshawk habitat selection in the home range and implications for forest management in the western United States. Wildlife Society Bulletin 33:120-129. PF Doc. WL-R453

Groves, C. 1989. Status and Distribution of the Plethodon vandykei idahohensis in Idaho. Part II. Idaho Department of Fish and Game. 20pp. PF Doc. WL-R74

HCA/CS Development Team for the State of Idaho. 1995. Habitat Conservation Assessment and Strategy for the Northern Goshawk (Accipiter gentillis). IDF&G, Dept. of Parks and Rec., R1 & R4 USFS, USFWS. PF Doc. WL-R47

Hansen, J. 1986. Wolves of Northern Idaho and Northeastern Washington. MT Cooperative Wildlife Research Unit, U.S. Fish and Wildlife Service. 88 pp.

Harvey, A.E., J.W. Byler, G.I. McDonald, L.F. Neuenschwander, and R. Jonalea. 2008. Death of an ecosystem: perspectives on western white pine ecosystems of North America at the end of the twentieth century. Gen. Tech. Rep. RMRS-GTR-208. Fort Collins, CO: U.S.

Department of Agriculture, Forest Service, Rocky Mountain Research Station. 10 p. PF Doc. WL-R451

Hayward, G.D. & T. Holland & R. Escano. 1983. Habitat Suitability Index Model- Goshawk. Northern Region. USDA- Forest Service. Missoula MT. PF Doc. WL-R24

Hayward, G.D. and R.E. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. The Condor 91:476-479. PF Doc. WL-R449

Hayward, G.D. 1986. Activity Pattern of a Pair of Nesting Flammulated Owls in Idaho. NW Science. Vol. 60 #3. PF Doc. WL-R23

Hayward, Greg. 1990. Goshawk Habitat Relationships in Old Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains. Nancy Warren ed. Northern Region Wildlife Habitat Relationships Program. PF Doc. WL-R22

Hayward, G.D., and J. Verner (tech. eds.). 1994. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. Gen. Tech. Rep. RM-253. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 214 pp. PF Doc. WL-R430

Hutto, R.L. 1995. USDA Forest Service Northern Region Songbird Monitoring Program Distribution and Habitat Relationships. USDA Forest Service contract #R1-95-05. Second Report. Division of Biological Sciences. University of Montana. 21 pp. PF Doc. WL-R443

Hansen, J. 1986. Wolves of Northern Idaho and Northeastern Washington. MT Cooperative Wildlife Research Unit, U.S. Fish and Wildlife Service. 88 pp. PF Doc. WL-R446

Harvey, A.E., J.W. Byler, G.I. McDonald, L.F. Neuenschwander, and R. Jonalea. 2008. Death of an ecosystem: perspectives on western white pine ecosystems of North America at the end of the twentieth century. Gen. Tech. Rep. RMRS-GTR-208. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 10 p. PF Doc. WL-R427.

Heinemeyer, Kimberly S., Jeffrey L. Jones. 1994. Fisher Biology and Management in the Western United States. 17 p. PF Doc. WL-R253

Hill, T, A.Reid, R. Clarke and J. Gwilliam. 2006. West Kootenay Townsend's Big-eared Bat Project. Western Bat Working Group Newletter Vo. 2, Number 2, p. 13. November 2006. PF Doc. WL-R173

Hillis, J., Thompson, M., Canfield, J., Lyon, J., Marcum, L., Dolan, P., and McCleery, D. 1991. Defining Elk Security: The Hillis Paradigm. Elk Vulnerability Symp., MSU, Bozeman, MT, April 10-12' 1991. PF Doc. WL-R452

Hillis, M. and A. Jacobs, V. Wright. 2002. U.S. Forest Service Region One Black-backed woodpecker Assessment. Reviewed by J. Losensky, L. Bate, S. Hejl, J. Taylor, D. Lockman. USFS-R1. PF Doc. WL-R58

Howie, R.R. and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. Pp. 249-254 in Biology and Conservation of Northern Forest Owls. Gen. Tech. Rep. RM-GTR-142. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Hutto, R.L. 1995. USDA Forest Service Northern Region Songbird Monitoring Program Distribution and Habitat Relationships. USDA Forest Service contract #R1-95-05. Second Report. Division of Biological Sciences. University of Montana. 21 pp. PF Doc. WL-R443

Hutto, R. L. and S. M. Gallo. 2006. The Effects of Postfire Salvage Logging On Cavity Nesting Birds. Avian Science Center, Division of Biological Sciences, University of Montana. Missoula, MT. Maine Audubon, Falmouth, ME. The Condor 108:817-831.

Idaho Conservation Data Center. Appendix B: Common and scientific names of Idaho species of Greatest Conservation Need. Idaho Fish and Game. Boise, Idaho. 10pp. PF Doc. WL-R331

Idaho Department of Fish and Game. 2005. Species of Greatest Conservation Need. Appendix B. 10pp. PF Doc. WL-R331

Idaho Department of Fish and Game. 2008. Project w-170-R-32. Furbearer. Boise, Idaho. PF Doc. WL-R342

Idaho Fish and Game and Nez Perce Tribe. 2009. 2009 Wolf Activity Map: Documented, Suspected and Reported Locations. 1 p. PF Doc. WL-R341

Idaho Department of Fish and Game. 2011. Furbearer. Project W-170-R-35. Boise, Idaho. PF Doc. WL-R426.

Idaho Department of Fish and Game. 2011. Elk. Project W-170-R-34. Boise, Idaho. PF Doc. WL-R417

Idaho Department of Fish and Game and Nez Perce Tribe. 2013. 2012 Idaho wolf monitoring progress report. Idaho Department of Fish and Game, 600 South Walnut, Boise, Idaho; Nez Perce Tribe Wolf Recovery Project, P.O. Box 365, Lapwai, Idaho. 72 pp.

Intermountain Forest Industry Association. 1995. Risk assessment for identifying reserve trees. 11 pp.

Johnsgard 1988 in Atkinson, E.C. and M. Atkinson. 1990. Distribution and Status of Flammulated Owls in the Salmon National Forest. PF Doc. WL-R68

Jones, J.L. 1991. Habitat use of fishers in northcentral Idaho. M.S. thesis, University of Idaho. Moscow, ID. 147pp. in Idaho Fish & Game. 1995. Nez Perce Tribe & Sawtooth National Forest. Idaho State Conservation Effort. Saving All the Pieces Draft. Forest Carnivores in Idaho. pp. 114. PF Doc. WL-R29

Jones, Jeffrey L. 1991. Habitat Use of Fisher in Northcentral Idaho. M.S. Thesis, University of Idaho. PF Doc. WL-R274

Jones, J. USFS Eastside Assessment Team. P29. In Idaho Fish & Game. 1995. Nez Perce Tribe & Sawtooth National Forest. Idaho State Conservation Effort. Saving All the Pieces Draft. Forest Carnivores in Idaho. pp. 114 PF Doc. WL-R30

Kasworm, W. USDI Fish and Wildlife Service Research Biologist. Pers. comm. with B. Lyndaker, 2009.

Keinath, D.A. 2004. Fringed Myotis (Myotis thysanodes): A Technical Conservation Assessment. UDSA Forest Service, Rocky Mountain Region. 63pp. PF Doc. WL-R104

Keller, B. 2000. Myotis thysanodes (Fringed Myotis). Digital atlas of Idaho Online. Available: http://imnh.isu.edu/digitalatlas/bio/mammal/mamfram.htm. PF Doc. WL-R437

Kingery, H. and Ghalambor, C.K. 2001. Pygmy Nuthatch (Sitta Pygmaea) in The Birds of North America No. 567. A. Poole and F. Gills (eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C. Cited in Ghalambor, C. 2003. Conservation Assessment of the Pygmy Nuthatch in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Rocky Mountain Region, Black Hills National Forest. PF Doc. WL-R432

Kowalski, S. 2006. Frequency of northern goshawk presence in R1. Unpublished report on file in USDA For. Serv., Region One, Missoula MT. PF Doc. WL-R454

Leege, T. 1984. Guidelines for evaluating and Managing Summer Elk Habitat in Northern Idaho. Idaho Fish and Game. PF Doc. WL-R78

Loeffler, C. (ed.). 1998. Conservation Plan and Agreement for the Management and Recovery of the Southern Rocky Mountain Population of the Boreal Toad (Bufo boreas boreas). Boreal Toad Recovery Team and Technical Advisory Group. 80 pp. PF Doc. WL-R448

Maj, M. 1996. Northern goshawk (Accipiter gentilis atricapillus): Assessment of monitoring and management in the Northern Region. USDA Forest Service, Northern Region. 32 pp. PF Doc. WL-R457

Maxell, B. 2000. Management of Montana's Amphibians: A Review of Factors that may Present a Risk to Population Viability and Accounts on the Identification, Distribution, Taxonomy, Habitat Use, Natural History and the Status and Conservation of Individual Species. A Report (Order Number 43-0343-0-0224). University of Montana. Missoula, Montana. PF Doc. WL-R149

McCallum, D. Archibald. 1994. Review of Technical Knowledge: Flammulated Owls Chapter 4, pp. 14-46 in Hayward, G.D. and J. Verner, Technical Editors 1994. Flammulated, Boreal and Great Gray Owls in the United States: A technical conservation assessment. GTR RM 253. Fort Collins, CO. USDA, Forest Service, Rocky Mountatin Forest and Range Experiment Station. PF Doc. WL-R271

McClelland, B.R. and P.T. McClelland. 1999. Pileated woodpecker nest and roost trees in Montana: links with old growth and forest "health". Wildlife Society Bulletin 1999, 27(3): 846-857. University of Montana, Missoula, MT. PF Doc. WL-R187

McEllin, S.M. 1979. Nest Sites and Population Demographies of White-breasted and Pigmy (sic) Nuthatches in Colorado. Condor 90:348-352. PF Doc. WL-R431

Montana Animal Field Guide. Fringed Myotis. PF Doc. WL-R100

Montana Natural Heritage Program. 2010. Animal species of Concern. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Online. Available: http://FieldGuide.mt.gov/detail_ABNKC12060.aspx [2011, March 4].

Montana Partners in Flight. 2000. Montana bird conservation plan Version 1.1. American Bird Conservancy, Kalispell, MT. 281 pp. PF Doc. WL-R418

Murphy, E.C. and W. A. Lehnhausen. 1998. Density and Foraging Ecology of Woodpeckers Following a Stand-Replacement Fire. University of Alaska Fairbanks. Fairbanks, AK. Journal of Wildlife Management, Vol. 62, No. 4. Oct. 1998. Pp. 1359-1372.

Nadeau, Steve, Curt Mack, editors. 2006. Wolf Conservation and Management in Idaho Progress Report 2006. Interagency Report 99. 76 p. PF Doc. WL-R249

NatureServe. 2009. NatureServe: A network connecting science and conservation. Online. Available: http://www.natureserve.org [2011, January 21].

O'Connor, Tricia and Mike Hillis. 2001. Conservation of Post-Fire Habitats, Black-backed Woodpeckers and Other Woodpecker Species on the Lolo National Forest. PF Doc. WL-R41

O'Farrell, M.J. and E. H. Studier. 1980. Myotis thysanodes. Mammalian Species 137:1-5. PF Doc. PF Doc. WL-R436.

Partners in Flight. 2007. Partners in Flight Landbird Population Estimates Database. Online. Available: www.rmbo.org/pif_db/laped/default.aspx [2011, February 2].

Patton, T and R. Escano. Revised by N. Warren. 1990. Old growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains: Marten habitat Relationships. USDA Forest Service. Northern Region. PF Doc. WL-R94

Pautuxent Wildlife Research Center. 2008. US Geological Survey. WL-R324, WL-R325, PF Doc. WL-R326

Pierson, E.D., M.C. Wackenhut, J.S. Alenbach, P. Bradley, P. Call, D.L. Genter, C.E.Harris, B.L. Keller, B. Lengus, L. Lewis, B. Luce, K.W. Navo, J.M. Perkins, S. Smith, and L. Welch. 1999.Species conservation assessment and strategy for Townsend's big-eared bat (Corynorhinus townsendii townsendii and Corynorhinus townsendii pallescens). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho. PF Doc. WL-R99

Pilliod, D.S., E.L. Bull, J.L. Hayes, and B.C. Wales. 2006. Wildlife and invertebrate response to fuel reduction treatments in dry coniferous forests of the Western United States: a synthesis. Gen. Tech. Rep. RMRS-GTR-173. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 34 pp. PF Doc. WL-R444

Powell, Roger A. and Willian J. Zielinski. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx and Wolverine in the Western United States. Gen. Tech. Rpt. RM-254. Ft. Collins, Colorado: USDA Forest Service Rocky Mtn. Forest and Range Experiment Station. PF Doc. WL-R43

Quigley, T.M. Haynes, R.W. and R.T. Grahm. 1996. Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia River Basin. USDA Forest Service. Pacific Northwest Research Station. Portland, Oregon. PF Doc. WL-R44

Rabe, M.J., T.E. Morrell, H. Green, J.C. deVos, Jr. and C.R. Miller. 1998. Characteristics of ponderosa pine snag roosts used by reproductive bats in northern Arizona. J. Wildl. Manage. 62:612-621. PF Doc. WL-R439

Rasheed, S.A., P.F.J. Garcia and S.L. Holroyd. 1995. Status of the Fringed Myotis in British Columbia. Ministry of the Environment, Lands and Parks, Wildlife Branch, Victoria, British Columbia. Wildlife Working Report No. WR-73. PF Doc. WL-R138

Reynolds, R.T, R.A. Ryder, B.D. Linkhart. 1987. Small Forest Owls. Western Raptor Management Symposium and Workshop. Boise, ID. National Wildlife Federation Scientific and Technical Series No. 12. Pp134-143. PF Doc. WL-R45

Reynolds, R.T., and B.D. Linkhart. 1992. Flammulated owls in ponderosa pine: pp. 166-169 in Old-growth forests in the southwest and Rocky Mountain regions; proceedings of a workshop. USDA Forest Service Gen. Tech. Report RM-GTR-213. PF Doc. WL-R441

Reynolds, R.T.,R.T. Graham, M.H. Reiser, R.L. Bassett, P.L.. Kennedy, D.A. Boyce, G.Goodwin, R. Smith, E.L. Fisher. 1992. Management Recommendations for the Northern Goshawk in the Southwestern United States. USDA Forest Service. Gen. Tech. Rpt. RM-217. Rocky Mtn. Forest and Range Experiment Station. PF Doc. WL-R46

Reynolds, R.T., R.T. Graham, D.A. Boyce. 2005. Habitat Conservation of the Northern Goshawk in the Southwestern United States: Response to Greenwald et al. 2005. Rocky Mountain Research Station USDA. 19 pp. PF Doc. WL-R142

Reynolds, R.T., R.T. Graham and D.A. Boyce, Jr. 2008. Northern Goshawk Habitat: an Intersection of Science, Management, and Conservation. J. Wildl. Manage. 72(4):1047-1055. PF Doc. WL-R456

Ruggiero, L. F.; Aubry, K.B; Buskirk, S.W.; Lyon, L.J.; Zielinski, W.J., tech eds. 1994. The Scientific Basis for Conserving Forest Caarnivores: American Marten, Fisher, Lynx and Wolverine in the Western United States. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 p. PF Doc. WL-R86

Saab, V., L. Bate, J. Lehumkuhl, B. Dickson, S. Story, S. Jentsch, W. Block. 2006. Changes in Downed Wood and Forest Structure After Prescribed Fire in Ponderosa Pine Forests. USDA Forest Service Proceedings RMRS-P-41. PF Doc. WL-R146

Samson, F. B. 2005 (amended March 6, 2006). A Conservation assessment of the northern goshawk, blacked-backed woodpecker, flammulated owl, and pileated woodpecker in the Northern Region, USDA Forest Service. Unpublished report on file, Northern Region, Missoula, Montana, USA. PF Doc. WL-R139

Samson, F.B. 2006a. A Conservation assessment of the northern goshawk, black-backed woodpecker, flammulated owl, and pileated woodpecker in the Northern Region, USDA Forest Service. Unpublished report on file, Northern Region, Missoula, Montana. PF Doc. WL-R459

Samson, F. 2006b. Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher. Northern Region. Pp 24. PF Doc. WL-R154

Sauer, J.R., J.E. Hines, J.E. Fallon. K.L. Pardieck, D.J. Ziolkowski, Jr. and W.A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966 - 2009. Version 3.23.2011. USGS Patuxent Wildlife Research Center, Laurel, MD. Most Recent Update: 23 March 2011. PF Doc. WL-R461

Schmidt, C.A. 2003. Conservation Assessment for the Fringed Bat in the Black Hills National Forest South Dakota and Wyoming. USDA Forest Service Rocky Mountain Region. Black Hills NF. Custer, S.D. PF Doc. WL-R101

Scott, V.E. 1979. Bird Responses to Snag Removal in Ponderosa Pine. Journal of Forestry 77:26-28. Cited in Ghalambor, C. 2003. Conservation Assessment of the Pygmy Nuthatch in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Rocky Mountain Region, Black Hills National Forest. PF Doc. WL-R435.

Smallwood, K. S. 1999. Scale domains of abundance amongst species of mammalian Carnivora. Environmental Management 26: 102-111. PF Doc. WL-R461

Squires, J.R. and P.L. Kennedy. 2006. Northern goshawk ecology: an assessment of current knowledge and information needs for conservation management. Studies in Avian Biology 31:8-62.

Stock, C. 2008. Pocket Gopher Control Project, Wildlife Report Sensitive Species BE. Idaho Panhandle National Forests, St. Joe Ranger District. 13p. PF Doc. WL-R387

Sydeman, M.G. and R.P. Balda. 1988. Annual Reproductive Yield in the Cooperative Pygmy Nuthatch. Department of Biological Sciences. Northern Arizona University, Flagstaff, Arizona in the AUK 105:70-77. January 1988. PF Doc. WLR103

Tomson, S.D., K.R. Foresman, P.E. Zager. Multiple Scale Habitat Selection of American Marten (Martes Americana) in North America. USFS, U of MT, IDF&G. PF Doc. WL-R144

Tomson, Scott. 1998. excerpt from Ecology and Summer/Fall Habitat Selection of American Marten in Northern Idaho. 3pp. PF Doc. WL-R335

USDA Forest Service. 1987. Forest Plan – Idaho Panhandle National Forests. Coeur d'Alene, ID. PF Doc. CR-002

USDA Forest Service. 1989. Reel, Susan, Lisa Schassberger and William Ruediger. Caring for Our Natural Community: Region 1 - Threatened, Endangered, & Sensitive Species Program. Northern Region. Missoula, Montana. PF Doc. WL-R56

USDA Forest Service. 1997. Upper Columbia River Basin Draft EIS. Vol. 2. Appendix 6pp. PF Doc. WL-R55.

USDA Forest Service, USDI, BLM. 1997. Appendix K of An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and great Basins. Trees and Logs Important to Wildlife in the Interior Columbia Baisn. PNW-GTR-390. USDA Forest Service. PF Doc. WL-R52

USDA Forest Service 2000a. Northern Region Snag Management Protocol. Northern Region. Missoula, Montana. PF Doc. Wl-R54

USDA Forest Service Northern Region. 2008. Sensitive Species List and 2005 and 2007 amendments changing status of goshawk and black-backed woodpecker. P.10. PF Doc. WL-R145

USDA Forest Service and USDI Fish and Wildlife Service. 2008. Memorandum of Understanding between the U.S. Department of Agriculture Forest Service and U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds. FS Agreement # 08-MU-1113-2400-264. 13 pp.

USDA Forest Service. 2010. Idaho Panhandle National Forests Forest Plan Monitoring Reports 2007, 2008 and 2009. Supervisor's Office. Coeur d'Alene, ID. 150 pp. PF Doc. WL-R428.

USDA Forest Service. 2012. Region 1 Timber Sale Summary Reports and Accomplishments. http://www.fs.usda.gov/detailfull/r1/landmanagement/resourcemanagement/?cid=stelprdb5131032&width=full

USDI Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. U.S. Fish and Wildlife Service, Denver, CO. 119 pp. PF Doc. WL-R133.

USDI Fish and Wildlife Service. 1998. Status Review of the northern goshawk in the forested west. Office of Technical Support- Forest Resources. Portland, OR. Unpublished. 250pp. PF Doc. WL-R330

USDI Fish and Wildlife Service. 2003. Final Rule to Reclassify and Remove the Gray Wolf From the List of Endangered and Threatened Wildlife in Portions of the Conterminous United States; Establishment of Two Special Regulations for Threatened Gray Wolves; Final and Proposed Rules. Federal Register 68:15804-15875. PF Doc. WL-R445

USDI Fish and Wildlife Service. 2007. Wolf Recovery in North America. 2pp. PF Doc. WL-R160

USDI Fish and Wildlife Service and USDA Forest Service. 2008. Process and Documentation eliminating Lynx Analysis Units (LAUs) on Coeur d'Alene River Ranger District. PF Doc. WL-R171

USDI Fish and Wildlife Service. 2008. Birds of Conservation Concern. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 87 pp. [Online version available at <http://www.fws.gov/migratorybirds/>]

U.S. Fish and Wildlife Service. Federal Register 2008. 50 CFR Part 17. Final Rule Designating the Northern Rocky Mountain Population of Gray Wolf as a Distinct Population Segment and Removing this distinct population segment from the Federal List of Endangered and Threatened Wildlife. Final Rule. Department of the Interior. PF Doc. WL-R152

USDI Fish and Wildlife Service. 2009a. Biannual Species List for the Idaho Panhandle National Forests. FWS Reference No. 1-9-09-SP-0035. Upper Columbia Fish and Wildlife Office, Spokane, WA.

USDI Fish and Wildlife Service. 2009b. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada lynx; Final Rule. February 25, 2009. Federal Register Vol. 74, No. 36: p. 8616-8702.

USDI Fish and Wildlife Service. 2011a. Endangered and Threatened Wildlife and Plants; Reissuance of Final Rule to identify the Northern Rockies Mountain Population of Gray Wolf as a Distinct Population Segment and To Revise the List of Endangered and Threatened Wildlife. May 5, 2011. Federal Register Vol. 76, No. 87: p. 25590-25592. PF Doc. WL-R389

USDI Fish and Wildlife Service. 2011b. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List a Distinct Population Segment of the Fisher in Its United States Northern Rocky Mountain Range as Endangered or Threatened With Critical Habitat. June 30, 2011. Federal Register Vol. 76, No. 126: p. 38504-38532.

USDI Fish and Wildlife Service. 2012a. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southern Selkirk Mountains Population of Woodland Caribou; Final Rule. November 28, 2012. Federal Register Vol. 77, No. 229: p. 71042-71082.

USDI Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States; Establishment of a Nonessential Experimental Population of the North American Wolverine in Colorado, Wyoming, and New Mexico; Proposed Rules. February 4, 2013. Federal Register Vol. 78, No. 23: p. 7864-7890.

Warren, N., tech editor. 1990. Old growth habitats and associated wildlife species in the northern Rocky Mountains. Northern Region Report R1-90-42: U.S. Department of Agriculture, Forest Service. Missoula, Mt. 47 pages. PF Doc. WL-R61

Warren, N. 1989 editor. Aney, W.C. and B.R. McClelland. Pileated Woodpecker Habitat Relationships. Old Growth Habitats. PF Doc. WL-R75

Washington Dept. of Wildlife. 1991. Management recommendations for Washington's priority species habitats and species. E. Rodnick and R. Milner, eds. Washington Dept. of Wildlife. 120 pp. PF Doc. WL-R62

Wasserman, T.N. 2008. Habitat Relationships and Gene Flow of Martes Americana in Northern Idaho. Western Washington University. 145 pp. PF Doc. WL-R380.

Weller, T.J. and C.J. Zabel. 2001. Characteristics of Fringed Myotis day roosts in northern California. Journal of Wildlife Management 65:489-497. PF Doc. WL-R440.

Wisdom, M.J., R.S. Holthausen, B.C. Wales, C.D. Hargis, V.A. Saab, D.C. Lee, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy and M.R. Eames. 2000. Source Habitats for Terrestrial Vertebrates in the Interior Columbia Basin: Broad-scale Trends and Management Implications. Vols. 1-3. General Technical Report PNW-GTR-485. USDA Forest Service, Pacific Northwest Research Station. Portland, Oregon. PF Doc. WL-R434

Wisdom, M.J. and L.J. Bate. 2007. Snag Density Varies with Intensity of Timber Harvest and Human Access. Forest Ecology and Management. Pacific Northwest Research Station. La Grande, Oregon. pp 24. PF Doc. WL-R155.

Witmer, G.W., S.K. Martin, R.D. Sayler. July 1998. Forest Carnivore Conservation and Management in the Interior Columbia Basin: Issues and Environmental Correlates. USDA Forest Service. Pacific Northwest Research Station. Portland OR. Gen Tech. Rep. PNW-GTR-420. 43 pp. PF Doc. WL-R93, WL-R64.

Zack, A. 1995. Coding Stand Size Class in Timber Stand Data Base. USFS. PF Doc. WL-R381

3.7. Threatened, Endangered and Sensitive Plants

3.7.1. Introduction

This is a discussion of the affected environment and environmental consequences to plants designated as Threatened, Endangered, Sensitive (TES) or Forest Species of Concern (FSOC).

3.7.1.1. Overview of Issues Addressed

Project-related activities that may affect Sensitive plants and FSOC habitat include timber harvesting, existing road improvements, road construction and decommissioning and fuels reduction treatments. All of the preceding activities may have direct impacts to TES Plants and FSOC. Timber harvesting and fuels reduction activities may cause indirect effects by altering the light and moisture regime of understory plant communities. Increased light in the forest understory, in combination with soil disturbance, may introduce noxious weeds that are highly competitive with native plants.

3.7.1.2. Issue Indicators

There is a potential for timber harvesting and associated activities to adversely affect suitable habitat and/or occurrences of TES Plants and FSOC of the moist forest, wet forest, and dry forest rare plant guilds.

- The effects indicator for TES plants is the determination of effects call in the Biological Assessment and Biological Evaluation (PF Doc. TES-39 and PF Doc.TES-42), and as listed in Table 93.
- FSOC plants are not addressed in Biological Evaluations; therefore, the effects indicator is the specific effects to plant occurrences and habitat that are predicted to result from proposed activities under the alternatives.

3.7.2. Affected Environment and Existing Conditions

3.7.2.1. Existing TES Plant Species

There are no federally-listed Endangered plants for the Idaho Panhandle National Forests; therefore Endangered plants are eliminated from further analysis. See Appendix B for more details.

A Threatened species, as determined by the US Fish and Wildlife Service, is any species that is likely to become an Endangered species within the foreseeable future throughout all or a significant portion of its range. Currently, the US Fish and Wildlife Service (USDI 2009, PF Doc. TES-11) lists two species as Threatened for the Idaho Panhandle National Forests: Water Howellia (*Howellia aquatilis*) and Spalding's Catchfly (*Silene spaldingii*). There are no documented occurrences of these species on the Idaho Panhandle National Forests, although suitable habitat is suspected to occur. No suitable habitat for Spalding's catchfly was found during field surveys. Grassland areas in dry forest guild habitat were searched for Spalding's Catchfly and no suitable habitat or plants were found. This species is not analyzed in detail in this document; additional information is contained in Appendix B and the Biological Assessment in the Project Files (PF Doc.TES–39).

3.7.2.2. Existing Sensitive Plant Species and Forest Species of Concern

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 in habitat capability which would reduce the specie's existing distribution. Twenty-nine species of Sensitive plants are known or suspected to occur on the Coeur d'Alene River Ranger District (Table 89). Plant species identified as "Forest Species of Concern" (FSOC) are species that may not be at risk on a range-wide, regional or state scale, but may be imperiled within a planning area, such as a National Forest (USDA 1997, PF Doc. TES-14, p. 5). FSOC are addressed in effects analyses to provide for continued diversity of plant species, as directed in NFMA (PF Doc. TES-60) and the IPNF Forest Plan (TES-02). Biological Evaluations are not required to address FSOC. A discussion of habitats for FSOC is included with the description of rare plant guilds.

Threatened and Sensitive plants and Forest species of concern can be assigned to one or more rare plant guilds (Mousseaux 1998; PF Doc.TES-5). These guilds are artificial assemblages based on similar habitat requirements used for the purpose of analysis. For the Coeur d'Alene River Ranger District, the rare plant guilds are aquatic, deciduous riparian, peatland, wet forest, moist forest, dry forest, grassland, and subalpine. Rock outcrops, seeps and springs are microsites that can support certain sensitive plants, such as Briton's Grimmia moss (Grimmia brittoniae) and Chickweed Monkeyflower (Mimulus alsinoides), however, these can occur across all guilds and are not identifiable at a coarse scale. Rock outcrops and seep habitats are detected through field surveys and aerial photo interpretation.

The tables below identify US Fish and Wildlife Service Threatened plants, Region 1 Sensitive plants, and IPNF Forest Species of Concern by habitat guild that are known or suspected to occur on the Coeur d'Alene River Ranger District. Refer to the project files (Mousseaux 1998; PF Doc. TES-5) for specific plant guild descriptions.

Table 88. Threatened Plants on the Coeur d'Alene River Ranger District, by Rare Plant Habitat Guild **

Status and Species	Common Name	Habitat Guild
*Howellia aquatilis**	Water Howellia	Aquatic
*Silene spaldingii**	Spalding's Catchfly	Dry grassland/grassy openings in Dry Forest

**Species suspected to occur on the Coeur d'Alene River Ranger District.*
*** Based on the updated Regional Forester's TES species list, February 25, 2011.*

Table 89. Sensitive Plants on the Coeur d'Alene River Ranger District, by Rare Plant Habitat Guild **

Status and Species	Common Name	Habitat Guild
*Asplenium trichomanes**	Maidenhair Spleenwort	rock seeps in Moist/Wet Forest
Blechnum spicant	Deerfern	Moist/Wet Forest
Botrychium ascendens	Upswept Moonwort	Wet Forest
Botrychium crenulatum	Dainty Moonwort	Wet Forest
Botrychium lanceolatum	Triangle Moonwort	Wet Forest/Moist Forest
*Botrychium lineare**	Slender Moonwort	Wet Forest/Moist Forest
Botrychium minganense	Mingan Moonwort	Wet Forest/Moist Forest
*Botrychium montanum**	Western Goblin	Wet Forest
*Botrychium paradoxum**	Paradox Moonwort	Wet Forest/Moist Forest
Botrychium pendunculosum	Stalked Moonwort	Wet Forest
Botrychium pinnatum	Northwestern Moonwort	Wet Forest/Moist Forest
*Botrychium simplex**	Least Moonwort	Wet Forest/Moist Forest
*Buxbaumia aphylla**	Leafless Bug-on-a-Stick Moss	Subalpine
Buxbaumia viridis	Green Bug-on-a-Stick Moss	Wet Forest
Cardamine constancei	Constance's Bittercress	Deciduous Riparian/Moist/Wet Forest
*Carex chordorrhiza**	String-Root Sedge	Peatland
*Carex livida**	Livid Sedge	Peatland
Cypripedium fasciculatum	Clustered Lady's Slipper	Moist/Wet/Dry Forest
Cypripedium parviflorum var. pubescens	Greater Yellow Lady's Slipper	Wet Forests/Peatlands
*Grimmia brittoniae**	Britton's Grimmia	Rock outcrops in Moist Forest
Hookeria lucens (H)	Clear Moss	Wet Forest
Hypericum majus	Large Canadian St. John's Wort	Peatland
*Mimulus alsinoides**	Chickweed Monkeyflower	Rock Cliffs/Seeps in Wet/Moist/Dry Forest
Rhizomnium nudum	Naked Mnium	Wet Forest/Moist Forest
*Rhynchospora alba**	White Beakrush	Peatlands
Scheuchzeria palustris	Pod Grass	Peatlands
*Schoenoplectus subterminalis**	Water Clubrush	Peatlands
*Thelypteris nevadensis**	Sierra Woodfern	Wet Forest Seeps

**Species suspected to occur on the Coeur d'Alene River Ranger District.*
*** Based on the updated Regional Forester's TES species list, February 25, 2011.*
(C) Candidate plant for federal listing.
(H) Historical Occurrence on the Coeur d'Alene River Ranger District.

Table 90. Forest Species of Concern Plants on the Coeur d'Alene River Ranger District, by Rare Plant Habitat Guild **

Status and Species	Common Name	Habitat Guild
Astragalus bourgovii	Bourgeau's Milkvetch	Subalpine
*Botrychium michiganense**	Michigan Moonwort	Moist Forest
*Calochortus nitidus**	Broad-friut Mariposa Lily	Dry Forest, Palouse Soils (St. Joe, St. Maries)
Cephalanthera austiniae	Phantom Orchid	Moist/Wet Forest
Carex californica	California Sedge	Subalpine
Carex hendersonii	Henderson's Sedge	Moist/Wet Forest
Cetraria sepincola	Eyed Ruffle Lichen	Deciduous Riparian, Peatland
*Cladonia bellidiflora**	Toy Soldiers	Moist Forest
*Cladonia transcendens**	Transcending Reindeer Lichen	Wet Forest
Collema curtisporum	Short-spored Jelly Lichen	Deciduous riparian
Corydalis caseana spp. hastata	Case's Fitweed	Wet Forest (St. Maries, North Fk Clearwater)
Dodecatheon dentatum	White-flowered Shooting Star	Wet Forest
Lobaria hallii	Hall's Lung Wort	Deciduous Riparian
*Lobaria scrobiculata**	Textured Lungwort	Deciduous Riparian
*Ludwigia polycarpa**	Many-Fruit False-Loosestrife	Peatland/aquatic
Mimulus clivicola	Bank Monkeyflower	Dry Forests
Romanzoffia sitchensis	Sitka Mistmaiden	Subalpine
Orobanche pinorum	Pine Broomrape	Dry Forest
Pinus albicaulis (C)	Whitebark Pine	Alpine/Subalpine
Platanthera orbiculata	Round-Leaved Rein Orchid	Moist/Wet Forest
*Pilophorus acicularis**	Devil's Matchstick Lichen	Wet Forests
*Ribes sanguineum**	Red-Flowered Currant	Moist forest
Sedum rupicolum	Lance-Leaved Sedum	Subalpine
Sphaerophorus globosus	Christmas Tree Lichen	Wet Forest
*Tauschia tenuissima**	Lieberg's Tauschia	Dry/Moist Forest, meadows
Trientalis latifolia	Western Starflower	Deciduous Riparian/Moist/Wet Forest
*Vallisneria americana**	Wild Celery	Aquatic
*Scheuchzeria palustris **	Pod Grass	Peatlands
Schoenoplectus subterminalis	Water Clubrush	Peatlands
*Thelypteris nevadensis**	Sierra Woodfern	Wet Forest Seeps
Waldsteinia idahoenesis	Idaho Barren Strawberry	Moist and Wet Forest

**Species suspected to occur on the Coeur d'Alene River Ranger District.*
*** Based on the updated Regional Forester's TES species list, February 25, 2011.*
(C) Candidate plant for federal listing.
(H) Historical Occurrence on the Coeur d'Alene River Ranger District.

3.7.2.3. Extent and Type of Suitable TES Plant Habitat

Suitable habitat for the Dry Forest, Moist Forest, and to a lesser extent, the Wet Forest Plant Guild was verified during botanical field surveys. No suitable habitat was found to be present for the Grassland, Subalpine, Deciduous Riparian, Peatland, and Aquatic Plant Guilds. The project files contain descriptions of the Rare Plant Guilds and species with potential for effects from proposed activities (Mousseaux 1998; PF Doc. TES-5). Botanical field surveys include an assessment of habitat suitability and documentation of TES plant occurrences (PF Doc. TES-16).

3.7.2.4. Plant Surveys and Known TES Plant Occurrences

Features designed to protect TES (Appendix E) require botanical field surveys in suitable habitat where activities are proposed and there is a risk of impacts to TES plants that cannot be avoided by the application of design features or mitigation measures. The intensity of botanical survey for the Beaver Creek project was based on several factors. The factors include: the location of known TES plant occurrences, the level of habitat suitability, and the potential for proposed activities to affects TES plants and habitat. Some surveys used in the effects analysis were done for projects other than Beaver Creek.

Over 90 percent of the required field survey acres were completed in 2012. The remaining activity area acreage requiring surveys would be completed prior to implementation. Copies of completed botanical surveys (PF Doc. TES-16) and a list of units that would be surveyed in 2013 (PF Doc. TES-83) are contained in the project files.

Table 92 illustrates the potential risk to Sensitive Plants and Forest Species of Concern from various types of activities. Regional direction (Leonard 1992; PF Doc. TES-15) states that the need for and extent of field reconnaissance should be commensurate with the risk associated with the project, the species involved, and the level of knowledge already in hand. Three new occurrences of FSOC species were discovered during botanical surveys for this project. Four occurrences were previously known to exist in the resource area. Table 88 through Table 90 display the species, status, and total number of rare plant occurrences known to exist in the resource area. There are no known occurrences of Threatened and Endangered plants.

Table 91. Sensitive Plant and Forest Species of Concern Occurrences in the Resource Area.

Species	Forest Service Status	New Occurrences (Beaver Creek)	Total Known Occurrences*
Bank Monkeyflower	Forest Species of Concern		1
Hall's Lungwort	Forest Species of Concern		2
Pine Broomrape	Forest Species of Concern	1	1
Round-Leaved Rein Orchid	Forest Species of Concern	2	2
Short-spored jelly lichen	Forest Species of Concern		1
Total Occurrences		3	7

**Includes occurrences on federally-managed lands only.*

The Dry Forest, Moist Forest, and Wet Forest Habitat Guilds are present in the Beaver Creek Resource Area, and may be affected by project-related activities. Only plant species that are known to occur in the resource area, or have a high likelihood of occurring, are discussed in detail in the Existing Condition and Environmental Consequences sections.

The Grassland, Subalpine, Deciduous Riparian, Aquatic, and Peatland Plant Guilds do not occur in the resource area. These guilds were not analyzed in detail because potential effects to these

guilds and species are unlikely. Additional information on these guilds and species is contained in Appendix B.

A complete description of Coeur d'Alene River Ranger District rare plant guilds and associated species is contained in the Project Files (PF Doc. TES-5 and TES-17).

3.7.2.4.1. Dry Forest Plant Guild

The Dry Forest Guild occupies approximately 45 percent of the Forest Service lands in the resource area (PF Doc. TES-06). The Dry Forest Guild Forest Species of Concern plants bank monkeyflower (*Mimulus clivicola*) and pine broomrape (*Orobanche pinorum*), are present in management units and would have features implemented to protect the populations (see Appendix E, Features Designed to Protect TES Plants).

Bank Monkeyflower is a Forest Species of concern on the IPNF. Bank monkeyflower is a regional endemic of the interior Pacific Northwest. In north Idaho it occupies a narrow set of environmental conditions consisting almost exclusively of steep slopes, (generally greater than 60 percent) on south facing aspects. Plants are usually found growing in mineral soil created by natural or human caused disturbances (Lorain 1993; PF Doc. TES-69). This tiny annual plant flowers in early summer and is highly dependent on seasonal moisture conditions for germination, flowering and reproduction.

This species is vulnerable to competition from invasive weeds such as spotted knapweed (*Centaurea stoebe ssp. micranthos*), Dalmatian toadflax (*Linnaria dalmatica*), cheatgrass (*Bromus tectorum*), and St. Johnswort (*Hypericum perforatum*), which can dominate disturbed mineral soils on dry sites.

About 16 populations of bank monkeyflower are present on the Coeur d'Alene River Ranger District. These populations are important because they are the northernmost extension of the species range in Idaho. The largest populations are located near Elk Mountain and Carrill Peak about 35 miles west of the resource area. One small occurrence of bank monkeyflower is present on the southwest slopes of the Pony Gulch drainage. The occurrence is approximately 0.5 miles from the nearest proposed harvest or prescribed fire unit. More suitable habitat for this species is present in the resource area in the Shehee, Beaver, and Ferguson drainages; intensive searches of habitat within and outside of proposed management units did not locate additional bank monkeyflower populations.

Pine Broomrape is a parasitic plant that inhabits dry Douglas-fir, grand fir, and ponderosa pine forests. Pine broomrape is found in mature forests associated with the host plant, oceanspray (*Holodiscus discolor*). There is very little information in the literature about this plant's biology and its response to various types of forest management activities. About 53 occurrences of pine broomrape are documented to occur on the IPNF, 31 of which occur on the Coeur d'Alene River Ranger District. One occurrence of pine broomrape was located during botanical surveys in the resource area in a burn-only unit (Unit F17).

3.7.2.4.2. Moist Forest and Wet Forest Plant Guilds

Moist Forest and Wet Forest Habitat Guilds occupy approximately 50 percent and 5 percent, respectively, of the Forest Service lands in the resource area (PF Doc. TES-06). Moist forest habitat occupies mainly east to northwest slopes, and drainage bottoms, while Wet forest habitat occupies a relatively small acreage in the resource area, and is restricted to stream bottoms. These areas have been considerably altered from historical conditions due to road building and logging.

Springs and seeps are relatively uncommon in the resource area, and when present, are usually associated with riparian areas.

Wet Forest Guild habitats would be excluded from timber harvesting by riparian buffers, as described in the Appendix E (Features Designed to Protect Aquatic Resources), therefore, the likelihood is low that harvesting would affect plants of this guild. Prescribed fire would not be applied in riparian buffers, but fires would be allowed to creep down into these areas. Control lines would be implemented only when necessary to prevent resource damage due to the burn (see Appendix E, Features Designed to Protect TES Plants).

The most likely species in these guilds to occur based on the presence of suitable habitat and known occurrences are the Sensitive Moonwort species round-leaved Rein Orchid, Hall's lungwort and short-spored jelly lichen.

Moonworts (Botrychium ascendens, B. crenulatum, B. lanceolatum, B. lineare, B. minganense, B. montanum, B. paradoxum, B. pedunculosum, B. pinnatum, and B. simplex) are fern-like plants that are found in a variety of habitats ranging from damp meadows and boggy areas to moist coniferous western hemlock and cedar forest (Lorain 1990, PF Doc. TES-21, p. 7). On the IPNF they occur most often in shallow sloped microsites in densely shaded moist to wet forest habitats. Moonworts frequently occur in "genus groups" of several different species. The species Triangle Moonwort (*B. lanceolatum*) often occurs in meadows bordering older roads and trails with a low level of natural or human-caused disturbance.

There are approximately 28 occurrences of Moonworts on the Coeur d'Alene River Ranger District. One moonwort occurrence is documented from a roadside habitat in the vicinity of Armstrong Creek. There are no proposed activities in the vicinity of this occurrence. Other undetected individuals may be present in the resource area based on potentially suitable moist to wet forest habitat. Moonwort plants are very difficult to detect, and can easily be missed during field surveys because they are small and inconspicuous. There can be large fluctuations in Moonwort plant emergence from one year to the next, depending on annual precipitation levels. For the above reasons Moonwort species are usually assumed to be present in highly suitable habitat.

Suitable habitat for Moonworts in the resource area is present mainly in the riparian zones of the Alder, Deer, Dudley, Scott, and White Creek drainages and the edges of older road prisms within moist to wet forest habitats.

Round-leaved Rein Orchid (Platanthera orbiculata) occurs in boreal, subalpine, montane and coastal forests of the Pacific Northwest, in mixed forests of the Great Lakes Region, and in mixed and deciduous forests of the Appalachian mountains. The species most often occupies damp, rich humus soil in the deep shade of heavily forested areas and is associated with late-successional forests (USDA 2003a; PF Doc. TES-70). Round-leaved rein orchid occurs in small widely scattered populations and is dependent on an association with wood decaying soil fungi for growth and development.

Figure 51. Roundleaved rein Orchid (*Platanthera orbiculata*)

Timber management activities can alter moisture, temperature, and light availability in large round-leaved orchid's densely shaded habitats, and can impact the litter layer and result in loss of mycorrhizal fungi from clearing and soil compaction (USDA 2003a; PF Doc. TES-70).

Eighteen occurrences of round-leaved rein orchid are known to occur on the Coeur d'Alene River Ranger District. Two occurrences of this species were found within proposed harvest units during botanical surveys for the project. Units C34a and C55 would have design criteria implemented to protect the occurrences from effects due to activities.

Short-spored jelly lichen and Hall's lungwort are FSOC with very similar habitat requirements: large black cottonwood trees (approximately 15 inches diameter or greater) in moist to wet forest guild habitat. There are known occurrences of each species within the resource area in the Beaver, Pony, and Trail Creek drainages. The primary threat to these lichens is mining and road work in riparian areas and wet habitat.

3.7.3. Management Framework

Federal legislation, regulations, policy and direction require protection of plant species and provisions for evaluation and planning process consideration of Threatened, Endangered and other rare (Forest Service "Sensitive" and Forest Species of Concern, or “FSOC”) plant species. Pertinent policy, law, and direction include the following:

- The Endangered Species Act (1973, as amended) requires Federal agencies to insure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.
- The National Forest Management Act (1976) states that National Forests “will provide for a diversity of plant and animal communities”.
- The Forest Service Manual (FSM 2670.1-2673.4; PF Doc. TES-1) requires that the FS will document project-related effects to TES plant species in Biological Assessments and Biological Evaluations.
- The IPNF Forest Plan, 1987 (PF Doc. CR-002, pp. II-1, 5, 6, and 27) provides a standard for sensitive species 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, p. II-28, PF Doc. TES-02).

3.7.4. Environmental Consequences

3.7.4.1. Methodology

A pre-field review was conducted of aerial photos, topographical maps, Idaho Department of Fish and Game Conservation Data Center (ICDC, 2010; PF Doc. TES-3) element occurrence records, Timber Stand Management Records System (TSMRS), U.S. Fish and Wildlife Service National Wetlands Inventory Maps (USDI, 1987; PF Doc. TES-4) and pertinent literature.

This assessment describes the extent of all rare plant guilds in the resource area. The potential for Threatened, Endangered, Sensitive, and Forest Species of Concern (FSOC) plant occurrence in the resource area was based on a habitat assessment for species that are known or suspected to occur on the Coeur d'Alene River Ranger District. A Sensitive plant list for the IPNFs was provided by the Regional Forester in February 2011 (USDA 2011: PF Doc. 13). For analysis purposes, the Coeur d'Alene Forest Threatened and Sensitive plant species list is grouped into eight habitat guilds; moist forest, wet forest, dry forest, grassland, subalpine, deciduous/ riparian, aquatic, and peatland guilds (Mousseaux, 1998; PF Doc. TES-5). Photo interpretation, USFWS Wetland Maps, the Natural Resource Information System database (NRIS-TESP 2008, PF Doc. TES-61), the Idaho Conservation Data Center database (ICDC 2012, PF Doc. TES-3), and professional judgment were used to identify activity areas in need of field survey. Highly suitable habitat for Sensitive plants where project work is proposed was field surveyed. Botanical surveys list all identifiable plant species, including rare species and invasive, exotic species. All botanical surveys for the project have been completed, and documentation is contained in the project files (PF Doc. TES-16).

Effects analysis was conducted using the results of botanical surveys, current distribution and condition of Sensitive plant occurrences relative to the proposed activities, and the likely effects to existing occurrences and habitat from the proposed activities based on the literature and professional judgment. During project development, Features Designed to Protect TES Plants and

FSOC (Appendix E) were developed to avoid detrimental impacts to plant species and habitat. Discussion of effects will focus on the wet forest, moist forest, and dry forest guilds, as these habitats are most likely to be impacted by proposed activities.

Effects to TES Plants, Forest Species of Concern, 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 may be affected and/or habitat capability may over the long term be reduced below a level which could support sensitive plant species

The table below illustrates the inherent risk level to TES plants and Forest Species of Concern, in the absence of mitigation measures, associated with various management activities that would be implemented with the action alternatives.

Table 92. Potential risk of adverse impacts to TES Plants and Forest Species of Concern as a result of proposed activities in highly suitable habitat, by plant guild.

Proposed Activity or Event	Rare Plant Guild potentially affected	Potential Risk of Adverse Impacts to TES Plants/FSOC
Shelterwood or Seed Tree	Moist Forest / Dry Forest	High
Improvement cut or Commercial Thinning	Moist Forest / Dry Forest	High
Tree Planting	Wet Forest / Moist Forest / Dry Forest	Low
Road decommissioning, storage	Wet Forest / Moist Forest / Dry Forest	Moderate
New road construction	Wet Forest / Moist Forest / Dry Forest	High
Temporary road construction	Wet Forest / Moist Forest / Dry Forest	Moderate to High
Road reconstruction, reconditioning, maintenance	Wet Forest / Moist Forest / Dry Forest	Low to Moderate
Gate Installation	Moist Forest / Dry Forest	Low
Post-harvest prescribed burning	Wet Forest/ Moist Forest / Dry Forest	Moderate to High
Post-harvest grapple piling	Moist Forest / Dry Forest	Moderate to High
Prescribed burning – without harvest	Moist Forest/ Dry Forest	Moderate
Fuel break construction	Wet Forest / Moist Forest / Dry Forest	Moderate
Noxious weed prevention and herbicide application	Dry Forest / Moist Forest	Low to Moderate
Gopher Abatement	Wet Forest / Moist Forest / Dry Forest	None

3.7.4.1.1. Incomplete and Unavailable Information

Effects to populations from disturbance events (natural or man-caused) are difficult to quantify with certainty for all Sensitive plant species and FSOC. Specific knowledge of population ecology is lacking for several species addressed in this analysis, particularly the sensitive Moonworts (Botrychium spp.), pine broomrape, and phantom orchid. Much of the current knowledge regarding sensitive plant species is based on observational (non-empirical) and even anecdotal information. Recent literature and monitoring reports on several species including

Moonworts (USDA 2005; PF Doc. TES-67), Deerfern (USDA 2003, PF Doc. TES-7), Clustered lady's-slipper (Lichthardt 2003; PF Doc. TES-8), Henderson's sedge and Constance's bittercress (Lichthardt 1998; PF Doc. TES-9) and Idaho barren strawberry (Crawford 1980, PF Doc. TES-10), provide a greater understanding of the relationship of natural and management related habitat disturbance to the persistence of these species.

For unsurveyed habitat that is highly suitable to support Sensitive plants, presence is assumed. This applies to the portion of Alternative 2 activity areas in suitable TES plant habitat that have not been field surveyed.

Protection of large occurrences and contiguous, unoccupied highly suitable habitat is assumed to be an effective conservation strategy (Burgman, et al 2001, PF Doc. TES 37). Examples of conservation strategies for Region 1 include Lichthardt, 1992 (PF Doc. TES-38), Lichthardt 2003 (PF Doc. TES-8), and Lorain, 1991 (PF Doc. TES-39a). As described in Features Designed to Protect TES Plants (Appendix E), populations would be protected, while some isolated individuals may be impacted by activities.

3.7.4.2. Spatial and Temporal Context for Effects Analysis

The geographic scale of the analysis area for TES plants and FSOC is the Beaver Creek Resource Area boundary. Potential effects would be localized in nature to the activity area (i.e. timber sale unit, fuelbreak, or new road right-of-way). The temporal scale of effects to habitat range from approximately 25 years to 100 years or greater, depending on the species. Moonworts may occur in younger stands of around 25 years old on moist to wet sites. Most other moist to wet site species require a longer time frame of 100 years or greater. This is the estimated time span required for shading from the tree canopy to re-establish and understory communities to recover, following timber harvesting or fuels reduction.

3.7.4.3. Alternative 1 – No Action

3.7.4.3.1. Direct and Indirect Effects of Taking No Action

The No-Action Alternative would have no direct impact on Sensitive plants or Forest Species of Concern. Under No-Action, no harvest treatments and associated activities would occur. While there would be no direct effects to Sensitive plant occurrences and habitat with No-Action, there may be indirect effects to Sensitive plants in the event of a wildfire in the resource area. In the long term, the Dry Forest and Moist Forest Guilds would be most affected because they would be the most likely habitats to burn.

Possible indirect effects to Sensitive plant habitat and populations would include an increased risk to sensitive plants and habitat due to a gradual increase in fuel loads over time, with continuing fire suppression. In the future, with the No-Action Alternative, if a wildfire started in the resource area fuels accumulations could result in areas of high intensity fire, and possibly a loss of rare plants and suitable habitat in these areas. The effects to rare plants resulting from a wildfire would depend on factors like the intensity of the fire, the species ability to survive the event, and its ability to regenerate in early seral habitat. The ability to analyze the possible effects for all sensitive plant species is limited given the available literature and relatively few monitoring studies regarding IPNF sensitive plant species. The following section provides information on the known responses of species that may be affected by the No-Action Alternative.

Effects to Moist and Wet Forest Plant Guilds

Indirect impacts to the moist forest guild would be low to moderate if a wildfire started and burned through fully stocked, moist forest habitat with moderate fuel levels. Such a fire, if it were to occur, would be detrimental to obligate mycorrhizal species such as Round-leaved rein orchid, and Moonworts. Populations of these species could be destroyed if the fire was severe enough to remove a substantial amount of duff and organic material, destroying plant root systems. The prospect of recolonization of affected habitat by any of these species would depend on the extent and duration of habitat alteration, and the availability of an adjacent seed source.

The wet forest plant guild would be the least affected guild in the event of a wildfire. Indirect effects to these species under the No-Action Alternative would be low. These habitats are confined to riparian areas which burn infrequently, except in the case of a stand replacing fire. If a mixed-severity fire should creep into riparian areas, it is likely that some patches of unburned habitat for Sensitive plants would remain, allowing re-colonization to take place over time.

Effects to the Dry Forest Guild

Indirect effects to Dry Forest Guild species and habitat with the No-Action Alternative are expected to be low to moderate. Dry forest habitats would be inherently at greater risk of a high intensity fire with continued fire suppression, and without timber harvesting or fuels reduction treatments. Dry Forest Guild species are adapted to habitats which, historically, experienced a greater fire frequency, and some individuals would likely survive a stand replacing fire in scattered microsites. Successful re-colonization for Sensitive plant species after such disturbance events is likely to be more uncertain than under historical conditions due to habitat fragmentation, modification, and introduction of exotic weeds.

3.7.4.3.2. Cumulative Effects to TES Plants under Alternative 1

The cumulative effects analysis for Sensitive plants considered the effects of the No-Action Alternative in combination with the effects of past, present, and reasonably foreseeable future actions listed in Appendix A (Past, Ongoing and Reasonably Foreseeable Activities). Historical occurrence information for rare plants in the resource area is incomplete. Prior to 1988 the IPNF did not conduct rare plant surveys, and occurrence reports to the Idaho Conservation Data Center were incidental (IPNF 2010; PF Doc. CR-040). Past activities on federal lands prior to policies affording protection of rare plants, have negatively affected populations and habitat of Sensitive species. Current activities proposed on Federal lands are required by law and policy to address sensitive plant species. Populations are managed for when they are found. Considering current Forest Service policy, there would be no cumulative effects to Sensitive plants under the No-Action Alternative.

3.7.4.4. Alternative 2

3.7.4.4.1. Direct and Indirect Effects on TES Plants under Alternative 2

The specific effects to Sensitive plants and Forest Species of Concern from proposed activities in Alternative 2 would be very similar to those of Alternative 3. However, the magnitude of the effects of Alternative 2 would be greater than with Alternative 3 because the acreage affected by regeneration harvesting and associated activities would be about twice as much as Alternative 3. Likewise, the effects from fuels treatments, road building and road management activities would be greater in Alternative 2, when compared with Alternative 3.

The gate installation in Pony Gulch in Alternative 2 would limit traffic to non-motorized only. This action would tend to control motorized vehicle travel that has affected the riparian area and introduced noxious weeds. Habitat for TES plants and Forest Species of Concern may improve if this action were implemented.

3.7.4.4.2. Cumulative Effects of Alternative 2

The added effect of implementing Alternative 2 in combination with the effects of past, present, and reasonably foreseeable future actions listed in Appendix A would be low, but somewhat greater than the cumulative effects predicted as a result of implementing Alternative 3.

3.7.4.5. Alternative 3

3.7.4.5.1. Direct and Indirect Effects on TES Plants under Alternative 3

The direct and indirect effects to habitat for TES plants and Forest Species of Concern (due to timber harvesting and associated management activities under Alternative 3) would be about half that of Alternative 2 due to the acreage affected.

Alternative 3 would construct no new roads, which would be less of a long-term impact to TES plant and Forest Species of Concern habitat on the acres affected. Alternative 3 would also decommission slightly less than double the miles of roads that Alternative 2 would. Road decommissioning contributes to recovery of TES plant habitat in the long term.

Aggregate retention of 360 acres would only take place with Alternative 3. Aggregate retention may be beneficial to TES plants and habitat in that patches may provide more shade and moisture retention.

3.7.4.5.2. Cumulative Effects on TES Plants under Alternative 3

The added effect of implementing Alternative 3 in combination with the effects of past, present, and reasonably foreseeable future actions listed in Chapter 2 and Appendix A would be low, but somewhat less than cumulative effects with Alternative 2.

3.7.4.6. Direct and Indirect Effects to TES Plants Common to Alternative 2 and Alternative 3

3.7.4.6.1. Effects of Timber Harvesting

Direct impacts of timber harvest can include elimination of individual Sensitive plants through ground disturbance. Indirect impacts to sensitive plants can include changes in fuel loading, duff levels, moisture regime, and increased light levels. Effects to sensitive plants would vary according to species and harvest prescription. Most timber harvest would take place in moist forest habitats, so most of the effects would be confined to moist forest guild species. Fewer acres of dry and wet, as opposed to moist forest guild habitat, would be potentially impacted by harvest in any alternative. Since Riparian Habitat Conservation Area guidelines would be followed for all action alternatives, most wet forest habitat would be excluded from harvest activities.

Effects of intermediate harvests (improvement cutting and commercial thinning)

Intermediate harvesting and associated activities would directly affect suitable habitat for sensitive plants of the moist and dry, especially those that are intolerant of changes in the moisture and light regime (i.e. the mycotrophic species, Moonworts and round-leaved rein orchid). Because most of the canopy cover would be retained in stands with intermediate harvesting, effects to suitable habitat of these guilds would generally be less than those resulting from regeneration harvesting. Intermediate harvesting with ground based yarding systems would have greater impacts to suitable habitat than skyline systems.

Effects of regeneration harvests (shelterwood and seed tree harvesting)

Regeneration harvesting would take place in the majority of commercial harvest units in both action alternatives. Primarily, live trees would be cut in order to provide conditions suitable for reforestation with long-lived seral tree species. Most of the tree canopy cover would be removed. Fuels treatment would occur in all regeneration units, consisting of mechanical fuels treatment (grapple) or a form of prescribed burning. Regeneration harvesting would directly affect moist and dry forest habitats by increasing sunlight, reducing soil organic matter, and elevating temperatures in the understory.

The limited data and observations available indicate that most species in the moist and dry forest plant guilds are intolerant of substantial canopy removal, with the exception of bank monkeyflower, which grows in grassy balds and open forest conditions on southerly slopes. Mycotrophic species such as Moonworts, and round-leaved rein orchid are very vulnerable to the effects of regeneration harvest. The most detrimental sort of regeneration harvest treatment would be with ground based equipment, followed by an intense burn, which consumes much of the organic matter on the site, or with mechanical fuels treatment. The action alternatives display various fuels treatment and harvest combinations.

Round-leaved rein orchid is present in shelterwood units C34a and C55. No-activity buffers would be implemented in these units to protect the orchids. Prescribed burning in Units C34a and C55 would be designed to eliminate any effects to the round-leaved rein orchid by having protection measures implemented to prevent fire from burning the buffered area. These measures may include a constructed fireline or localized fuels reduction measures to limit burn intensity.

Design features of the action alternatives for Soils, Aquatics, Sensitive Plants, Noxious Weeds, and Vegetation discussed in Appendix E would minimize potential adverse effects to Sensitive plant habitat from regeneration harvesting and associated activities.

3.7.4.6.2. Effects of different yarding systems

The yarding methods proposed for the action alternatives consist of, skyline, cable, and ground-based yarding (escaliner-swing, tractor or forwarder). The effects of skyline yarding would be somewhat less than those resulting from tractor yarding. Skyline would necessitate construction of corridors for yarding purposes in which long narrow canopy openings would be created. Some ground disturbance would result from the yarding process. Tractor yarding has the potential to cause the most detrimental and long lasting impacts to sensitive plant habitat, but effects would be confined mainly to designated skid trails. Soil compaction and displacement can affect soil structure and nutrient levels, which in turn lengthens the time for native plant communities to recolonize. Features of the action alternatives related to soils would maintain standards for down woody material and minimize soil displacement and compaction (refer to Appendix E, Features Designed to Reduce Impacts to Soils, and the Soils Section 3.5).

3.7.4.6.3. Effects of New Road Construction, Road Reconstruction, and Reconditioning

New road construction, road reconstruction, and reconditioning would take place in both action alternatives. These activities vary in the potential to affect moist, wet, and dry forest guild habitats and species. New road construction is a highly ground disturbing activity, constituting a considerable risk to sensitive species in these guilds. In contrast, road reconstruction and reconditioning are relatively low risk activities, in terms of direct or indirect effects to sensitive plants and habitat. For these activities, existing road prisms would be treated which are currently disturbed and of low habitat suitability. While there are a few sensitive plant occurrences on the District on old roads or cutbanks they are, in general, individuals isolated from the main occurrence.

There are no known occurrences of short-spored jelly lichen or Hall's lungwort lichen in areas proposed for road construction, road reconstruction, and reconditioning. There would be no direct or indirect effects to these species.

3.7.4.6.4. Effects of Fuels Treatments

Various methods of fuels reduction are proposed under the action alternatives, all having the potential to directly and indirectly impact sensitive plants and habitat. Slashing and lop and scatter fuels treatments would have a negligible effect on sensitive plant species. Grapple piling would have high impacts on sensitive plant habitat in the affected areas because this is a ground based activity that can disturb soils and cause compaction. Grapple piles, when burned, can impact soil structure and microorganisms in a localized area. Fuelbreak construction would be done manually using hand tools, and would result in low effects to rare plant habitat.

Prescribed burning for fuels reduction would be done within most regeneration harvest units, and as a fuels reduction treatment alone, without harvesting. Spring burning has the potential to impact rare plant individuals of Pine Broomrape, Clustered Lady's Slipper (Harrod 1995; PF Doc. TES-31), Round-Leaved Rein Orchid, and Moonwort species. Features and design criteria (Appendix E) would protect known Sensitive plant populations of the moist forest guild (Round-leaved Rein Orchid) and minimize effects to highly suitable habitat. A Pine Broomrape occurrence in burn-only Unit F17 would not be buffered from prescribed burning. This dry forest guild FSOC plant depends upon oceanspray for growth and reproduction. Prescribed burning prescriptions would not eliminate oceanspray, and may result in stimulating understory shrub growth. There is a possibility that the pine broomrape occurrence in could be impacted with this activity. Prescribed burning carries a risk of increasing noxious weeds in activity areas, thus causing competition with TES species and other native plants, especially on dry forest cover types (refer to Noxious Weeds section in Appendix B).

Regeneration units would generally have control lines constructed to contain the fire. Fire line construction has the potential to impact undetected sensitive plants and suitable habitat by vegetation and ground disturbance. There would be no direct ignition within designated Riparian Habitat Conservation Areas (RHCAs), however fire would be allowed to back down into RHCAs. Impacts to moist forest habitat would be very low. Specific features of the action alternatives would protect documented populations and mitigate for new ones discovered prior to implementation.

3.7.4.7. Cumulative Effects Common to Alternative 2 and Alternative 3

Reasonably foreseeable and ongoing activities in the cumulative effects analysis area are identified in Appendix A. Activities on Forest Service lands including mining, and minerals exploration, wildfire response, special uses, road and trail maintenance, dispersed recreation, Christmas tree cutting, fuelwood gathering, and noxious weed treatment would have immeasurable impacts to Sensitive plants and FSOC. These activities are regulated by the Forest Service to minimize resource impacts; therefore effects to plants are very low. Timber harvesting, Travel Plan implementation, and Outfitter Guide activities, have been through the NEPA process, and features to protect TES plants have been implemented. These activities would have a low level of cumulative effects to TES plants.

Implementation of projects on National Forest System lands would have low impacts on sensitive plants or suitable habitat, since Federal lands are managed to maintain sensitive plant populations. Sensitive plant habitat assessment is conducted for all ground and/or vegetation disturbance on the District. While individuals of some sensitive plants may occasionally be impacted, cumulative impacts to species and habitats are expected to be low.

The Forest Service has no control over timber harvesting and related activities on private lands. Impacts to TES plants have likely occurred in the past and are continuing because there are no policies in place providing protection of rare plant species on private lands. Because no baseline data exists for TES plants on private lands, it is not know to what extent activities have affected plants there.

3.7.4.8. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

3.7.4.8.1. Forest Plan

All of the proposed activities with the requirements for surveys and implementation of mitigation measures would meet the intent of the Forest Plan. The No-Action Alternative would also meet the intent of the Forest Plan.

A Forest Plan management goal is to "manage habitat to maintain populations of identified sensitive species of animals and plants". Also to “Provide for a diversity of plant and animal communities”. (Forest Plan, p. II-1, TES-02).

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, p. II-28, PF Doc. TES-02).

The effects analysis considered the distribution of habitat for rare plants, including Region 1 Forest Service Sensitive plants, Forest Species of Concern, and Threatened plants. The Idaho Conservation Data Center was consulted for information on rare plant occurrence in the State. Alternative design considered the documented occurrence of TES plants in the resource area, and the potential effects of proposed activities. Features Designed to Protect Rare Plants (Appendix E) provides that rare plant surveys will be conducted in all areas of suitable habitat where activities would occur prior to project implementation. Mitigation measures for rare plants would protect known occurrences and those that may be discovered during project implementation. Documentation of botanical surveys for rare plants is included in the Project File in PF Doc.TES-16.

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, p. II-18, PF Doc. TES-02).

Two species of Threatened plants are listed by the USFWS for the Coeur d'Alene River Ranger District (USDI 2009; PF Doc. TES-11). Although there is potentially suitable habitat, no Threatened species have been discovered on Forest Service lands. There are no Endangered plant species currently listed for the IPNF or Coeur d'Alene River Ranger District. All projects on the Coeur d'Alene River Ranger District are analyzed for effects to Threatened plant species. Potentially suitable habitat is surveyed prior to project implementation. Projects that may have effects to Threatened plants are consulted on with the U.S. Fish and Wildlife Service according to Section 7 Guidelines under the Endangered Species Act, 1999.

3.7.5. Effects Summary

3.7.5.1. Determination of Effects for Threatened and Endangered Plant Species

There would be no effect to Threatened and Endangered plants with implementation of Alternative 2 or 3. Refer to PF Doc. TES-39 for the complete Biological Assessment for Threatened and Endangered plants.

3.7.5.2. Determination of Effects for Sensitive Plant Species

Based on the above analysis, and given implementation of Features Designed to Protect Rare Plants, described in Appendix E, summarizes the determination of effects to Sensitive plants for each alternative. A description of habitat guilds (PF Doc. TES-5) and list of sensitive species (PF Doc. TES-13) is included in the Project Files. Also refer to Project File document TES-42 for the full Biological Evaluation for Sensitive plants.

Table 93. Summary of determination of effects on Sensitive plant species, by guild, for each alternative.

Species Guild	Alt. 1 (No Action)	Alt. 2	Alt. 3
Moist Forest Guild	No Impact	May Impact*	May Impact*
Dry Forest Guild	No Impact	May Impact*	May Impact*
Wet Forest Guild	No Impact	May Impact*	May Impact*
Subalpine Guild	No Impact	No Impact	No Impact
Peatland Guild	No Impact	No Impact	No Impact
Deciduous Riparian Guild	No Impact	No Impact	No Impact
Aquatic	No Impact	No Impact	No Impact

** May Impact = May Impact Individuals or Habitat with no trend to federal listing or loss of species or population viability*

3.7.5.3. Summary of Effects to Forest Species of Concern

There would be no direct effect to known occurrences of Forest Species of Concern with implementation of any action alternative. Alternative 2 would impact more suitable habitat of moist forest and wet forest FSOC species than Alternative 3. Alternative 3 would restore more acres of suitable FSOC habitat over time with more road decommissioning and no new road building.

3.7.6. TES Plants References

Burgman, Mark A., et al. A Method for Setting the Size of Plant Conservation Target Areas. Conservation Biology, Vol. 15, pp. 603-616, June 2001.

Crawford, Rex C. 1980. Ecological investigations and management implications of six northern Idaho endemic plants on the proposed endangered and threatened lists. Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, Idaho. 176 pp.

Harrod, Richy, et al. Effects of the Rat and Hatchery Creek Fires on Four Rare plant Species. From Proceedings: First Conference on Fire Effects on Rare and Endangered Species and Habitats, Pages 311-319. Organized by The International Association of Wildland Fire. Coeur d'Alene, Idaho. 1995. 343 pp.

ICDC, 2012. Rare plant occurrence records, Idaho Conservation Data Center, Idaho Fish and Game. Boise, Idaho.

Leonard, G.M., 1992. Memo to Regional Foresters from the Washington Office regarding Forest Health and Biological Evaluations. Washington, DC. 3 pp.

Lichthardt, Juanita. 2003. Draft Conservation Strategy for Clustered lady's-Slipper Orchid (*Cypripedium fasciculatum*) in U.S. Forest Service Region 1. Idaho Department of Fish and Game. Boise, Idaho. 27 pp. plus appendices.

Lichthardt, Juanita. 1998. Monitoring of rare plant populations on the Clearwater National Forest: Third annual summary report. Idaho Department of Fish and Game, Boise, Idaho. October 1998. 14 pp. plus appendices.

Lichthardt, Juanita. 1992, Conservation Strategy for *Allotropa virgata* (candystick) USDAforest Service. Northern and Intermountain Regions. 23 pp. plus Appendices.

Lorain, Christine. 1993. Conservation Assessment of *Mimulus clivicola* (Bank Monkeyflower). Prepared for the USDA Forest Service, Pacific Northwest, Intermountain, and Northern Regions.

Lorain, Christine C. 1991. Species management guide for *Grindelia howellii* (Howell's gumweed), on the St. Joe National Forest. Idaho Department of Fish and Game, Conservation Data Center, Boise. 17 pp. plus appendices.

Lorain, Christine C. 1990. Field investigations of *Botrychium* (moonworts), on the Idaho Panhandle National Forests, Idaho Dept. of Fish & Game, Boise, Idaho. December 1990. 16 p. plus appendices.

Mousseaux, Mark. 1998. Idaho Panhandle National Forests Rare Plant Guild Descriptions. IPNF Botanist, Coeur d'Alene, Idaho. 6 pp.

Regional Forester, 2011. Regional Foresters Sensitive Species List, February 25, 2011. Missoula, Montana.

USDA Forest Service 2011. Idaho Panhandle National Forests Draft Land Management Plan and Draft Environmental Impact Statement. December 2011. 438 p. plus appendices.

USDA Forest Service. 2008. Natural Resource Information System- Threatened, Endangered, and Sensitive Plant Database . (NRIS-TESP).

USDA Forest Service. 2003. Species Conservation Strategy and Monitor Plan for *Blechnum spicant* for Northern Idaho, Idaho Panhandle National Forests and Clearwater National Forest. Idaho Panhandle National Forests, Sandpoint Ranger District. Sandpoint, Idaho. February 2003.

USDA Forest Service. 2003a. Conservation Assessment for the Large Round-leaved Orchid in the Black Hills National Forest, South Dakota and Wyoming. Prepared by J. Hope Hornbeck, et al for the Rocky Mountain Region. May 2003.

USDA, FSM 2670-2673.4. Forest Service Manual: Wildlife, Fish, and Sensitive Plant Habitat Management with Amendments and Supplements.

USDA Forest Service. 1987. Idaho Panhandle National Forests. Forest Plan. 88 pages plus appendices.

USDA Forest Service. 1997. Terrestrial protocols: Species at risk. Northern Region. Missoula, MT. 7 p.

USDI, 2009. US Fish and Wildlife Service, Biannual Forest Wide Species list. Reference number #FWS 1-9-95-SP-0154 (File #105.0100). Upper Columbia Basin Field Office, Spokane, Washington.

USDI, 2000. US Fish and Wildlife Service, Section 7 Guidelines, *Silene spaldingii*, dated January 2000. Upper Snake River Basin Office, Boise, Idaho.

USDI, 1987. National Wetlands Inventory

3.8. Recreation

3.8.1. Introduction

3.8.1.1. Overview of Issues Addressed

Recreation managers are concerned for public safety and any impacts to the full range of existing recreational patterns, opportunities and improvements of a project area. This analysis will evaluate any effects from proposed activities to public safety and the various recreational activities near or within the Beaver Creek Resource Area.

Off Highway Vehicle (OHV) riding is by far the largest form of recreation in the Beaver Creek Resource Area. Hunting and snowmobiling compete as noteworthy activities in the area while such things as camping, berry picking, gold panning, mushroom hunting, sightseeing, hiking and other forms of recreation occur on a more limited or isolated basis. Firewood gathering, considered by some as a recreational activity, occurs often in the Beaver Creek area. Road 1505 is within the project boundary and is designated as a “disabled hunt” area.

This analysis is focused on three primary activities: OHV riding, disabled hunting, and snowmobiling. Trails and recreational activities that lie immediately adjacent to the project area boundary and may be impacted are included in the analysis.

3.8.1.2. Issue Indicators

Indicators of effects to recreation from project activities include the following:

- Operations along or near travel routes, recreation improvements and high use recreation areas
- Projected increases or decreases in the amount of recreational use
- Physical damage to recreational signs and trails
- Proximity of recreation areas to potential noise, smoke or other project related activities
- Loss of habitat or other physical change on the landscape that may alter an individual’s “sense of place,” briefly defined as a psychological outcome that is expected by an individual while enjoying nature.

Quantitative measurements of effects to OHV riding, disabled hunting and snowmobile trails were calculated using miles and percentages of routes subject to log haul, snow plowing, and general logging operations along with an accompanying map displaying the broader impacts. Qualitative measurement follows the Recreation Opportunity Spectrum framework discussed in Section 3.8.3 – Management Framework.

Determination of the existing conditions for recreation activities, facilities and opportunities are derived from inventories, maintenance work, observation by recreation specialists and technical personnel and contact with recreation groups and individuals.

Abbreviations Used in the Recreation Analysis

MA (Management Area); MVUM (Motor Vehicle Use Map); OHV (Off-highway Vehicle)

3.8.2. Existing Conditions

When compared to other areas of the Coeur d'Alene River Ranger District, overall recreational use within the Beaver Creek Resource Area is light. It consists solely of dispersed recreation, briefly defined as recreating in a general forested area or an area with no developed recreation sites. Once off of the two paved roads that are in or near the area (Forest Highway 9 and County Road 456), access becomes remote with rough and narrow gravel roads.

There are no lakes, rivers, or developed recreation sites within the Beaver Creek Resource Area. Without major water bodies, developed sites, or other attracting features, camping is infrequent through the summer months. Most of the recreation use during this time is generated from OHV riding or firewood, huckleberry and mushroom gathering. Camping increases somewhat during hunting season, yet even then it is less than in many other parts of the District as small hunting camps are scattered about the area at some of the road junctions or trailheads. Much of the increased use during this time is from nearby residents who, rather than camp, are close enough in proximity to drive in for a day of hunting and return home in the evenings.

3.8.2.1. Designated OHV Routes

The Motor Vehicle Use Map (MVUM) serves as the enforcement tool of the 2009 Coeur d'Alene River Ranger District Travel Plan Decision. The Motor Vehicle Use Map not only displays the routes designated for motorized use, but also identifies the types of motor vehicle classes that can operate upon them.

Within the Beaver Creek Resource Area, only Forest Roads 271, 424, 429, 957, 1505, 2322, and 2361 are designated as open to all vehicles (Figure 52). Routes 933, 1586, 151, 1505, 6003, 6328 and 6328A are designated as seasonally-restricted Off Highway Vehicle (OHV) trails open to motorized vehicles less than 50 inches. These OHV trails lie either within or immediately adjacent to the project area, for a combined total of 40.7 miles.

A 1.3-mile portion of the 6-mile Graham Ridge Trail 17 (a single-track trail used predominantly by motorcycles) lies along the far western boundary of the project area. There are no other motorized routes designated on the Motor Vehicle Use Map within the project area. There are no District-managed routes within the area that are designated for non-motorized uses only.

Table 94. Miles of Motorized Designated Routes within the Beaver Creek Resource Area.

Type of Route	Miles
4-wheel drive (high-clearance vehicle) trails	0.0
Seasonally-restricted double track (OHV) trails	40.7
Single-track (motorcycle) trails	1.3
Roads open to all vehicles	27.4
Total motorized designated routes	**69.4**

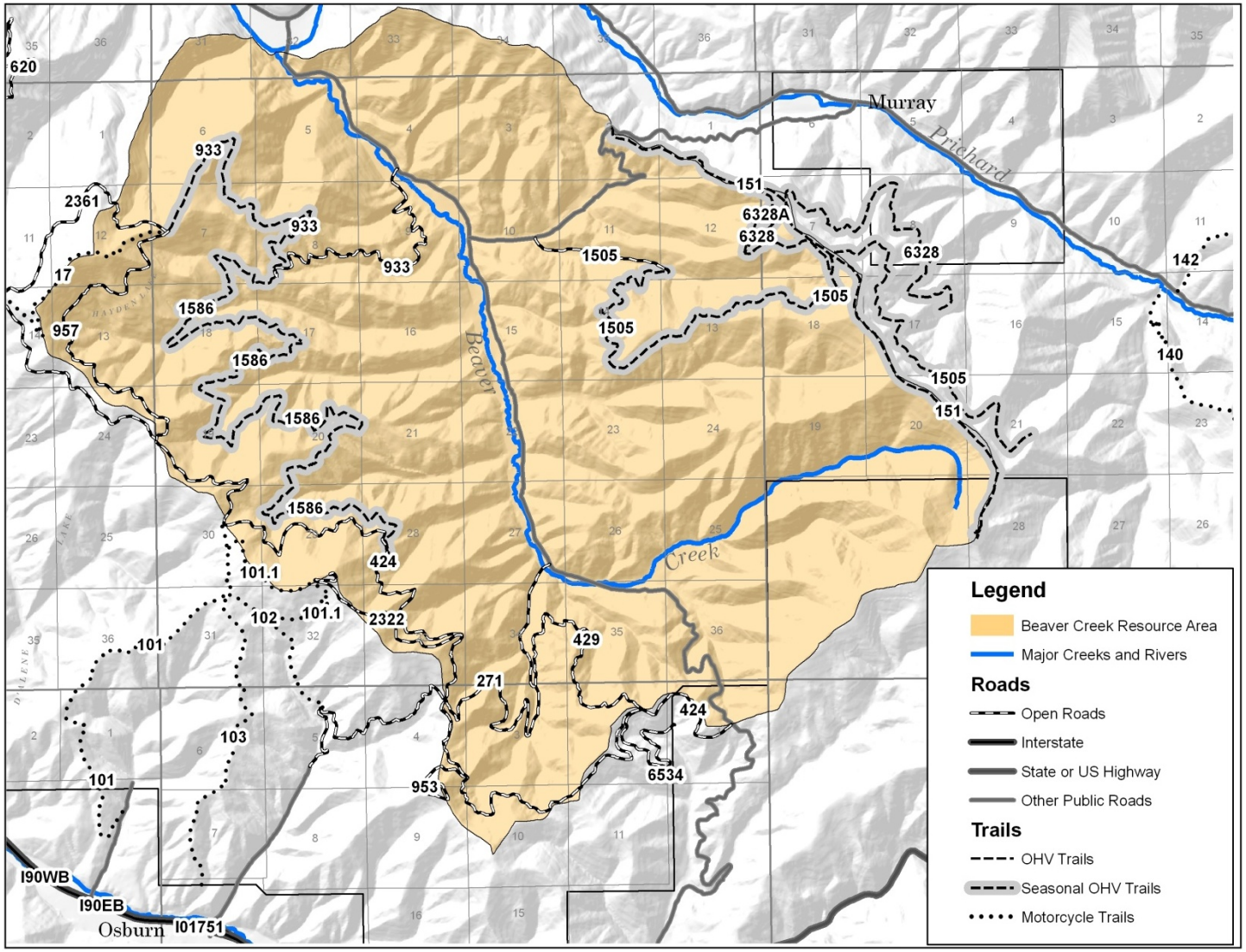


Figure 52. Designated Motorized Routes within the Beaver Creek Resource Area as authorized by the Motor Vehicle Use Map.

3.8.2.2. Snowmobile Routes

The Motor Vehicle Use Map only designates routes for motorized traffic during the non-winter months. The Beaver Creek Resource Area also includes 39.5 miles of routes groomed for snowmobiles (Figure 53). These winter trails are designated on the Motor Vehicle Use Map as motorized routes 271, 424, 429, 933, 1586, and 2361. Once snow grooming occurs on these routes, their definition changes from a road to a trail and wheeled vehicles are restricted.

Although available for snow grooming, the routes in the Beaver Creek Resource Area are not always groomed, because there are several more popular snowmobile areas of the District that demand the attention of the grooming program during winter operations. If the routes are not groomed, wheeled traffic is not restricted.

3.8.2.3. Disabled Hunt Program

The Motor Vehicle Use Map restricts motorized travel each year on OHV Trail 1505 from September 7 through April 1. From October 10–31, it is dedicated by the District to the disabled hunt program. This program issues a key to the participants for unlocking the gate at Potosi Gulch and authorizes permitted hunters to operate full-sized motorized vehicles on routes 1505, 1505D, 6328 and 6328A (Figure 54), a total of 20 miles.

Disabled hunters are able to take along a partner for assistance with the gate and for game retrieval, but only the disabled hunter is allowed to shoot. The disabled hunter is provided a quiet opportunity to pursue game without interference from motors and machinery. The Disabled Hunt Program is highly popular and fully booked with hunters chosen through a District-administered lottery.

3.8.2.4. Motorized Use on Non-Designated Routes

Illegal OHV use on routes not designated for motorized use is reported to be prevalent in the Beaver Creek Resource Area. This is especially noteworthy on the 1505 system as the District has received numerous reports from disabled hunters of their encounters with OHVs during its restricted period. Although physical barriers, enforcement and education efforts combined with the widespread availability of the Motor Vehicle Use Map have all helped slow the illegal use of OHVs on undesignated routes over the past few years, it continues as a problem in the Beaver Creek Resource Area.

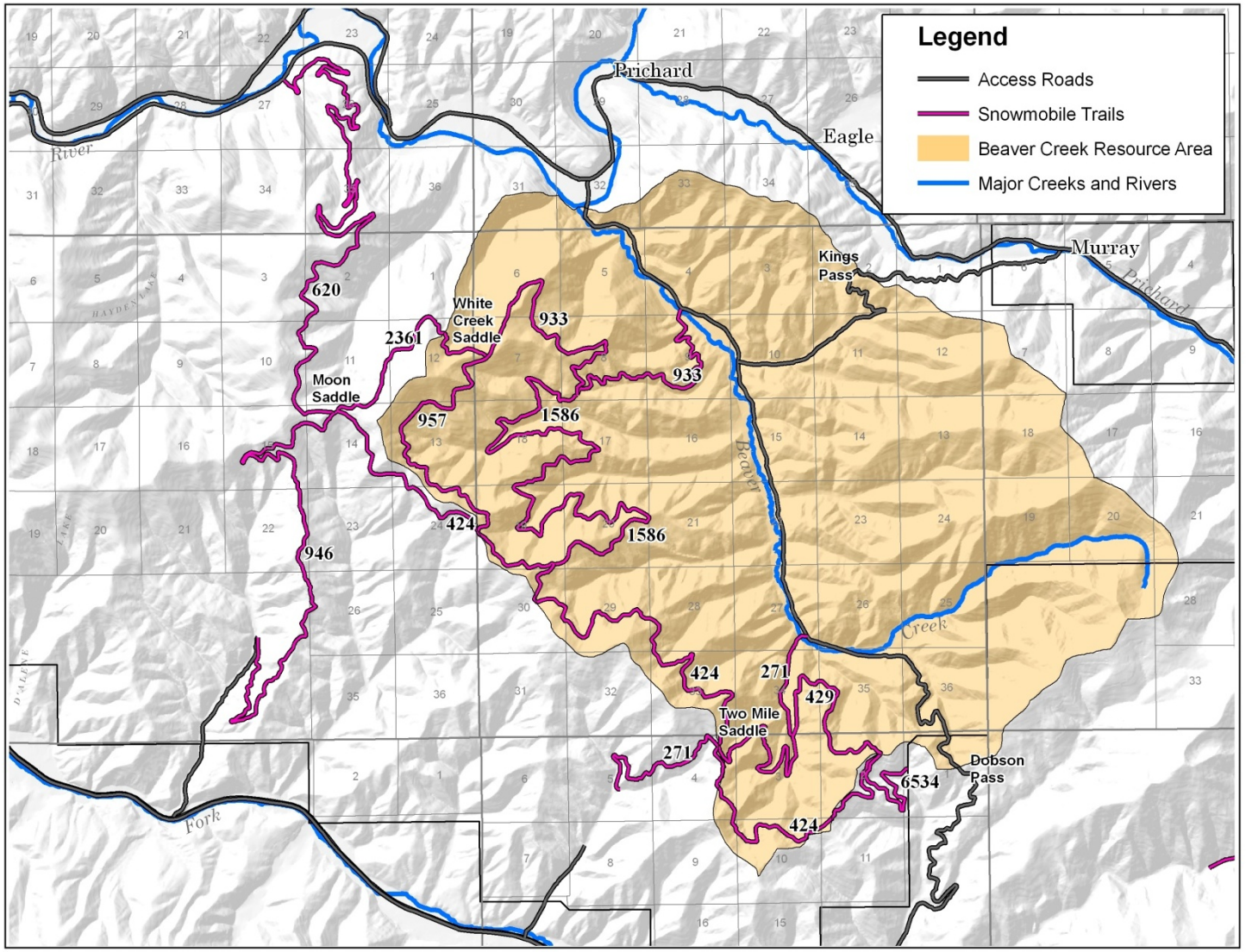


Figure 53. Groomed Snowmobile Trails in or near the Beaver Creek Resource Area.

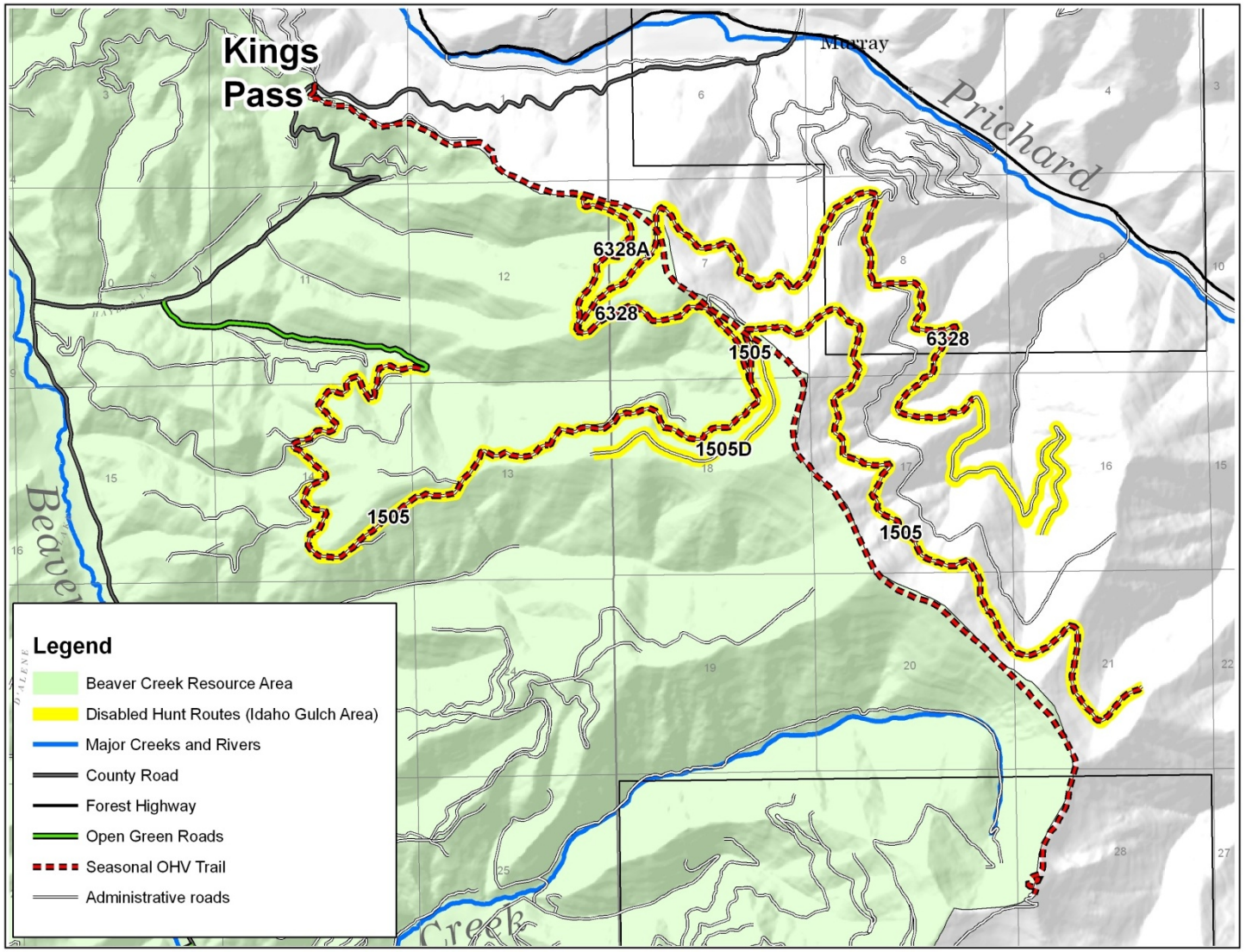


Figure 54. Disabled Hunting Program Route in Potosi Gulch.

3.8.3. Management Framework

Guidance for recreation managers on the Idaho Panhandle National Forest is provided through the Forest Plan which identifies specific goals, objectives and standards related to a variety of recreation opportunities and settings (Forest Plan, pages II-1 and II-3). The following Forest Plan standards (PF Doc. CR-002, Section E. II-24) are applicable to the Beaver Creek Resource Area:

1. The Forest Service shall continue to provide a share of recreation opportunities and diversity in relation to other public and private entities.
2. Consult with recreational users and other recreational suppliers to coordinate public needs.
3. Provide a broad spectrum of dispersed and developed recreation opportunities in accord with identified needs and demands.
4. Trailhead facilities in dispersed areas will be minor and limited to resource protection
5. Trails will be managed in accordance with management area requirements as identified in a more site-specific analysis of needs.

The Forest Plan designates National Forest System lands according to Management Areas (MA). MA's are described in terms of their distinctive resource values and characteristics. Recreation, along with wildlife, fish, range, timber, water, soil, facilities and protection, are resource elements within the MA's to be managed according to the Standards established by the Forest Plan. For recreation, these Standards are defined within the framework of seven categories or "settings" under the Recreation Opportunity Spectrum. The Beaver Creek Resource Area occupies portions of MAs 1, 4, 6 and 9, all of which include the settings of either "*Roaded Modified*," "*Roaded Natural*," or "*Semi-Primitive.*" In brief, the primary goals of these MA's and their ROS settings are:

- MA-1: long term growth and production of commercially viable timber (in a *Roaded Natural* or *Roaded Modified* setting)
- MA-4: management of big game winter range (in a *Roaded Natural* or *Roaded Modified* setting)
- MA-6: provide high quality elk summer habitat and production of wood products (in a *Roaded Natural* or *Semi-Primitive* setting)
- MA-9: manage to maintain a protect existing improvements and resource productive potential with minimum investments (in a *Roaded Natural* or *Semi-Primitive* setting)

Following is a synopsis of the definitions for applicable ROS settings in the Beaver Creek Resource Area (Management Areas 1, 4, 6 & 9):

- **Roaded Modified Setting:** Recreation management for this setting can allow a substantially-modified environment with easy access but must also assure some self-reliance and an opportunity for the user to get away from the comforts of an urban environment. Other than gated roads, there are few site controls. Roads, landings, slash and debris may be strongly dominant from within but must remain subordinate from distant and sensitive roads.
- **Roaded Natural Setting:** Under this category, recreation management is responsible for assuring a natural appearing setting, with moderate sights and sounds of human

activities and structures. The overall perception needs to be one of naturalness. Evidence of human activities can vary in the Roaded Natural setting. Roads and motorized equipment and vehicles are common in this setting. Density of use is moderate except at specific developed sites, and regulations on user behaviors are generally less evident than in higher classes of the Recreation Opportunity Spectrum.

- **The Semi-Primitive Motorized Setting:** The size of this setting typically exceeds 2,500 acres and is characterized predominantly by a natural appearing environment. It is an essentially unroaded block where motorized use may be permitted. Vegetative alterations are small in number and size, are widely dispersed and visually subordinate.

3.8.4. Environmental Consequences

3.8.4.1. Methodology

Effects to Recreation Opportunity Spectrum settings appropriate for any given project or analysis area are considered under the guidelines and framework described above. Recreation managers compare these guidelines to the conditions of the landscape both before and after project activities. Any changes to the mode of access, degree of remoteness, the number and type of other recreationists met along travel ways or camped within sight or sound of others, the level of facility development, impacts to visitor use, as well as the degree of naturalness that might affect psychological outcomes associated with enjoying nature (sense of place) must remain within the appropriate Recreation Opportunity Spectrum setting once activities are complete.

Effects that might lead to increased and/or decreased recreational use are determined by recreation managers through careful scrutiny of proposed activities in relation to the existing recreational opportunities. Considerations are given to the timing and location of activities, compromises to public safety, alterations of habitat, potential damage to recreational improvements, physical inconveniences such as noise or smoke, and alterations to lengths and/or locations of access routes.

Determination of the existing conditions for recreation activities, facilities and opportunities are derived from facility inventories, facility maintenance work, observation by recreation specialists and/or technical personnel and contact with recreation user groups and individuals. Guidance for the management of recreation resources is provided in various Forest Service manuals and handbooks, as well as professional publications and documents.

3.8.4.2. Geographic Scale of the Analysis

The geographic scale for effects to recreation in the Beaver Creek Resource Area encompasses all of the contiguous National Forest System lands in Shoshone County, north to south from Forest Highway 9 to Dobson Pass via Forest Road 424, and east to west from OHV Trail 6328 to Forest Road 424 at Moon Pass. The temporal scale of effects ranges from 1 season to 100 years. A one season effect might be to the temporary restriction of a road used for OHV riding while a 100 year effect might be to changes of landscape and vegetation that does not readily, if ever, recover.

3.8.4.3. Alternative 1 (No Action)

3.8.4.3.1. Direct and Indirect Effects

No activities are proposed under the No-Action Alternative, therefore there would be no direct or indirect effects to the current forms of recreation from this alternative.

3.8.4.3.2. Cumulative Effects

Since there are no direct or indirect effects to recreation under this alternative, there would be no cumulative effects.

3.8.4.4. Alternatives 2 and 3

3.8.4.4.1. Direct and Indirect Effects Common to Both Action Alternatives

Neither Alternatives 2 nor 3 propose a change to the Motor Vehicle Use Map, however both alternatives propose harvest and burn units along Routes 271, 424, 429, 957, 1505, 2322, 2361, 933, 1586, 151, 1505, 6003, 6328 and 6328A. These routes are designated as OHV Trails, snowmobile trails and, in the case of Route 1505, the Disabled Hunting Area.

Effects from haul, snowplowing, full sized vehicle travel and operations in general would be the same from both alternatives and so they are analyzed together. The duration of the effects could be somewhat less for Alternative 3, since there is less volume to be harvested and hauled, but the reduced effect is not enough to be analyzed separately.

Designated OHV Routes

Proposed burning and harvest activities would affect the 40.7 miles of OHV trails made up from routes 151, 1505, 6003, 6328, 6328A, 933 and 1586. All are proposed for timber haul under either action alternative.

Because of the Motor Vehicle Use Map restrictions on routes 151, 1505, 6003, 6328, 6328A, 1586, and the portion of 933 from White Creek Saddle to the 1586 junction, users have become accustomed to operating on these “trails” without encountering full-sized vehicles. OHV operators who assume the route is closed to full-sized vehicles could be unpleasantly surprised as they speed left of center around a blind curve only to meet one unexpectedly. Requiring caution signs and other forms of public notice coupled with haul restrictions on weekends and summer holidays will help to address this concern. Public safety (through signing and haul restrictions) is addressed in the Design Features listed in Appendix E.

All routes except portions of 151 were originally excavated as logging roads with road prisms of 12 feet. To accommodate timber haul there would be brushing, grading and culvert upgrades but no change to the current Roaded Natural and Roaded Modified Recreation Opportunity Spectrum settings. Recreational users may be impacted on any given day from noise, equipment, vehicles, signs, workers, and other aspects of project activities, but operations would end, vegetation would soon grow back, and the recreational users “*Sense of Place*” would return to what it is now. Effects from harvest may linger the first few years but would soon fall into the background as it has always done.

Except for portions of 151, these routes were originally constructed as logging roads and are able to accommodate full-sized vehicles. They are separated east and west within the resource area by Beaver Creek (see Figure 52). All are restricted from motorized use each year between September 8 and March 31 and allow only motorized vehicles less than 50 inches from April 1 to September 7.

On the east side of Beaver Creek, routes 151, 1505, 6003, 6328 and 6328A are connected forming a system with loops (Figure 55). On the west side, routes 933 and 1586 join to form a lineal trail that connects routes 957 at White Creek Saddle with route 2361 at Route 424 near Two Mile Saddle (Figure 56). Table 95 summarizes the separation.

Table 95. Summary of the two separate OHV trail systems within Beaver Creek Resource Area

Area	Routes	Miles	Comments
East of Beaver Creek (Kings Pass – Potosi Gulch)	151 6003 1505 6328 6328A	24.1	Except route 151, all routes are 12-foot road prisms. Route 1505 is used for the Disabled Hunt. Portions of Routes 1505 and 6328 (totaling 8.3 miles) are outside of the resource area boundary. Two trailheads (Potosi Gulch and Kings Pass) are both gated.
West of Beaver Creek (Jack Ass Ridge)	933 1586	16.6	Both routes are gated at the trailhead and are 12-foot road prisms.

Kings Pass-Potosi Gulch (Eastside) OHV Trails: If operations occur on both sides simultaneously (Potosi Gulch Road 1505 and Kings Pass Road 6003) all 24.1 miles of OHV trail in this area would be impacted (see Figure 55).

Operations along route 1505 must channel through the gate located in Potosi gulch. The operations along this route would effectively disturb 3.5 miles to Unit 68 (15% of the 24.1 OHV miles in this area).

Timber from Unit 77 would haul out either Kings Pass or Potosi Gulch. If it goes out Kings Pass then once it and Unit 57 are completed, 20.6 miles or 85% of OHV trail could be accessed from Kings Pass undisturbed from harvest activities.

Burning activities would also allow full-sized vehicles on these OHV routes. With access from both entries likely during the burning operations, it is safe to conclude that all 24.1 miles of OHV trail in the Kings Pass – Potosi Gulch section of the Beaver Creek Project would be affected by its operations throughout the duration of the project.

Jackass Ridge (Westside) OHV Trails: Route 1586 and the upper portion of route 933 serve as one contiguous OHV route totaling 16.6 miles (Figure 58). Units located along the southern portion of this area along route 1586 are expected to haul using route 424 through Dobson Pass, while the units to the north on 933 and the upper end of route 1586 are planned to haul using route 933 down Scott Creek. OHV riding typically takes in several miles during the course of a day. Loops in this area are made using the entire distance of lineal trail 1586 and 933 to connect with routes 424, 933, 957 or 2361 all roads that are open to full sized vehicles. Thus, any Beaver Creek operation along routes 1586 or 933, be it north or south, will affect the entire 16.6 mile OHV route.

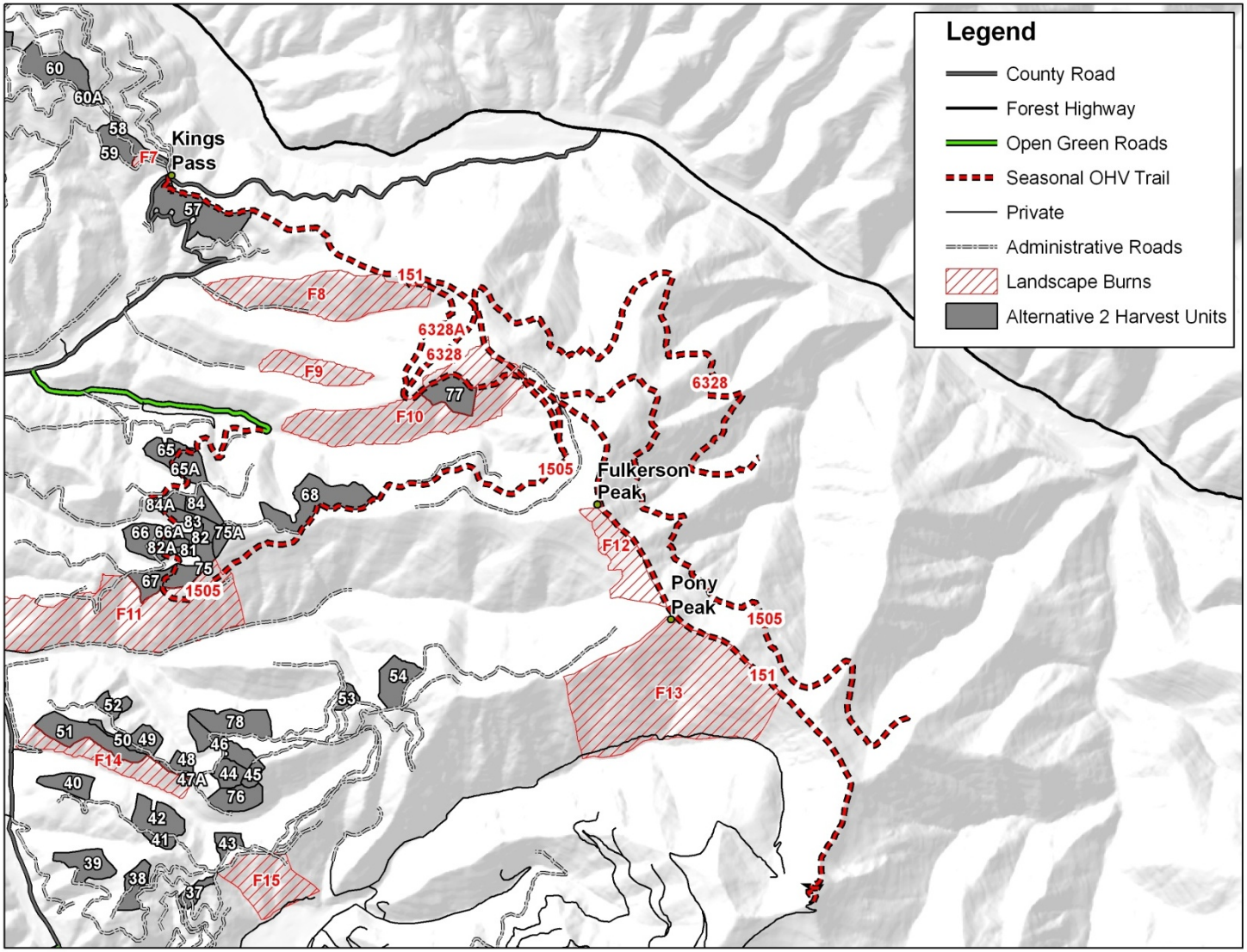


Figure 55. Kings Pass/Potosi Gulch (Eastside) OHV Trails.

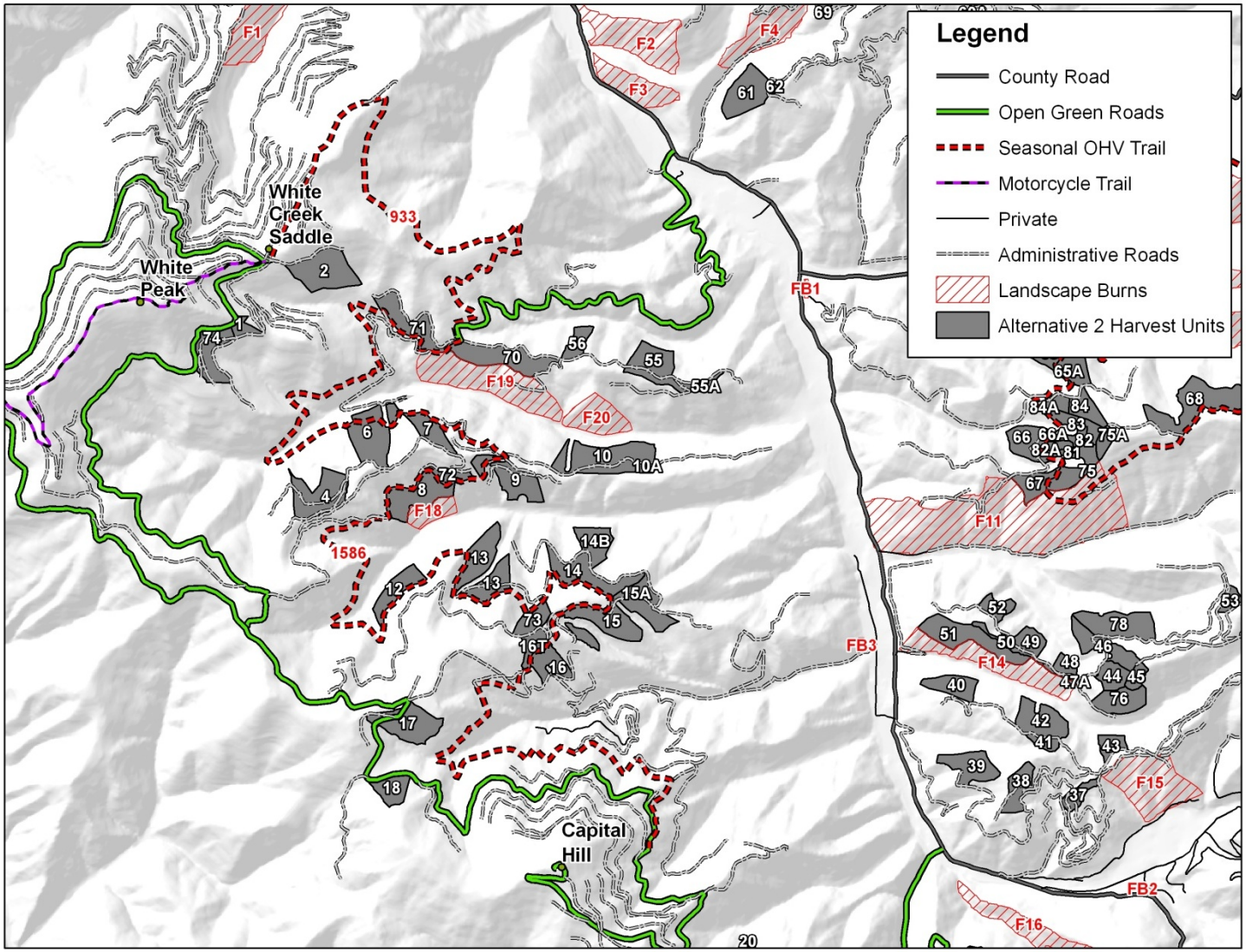


Figure 56. Jackass Ridge (Westside) OHV Trails.

Snowmobile Routes

Routes 271, 424, 429, 620, 933, 946, 957, 1586, and 2361 connect, creating almost 65 miles of groomed snowmobile trail loops in the area known locally as "Jackass Ridge." Due to proposed harvest activities, routes 271, 424, 429, 933, 957, 1586, and 2361 are subject to snowplowing. To provide for public safety, Idaho Statute 677109 prohibits snowmobiles from operating on plowed roads, thus plowing any portion of the Jackass Ridge road system would impact snowmobile recreation for that area (Figure 57).

Snow plowing for timber haul down Scott Gulch Road 933 would eliminate as many as 23 miles (35%) of the snowmobile trail system for the season while snow plowing on Road 424 to Dobson Pass would eliminate 33% or 21 miles. Should both sides be snowplowing at the same time, a total of 44 miles (68%) of the 65-mile system could be unusable by snowmobilers.

The 21-mile connection between two trailheads leading into this system (Cinnabar Creek Road 620 and Montgomery Gulch Road 946) would not be affected by snowplowing.

As noted earlier, these routes are not always groomed as several more popular snowmobile areas in Shoshone County (such as Steamboat and Lookout Pass) demand greater attention of the grooming program during winter operations. Attempts are made to groom the Jackass system at least one to two times each winter but some winters have passed when no grooming occurred. It remains a popular area for local snowmobile enthusiasts however, and even without grooming they can be seen along these routes "powdering" through the snow.

These potential effects have been discussed with the Shoshone County Grooming Board and they are agreeable to winter plowing of these routes. Effects to the program could be reduced if plowing were only allowed through either Scott Gulch Road 933 or Dobson Pass Road 424, but not both at the same time. Snowplowing restrictions are addressed in the Design Features listed in Appendix E.

Disabled Hunt Program

As stated earlier, OHV route 1505 is closed to motorized travel each year from September 7 through April 1, and is dedicated by the District to the Disabled Hunting Program from October 10–31. Any type of operations from the Beaver Creek project during this time would be incompatible (Figure 58). Effects to the Disabled Hunting program can be reduced by the Design Features listed in Appendix E. There will be no long term effects from proposed activities.

3.8.4.4.2. Cumulative Effects Common to Both Action Alternatives

Effects to recreation from the Beaver Creek Project are expected to be short term. There are no foreseeable activities or past activities that have added toward a cumulative effect to recreation in this area. There would be no cumulative effects to recreation from the Beaver Creek Project.

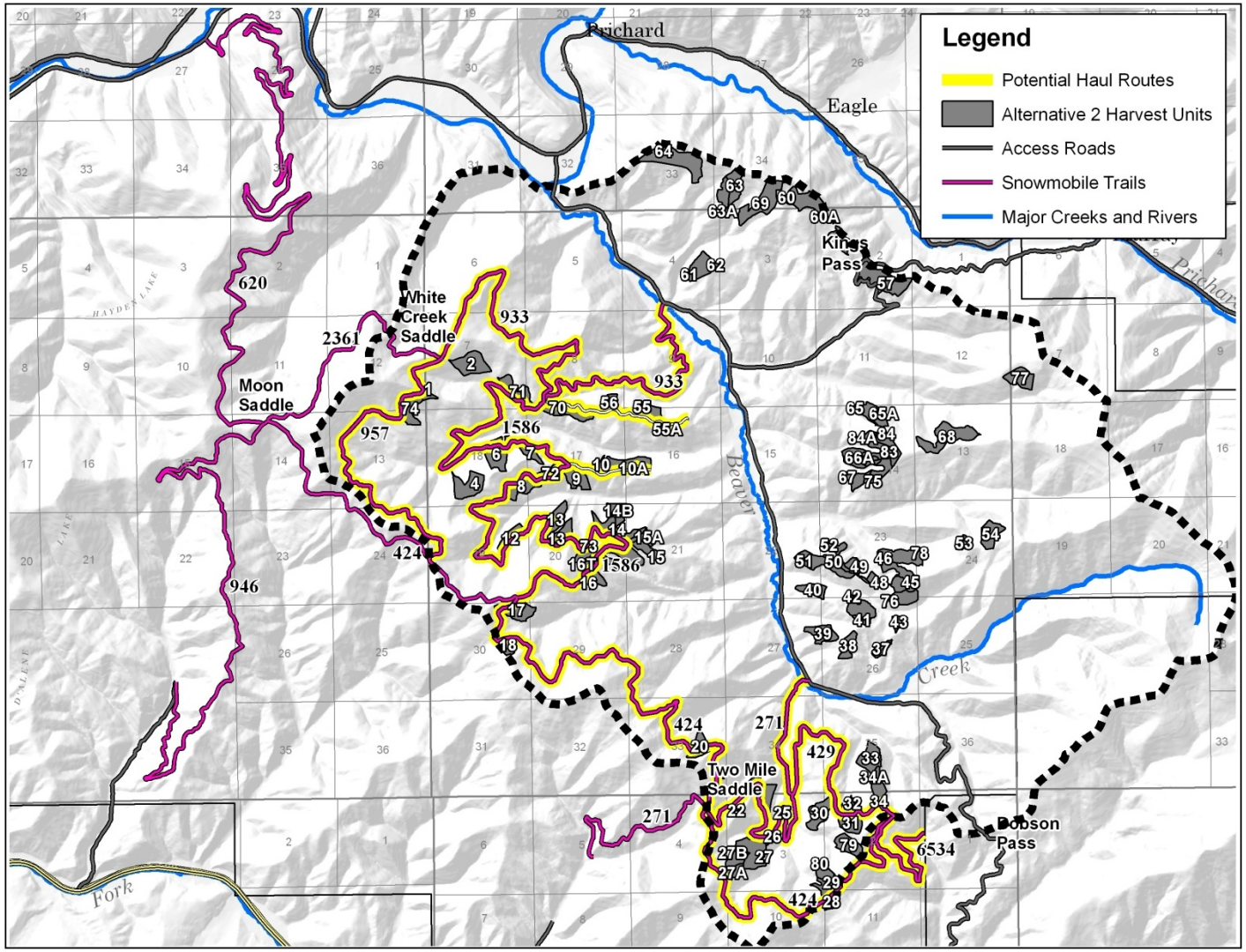


Figure 57. Groomed snowmobile routes and timber haul routes in the Beaver Creek Resource Area; (routes highlighted in yellow indicate potential plowing on a snowmobile trail).

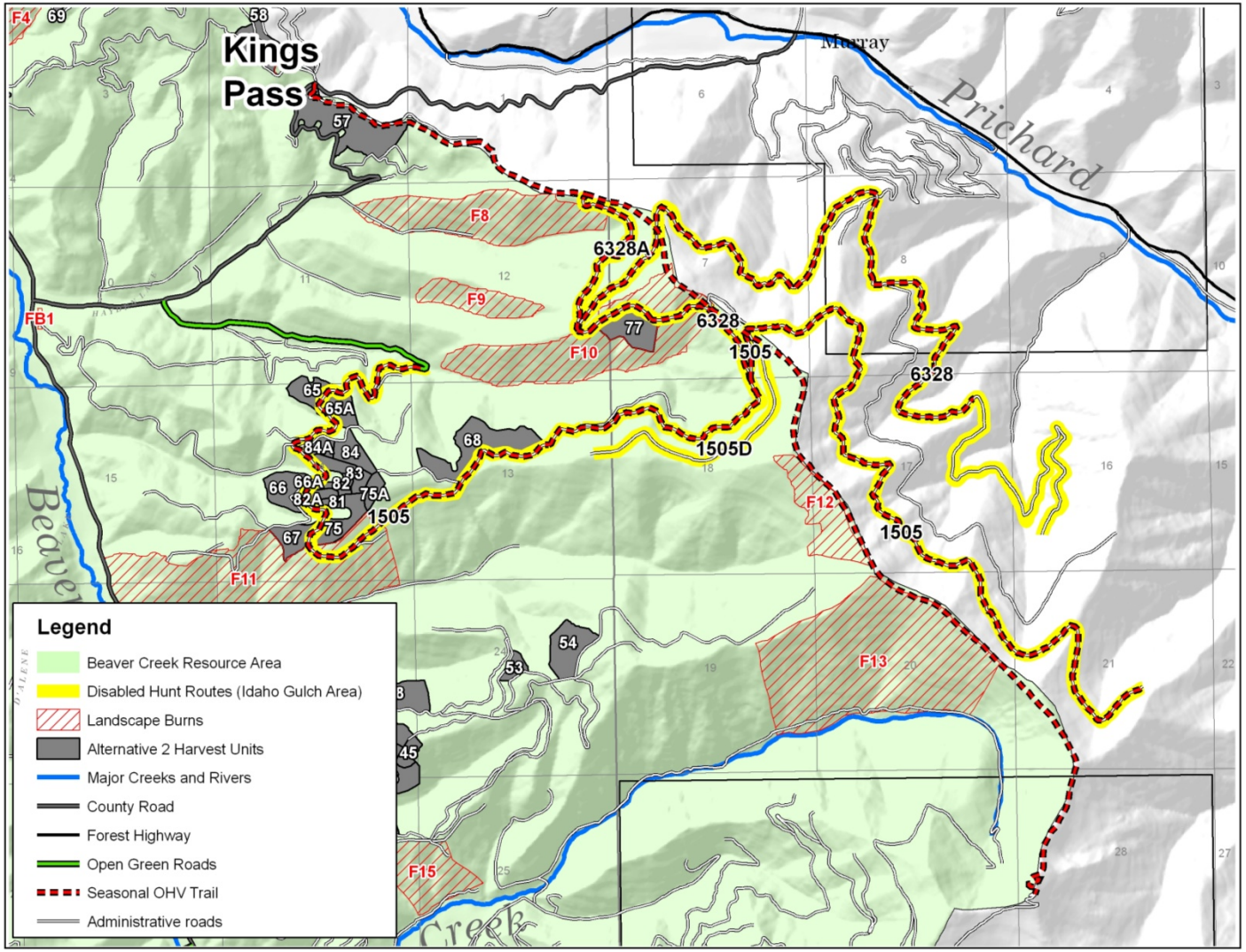


Figure 58. Potosi Gulch disabled hunting routes in relation to proposed harvest units.

3.8.4.4.3. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Forest Plan identifies specific goals and objectives related to providing a variety of recreation opportunities and settings (Forest Plan, pages II-1 and II-3). The following standards apply to recreation management in the Beaver Creek Resource Area.

1. The Forest will continue to provide a share of recreation opportunities and diversity in relation to other public and private entities; recreation planning and operations will be coordinated with other federal, state, local and private recreational managers.

All alternatives would continue to provide a diversity of recreation opportunities. Coordination with other recreation managers is done on an ongoing basis throughout the Coeur d'Alene River Ranger District. Based on this information, all alternatives would meet this standard.

2. Forest Service recreational programs will be complementary with other public and private programs where possible.

Recreational programs on the Coeur d'Alene River Ranger District are complementary with other recreational programs provided by county, state, and private facilities. The activities proposed under the action alternative would not change this situation; therefore all alternatives would meet this standard.

3. Consult with recreational users and other recreational suppliers to coordinate public needs.

Consultation occurs with recreational organizations on an ongoing basis, and with the recreating public at large through project scoping. Recreation needs in the Beaver Creek Resource Area have been considered and would be provided under all alternatives. Based on this information, all alternatives would meet this standard.

4. Provide a broad spectrum of dispersed and developed recreation opportunities in accord with identified needs and demands. Enhance user experience by on and off-site interpretation.

Broad spectrums of dispersed opportunities are provided in the Project Area. There are no developed recreation sites other than the logging roads that have been turned into OHV and snowmobile trails. Under all Alternatives these opportunities will continue throughout the Beaver Creek Resource Area.

5. Trailhead facilities in dispersed areas will be minor and limited to resource protection. Off-site interpretation is encouraged.

At this time, no expansion of trailheads in the area is warranted. All alternatives would be consistent with this standard.

6. Trails will be managed in accordance with management area requirements as identified in a more site-specific analysis of needs.

All alternatives would meet this standard for trails.

3.8.5. Recreation References

USDA Forest Service. 1987. Forest Plan, Idaho Panhandle National Forests, Northern Region. pp. II-3, III -2, 17-18, 28 and 39. PF DOC. CR-002.

USDA Forest Service. 1986. ROS Users Guide. PF Doc. REC-R01

USDA Forest Service, 2008. Coeur d'Alene River Ranger District Travel Plan Project Environmental Assessment; April 2008. PF Doc. REC-R02

USDA Forest Service, 2009. Coeur d'Alene River Ranger District Travel Plan Project Decision Notice; April 2009. PF Doc. REC-R02

USDA Forest Service 2013. Motor Vehicle Use Map for the Coeur d'Alene River Ranger District. PF Doc. REC-R02

3.9. Visuals

3.9.1. Introduction

The Beaver Creek Resource area is located south of Forest Highway 9 between Babin's Junction and Murray, Idaho. Within the 28,200-acre Beaver Creek resource area management activities are proposed to improve water quality and aquatic habitats, develop resilient forest conditions, and reduce hazardous fuels. The Proposed Action utilizes vegetation management, fuel management and watershed improvements to respond to these needs.

3.9.1.1. Overview of Issues Addressed

The analysis considers the character and appearance of the surrounding natural (and modified) landscape, and the visual quality objectives (VQOs) of areas proposed for treatments as assigned under the current Forest Plan. Visual quality objectives are a desired level of scenic quality and diversity of natural features based on physiological and sociological characteristics of an area, and refers to the degree of acceptable alterations of the. Management activities such as commercial timber harvest, prescribed burning, and road construction can alter the scenic character of the landscape. There is a potential concern that activities proposed under the action alternatives could adversely affect visual resources to the extent that the visual quality objectives established by the current Forest Plan (1987; PF Doc. CR-002) would not be met.

3.9.1.2. Issue Indicators

Effects to the visual resource will be discussed in general terms; however, the indicator used to measure effects will be whether or not visual quality objectives are achieved. Visual quality Objectives are listed below, along with a brief description of each objective level.

- Preservation: In general, human activities are not detectable to the visitor.
- Retention: Human activities are not evident to the casual Forest visitor.
- Partial Retention: Human activities may be evident, but must remain subordinate to the character of the landscape.
- Modification: Human activities may dominate the characteristic of the landscape but must, at the same time, utilize naturally established form, line, color, and texture.

3.9.2. Affected Environment or Existing Conditions

The Beaver Creek Resource Area forms a background to the rural corridor that lies adjacent to Forest Road 456. The scenic quality of the Resource Area is highly influenced by private lands that form the foreground (approximately one-quarter to one-half mile) from this forest road. The private lands have been slightly modified from natural conditions and have the appearance of an agrarian community.

Figure 59. View of Beaver Creek Resource Area from Forest Road 456 near Dobson Pass.

The Beaver Creek Resource Area is also visible in the background view from locations identified in the Idaho Panhandle National Forest Plan as having a high to average sensitivity and concern for the scenic quality of the area. The Forest Plan has designated U.S. Interstate Highway 90 (I-90) and Forest Highway 9 as corridors of scenic concern (see Table 96). For the lands that can be observed from the points of high visual sensitivity (levels 1 and 2) the Forest Plan assigned visual quality objectives of retention and partial retention. Portions of the resource area not observable from key viewpoints have a visual quality objective of modification or maximum modification. Also within the resource area are several miles of motorized trails. These trails have not been identified in the forest plan as having a high visual sensitivity, but do act as popular summer recreation activity areas.

The Beaver Creek Resource Area is made up of many side drainages and ridgelines that all drain into Beaver Creek. Full observation of the resource area is largely blocked by terrain that interrupts the view. The foreground visual range is limited to slopes adjacent to roads. Much of the Beaver Creek Resource Area is only visible in the middle ground (generally extending from the foreground up to 3 to 5 miles) and background when viewed from most sensitive viewpoints although Forest Road 456.

Due to steep topography in the northern and southern portions of the analysis area, there are limited views of the resource area from any critical viewpoints along I-90 or Forest Highway 9.

Visitors to the Resource Area will notice that the land has received past timber harvest and related road development. When the view changes, it may be readily noticed. It may take some time for residents and other observers to become accustomed to the changes on the landscape.

3.9.2.1. Past Management Activities

The private lands in the foreground have been modified slightly from the natural condition through home construction and vegetative manipulation for agrarian use. Around the turn of the 20th century approximately 85% of the area was affected by wildfire. Within the resource area there has been timber harvest and other management activities since the early 1900's. Most of the earlier activity no longer appears as openings on the landscape, but approximately 8,000 acres of harvest completed since the 1960s still appears as openings. These are in varying stages of regeneration ranging from almost closed canopy to recently harvested openings (see Figure 60).

Figure 60. Google Earth image of Beaver Creek Resource Area showing past harvest units.

Figure 61. Harvest area adjacent to Road 605 near Kings Pass.

Roads were created in order to access these areas of timber harvest. These roads provided greater access within the resource, but also changed the scenic quality of the landscape. From the late 1970's to the early 1990's regeneration harvests (clearcut, shelterwood and seed tree cuts) were the predominant means of timber removal, though sanitation and salvage continued during this period as well. New roads were also created in association with these activities. These activities created grouped scatterings of angular openings, most of which were approximately 30 to 40 acres in size. Many of these past activities fall within areas assigned objectives of *partial retention* and *modification*.

Figure 62. Evidence of insect and disease activity is found throughout the analysis area.

3.9.2.2. Current Conditions

Visual quality objectives for the majority of the resource area are *Modification* and *Maximum Modification*. The foreground viewing zone from I-90 and Forest Highway 9 have an objective of Retention and the foreground viewing zone from Forest Road 456 is Partial Retention, but none of the activities occur within these viewing zones. The visual landscape within the Beaver Creek visual resource area is primarily classified as common (Class B). Slopes are moderately dissected or rolling. The vegetation cover is generally continuous with interspersed patterns, some natural, some created from past management activity as discussed above. Many of the past regeneration harvest openings are still visible in contrast to adjacent stands when viewed from key viewpoints due to differences in shape and texture; and in some areas these openings tend to dominate other features and patterns of the surrounding landscape. Terrain greatly limits full observation into the proposed treatment units within the resource area and gives it a fairly high capacity for visual absorption of management activities. Many areas of the drainage show areas of insect and disease activity.

3.9.3. Management Framework

General direction for scenery management is provided Forest Service Manual 2380 (Landscape Management). Specific visual resource management direction is provided by the Forest Plan (PF Doc. CR-002) and is described in terms of Visual Quality Objectives (VQO). Forest Plan visual quality objective standards and guidelines were based on the Visual Management System described in Agriculture Handbook Number 462, National Forest Landscape Management, Volume 2 (PF Doc. VIS-R02). The visual management system was revised in 1995, and is now known as the Scenery Management System. The revised guidelines are provided in Agricultural Handbook 701, Landscape Aesthetics: A Handbook for Scenery Management (USDA Forest Service, 1995; PF Doc. VIS-R01).

Visual quality objectives provide measurable standards for scenery management in conjunction with demands for goods and services from the forest. Visual resource management is integral to all management areas and implied in all management goals. The Forest Plan standards relevant to the Beaver Creek visual resources are:

1. Meet adopted visual quality objectives. Exceptions occur in unusual situations: these will be identified through the project planning process involving an interdisciplinary team…Mitigation measures should be developed for areas when visual quality objectives are not met.
2. The visual resource has been evaluated based on visual sensitivity levels assigned to travel routes, use areas and water bodies in and adjacent to the Idaho Panhandle National Forests. Adjustments in the visual quality objective boundaries based on project level analysis will conform to principles in FSM 2380.

3.9.3.1. Geographic Scale of the Analysis

The geographic scope of the scenery analysis for the Beaver Creek Resource Area includes landscapes visible from key locations both within and outside the project area boundary. Key visual points bounding the visual resource area include I-90 to the south; Forest Highway 9 to the north and west and Forest Road 456 that bisects the analysis area. Table 1 lists key travel ways and their sensitivity levels identified in the IPNF 1987 Forest plan that are relevant to the Beaver Creek visual resource analysis (PF Doc. CR-002, p. D-1). The direct and indirect effects analysis focuses on the viewshed within which the proposed activities that occur can be seen from these travel ways, and the extent proposed treatment units affect the Visual Quality Objectives assigned to that piece of ground. The cumulative effects area is similar to that for the direct and indirect effects, except that it takes into account the whole viewshed, as opposed to focusing on the individual units and surrounding area. The temporal scope of the analysis is limited to the 25 to 30 years following harvest activities – the length of time openings created by regeneration harvest are likely to be evident.

Table 96. Sensitive level and visual quality objective for viewpoints/viewing corridors in the Beaver Creek Resource Area.

View Point or Viewing Corridor	Sensitivity Level	Foreground (0 – ¼ mi.)	Middleground (¼ mi. – 3 mi.)	Background (3 mi. – 5+ mi.)
Interstate 90 (I-90)	1	Retention	Part. Retention	Part. Retention
Forest Highway 9	1	Retention	Part. Retention	Part. Retention
Forest Road 456	2	Partial Retention	Modification	Maximum Mod.
Motorized Trails	3	Maximum Mod	Maximum Mod	Maximum Mod

3.9.4. Environmental Consequences

3.9.4.1. Methodology

Although the Visual Management System (PF Doc. VIS-R02) has been replaced by the Scenery Management System (PF Doc. VIS-R01), this analysis uses terminology used in the Forest Plan which was developed and written under the latter. A crosswalk between the two systems is found in Agricultural Handbook 701, Appendix A (PF Doc. VIS-R01). Visual quality objectives are based on the area seen from sensitive viewpoints such as travel corridors, urban areas where the forest background scenery is important and other features where there may be a high visual sensitivity level. These visually sensitive viewpoints are located in the Forest Plan Appendix D

(PF Doc. CR-002). A variety of tools were used in the visual resource analysis including analyzing VQO maps, field visit and visibility modeling.

Using ArcMap 9.3.1 (ESRI Inc, 1999-2009), GIS shapefiles of prescribed burning, harvest units, and new road construction were overlaid on spatially-rectified visual quality objective maps displaying scenic variety class, distance zones and sensitivity levels, and quality objectives (PF Doc VIS-03; VIS-04) across the analysis area. Original visual quality objective maps were prepared for the current Forest Plan (1987) utilizing the process outlined in the Agriculture Handbook Number 462 (1976; PF Doc. VIS-R02). Units were imported into Google Earth to get a sense of existing landscape patterns such as opening size, texture and color compared to the existing topography. Viewpoints were analyzed using both existing photography and Google Earth (Google Inc. 2012) simulations.

Treatment units and their associated visual quality objectives were evaluated in relation to visually sensitive viewpoints identified in the Forest Plan Appendix D (PF Doc. CR-002, p. D-1), to determine the extent to which proposed activities would likely be seen, and the likelihood that those activities would adversely affect visual quality objectives. Areas identified as having visual quality objectives of “retention” were given specific consideration, since these were the most visually sensitive locations within the resource area. Visual quality objective maps prepared under the Forest Plan are very general in nature. Scenic class and sensitivity level can provide a general understanding; however, the maps can’t always illustrate how visible specific treatments would be from locations of concern, or the extent to which treatments are likely to stand out or blend with existing scenic features.

Initial field reconnaissance was done to further assess the visibly of potential treatments in the context of the current landscape. Points on visual quality objective maps with direct line of site to treatment units were identified. Units were observed from these locations, using unit maps and digital representations from Google Earth (Google Inc. 2012). Many of the units are in the background or middle ground when viewed from key viewpoints, and the specific locations of proposed treatments were difficult to discern on the ground due to the variability of the existing terrain and distance from treatment units. To assist in determining unit visibility, the analysis utilized Google Earth Treatment units for each alternative were imported into Google Earth and draped over the landscape. Units were then viewed from ground-level or “street view” at a variety of representative sensitive locations, including: Interstate 90, various residences, Forest Highway 9 and Forest Road 456. This 3-D modeling gives a different perspective on how visible a given area is from a specific geographic location. A limitation of using Google Earth for determining visibility is that near view screening from adjacent trees cannot be taken into consideration; for instance, if you are on a trail or road, the 3-D imaging cannot place you down amongst the trees, where your view might be obscured by trees and other vegetation in the foreground.

After establishing relative sensitivity of affected areas when viewed from key viewpoints, Agricultural Handbooks 462 and 701 were used as references to determine if proposed activities were likely to modify the landscape to the extent that visual quality objectives could not be met.

3.9.4.2. Spatial and Temporal Context for Effects Analysis

The geographic scope of the scenery analysis for the Beaver Creek Project includes areas visible from key locations both within and outside the project area boundary. Key visual points bounding the visual resource area include Interstate 90 to the south, Forest Highway 9 to the north, and Forest Road 456 which bisects the analysis area from northwest to southeast. Table 96 lists all key viewpoints or viewing corridors and their sensitivity levels identified in the Forest Plan that are relevant to the Beaver Creek project scenic quality analysis.

Direct and indirect effects analysis focuses on the viewshed within which the proposed activities can be seen from these viewpoints, and the extent proposed treatment units affect the visual quality objectives assigned to that piece of ground. The cumulative effects area is similar to that for the direct and indirect effects, except that it takes into account the whole viewshed, as opposed to focusing on the individual units and surrounding area. The temporal scope of the analysis is limited to the 25 - 30 years following harvest activities – the length of time openings created by regeneration harvest are likely to be evident.

3.9.4.3. Connected Actions, Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Past Activities – Several harvest units visible within the analysis area are in various stages of regeneration. There are examples of seed tree harvest, commercial thinning, and pre-commercial thinning. The harvest units are evident, but they do not dominate the existing landscape character from the major travelways in the drainage. Therefore the existing visible units meet and in some cases exceed Forest Plan visual quality objective of modification and maximum modification in the middleground and background views. All of the existing visible harvest units within the analysis area should be regenerated to the point they no longer appear as openings within the next 25- 35 years. In addition to timber harvest on Forest Service lands there is also mining, ranching and farming, timber harvest, road building and other development on the private, State and BLM lands within and adjacent to the project area.

Present Activities – There is ongoing development and activities associated with agrarian activities on private land within the analysis area. The Forest Service is currently treating noxious weeds, maintaining roads, and allowing public activities such as dispersed camping and trail use, firewood gathering and completing minor vegetation manipulation for hazard tree removal and utility corridor maintenance.

Foreseeable Activities – Within the next 20 years it is planned to complete under-burning and wildlife improvement activities on 12 acres and 828 acres respectively. It is planned to pre-commercial thin, prune and complete regeneration exams on 6,129 acres. There are also opportunities to complete road and stream improvements within the area. On private land it is expected that mining and harvesting will continue. The activities on Forest Service lands will be minor and all proposed activities should meet or exceed Forest Plan Visual Quality Objectives.

3.9.4.4. Alternative 1 – No Action

3.9.4.4.1. Direct and Indirect Effects of Taking No Action

With no harvest activity planned to occur under Alternative 1 (no-action) there would be no direct or short-term affects to the scenic condition of the area. The openings in forest cover that are visible as a result of past forest management would continue to recover tree growth, and overtime would recover unnatural appearing openings. Processes affecting forest dynamics would continue, including continuing insect and disease related mortality which would appear as individual and groups of dead trees scattered across the landscape. While for some, this may have a negative impact on the scenic quality of the area; these are considered natural processes the Resource area would continue to meet assigned visual quality objectives.

3.9.4.4.2. Cumulative Effects

There would be no change in the scenic quality of the analysis area in Alternative 1 in the short term, but the risk of wildfire would increase with time. The existing openings would continue to

regenerate and within 20 to 35 years would no longer appear as openings. The potential for wildfire would remain. Alternative 1 would not change the landscape character of the geographic area encompassed within the Beaver Creek drainage and its tributaries.

3.9.4.4.3. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

This area currently meets the Forest Plan visual quality objectives of Modification and Maximum Modification in the middle and background viewing zones from all identified viewpoints and viewing corridors. Although there are currently harvest units that appear as openings they do not dominate the existing landscape character of the area.

3.9.4.5. Effects Common to Both Action Alternatives

Commercial Thinning – In both Alternative 2 and 3 the activities outlined for commercial thinning will retain enough canopy cover within those harvest units that there would there have minimal effect on the scenic quality of the analysis area and the activity would meet either Modification in the middleground or Maximum Modification in the background views.

Fuels Treatment – Fuel management activities including both landscape burns and fuel breaks will be apparent, but will appear as a natural process on the landscape. Burning within harvest units will have some visual effect depending on the amount of retention vegetation affected. All burning activities should meet the visual quality objectives for the analysis area.

3.9.4.6. Alternative 2

3.9.4.6.1. Direct and Indirect Effects

This analysis is mainly concerned with the landscape that can be observed from viewpoints identified in the Forest Plan. Proposed activities that are blocked from these viewpoints by terrain are considered to be in compliance with visual quality objectives. Proposed management actions that have concern from a scenic resource standpoint are evaluated for how they conform to naturally occurring features that exist or could be created by natural events. Many of the proposed management features have short term visual effects, but will not have long-term scenic effects.

The Beaver Creek Resource Area is located within the middleground and background viewsheds of Forest Road 456, and within the background viewsheds of I-90 and Forest Highway 9. While some of the analysis area is visible from I-90 and Forest Highway 9, there are no proposed units that are visible from these visually sensitive travel corridors due to steep landforms blocking views of the area. Units that are visible or partially visible from the Forest Road 456, which has a moderate visual sensitivity, include portions of the following seed tree (263-acres) and shelterwood units (917-acres) 17A, 27, 30, 31, 32, 33, 39, 38, 55, 56, 61, 65 and 79. Since these units are observed in the middle and background views from the travel corridor they should meet the visual quality objectives of Modification and Maximum Modification. All other units are unseen from Forest Road 456.

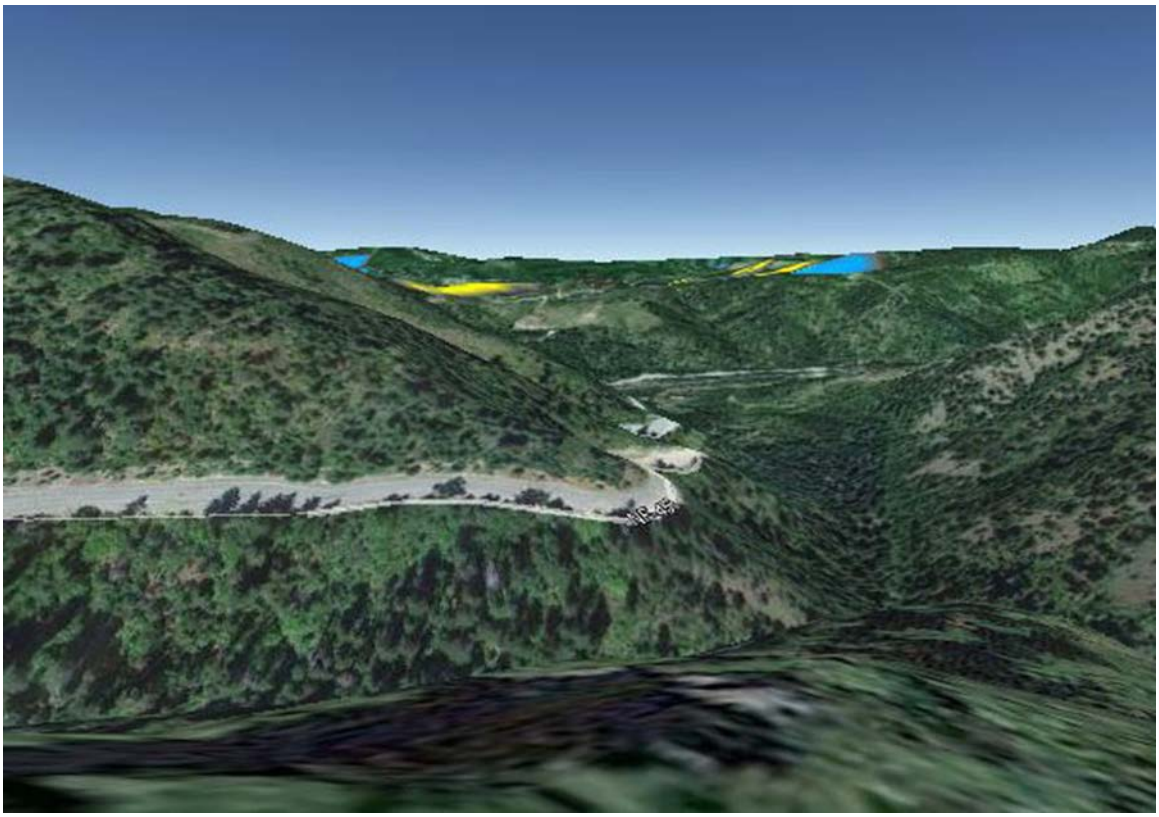


Figure 63. Google Earth simulation of harvest units as viewed from Forest Road 456 near Dobson Pass.

Design measures for edge treatment to naturalize the openings can be developed for these units to reduce the visual impact of the harvest activities to the point that they may exceed the Visual Quality Objectives. Use of edge treatment between new and existing openings could also reduce the visual impact of past harvest units. For many of these units only a small portion of the unit is visible from critical viewpoints so no design measures will be required. Units proposed for Improvement Cuts (493-acres) and Commercial Thinning (300-acres) should meet VQO given the percentage of crown coverage retained.

Transportation System – New permanent road construction is limited occurs mostly along the ridge top areas which would not be visible from critical viewpoints or viewing corridors. Temporary road construction will occur throughout the project area, but these roads will not be used after the project is complete so should not have a long term effect on the visual resource from sensitive travel corridors. The roads will be visible from motorized recreation trails in the areas. Reconstruction, storage, and decommissioning of existing roads would have no visual impacts in the long term.

Watershed Improvements – Culvert replacement and gate installation will not have long-term impacts for the visual resource.

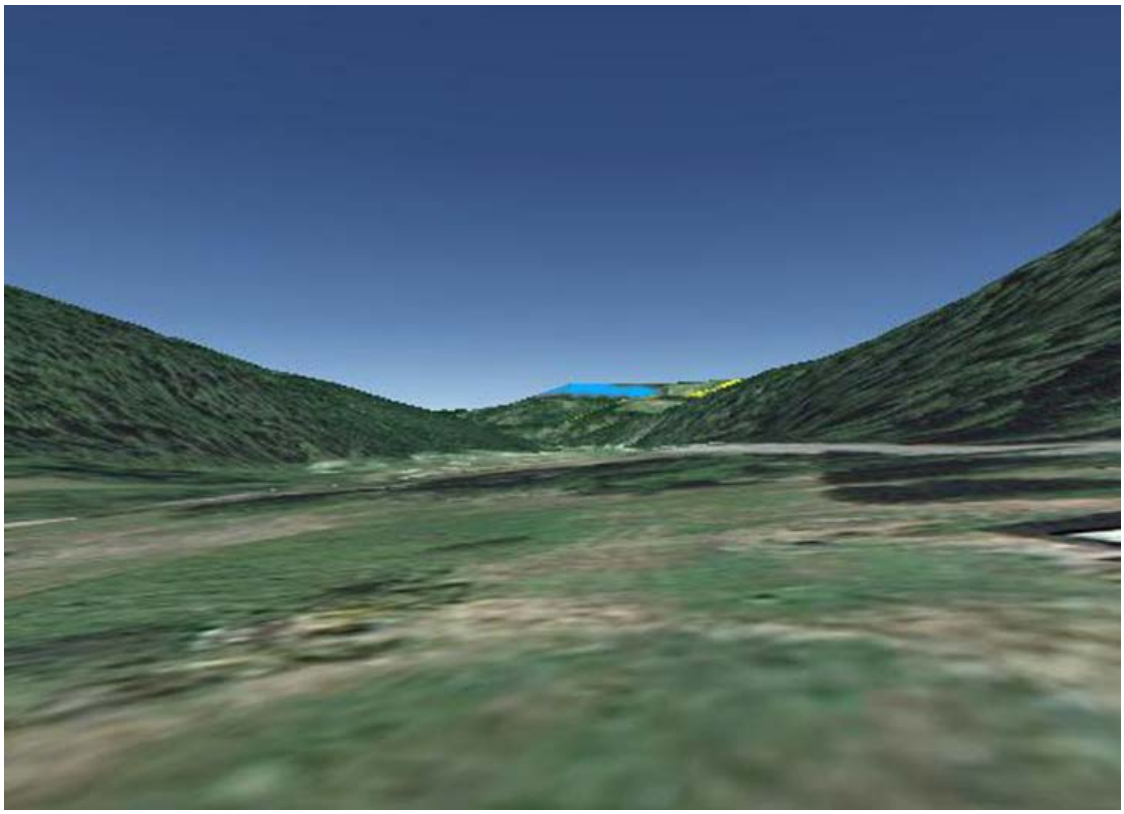


Figure 64. Google Earth Simulation of harvest unit location near residential development near Forest Road 456.

3.9.4.6.2. Cumulative Effects

Currently several past harvest units are visible in the northern and central portions of the analysis area and are viewed from Forest Road 456 in the middle and background viewing areas. The units currently visible are in a variety of age classes from almost regenerated to recently harvested. These areas could take from 10 to 35 years to completely regenerate. Additional openings in this proposal will be visible, but still will meet the VQO of Modification and Maximum Modification for the analysis area. This proposal will not significantly impact the condition of the viewshed within the analysis area. Currently the proposed harvest may reduce the visual impact of some units due to feathering of unit edges. There will be more openings visible within the analysis area, but these opening would emulate natural fire patterns within the middle and background viewsheds. Given the aspect and growing history of the area, the openings created by this proposal would no long appear as openings within 25 to 35 years.

3.9.4.6.3. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

This alternative would meet the visual quality objectives found in the IPNF Forest Plan (PF Doc. CR-002, Appendix D).

3.9.4.7. Alternative 3

3.9.4.7.1. Direct and Indirect Effects

The amounts of harvesting, watershed improvements and road building are reduced in Alternative 3, so the impact on the visual resource will be less than that outlined in Alternative 2. Alternative 3 proposes to harvest approximately 498 acres using shelterwood harvest and 121 acres of seed tree harvest. This will reduce the visual impact of the proposal and this alternative should meet or exceed Forest Plan standards for Visual Quality Objectives in both middle and background viewing zones.

3.9.4.7.2. Cumulative Effects

Cumulative effects for Alternative 3 will be similar to Alternative 2. Visual impacts will be slightly reduced due to a reduction in the number of units proposed in this alternative.

3.9.4.7.3. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

With implementation of the outlined design measures, similar to those in Alternative 2, this alternative would meet the Forest Plan Visual Quality Objectives found in the Scenic Quality section (3.9).

3.9.5. Effects Summary

For Alternatives 2 and 3, the proposed activities will be evident, but will meet the Forest Plan Visual Quality Objectives of Modification and Maximum Modification as observed from Forest Road 456. Activities in both Alternatives will not be visible from more visually sensitive scenic viewpoints found along I-90 and Forest Highway 9. Once the project has been implemented it should be reviewed in the field by the Landscape Architect to determine if it met the Forest Plan Visual Quality Objectives. Of greatest concern will be the visual effects of post-harvest burning on reserve trees within the units. This review will then be documented in the Idaho Panhandle National Forest Monitoring Report.

3.9.6. Visuals References

USDA, Forest Service. 1995. Landscape Aesthetics: A Handbook for Scenery Management. Agric. Handbook. 701. Washington, DC: U.S. Department of Agriculture, Forest Service. 246 p.; PF Doc. VIS-R01

USDA, Forest Service. 1974. National Forest Landscape Management, Volume 2, Chapter: The Visual Management System. Agric. Handb. 462. Washington, DC: U.S. Department of Agriculture, Forest Service. 47 p.; PF Doc. VIS-R02

Cooley, Patrick; Dickerson, Gary; Maffei, Tom; Novak, Lis. 2009. Scenic Resource Mitigation Menu & Design Considerations for Vegetation Treatments. [Unpublished] Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region. 8 p.; PF Doc. VIS-R03

3.10. Financial Analysis

3.10.1. Introduction

The management of natural resources on the Idaho Panhandle National Forest (IPNF) has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visitation to the Forest generate employment and income in the surrounding communities and counties and generate revenues that are returned to the federal treasury or are used to fund additional on the ground activities to accomplish resource management objectives.

This analysis delineates the affected area and outlines methods and results of analyzing the economic effects of the project, including the sale feasibility, project feasibility, financial efficiency, and economic impacts. Sale feasibility, project feasibility and financial efficiency relate to the costs and revenues of doing the action. Economic impacts relate to how the action affects the local economy in the surrounding area.

3.10.1.1. Overview of Issues Addressed

The Economic analysis is completed to determine the costs and revenues associated with the project and the economic impact to the local community. The costs include those related to the amount of timber harvested in each proposal as well as the additional restoration activities to be accomplished as funds become available. The value generated by the sale of the timber is measured against the costs of timber sale activities and other project-related costs. This analysis is done to inform the decision maker of the economic feasibility of each alternative.

3.10.1.2. Issue Indicators

The indicators for this analysis include sale feasibility, project feasibility, financial efficiency, and economic impact. *Sale feasibility* indicates whether or not the timber sale portion of the project is likely to attract bids. *Project feasibility* outlines the anticipated costs and revenues that are part of Forest Service monetary transactions (and used in the financial efficiency analysis). *Financial efficiency* is assessed using Present Net Value (PNV) which takes into account the timing of the activities over the course of the project. Financial efficiency provides information relevant to the future financial position of the Coeur d'Alene River Ranger District's timber program if the project is implemented. The economic impact analysis estimates the potential job and labor income impacts to the local area.

3.10.2. Affected Environment

The combination of small towns and rural settings, larger towns such as Coeur d'Alene, Idaho, and the urban area of Spokane, Washington create a diverse social environment for the geographical region around the Idaho Panhandle National Forest. Local residents pursue a wide variety of life-styles, but many share a common theme, an orientation to the outdoors and natural resources, especially within the smaller communities. This is evident in both vocational and recreational pursuits including employment in logging and milling operations, outfitter and guide businesses, hiking, hunting, fishing, camping and many other recreational activities.

Timber, tourism, and agricultural industries are important to the economy of local areas. Despite the common concern for, and dependence on, natural resources within the local communities, social attitudes vary widely with respect to their management. Local residents hold a broad

spectrum of perspectives and preferences ranging from complete preservation to maximum development and utilization of natural resources.

Socioeconomic measures used to describe the affected environment were obtained from the Headwater Economics' Economic Profile System – Human Dimensions Toolkit (EPS-HDT 2011), which compiles and summarizes primary population and economic data from a variety of government sources into a report. Key measures used in this report include land ownership, population, employment, income, and wildland urban interface development.

Timber management activities within the project area have the potential to impact the economic conditions of local communities and counties. To estimate the potential effect on jobs and income, a zone of influence (or impact area) was delineated. Counties were selected based on commuting data suggesting a functioning economy and where the timber is likely to be processed (log flows). Recent data on log flows from the IPNF was provided by the University of Montana's Bureau of Business and Economic Research. The zone of influence for this project is comprised of Shoshone and Kootenai counties in Idaho.

A comprehensive socio-economic analysis and social assessment was completed during the revision of the forest plan. See the social and economics section of Chapter 2 of the Analysis of the Management Situation for the revised Forest Plan (March 2003; PF. FIN-02) and the Social Assessment for the Idaho Panhandle National Forests (Parker et al, 2002; PF FIN-01) for a description of the employment, income and social composition of the counties comprising the analysis area and the impact on each county from management of the IPNF.

3.10.2.1. Land Ownership

The vast majority of the land in the two-county impact area is managed by various public agencies. Shoshone County has the largest share of Federal public lands with more than 1.2 million acres (76.8 percent) under federal management. By comparison, Kootenai County has 259,232 acres of federal public lands (30.8 percent). Only 28.8 percent of the land area of the United States is publicly owned (figure 1). In Shoshone County, the US Forest Service holds 73 percent of all of the federal lands in the county.

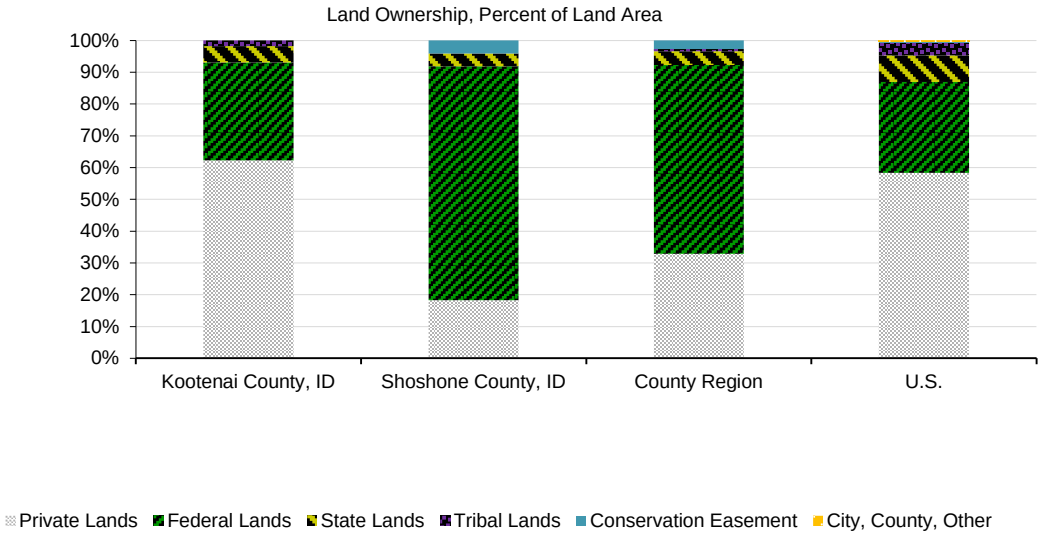


Figure 65. Land Ownership, by percent of land area (source: U.S. Geological Survey, Gap Analysis Program. 2012).

3.10.2.2. Population, Employment, and Income

3.10.2.2.1. Population and Demographics

From 1970 to 2011, the population of the Kootenai - Shoshone County impact area grew 178 percent. However, all of this growth was associated with Kootenai County. Kootenai County's population increased rather steadily during this period while the population of Shoshone County decreased by 36 percent. In the time period 2000-2011 Kootenai County grew 26 percent (28,492 new residents). In this same time period Shoshone County shrunk by 7 percent with an attrition of 922 residents (Figure 66). The majority of the people in both counties are between the age of 45-64, and all residents are overwhelmingly white (96 percent).

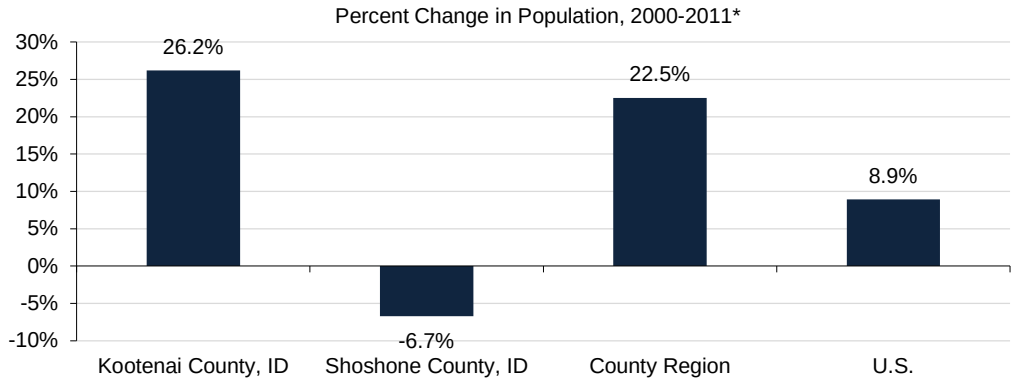


Figure 66. Change in population, 2000-2011 (source: US Department of Commerce 2012).

3.10.2.2.2. Employment and Economic Well Being

Employment in the two-county impact area from 1970 to 2011 increased, but only in Kootenai County (491 percent). Overall employment decreased in Shoshone County by 28 percent. The total number of people involved in wage and salary employment (people who work for someone else) and proprietors (the self-employed) has continued to increase since 1970 in both counties, but this is disproportionally skewed by the large increase in jobs in Kootenai County versus the overall loss of jobs in Shoshone County.

In 2011 the three industry sectors with the largest number of jobs were Retail Trade with 11,729 jobs (up 17 percent since 2001), Government with 11,526 jobs (up 15 percent since 2001), and Health Care and Social Assistance with 7,706 jobs (up 39 percent since 2001). From 2001 to 2011, the three industry sectors that added the most new jobs were Real Estate & Rental & Leasing (2,264 new jobs), Health Care and Social Assistance (2,176 new jobs), and Retail Trade (1,629 new jobs). The biggest losses in jobs from 2001-2011 were in Information (-409 jobs), and Forestry, Fishing and related activities (-184 jobs).

The Headwater Economics' Economic Profile System – Human Dimensions Toolkit (EPS-HDT 2013) describes commodity sectors as industrial sectors that have the potential to use Federal public lands for the extraction of commodities. Commodity sectors include timber, mining (including oil, gas, and coal), and agriculture. In 2010, mining was the largest component of commodity sector employment in Shoshone County, accounting for 17.2 percent of total jobs. However, there was a large difference between the two counties in the impact area in terms of reliance on commodity sectors. In 2010, nearly 20 percent of private employment in Shoshone County was in commodity sectors, while commodity sectors only accounted for 3.5 percent of

Kootenai County's private employment. In comparison, commodity sectors accounted for 2.7 percent of the Nation's jobs.

Currently, the service sector accounts for the majority of jobs created in the U.S. The service sector includes a wide variety of jobs, ranging from lower-wage occupations such as restaurant workers and retail store clerks to high-wage, high skilled occupations such as doctors and software developers. Some service sectors, such as utilities and transportation, are associated with goods-producing sectors. From 1970 to 2000, employment in services in the Kootenai-Shoshone County impact area increased by 16,967 jobs, while employment in non-services increased by 4,884 jobs. From 2001 to 2011, employment in service-related sectors increased by 12,462 jobs, while employment in non-service related sectors increased by only 351 jobs.

In 2011, the unemployment rate in the impact area was 10.6 percent. Shoshone County had the highest unemployment rate (13.7 percent), and Kootenai County had the lowest (10.6 percent), as compared to the national average of 8.9 percent. Since 1990, the annual unemployment rate ranged from a low of 3.4 percent in 2007 to a high of 10.7 percent in 2010.

3.10.2.2.3. Income

Labor income and total personal income are often used as proxies for standard of living. Total personal income is comprised of labor earnings (employee compensation and proprietor income) and non-labor income. From 1970 to 2011, total personal income in Kootenai and Shoshone County grew, by 551 percent for Kootenai County and 4.4 percent for Shoshone County.

Average earnings are often used as an indicator of the quality of local employment, in terms of high-wage jobs. In 2011, average earnings per job in the U.S. were $54,897. In 2011, the average earnings for Shoshone County were $40,647, and for Kootenai County were $37,000, both below the national average. In 2011 mining jobs paid the highest annual average wages ($91,535) and leisure and hospitality jobs paid the lowest ($15,324). Manufacturing, including forest products, paid $39,487.

3.10.2.2.4. Wildland Urban Interface (WUI) Development

As defined in the National Fire Plan, the wildland urban interface includes areas "where structures and other human development meet or intermingle with undeveloped wildland." Other federal documents define the wildland urban interface as areas "where humans and their development meet or intermix with wildland fuel" or "the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel." [Excerpted from Economic Profile System – Human Dimensions Toolkit]. Headwaters Economics, the developers of The Headwater Economics' Economic Profile System – Human Dimensions Toolkit, define the wildland urban interface as private forestlands that are within 500 meters of public forestlands. Land (public or private) was classified as forestland based upon land cover imagery from the National Land Cover Dataset (Vogelmann et al. 2001) using the classifications of evergreen needleleaf forest, evergreen broadleaf forest, deciduous needleleaf forest, deciduous broadleaf forest, mixed forests, and closed shrublands. Further information on how the wildland urban interface area in Economic Profile System – Human Dimensions Toolkit was calculated can be found in the report, "A Profile of Development and the Wildland Urban Interface" found in the project file (PF Doc. FIN-12).

Using this definition, in 2010 Kootenai County had developed 23 percent of its wildland urban interface, whereas Shoshone County had developed 5.3 percent of their wildland urban interface, as compared to the national average of 16.3 percent. Development of homes adjacent to fire prone public lands can present management challenges to land management agencies such as the

Forest Service. As a percent of total number of homes in the County, Shoshone has 44 percent of the county's homes in the wildland urban interface. While Kootenai County has a larger total acreage of the wildland urban interface developed, the total number of homes in the wildland urban interface is only 13.7 percent. For both counties, a little less than 20 percent of the homes built in the wildland urban interface are second homes.

3.10.3. Management Framework

The preparation of NEPA documents is guided by the Council on Environmental Quality (CEQ) regulations for implementing NEPA [40 CFR 1500-1508]. NEPA requires that consequences to the human environment be analyzed and disclosed, based on issues. NEPA does not require a monetary benefit-cost analysis. If an agency prepares an economic efficiency analysis, then one must be prepared and displayed for all alternatives [40 CFR 1502.23]. The preparation of NEPA documents is also guided by CEQ regulations for implementing NEPA [40 CFR 1500-1508].

The development of timber sale programs and individual timber sales is guided by agency direction found in Forest Service Manual (FSM) 2430. Forest Service Handbook (FSH) 2409.18 (PF FIN-03) guides the financial and, if applicable, economic efficiency analysis for timber sale.

Many of the costs and benefits associated with a project are not quantifiable in financial terms. For example, the benefit to wildlife from habitat improvement from a project is not quantifiable in financial terms. These costs and benefits are described qualitatively in the indicated resource sections of this document.

Executive Order 12898, issued in 1994 orders Federal Agencies to identify and address any adverse human health and environmental effects of agency programs that disproportionately impact minority and low-income populations.

The Civil Rights Act of 1964 provides for nondiscrimination in voting, public accommodations, public facilities, public education, federally assisted programs, and equal employment opportunity. Title VI of the Act, Nondiscrimination in Federally Assisted Programs, as amended (42 U.S. C. 2000d through 2000d-6) prohibits discrimination based on race, color, or national origin.

Executive Order 1298, issued in 1994 orders Federal Agencies to identify and address any adverse human health and environmental effects of agency actions that may disproportionately impact minority and low-income populations.

Additionally, the Idaho Panhandle Forest Plan includes the following forest-wide goals and standards related to the effects of a timber sale on community stability:

- Management activities should contribute to local employment, income and lifestyles. (IPNF Forest Plan, II-11, CR-002).
- Participate with local communities in assessing social and economic needs. Manage National Forest lands to help meet community socioeconomic goals consistent with Forest wide management direction (IPNF Forest Plan, page I-2, page II-39; CR-002).

3.10.4. Environmental Consequences

3.10.4.1. Methodology

The economic measures used for this analysis are sale feasibility, project feasibility, financial efficiency, and economic impacts. These measures, including methodologies, are described below.

3.10.4.1.1. Sale Feasibility

Sale feasibility is used to determine if a project is feasible, that is, will it sell, given current market conditions. The determination of feasibility relies on a residual value (stumpage = revenues - costs) feasibility analysis that uses local delivered log prices and stump to mill costs to determine if a project is feasible. The appraised stumpage rate from this analysis is compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The timber portion of the project is considered to be feasible if the appraised stumpage rate exceeds the base rates. If the feasibility analysis indicates that the project is not feasible, the project may need to be modified. Infeasibility indicates an increased risk that the project may not attract bids and may not be implemented.

3.10.4.1.2. Project Feasibility

Project feasibility deals with the issue of whether or not a project is financially feasible. Historically, since many of our projects had a substantial commercial timber component, project feasibility dealt mainly with “sale feasibility”, or the likelihood that the timber would sell. However, since many of our projects today often involve restoration work, which may have a very small commercial timber component or none at all, the notion of feasibility needs to be extended. Project feasibility looks at the feasibility of a project from a budgetary standpoint; that is, how much is the project going to cost, for all of the planned activities. If the project is going to be implemented through a stewardship contract, estimates of potential revenue from timber removals and the costs of mandatory activities provides information on whether or not the value of the timber removed will likely be enough to cover the costs of the mandatory stewardship activities.

3.10.4.1.3. Financial Efficiency

Financial efficiency provides information relevant to the future financial position of the program if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. Present net value combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive present net value indicates that the alternative is financially efficient. Financial efficiency analysis is not intended to be a comprehensive analysis that incorporates monetary expressions of all known market and non-market benefits and costs. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited financial efficiency framework. These non-market benefits and costs associated with the project are discussed throughout the various resource sections of this document. Management of the forest is expected to yield positive benefits, but not necessarily financial benefits.

Costs for restoration activities are based on recent experienced costs and professional estimates. Non-harvest related costs are included in the present net value analysis, but they are not included in appraised timber value.

3.10.4.1.4. Economic Impacts

Economic impacts are used to evaluate potential direct, indirect, and cumulative effects on the economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and between businesses and final consumers. It captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis. The IMPLAN modeling system (MIG 2003) allows the user to build regional economic models of one or more counties for a particular year. The model for this analysis used the 2010 IMPLAN data. IMPLAN translates changes in final demand for goods and services into resulting changes in economic effects, such as labor income and employment of the affected area's economy.

The economic impact effects are measured by estimating the direct jobs and labor income generated by (1) the processing of the timber volume from the project, and (2) Forest Service expenditures for contracted restoration activities included as part of the proposed treatments. The direct employment and labor income benefit employees and their families and, therefore, directly affect the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Indirect effects are felt by the producers of materials used by the directly affected industries. Induced effects occur when employees of the directly and indirectly affected industries spend the wages they receive. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

Data used to estimate the direct effects from the timber harvest and processing were provided by the University of Montana's Bureau of Business and Economic Research (Morgan et al. 2007). This national data is broken into multi-state regions and is considered more accurate than that which is available from IMPLAN. The Northern Rockies Bureau of Business and Economic Research Region (Montana and Idaho) is used for this analysis. The Bureau of Business and Economic Research data represents the results of mill censuses that correlate production, employment, and labor income. The economic impact area for this analysis consists of Kootenai and Shoshone County, Idaho.

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

3.10.4.2. Spatial and Temporal Context for Effects Analysis

The analysis area for the project feasibility analysis is the Beaver Creek Resource Area. It is approximately 28,200 acres in size and is located north of Wallace, Idaho in Shoshone County. The temporal scope of this analysis is the duration of the proposed activities. The project is expected to be implemented over a 5-10 year period, with most harvest activity occurring within the first 5 years.

Timber management activities within the project area have the potential to impact the economic conditions of local communities and counties. To estimate the potential effect on jobs and income, a zone of influence (or economic impact area) was delineated. This analysis uses

Kootenai and Shoshone Counties as appropriate counties to include in the economic impact analysis area.

3.10.4.3. Alternative 1 – No Action

3.10.4.3.1. Direct and Indirect Effects of Taking No Action

The no-action alternative would not harvest timber, implement best management practices on haul routes, return fire to the landscape or take other restorative actions and, therefore, incurs no financial costs. It would also produce no revenue and have no effects on jobs or income.

Indirectly, as stated in Chapter 3 Fire/Fuels analysis, a lack of fuel-reduction activities under Alternative 1 would heighten fire hazards to forest homes as people continue to develop and settle lands along the urban-wildland interface. The loss of homes and human life can escalate as the surrounding forest advances in succession because of the buildup of canopy and surface fuels. Moreover, multi-layered canopies and dense crowns would increase the chance of crown fires that are difficult to control. This would increase the cost of fighting to control the fires, as well as the cost to homeowners if property is lost.

3.10.4.3.2. Cumulative Effects

Under Alternative 1, there would be little cumulative effect on economics. Overall, there may be an indirect future effect of increased costs of fire suppression in the area. Fixed costs, such as road maintenance costs would continue to be incurred.

3.10.4.3.3. Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest-wide goals, objectives and standards for economics are not specifically addressed in the 1987 Forest Plan. This issue was addressed indirectly in the discussion of community stability. Chapter II of the Forest Plan states, “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” (Forest Plan, p. II-11CR-002). Alternative 1 does not meet this Forest Plan direction.

3.10.4.4. Alternatives 2 and 3

3.10.4.4.1. Environmental Consequences

Sale Feasibility

The estimation of sale feasibility was based on the Region 1 sale feasibility model, which is a residual value timber appraisal approach that takes into account logging system, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, temporary roads and road maintenance. The appraised stumpage rate from the feasibility analysis was compared to base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury), which varies by alternative. The base rate is $26.53 per CCF (hundreds of cubic feet) for Alternative 2 and $23.87/CCF for Alternative 3. The appraised stumpage rate and base rates for each alternative are displayed in Table 97. For each of the action alternatives, the appraised stumpage rate is greater than the base rate, indicating that each of the alternatives is feasible (highly likely to sell). Alternative 3 has the

highest appraised stumpage rate ($50.22/CCF) and, therefore, would likely generate the most revenue.

Table 97. Project Feasibility and Financial Efficiency Summary (2012 dollars)

Measure	Alternative 1 (No Action)	Alternative 2	Alternative 3
Timber harvest (acres)	0	1,973	1,661
Timber volume (CCF)	0	73,329	66,330
Base rates ($/CCF)	$0	$26.53	$23.87
Appraised stumpage rate ($/CCF)	$0	$40.48	$50.22
Predicted high bid ($/CCF)	$0	$59.69	$69.43
Total revenue (thousands of $)	$0	$4,377	$4,605
Timber Harvest & Required Design Criteria - PNV (thousands of $)	$0	$1,566	$2,070
Timber Harvest & All Other Planned Non-timber Activities - PNV (thousands of $)	$0	$792	$848

Project Feasibility

The table below outlines estimated financial costs associated with all of the planned project activities. Planning (NEPA) costs were not included since they are sunk costs at the point of alternative selection. The costs associated with Alternative 3 are highest due to the larger amount of restoration activities such as road decommissioning and fish barriers. However, Alternative 3 will also likely generate more revenue, as seen in the table below.

Table 98. Activity expenditures (not included in appraisal), by alternative.

Planned Activities	Alt. 1 Total Cost	Alt. 2 Total Cost	Alt. 3 Total Cost
Road decommissioning (non-haul routes)	$0	$110,000	$360,000
Gate installation	$0	$4,000	$0
KV site prep burning	$0	$389,400	$323,070
Regeneration planting	$0	$702,300	$566,340
Regeneration exams	$0	$35,115	$28,317
Regeneration animal damage control	$0	$10,200	$8,075
Fireline/fuel break construction (manual; not connected to harvest)	$0	$12,000	$12,000
Fish barriers	$0	$600,000	$900,000
Prescribed fire in non-commercial areas	$0	$208,000	$208,000
Sale preparation	$0	$989,942	$895,455
Sale administration	$0	$329,981	$298,485
Total costs	$0	$3,390,937	$3,599,742

Financial Efficiency

The financial efficiency analysis is specific to the timber harvest and ecosystem management activities associated with the alternatives (as directed in Forest Service Manual 2400-Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team.

The expected revenue is the corresponding predicted high bid (Table 1) from the sale feasibility analysis times the amount of timber harvested. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The actual timber value will depend on the market when the timber is sold and may be higher or lower than the predicted high bid. Present Net Value was calculated using a 4 percent discount rate over the lifespan of the project. For more information on the values or costs, see the project file

This analysis is not intended to be a comprehensive benefit-cost or present net value analysis that incorporates a monetary expression of all known market and non-market benefits and costs that is generally used when economic efficiency is the sole or primary criterion upon which a decision is made. Many of the values and costs associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. Therefore, they are not described in financial or economic terms for this project, but rather are discussed in the various resource sections of this analysis. For instance, changes in fire risk are described in terms of changes in fire behavior, while wildlife resource changes are described in terms of changes to habitat conditions

Table 97 summarizes sale feasibility and financial efficiency, including the base rate, stumpage rate, predicted high bid, total revenue, and two present net value calculations for each alternative. One present net value calculation indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design criteria. A second present net value calculation includes all costs for the proposed action, including other restoration activities disclosed in the NEPA but not required for the timber sale to occur.

Table 97 indicates that all alternatives are financially efficient for both the timber harvest and required design criteria, as well as for all activities, as indicated by the positive present net value for all alternatives. Alternative 3 has the highest present net value, for timber related activities only at $2.1 million. For all project activities, the present net value for Alternative 3 is also higher at $848 thousand. Alternative 2 has the lowest present net value, with a present net value of approximately $1.6 million for the timber-related activities and $792 thousand for all activities.

When evaluating trade-offs, the use of efficiency measures is one tool used by the decision maker in making the decision. Many things cannot be quantified, such as effects on wildlife, impacts on local economies, and restoration of watersheds and vegetation. The decision maker takes many factors into account in making the decision.

Economic Impact Effects

The analysis calculated the jobs and labor income associated with the processing of the timber products harvested and the other planned restoration activities. Timber products harvested from the proposed project and the non-timber activities would have direct, indirect, and induced effects on local jobs and labor income. In order to estimate jobs and labor income associated with timber harvest, the timber harvest levels were proportionally broken out by product type

(Table 99). In order to estimate jobs and labor income associated with reforestation and restoration activities, expenditures for these activities were developed by the resource specialists. Only the expenditures associated with the contracted activities are included in the impact analysis.

Table 99. Proportion of timber harvest by product type.

Product Type	Proposed Action
Sawmills	90
Log Homes	0
Post and Poles	0
Pulp	10

Table 100 displays the direct, indirect and induced, and total estimates for employment (part and full-time) and labor income that may be attributed to each alternative. A job (as defined in IMPLAN) is an annual average of monthly jobs. Thus, one job lasting 12 months = two jobs lasting six months each = three jobs lasting four months each. Each of those examples would appear as one job. That one job lasting 12 months can be either full-time or part-time; but it does last for 12 months. When jobs are counted this way, one cannot tell from the data the number of hours worked or the proportion that are full or part-time or anything about seasonality; only that they are yearlong. These jobs are different than full-time equivalent (FTE) jobs. However, they can be converted to average full-time equivalent jobs by using industry-specific full-time equivalent to employment ratios (the number of full-time equivalent jobs in an industry divided by total employment in the industry). These ratios are all less than one because Employment contains part-time jobs (so there are more jobs than there are full-time equivalents).

Estimates of average year-long part-time and full-time jobs shown in the following table are heavily dependent upon the implementation period of the project. The estimates shown reflect the average over an estimated implementation time of 10 years. If the actual implementation period is shorter than this, more jobs would be supported over a shorter period of time. Conversely, if the implementation period is expanded, fewer jobs would be supported annually but for a longer period of time. Also, within the implementation period of a project, numbers of jobs supported may or may not be distributed evenly over time depending upon the nature of the project.

Table 100. Economic impacts (employment and labor income), total and annual ($2010).

	Alt. 1 (No Action)	Alt. 2 Total	Alt. 2 Annual	Alt. 3 Total	Alt. 3 Annual
Non-timber harvest activities					
Part- and full-time jobs contributed[1]					
Direct	0	39	6	40	6
Indirect and induced	0	14	2	15	2
Total	0	53	8	55	8
Labor income contributed ($M2010)[2]					
Direct	$0	$1,695	$242	$4,748	$250
Indirect and induced	$0	$438	$65	$458	$65
Total	$0	$2,133	$305	$2,206	$315
Timber harvest activities					
Part- and full-time jobs contributed[1]					
Direct	0	208	52	188	47
Indirect and induced	0	236	59	216	53
Total	0	443	111	402	100
Labor income contributed ($M2010)[2]					
Direct	$0	$10,533	$2,633	$9,528	$2,382
Indirect and induced	$0	$11,020	$2,755	$9,968	$2,492
Total	$0	$21,553	$4,388	$19,496	$4,874
All activities					
Part- and full-time jobs contributed[1]					
Direct	0	247	57	228	53
Indirect and induced	0	249	61	228	55
Total	0	496	118	455	108
Labor income contributed ($M2010)[2]					
Direct	$0	$12,228	$2,875	$11,276	$2,632
Indirect and induced	$0	$11,458	$2,818	$10,426	$2,557
Total	$0	$23,686	$5,693	$21,702	$5,189

[1] Employment is the total full- and part-time wage, salaried, and self-employed jobs in the region.

[2] Labor income includes the wages, salaries and benefits of workers who are paid by employees and income paid to proprietors.

Alternative 3 would contribute approximately 228 direct and 455 total jobs and $21.7 million in total labor income over the life of the project. On an annual basis, this would amount to approximately 108 jobs over the life of the project and about $5.2 million annually in total labor income. Approximately 402 jobs and $19.5 million of the total would be associated with the timber harvest activities, with the rest associated with non-timber activities.

Alternative 2 would result in more total jobs (247 direct and 496 total jobs) and more labor income ($23.7 million over the life of the project). On an annual basis, this would amount to approximately 118 jobs over the life of the project and about $5.7 million annually in labor income. Approximately 443 jobs and $21.5 million of the total would be associated with the timber harvest activities, with the rest associated with non-timber activities. The No-Action Alternative maintains no jobs nor income because there are no activities associated with this alternative.

3.10.4.4.2. Effects Common to Both Action Alternatives

Cumulative Effects

Many factors influence and affect the local economies, including changes to industry technologies, economic growth, international trade, and the economic diversity and dependency of the counties. This analysis focuses on the cumulative impacts of proposed activities. Past, ongoing and reasonably foreseeable activities on National Forest System and other lands within the project area (Chapter 2, Section 2.10 and Appendix A) would not have an effect on the economics issues for these alternatives because they would not come as a direct result of the proposed project. The financial aspect of the project is not expected to add to any existing cumulative effect. However, the jobs and income associated with the action alternatives may bring the local economy some increased relative stability during the life of the project.

Many of the costs and benefits associated with a project are not quantifiable. For example, the benefit to wildlife from habitat improvement or the cost associated with the degradation of visual quality from a project is not quantifiable. These costs and benefits may be described qualitatively, in the individual resource sections of this document. Title 40 Code of Federal Regulations for NEPA (CFR 1502.23) indicates "For purposes of complying with the Act, the weighing of 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 qualitative considerations." Management of the forest is expected to yield positive benefits, but not necessarily financial benefits.

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

Forest-wide goals, objectives and standards for finances are not specifically addressed in the 1987 Forest Plan. This issue was addressed indirectly in the discussion of community stability. Chapter II of the Forest Plan states, "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." (Forest Plan, p. II-11, CR-002) Alternatives 2 and 3 would meet this direction.

Executive Order 12898 requires that all federal actions consider the potential of disproportionate effects of projects on minority and low-income populations in the local area. No disproportionate impacts to minority or low-income populations were identified during scoping or during any other portion of public involvement portion of this analysis.

3.10.4.5. Effects Summary

As shown in the table below, both alternatives would generate funds (positive present net value) in both circumstances (whether the entire project is implemented or just the required portions for the timber harvest). Alternative 2 would generate less overall funds than Alternative 3.

Both alternatives would also generate jobs. Alternative 2 would generate 41 more jobs than Alternative 3. Overall, the largest number of jobs in both alternatives would come from the activities related to the timber sale, but more non-timber related jobs would be generated by Alternative 3 than by Alternative 2.

Table 101. Project feasibility and financial efficiency summary (2012 dollars).

Measure	Alternative 1 (No Action)	Alternative 2	Alternative 3
Timber harvest (acres)	0	1,973	1,661
Timber volume (CCF)	0	73,329	66,330
Base rates ($/CCF)	$0	$26.53	$23.87
Appraised stumpage rate ($/CCF)	$0	$40.48	$50.22
Predicted high bid ($/CCF)	$0	$59.69	$69.43
Total revenue (thousands of $)	$0	$4,377	$4,605
Timber Harvest & Required Design Criteria - PNV (thousands of $)	$0	$1,566	$2,070
Timber Harvest & All Other Planned Non-timber Activities - PNV (thousands of $)	$0	$792	$848

3.10.5. Financial References

Economic Profile System – Human Dimensions Toolkit (EPS-HDT). (2011). Headwaters Economics. www.headwaterseconomics.org/eps-hdt. PF Doc. FIN-12

Minnesota IMPLAN Group (MIG). 2003. IMPLAN Pro Version 2.0 User's Guide, Analysis Guide, Data Guide. 418 p. PF Doc. FIN-11

Parker, J., J.D. Wulfhorst, and J. Kamm. 2002. Social Assessment for the Idaho Panhandle National Forests: Final Report. University of Idaho. PF DOC. FIN-01

U.S. Department of Commerce (USDC). 2008 and 2010. Bureau of Economic Analysis, Regional Economic Information System, Washington, D.C. (accessed via EPS-HDT 2011)

USDA Forest Service. 2003. Analysis of the Management Situation for the Revised Forest Plan PF DOC. FIN-02

USDA Forest Service. Forest Service Handbook, Title 2409.18 Timber Sale Preparation Handbook. Chapter 20 Timber Sale Project Development. Forest Service. Washington D.C. PF DOC. FIN-03

USDA Forest Service. 1987. Forest Plan Idaho Panhandle National Forests. PF DOC. CR-002

4. Chapter 4 - Required Disclosures

4.1. Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

An evaluation of the relationship between the local short-term uses of the human environment and the maintenance and enhancement of long-term productivity discloses the trade-offs between short-term adverse impacts and long-term benefits of the proposed project. Short-term impacts, disruptions, and uses of the local environment may be worthwhile if there are long-term benefits to the environment resulting from the actions. The intensity and duration of the effects described in this EIS are dependent on the alternative selected and the activities that are associated with that alternative.

All alternatives would come under the mandate of the Multiple Use and Sustained Yield Act of 1960. This act requires the Forest Service to manage National Forest System lands for multiple uses, including timber, recreation, fish, wildlife, and watershed, ensuring that these resources are available for future generations. There may be short-term impacts to these resources (i.e. removal of timber) that will not affect these resources in the long term (e.g., trees can be re-established if the land productivity is not impaired).

Maintaining the productivity of the Beaver Creek area is the goal of this project and both action alternatives aim to protect the long-term productivity of the resource area. The No-Action Alternative has the potential to negatively impact long-term productivity in the resource area.

Discussion of the impacts both short and long term are documented in more detail in the environmental consequences section of each resource report in Chapter 3 and in the Specialist Reports in the project file. Most of the impacts are minimized through the design features developed for each alternative, as described in Appendix E).

4.1.1. Vegetation

The capability of the land to produce timber, high quality water, and forage would not be impaired by any 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.

Alternatives would make progress to ensure the long term productivity of the Beaver Creek Resource Area. 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.

4.1.2. Fire/Fuels

Timber harvest could affect both short- and long-term fuel loading. Harvest moves unavailable canopy fuels (tops, stems, limbs, needles) into available surface fuels. The risk of a crown fire may be reduced, but the risk of surface fires could be increased. Proposed fuel treatments would reduce some ignition risk over time and improve our ability to control wildfires.

The action alternatives have the potential to aid in long-term productivity of sites as a result of the reduction in the potential impacts of a large wildfire. In the short term there would be effects from prescribed burning such as reddened trees and an immediate reduction in available browse, but all these affects are short term in nature.

4.1.3. 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. 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.

Under either alternative, there would be short-term effects to elk security during project activities, but both alternatives would reduce the total amount of roads in the resource area over time, providing for a long-term benefit in elk security.

4.1.4. 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 Hydrology Report (PF Doc. SR-03) and Fisheries Report (PF Doc. SR-04) for more information and sections 3.3 and 3.4 in Chapter 3.

4.2. Adverse Environmental Effects Which Cannot Be Avoided

Implementation of any of the alternatives 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 (see Appendices E and F for more information). If management activities occur, however, some effects cannot be avoided. Even the No Action Alternative has effects. See the individual resource discussions for detailed analyses of effects.

4.2.1. Hydrology

Road construction, reconstruction, and maintenance activities could create sediment that would reach some stream systems during the short term, but Best Management Practices, site-specific design criteria, and use of stream buffers would reduce the effects to a minimal level (see Appendices E and F).

4.2.2. Fish

During Aquatic Organism Passage (culvert) upgrade activities, a variety of fish species would most likely be displaced from the immediate area for a portion or the duration of the activities. After upgrades have occurred, there is the potential for increased competition or hybridization among native and non-native fish species.

4.2.3. Wildlife

During timber harvest and site-preparation activities a variety of wildlife species would most likely be displaced from the immediate area for a portion of or the duration of the activities. Prescribed burning that occurs in the spring may result in mortality to some species of nesting birds and small mammals.

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. Such changes can result in changes in local populations of specific species.

4.2.4. Recreation

Implementation of project activities would temporarily affect recreational users of the Beaver Creek Resource Area. Timber hauling has the potential to affect motorized vehicle use because users may encounter full size vehicles. Should winter hauling occur in the resource area there is the possibility that some of the groomed snowmobile trails could be partially plowed for timber haul. Additionally, project activities may impact the disabled hunting program on Road 1505.

4.2.5. Visual Resources

The introduction of timber harvest units would add a variety of line, form, color, and texture to the landscape. Forest users may see a modified forest in the foreground, middleground, and background where harvest and prescribed burning is implemented.

4.2.6. Soil Productivity

Compaction and displacement can affect soil physical, chemical and biological properties, which can indirectly affect growth and health of trees and other vegetation. Some soils could be compacted during timber harvest activities; however, none of the stands proposed for harvest activities would have compaction over Regional or Forest Plan standards.

4.2.7. 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 disturbances through project design features.

4.2.8. Noxious Weeds

Any activity has a risk of introducing and spreading weeds. Vehicle use and travel associated with timber harvest, road construction, and other activities can increase the risk of spread. Design features (Appendix E) would reduce but not eliminate the risk of weed spread from proposed activities.

4.2.9. Air Quality

Temporary seasonal effects on air quality are unavoidable under either of the action alternatives. Prescribed fire is an integral part of ecosystem management, fuel treatment, and site preparation for reforestation. Prescribed burning of slash and prescribed fires may cause a temporary reduction in air quality. The District will comply with procedures and requirements to limit smoke accumulations to legal, acceptable levels (Appendix B, Section B.6), and will schedule these activities when air dispersion is good.

4.3. Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources describe the loss of future options; those apply primarily to effects of using nonrenewable resources such as minerals or cultural resources, or to factors such as soil productivity that are renewable only over long periods of time.

Irretrievable commitments are opportunities foregone, and represent tradeoffs in the use and management of Forest resources. Irretrievable commitments apply to the loss of production, harvest, or use of natural resources, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. The production loss is irretrievable, but the action is not irreversible (if the use changes, it is possible to resume production).

4.3.1. Soil Productivity

Permanent road construction (as proposed under Alternative 2) would cause irreversible effects to soil productivity, since there is removal of topsoil, and compaction. These sites can only be restored after a long period of time or after recontouring and revegetation of the road. Best management practices would be used to avoid soil productivity losses from timber harvesting and associated temporary road/skid trail construction. Temporary roads would constitute an irretrievable commitment of resources even though they would be recontoured. The soil mixing and disturbance that would be associated with temporary construction would lower soil productivity. Temporary roads constructed under Alternative 2 would be decommissioned following completion of timber harvest activities. While plant and tree growth on these sites would occur over the short term, full productivity recovery could take decades to hundreds of years**.**

Discussion of the effects of road construction on the soil resource can be found in Chapter 3 (Section 3.5) and in the Soils Report (PF. Doc. SR-05).

4.4. Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

4.4.1. Administration of the Forest Development Transportation System

A roads analysis has been prepared for the Beaver Creek in accordance with the Roads Policy at 36 CFR Part 212, published in the Federal Register on January 12, 2001 (PF Doc. TRANS- 01).

4.4.2. Environmental Justice Act

Executive Order 12898 (issued in 1995) required federal agencies to conduct activities related to human health and the environment in a manner that does not discriminate or have the effect of discriminating against low-income and minority populations. . Although low-income and minority populations live and recreate in the vicinity, activities under the Beaver Creek project would not discriminate against these groups. Based on the composition of the affected communities and the cultural and economic factors, there would be no adverse effects to human health and safety or environmental effects to low income, minority or any other segment of the population.

4.4.3. National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) directs all Federal agencies to take into account the effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the National Register. Advisory Council on Historic Preservation regulations at 36 CFR part 800 implement NHPA section 106.

An appropriate inventory has been conducted in the Beaver Creek Resource Area. The project has been designed (Appendix E, Section E.9) to avoid significant effects to components or features associated with cultural sites determined to be eligible for listing in the National Register of Historic Places (Appendix B, Section B.8) . No known cultural resources would be adversely affected by this project. Any future discovery of cultural resource sites would be inventoried and protected if found to be of cultural significance (Appendix B, Section B.8).

Consultation with the State Historic Preservation Office has been completed as in accordance with the National Historic Preservation Act. For more information see the Cultural Resources section in Appendix B (Concerns Addressed but Not Analyzed in Detail) and project design features (Appendix E).

4.5. Possible Conflicts with Other Agency or Government Policies, Plans or Regulations

Public involvement and consultation efforts with other federal and state agencies and the Coeur d'Alene Tribe indicate no major conflicts between activities proposed in the Beaver Creek Resource Area and the policies, plans or regulations of other government entities.

4.5.1. Clean Water Act

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 abatement of water pollution. Executive Order 12088 also requires the Forest Service to meet the requirements of the Act.

All action alternatives would comply with the Clean Water Act and Idaho State Water Quality Standards. These alternatives would incorporate reasonable Soil and Water Conservation Practices, avoid channel degradation, and comply with the Forest Plan.

For more information see the Specialist Reports on Hydrology (PF Doc. SR-03) and Fisheries (PF Doc. SR-04). The Inland Native Fish Strategy (INFS) standards and guidelines and the BMP (Best Management Practices) implemented with this project would protect floodplains and wetlands. For more information see Appendix F (Application of Soil and Water Conservation Practices).

4.5.2. Endangered Species Act

Effects to Threatened and Endangered wildlife, fish, and plant species as a result of implementing the alternatives (including No Action) have been considered and addressed (Sections 3.6, 3.4, and 3.7, respectively). A biological assessment will be prepared and submitted to the US Fish and Wildlife Service for concurrence according to the Endangered Species Act, to ensure protection of these species. For more information see the specialist reports on Wildlife (PF Doc. SR-06), Fisheries (PF Doc. SR-04), and TES Plants (PF Doc. SR-07).

4.6. Incomplete or Unavailable Information

4.6.1. Rare Plants

Effects to populations from disturbance events (natural or man-caused) are difficult to quantify with certainty for all Sensitive plant species and Forest Species of Concern. Specific knowledge of population ecology is lacking for several species addressed in this analysis, particularly the sensitive Moonworts (Botrychium spp.), pine broomrape, and phantom orchid. Much of the current knowledge regarding sensitive plant species is based on observational (non-empirical) and even anecdotal information. Recent literature and monitoring reports on several species including Moonworts (USDA 2005; PF Doc. TES-67), Deerfern (USDA 2003, PF Doc. TES-7), Clustered lady's-slipper (Lichthardt 2003; PF Doc. TES-8), Henderson's sedge and Constance's bittercress (Lichthardt 1998; PF Doc. TES-9) and Idaho barren strawberry (Crawford 1980, PF Doc. TES-10), provide a greater understanding of the relationship of natural and management related habitat disturbance to the persistence of these species.

For unsurveyed habitat that is highly suitable to support Sensitive plants, presence is assumed. This applies to the portion of Alternative 2 activity areas in suitable TES plant habitat that have not been field surveyed.

Protection of large occurrences and contiguous, unoccupied highly suitable habitat is assumed to be an effective conservation strategy (Burgman, et al 2001, PF Doc. TES 37). Examples of conservation strategies for Region 1 include Lichthardt, 1992 (PF Doc. TES-38), Lichthardt 2003 (PF Doc. TES-8), and Lorain, 1991 (PF Doc. TES-39a). As described in Features Designed to Protect TES Plants (Appendix E), populations would be protected, while some isolated individuals may be impacted by activities.

APPENDIX A
Past, Ongoing and Reasonably Foreseeable Activities

A.1. Introduction

NEPA requires analysis and disclosure of potential cumulative effects – the impact on the environment which results from the incremental impact of the action when added to other past, present (ongoing) and reasonably foreseeable actions, regardless of what agency or person undertakes such actions (40 CFR § 1508.7). Cumulative effects analysis shall be carried out in accordance with 40 CFR 1508.7 and in accordance with the Council on Environmental Quality Guidance Memorandum on Consideration of Past Actions in Cumulative Effects Analysis dated June 24, 2005 (PF Doc. CR-048).

This appendix provides information of relevant past, present and reasonably foreseeable projects and/or 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 in each specialist report to promote an informed assessment of environmental considerations and to aid in assessing whether or not project activities would meet the project's purpose and need for action with minimal environmental harm.

A wide variety of activities has occurred or will occur in the Beaver Creek Resource Area. For simplicity, these have been grouped by **past, ongoing and reasonably foreseeable activities**, with the following subgroups:

- Activities on National Forest System (NFS) lands
- Activities on private lands and other ownership
- Road management activities, which may overlap between NFS and other ownership

A.2. Past Activities

A.2.1. Past Activities on National Forest System Lands

A.2.1.1.Past Timber Management

Commercial Timber Harvest

A summary of past harvest activities in and adjacent to the Beaver Creek Resource Area (on both private and National Forest System lands) is provided in Table A-1. These timber harvest projects span decades, but were grouped by decade for summary purposes. Acres are specific to the resource area, and harvest may have occurred in the same stand more than once. Refer to the Chapter 3 Forest Health/Vegetation section (3.1) for additional discussion of past harvest activities.

Past timber management activities on National Forest System lands in the Beaver Creek Resource Area were queried from the District's Timber Stand Management Record System (TSMRS) database and the Forest Service Activity Tracking System (FACTS) database (PF Doc. VEG-02). The database contains information about past harvest and management in the Beaver Creek Resource Area from as early as 1889 to the present. Information on the Beaver Creek Resource

Area from before about 1976 was drawn from historic references, including maps, photos and newspapers. FACTS activity acre figures represent acres of the specified activity, not necessarily stand acres. Some stands may have had multiple activities or harvests.

Information on timber harvest activities on public land managed by the Bureau of Land Management (BLM) within and adjacent to the resource area comes from the BLM timber sale atlas and associated GIS data. This information was provided by the BLM, Coeur d'Alene Field Office and summarized by the District (PF Doc. VEG-02).

Past timber harvest on private lands was primarily identified based on the Forest Service Activity Tracking System (FACTS) database, Field Sampled Vegetation (FSVeg) database, stand exam field data, photo interpretation, contract accomplishments, historical records/maps, and field observations. In compliance with the Idaho Forest Practices Act, operators planning forest practices (timber harvest, road construction, reforestation, slash management, etc.) are required to secure a Slash Compliance and Forest Practice Notice from the Idaho Department of Lands (IDL). The IDL provided the project team with information regarding timber harvest and associated road construction on private lands in or adjacent to the Beaver Creek Resource Area from 2002 to present, including all known planned forest practices (PF Doc. VEG-02).

Notifications are valid for a maximum of two years, but can be extended. IDL tracks land owners, legal locations, and volume if it is determined that a deposit is needed to ensure fire hazard treatment is covered. From 2002 through February 2013, notifications reported a total volume of 9,022,079 MBF harvested on lands in or adjacent to the Beaver Creek Resource Area (PF Doc. VEG-02).

Table A-1. Identification of past commercial timber harvest in and adjacent to Beaver Creek Resource Area.

Timing	Description
1910 – 1920	FS timber harvest (Carpenter Gulch, Hurricane Gulch, and legacy sales without names); 1,168 acres of salvage harvest by horse logging
1921 – 1930	FS timber harvest (legacy sales without names); 636 acres of salvage harvest by horse logging
1931 – 1940	FS timber harvest (legacy sales without names); 224 acres of salvage harvest by horse logging
1941 – 1950	No data on record
1951 – 1960	FS timber harvest (legacy sales without names); 299 acres of salvage and shelterwood harvest by jammer logging.
1961 – 1970	FS timber harvest (Character Ridge, Cedar Creek #1, Cedar Creek #2, Carpenter Gulch, Deer Creek, and legacy sales without names); 1,714 acres of salvage, liberation cuts, and clearcut harvest by jammer and tractor logging
1971 – 1980	FS timber harvest (White Peak, Long Thin, Cedar Carpenter, White Peak Pulp, White Peak Cedar, Cedar Cedar and legacy sales without names); 1,215 acres of salvage, liberation cuts, clearcuts and commercial thinning harvest by jammer and tractor logging. BLM timber harvest (Reeder Gulch) – 3 acres
1981 – 1990	FS timber harvest (Dudley Cedar, Long Thin, Dobson Passover, Kings Seed, County Gravel Pit, Scott Claim, Kings Pass SPA, East Two Mile, BPA Line Clearing ROW, Beaver Copter, Wild Pony, Kings Ridge, Idaho Gulch, and Beaver Powerline Daylight sales); 1,540 acres of salvage, shelterwood, clearcut, special cut, seed tree, and special forest product harvest by skyline, tractor, jammer and helicopter logging; 79 acres of permanent land clearing for the BPA powerline right of way.

Timing	Description
1991 – 2000	FS timber harvest (Kings Ridge, Cinnabar Cedar, Upper White, Alder Kid, Scott Gulch, Capitol Hill, Dudley Creek, Lower White, Unknown Pony, Alder White Salvage, Scott Gulch Salvage, Kings Ridge Salvage, All Kings Down, Deckzke, and Beaver Heli Bug sales); 2,903 acres of salvage, seed tree, clearcut, shelterwood, group selection, and special cut harvest by tractor, skyline, jammer, and helicopter logging. BLM timber harvest (Ophir Gulch) – 100 acres
2001 – 2010	FS timber harvest (Beaver Heli Bug, Avista Beaver, East Side Beetle, Unknown King Bug, Beaver Down, Small Missouri Heli Bug, Red Eyed Grizzly Heli, South King Roadside, Small Beetle Trails, Yon Ferguson, BPA Powerline #4, and Carpenter Thin sales); 426 acres of salvage, shelterwood, clearcut, improvement cut, and commercial thinning harvest by tractor, skyline, jammer, and helicopter logging; 85 Acres of permanent land clearing for BPA powerlines; private land timber harvest - 9,022,079 MBF; BLM timber harvest (Tiger West and Tiger Gulch) – 15 acres.
2011-2013	FS Timber Harvest (Carpenter Thin and Capital Dudley Salvage); 168 acres of salvage and commercial thinning harvest by tractor and skyline logging. BLM timber harvest (Murray South) – 225 acres.

Approximately 10,427 acres of timber harvest has occurred on National Forest System lands in the resource area since 1910 (Table A- 2). Over half of the harvests were sanitation/salvage. Because we do not know exact locations or the types of trees harvested with this harvest activity, it is not clear if this salvage changed successional pathways. Many of the stands were salvaged due to white pine blister rust and/or bark beetles mortality. Where extensive and/or repeated salvage occurred in stands, shade-tolerant trees have gained developmental advantage.

Table A- 2. Past timber harvest activities on NFS lands in the Beaver Creek Resource Area prior to 2010, by decade (source of harvest acres is the FACTS database).

Harvest Decade	Sanitation/ Salvage	Partial Harvest	Uneven-Aged Regen Harvest	Even-Aged Regen Harvest	Overstory Removal
1910s	1168	0	0	0	0
1920s	627	0	0	0	0
1930s	215	0	0	0	9
1940s	0	0	0	0	0
1950s	288	0	0	11	0
1960s	1,013	0	0	123	508
1970s	829	198	0	52	206
1980s	878	96	0	401	153
1990s	126	0	116	2,538	7
2000s	288	69	0	169	16
2010s	0	47	0	0	85

Shelterwood, seed tree, and clearcut harvests are included in the even aged (EA Regen Harvest) column of Table A- 2. Patch clearcut, individual tree selection, and group selection harvests are included in the uneven aged (UA Regen Harvest) column of Table A- 2. Improvement, commercial thin, shelterwood preparation, seed tree preparation cuts and special product removals are included in the Partial Harvest column.

While some of these areas have had multiple harvest entries, it is not always possible to track in the current database if the same acres were harvested (or had other non-harvest activities) on the

re-entries because stands are often larger than the recorded activity acres. It is reasonable to have multiple harvest entries on some areas because certain silvicultural systems require multiple entries (e.g. 85 acres of permanent land clearing, recorded in 2010, was maintenance clearing of the original permanent land clearing associated with the establishment of the powerline corridor through the resource area and therefore shares the same spatial footprint).

The actual foot print of harvesting in the resource area is less than the grand total of all harvesting as shown in Table A- 2 because some of the past harvests overlap each other spatially.

Precommercial Timber Harvest

Precommercial thinning activities that have occurred in the area are identified in the table below.

Table A-3. Identification of acres of past precommercial thinning activities on NFS lands in the Beaver Creek Resource Area.

Timing	Precommercial Thinning (acres)
1921-1930	104
1931-1960	N/A
1961-1970	226
1971-1980	27
1981-1990	N/A
1991-2000	162
2001-2010	1,097
2011-2013	101

Reforestation

Since 1959, tree planting has occurred on 4,785 acres.

A.2.1.2. Past Fire/Fuels Activities

Prior to European settlement in the Coeur d'Alene River Basin, fire was the most important disturbance occurring across the landscape. Fire in this landscape has been characterized as a mixed severity fire regime. The historic mixed severity fire regime is complex with both fuels and climate as major influences (Schoennagel, Verlen and Romme, 2004; PF Doc. VEG-R25). Zack and Morgan (1994; PF Doc. VEG-R14) describe fire history within the Coeur d'Alene River Basin. Their report indicates that fires covering greater than five percent of this forest occurred on an average of once every 20 years. Overall, Zack and Morgan (1994; PF Doc. VEG-R14) found there was great variation in fire frequencies, patterns and fire severity on the landscape scale.

Wildfires/Wildfire Response

From 1889-1910, wildfire occurred on more than 24,000 acres within the boundary of the Beaver Creek Resource Area. The fires of 1910 had minor impact on the Beaver Creek drainage. Most of the drainage burned in a large fire event during 1889. It appears that much of the 1889 fire was stand replacing and approximately 90% of the entire Beaver Creek watershed was directly affected by this fire event. Since 1910, wildfires have been attacked and suppressed as soon as possible following detection. A total of 64 wildfires have burned 42 acres within the Beaver Creek Resource Area within the last 40 years; 27 of these fires were caused by lightning.

Figure A-1. Aerial view of lands in and adjacent to the Beaver Creek Resource Area in 1933 (PF.Doc AQ - R15).

Past Fuel Treatment Activities

The fuel treatment activities that have occurred in the area are displayed by decade in the table below.

Table A-4. Past fuel treatments in the Beaver Creek Resource Area.

Activity	1961-1970	1971-1980	1981-1990	1991-2000	2001-2010	2011-2013
Fuel re-arrangement (acres)				89	225	
Broadcast burning or underburning (acres)	99	52	435	637	335	
Chipping activity fuels (acres)		68				
Piling of fuels (acres)	376	421	842	144	42	
Pile burning (acres)	36	88	519	106	7	3
Fireline construction (miles)	1.2	.6	9.5	34.9	5.8	
Slashing (pre-site prep)			26	30	64	
Site prep – burning (acres)				807	100	
Site prep - mechanical (acres)		99	21			
Mechanical removal of fuels – yarding (acres)				379	15	
Jackpot burning (acres)					89	
Leave Tree Protection				212	32	

A.2.1.3. Other Past Activities on National Forest System Lands

Mines and Prospecting

Mining and prospecting began in Beaver Creek around the mid to late 1880's, and continues today (PF Doc. CR-035). In the 1800's and early 1900's fire was commonly used to clear areas for prospecting and to improve grazing during early Euro-American settlement. The Beaver Creek watershed has a substantial mining history. Settlers began visiting the Beaver Creek area in the 1850s and settlement exploded in the 1880s when gold was discovered in nearby Prichard Creek. Mines, mills, and towns were established in what came to be known as the Coeur d'Alene Mining District, one of the nation's richest mining districts which stretched from the Prichard Creek drainage to Beaver Creek and into the South Fork Coeur d'Alene River Subbasin. Within Beaver Creek, various underground mines and placer mines were operated, peaking during the early 20th century. Past mining has resulted in tree removal and sedimentation to waterways at multiple locations in the analysis area. Tailings from the older mines in the area have become deposited downstream over time. In 2011-2012, the Idora Mine and Mill Site Remediation project was completed (PF Doc. AQ-R15)..

Beaver Creek Instream and Channel Work

In 2007 Shoshone County focused the flow of Beaver Creek along FR456 near the Carbon Center Bridge to reduce flooding. From 2008-2012 private landowners, Kootenai-Shoshone Soil and Water Conservation District, and other partners have worked to complete bank stabilization along the main stem of Beaver Creek. In 2010, private landowners with DEQ, Benewah SWCD, and partners worked to complete bank stabilization through a bioengineering project.

In 2011 Shoshone County led a project to manage the Beaver Creek stream channel upstream of the bridge over Beaver Creek at Carpenter Creek. Also in 2011, the county and private

landowners did stream channel management and bank stabilization on Dobson Creek along Carbon Center Road.

From 2011-2012, Shoshone County (along with ACOE and private landowners) worked to realign the channel of Beaver Creek along the main road (Road 456). In 2012, Shoshone County led a project to realign the Beaver Creek stream channel upstream of the Scott Creek Bridge (Road 933).

In 2012, private landowners with Idaho Soil and Water Conservation Commission worked together to provide bank stabilization along portions of the main stem of Beaver Creek (all information from PF Doc. AQ-R15).

A.2.2. Past Activities on other Public Lands

The BLM has had three timber sales in the area, outside of the Beaver Creek Resource Area, but has used the roads within the Beaver Creek Resource Area to haul timber to the mill. The have harvested 240 acres in the past two decades.

A.2.3. Past Activities on Private Lands

Development of privately-owned lands within and around the analysis area has occurred for over 100 years. Activities include land clearing, ranching, farming, logging, and other development.

A.2.4. Past Road Management Activities

Road construction began sometime after 1854, when the Mullan Road was created (PF Doc. CR-035). Later road development was created for mining, the railroad, timber management, and fire suppression access. In 2011, the culvert of Potosi Creek, along the Kings Pass road failed, and the road was re-stabilized, though replacement of the culvert has not occurred. Also in 2011, Shoshone County (along with DEQ and private landowners) removed a failing culvert on Unknown Gulch and replaced it with a rock ford (PF Doc. AQ-R15). In 2012, Shoshone County replaced a failed culvert on Placer Creek along the King's Pass road (PF Doc. AQ-R15).

A.3. Ongoing Activities

The following addresses relevant ongoing activities in or adjacent to the Beaver Creek Resource Area, on both private and National Forest System lands, that could contribute effects to resource conditions.

A.3.1. Ongoing Activities on NFS Lands

In addition to past activities, the analysis of cumulative effects includes effects of activities that are currently ongoing or have a reasonable chance of occurring in the resource area (that is, the proposed location, timeframe and scope have tentatively been identified).

A.3.1.1. Timber Management

There is ongoing and future salvage harvesting associated with the Capital Dudley Timber Sale. This sale is a roadside salvage of dead trees that are close enough to roads that are open to public traffic that they have potential to fall on the road and pose a hazard to the public. There are no other timber sales or other vegetation management activities (such as precommercial thinning or timber stand improvement) currently occurring in the Beaver Creek Resource Area.

A.3.1.2. Fire/Fuels Activities

Management response to wildfires will occur across the resource area as guided by the Forest Plan and individual assessment of each wildfire.

A.3.1.3. Other Ongoing Activities

Ongoing Noxious Weed Treatment

Noxious weed treatments identified in the Coeur d'Alene Noxious Weeds EIS and Record of Decision (PF Doc. CR-028 and CR-029) will continue to occur within the Beaver Creek Resource Area, as identified in the following table.

Table A-5. Ongoing noxious weed treatment sites in the Beaver Creek Resource Area.

Road #	Road Name
933	Scott Gulch
424	Moon-Dobson
1505	Idaho Gulch
3100	No Name Gulch
429	Dudley Creek
1586	Deer Kid
456	Beaver Creek Road (Shoshone County sprays the main Beaver Creek Road)

Dispersed Recreation

Recreationists will continue to enjoy dispersed camping, hunting, use of motorized vehicles, snowmobiling, hunting, mountain biking, fishing, and berry picking throughout the resource area.

Mining

Recreational and permitted placer and dredge mining will continue to occur in the Resource Area on NFS lands and on private lands. There are over 150 mining claims on National Forest System lands within the resource area, with 118 held by one claimant. Three Plans of Operations have been submitted for activities within the project area, and this includes activities within Trail Creek. Proposed activities include trench excavations, utilization of access roads, and small timber sales.

Special Uses

Maintenance of utility corridors and access to these corridors will continue (e.x. BPA powerline). This may include brushing, grinding, mastication, or removal of hazard trees.

Christmas Tree Cutting

Christmas tree cutting (removal of small understory trees less than 12 inches diameter) for personal use will continue.

Fuelwood Gathering

Fuelwood gathering will continue to occur along roads in the resource area.

A.3.2.Ongoing Activities on other Public Lands

There is one active BLM timber sale located outside of the project area, but it is expected that the BLM will use roads within the Beaver Creek Resource Area to haul timber to the mill.

A.3.3. Ongoing Activities on Private Lands

Home building, land clearing, and other development is likely to continue to occur on private lands within and adjacent to the resource area.

A.3.4. Ongoing Road Management Activities

Motor vehicle use will occur on designated routes in the resource area. Implementation of the District Motor Vehicle Use Map (MVUM) will continue. Illegal motor vehicle use will be monitored and regulations enforced across the resource area.

Road maintenance activities are expected to occur on roads as needed, including County and State road maintenance (brushing, blading, graveling, de-icing, etc.).

A.4. Reasonably Foreseeable Activities

The Beaver Creek team identified the following reasonably foreseeable activities to be considered in the cumulative effects analysis by resource (Chapter 3).

A.4.1. Reasonably Foreseeable Activities on NFS Lands

A.4.1.1. Timber Management Activities on NFS Lands

Precommercial Thinning and Pruning

Over the next two decades, 6,129 acres of precommercial thinning, pruning, and regeneration exams will occur at multiple sites in the resource area. Pesticide application to manage insects is planned to occur on 13 acres.

Tree Planting

By 2020, trees will be planted on 19 acres and 111 acres of stocking surveys are scheduled to occur.

A.4.1.2. Fire/Fuels Activities on NFS Lands

Fuels Treatment

Under the Capitol Dudley project, low intensity underburning of natural fuels and burning of piles will occur on 12 acres.

A.4.1.3. Other Reasonably Foreseeable Activities

Reasonably Foreseeable Mining and Prospecting

There are many mining claims within the resource area. Plan of Operations for claims are active and proposed in the area, and more are expected to come forward. Planned activities include brushing and clearing vegetation and debris from existing trenches and test sites, and conducting geophysical and geochemical surveys.

A.4.2. Reasonably Foreseeable Activities on Private Lands

A.4.2.1. Reasonably Foreseeable Timber Harvest on Private Lands

To ensure a comprehensive view of reasonably foreseeable activities, Forest Practices Act Notifications for private land within and adjacent to the Beaver Creek Resource Area were obtained from the Idaho Department of Lands in November 2011 (PF Doc. ACT-01). None of the compliance notices showed planned harvest in the future, but it can be expected that timber harvest activities are likely to occur on private lands into the future.

A.4.2.2. Reasonably Foreseeable Development on Private Lands

Development is occurring on private lands within and adjacent to the Beaver Creek Resource Area, including building of homes and agricultural outbuildings. Specifics of this development are unknown; however it is reasonable to assume development will continue into the future.

APPENDIX B
Concerns Addressed But Not Analyzed in Detail

B.1. Introduction

Some concerns are either addressed through alternative design or are outside the scope of this project. There is no detailed discussion of these concerns in Chapter 3 because they are either not relevant to the project or its resources, they are beyond the scope of the project, or they have been addressed by virtually eliminating any potential effects through alternative design or through design features (described in Appendix E). The following concerns were briefly considered and subsequently eliminated from further study for the reasons stated.

B.2. Specific Rare Plant Species

Design features to protect Threatened, Endangered and Sensitive plants are identified in Appendix E, with additional information provided in the Specialist's Report on Threatened, Endangered and Sensitive Plants (PF Doc. TES-76).

B.2.1. Threatened Plant Species

Two species of Threatened plants are listed for the Coeur d'Alene River Ranger District: water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*). Botanical surveys in the resource area (PF Doc. TES-16) concluded that no habitat exists for the Threatened plants water howellia and Spalding's catchfly; therefore, there is no possibility of effects to these species under any alternative.

More information on Threatened plants is contained in the Biological Assessment in the project file (PF Doc. TES-39).

B.2.2. Endangered Plant Species

No Endangered plants are listed by the U.S. Fish and Wildlife Service for the Idaho Panhandle National Forests (IPNF), therefore Endangered plants are eliminated from further analysis.

More information on Endangered plants is contained in the Biological Assessment in the project file (PF Doc. TES-39).

B.2.3. Sensitive Plants and Forest Species of Concern

Threatened and Sensitive plants and Forest species of concern can be assigned to one or more rare plant guilds (Mousseaux 1998; PF Doc.TES-5). These guilds are artificial assemblages based on similar habitat requirements used for the purpose of analysis.

The Sensitive plant guilds listed below do not occur in the Resource Area, and therefore have no potential for effects to associated species or habitats:

- Grassland
- Subalpine
- Deciduous Riparian
- Aquatic
- Peatland

Established practices to protect rare plants are being implemented routinely for all Forest Service projects, including features of the action alternatives pertaining to rare plants, rare plant detection surveys and project screening using GIS and aerial photography. The above-listed plant guilds and associated species are eliminated from further analysis.

Further information on Sensitive plants is contained in the Biological Evaluation (PF Doc. TES-42).

B.3. Specific T&E Fish Species

Design features to protect fish are identified in Appendix E, with additional information provided in the Specialist's Report on Fisheries (PF Doc. SR-04).

B.3.1. Threatened and Endangered Fish Species

B.3.1.1. Kootenai River White Sturgeon

White sturgeon are found to occur only in the Kootenai River system and possibly the Kootenai River larger (e.g. Yaak River for sturgeon). No suitable habitat is present within the Beaver Creek Resource Area and they do not naturally inhabit the Coeur d'Alene River drainage. Therefore, detailed analysis of this species is not needed.

B.3.1.2. Bull Trout

Bull trout are listed as threatened under the Endangered Species Act (1973). Streams within the analysis area have been surveyed for presence/absence of fish as part of other project work in 2007 and 2011. Data collected by the USFS and IDFG do not indicate that bull trout are present in the NFCDA River and tributaries. Bull trout (*Salvenlinus confluentus)* have been documented in the Coeur d'Alene River and Coeur d'Alene Lake (IDFG 1985) but recent surveys by Dunnigan (1997), Abbott (2000), the USFS (2005) and IDFG (2008), show no indication of their presence in tributary streams throughout the Coeur d'Alene basin. Critical habitat designation for Columbia River bull trout did not include Beaver Creek or its tributaries (Federal Register, October 18, 2010, 50 CFR Part 17).

Since bull trout are not present in the analysis area and critical habitat is not designated in the Beaver Creek cumulative effects areas the project will have no effect to bull trout or Designated Critical Habitat. Therefore, further analysis on the project's effects to bull trout or Designated Critical Habitat is not needed.

B.3.2. Sensitive Fish Species

B.3.2.1. Burbot and Redband Trout

Burbot and interior redband trout are found to occur only in the Kootenai River system, and possibly the Kootenai River larger (e.g. Yaak River for burbot) and smaller tributaries (e.g. Long Canyon - interior redband trout). Therefore, these fishes will be given no further analysis within the context of this document since they do not naturally inhabit the Beaver Creek watershed or the Coeur d'Alene River drainage.

B.3.2.2. Western Pearlshell Mussel

In February, 2011 the Regional Forester updated the Sensitive Species List to include the western pearlshell mussel as a sensitive species on the Idaho Panhandle National Forest (USDA 2011). Effective May 27, 2011, the potential effects of project activities on this species became a required consideration.

The existence of WPM has not been documented on the Idaho Panhandle National Forest outside of the Coeur d'Alene, St. Joe, and St. Marie river drainages. However, it should also be noted that surveys to locate the mussels prior to being listed as a Region 1 sensitive species have not been widespread. Therefore, to better determine if the species may potentially exist in the project area, an extensive review of the Xerces Society for Invertebrate Conservation website (http://www.xerces.org/western-pearlshell/) was conducted. The distribution maps and reference materials on this website were created from thousands of records from the published literature, museum collections, unpublished reports, and information provided by state, tribal, nonprofit, retired and amateur biologists.

While Western pearlshell mussels are known to occur in the Coeur d'Alene River system, they are not known to occur within the Beaver Creek Resource Area. Recent stream surveys by the Idaho Department of Fish and Game and the Forest Service in lower Beaver Creek did not find their presence. Therefore, detailed analysis of this species will not occur.

B.3.2.3. Rainbow Trout

Rainbow trout have been introduced extensively throughout the Coeur d'Alene basin and are widely distributed across its tributaries. Because rainbow trout are a non-native species, and because its life history characteristics closely match those of westslope cutthroat trout, the effects of the proposed actions on rainbow trout will be considered similar to those of westslope cutthroat trout for the purposes of this analysis.

B.4. Specific TES Wildlife Species

Design features to protect wildlife habitat are identified in Appendix E with additional information provided in the Specialist's Report on Wildlife (PF Doc. SR-06). The following species are either not considered relevant to the Beaver Creek project because they are presumed not to be present within the action area (area where effects of the project may be felt) based on the distribution of the species, the habitat requirements of the species, and the current habitat conditions in the action area or have habitat in the Beaver Creek area but are affected at a level that does not increase risk to the species, or effects have been adequately mitigated through project design (see Appendix E – Design Features).

B.4.1. Threatened and Endangered Wildlife Species

B.4.1.1 Woodland Caribou

The woodland caribou population is generally found above 4,000 feet elevation in the Selkirk Mountains in Engelmann spruce/subalpine fir and western red cedar/western hemlock forest types. They are highly adapted to upper elevation boreal forests and do not occur in drier low elevation habitats except as rare transients. The recovery area for the population is in the Selkirk Mountains of northern Idaho, northeastern Washington and southern British Columbia, Canada (USDI Fish and Wildlife Service 2012, PF Doc. WL R402). The Beaver Creek area provides no suitable habitat for woodland caribou and is greater than 100 miles outside areas designated for its recovery. Consequently, this project would ***not affect*** woodland caribou. No further analysis and discussion is warranted.

B.4.1.2. Grizzly Bear

The historic range of the grizzly bear once included most of the continental United States west from the Great Plains, but widespread reductions in range and population numbers led to the grizzly bear being listed as threatened under the Endangered Species Act in 1975. 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 Cabinet-Yaak and Selkirk Ecosystems that are located in northeastern Washington, northern Idaho and northwestern Montana. Habitat loss and direct and indirect human-caused mortality are related to its decline (USDI Fish and Wildlife Service, 1993).

The Coeur d'Alene River Ranger District is not in a Grizzly Bear Recovery Area (USDI Fish and Wildlife Service, 2000), nor was it included in the Bitterroot grizzly bear evaluation area in the Grizzly Bear Recovery Plan Supplement: Bitterroot Ecosystem Recovery Plan Chapter (USDI Fish and Wildlife Service, 1996, PF Doc. WL R59). There is one record of a grizzly bear passing through the district, likely from the Selkirk population, in 2010. This bear was shot near the Rose Lake area and species was confirmed. The Beaver Creek area provides no suitable habitat for grizzly bear and is outside areas designated for its recovery. Consequently, this project would ***not affect*** grizzly bear. No further analysis and discussion is warranted.

B.4.1.3. Canada Lynx

Lynx habitat on the IPNF generally occurs above 4,000 feet in subalpine fir forests or cedar/hemlock types when in association (i.e. within approximately 200 meters) with subalpine fir and spruce habitat types. Habitat analysis for lynx is based on the Northern Rockies Lynx Management Direction (USDA 2007, PF Doc. WL R416). Objectives, standards and guidelines for the maintenance of lynx habitat and populations apply only to lynx habitat on federal lands within lynx analysis units. There were no designated lynx analysis units on the Coeur d'Alene River Ranger District as a result of this 2008 mapping effort, therefore the Beaver Creek project area does not occur within a lynx analysis unit. There was one sighting in the project area from the 1980's, however; recent attempts to collect hair samples from hair snare efforts have not shown any lynx in the area. The species is not known or suspected in the project area. Based on the lack of suitable habitat and occurrence there would be ***no effect*** on habitat or the species. No further analysis and discussion is warranted.

B.4.1.4. North American Wolverine (Proposed Threatened Species)

Habitat Relationships

Wolverines are low density, wide-ranging species that inhabit remote forested areas, ranging over a variety of habitats. Wolverines tend to use lower elevations in the winter and higher elevations in summer, when these areas provide the greatest potential for a food supply (Hornocker and Hash, 1981; PF Doc. WL R27). Wolverines are primarily scavengers but will also hunt small mammals. Denning habitat is high elevation snowy cirque basins.

The wolverine is now a proposed threatened species, per the findings of the USDI Fish and Wildlife Service, 50 CFR Part 17 , 78 FR 7864, Endangered and Threatened Wildlife and Plants; Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States, dated February 4, 2013, found at http://federalregister.gov/a/2013-01478. Also on February 4, 2013 the U.S. Fish and Wildlife Service published a proposed special rule under Section 4(d) of the Endangered Species Act, outlining the prohibitions necessary and advisable for the conservation of the wolverine (78 FR 7864). This proposed Section 4(d) rule would prohibit take of wolverine from trapping, hunting, shooting etc., while allowing incidental take associated with activities such as dispersed recreation, timber harvest, firefighting, mining etc., if those activities are conducted in accordance with applicable laws and regulations (78 FR 7890). In their proposed ruling, the Fish and Wildlife Service determined that global climate change is the primary threat to the species, and that legal and incidental trapping of wolverines are substantial threats in concert with climate change. Management activities of land management agencies, for example, winter recreation and timber harvest, were not identified as threats (78 FR 7877-7879).

Wolverine mortality associated with human/wolverine interactions is considered one of the primary limiting factors in wolverine populations. Improved access increases the potential for these conflicts, which can lead to shooting loss or incidental take by trapping (wolverines are occasionally taken by trappers focusing on other furbearers such as bobcat and American marten). Other factors with the potential to threaten local

population viability of the species include reductions of "wilderness refugia" (large areas of habitat with limited human access) or food availability (Butts 1992; PF Doc. WL R9).

Affected Environment

Wolverines are considered rare in north Idaho, however, the actual population status and range remains uncertain. The scarcity of information is largely due to the difficulty and expense in studying an animal that is solitary and secretive, and found mostly in remote areas at low densities.

The project area does not contain any potential maternal denning habitat (high elevation cirque basins). As is the case with other large forest carnivores, wolverines require large, remote areas to roam and feed. The proposed actions are located in a developed (roaded) portion of the District, in an environment that makes wolverine presence unlikely and ephemeral at best. There have been sightings of wolverine on the district, most notably the area south of I-90; however, there are no confirmed observations of wolverines near proposed activity areas. Given their wide-ranging nature, it is not unreasonable to assume wolverines may be present, although their presence is likely to be transitory. However, any disturbance to wolverine as a result of project activities would be temporary, and ample displacement habitat is available in adjacent areas.

Rationale for No Further Analysis

Proposed units are located on a portion of National Forest System lands characterized by open and restricted roads and past timber harvest. While these areas provide foraging opportunities for wolverine, they do not represent the secure habitat that wolverine prefer for denning and rearing kits. The Coeur d'Alene River Ranger District has very few, if any, potential denning sites. Denning sites, if they occur would exist on along the Bitterroot Divide between Montanan and Idaho, several miles from any proposed activity under the Beaver Creek project. There would be no increase, and a net decrease, in motorized access of administrative use roads; so the chance of human/wolverine interactions and subsequent mortality risk would be reduced. Ungulate populations are at or near all-time highs in the Northern Idaho Panhandle (IDFG, 2011, 2012; PF Doc. WL 407, 417), so food availability does not appear to be limiting to wolverines. Other ongoing or reasonably foreseeable activities in the project area (mining activities, pocket gopher control, timber harvest and related activities, precommercial thinning and timber stand improvement, public activities) would not affect potential denning habitat or result in discernible changes to prey species. Since the proposed alternatives would not affect potential maternal dens, result in measurable changes to the forage base, or increase human access, potential impacts to wolverine or their habitat are extremely unlikely to occur and would be of an inconsequential nature. Therefore the proposed Beaver Creek Project will not jeopardize the wolverine. This determination is based on the following rationale, consistent with the findings of the proposed rule.

The proposed rule states: "Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species. The available scientific and commercial information does not indicate that other potential stressors such as land management, recreation,

infrastructure development, and transportation corridors pose a threat to the DPS [distinct population segment]."

This project will ***not jeopardize*** wolverine because the project does not occur at a scale that poses a threat to wolverine populations. The home range for a female (females have smaller home ranges than males) can range between 18,000 – 102,000 acres (Hornocker and Hash 1981; PF Doc. WL R27, Gardner 1985; PF Doc. WL R16, Whitman et al. 1986; PF Doc. WL R63, Banci 1987; PF Doc. WL R3, Copeland 1996; PF Doc. WL R3). The Beaver Creek project is 28,200 acres in size, with activities proposed on up to 4,059 acres, a level significantly smaller than the smallest home range of a wolverine. Furthermore, proposed activities are more than 25 miles away from any possible high quality wolverine habitat occurring at high elevation and in remote areas. Lastly, the proposed activities are not considered a threat to wolverines as discussed in the rule mentioned above.

B.4.2. Sensitive Wildlife Species

B.4.2.1. Townsend's Big-eared Bat

Habitat Relationships

Although Townsend's big-eared bats occur in a wide variety of habitats, distribution tends to be correlated with the availability of caves, especially old mine workings (Pierson et al. 1999, PF Doc. WL R99). Large trees appear to be a relatively minor component of Townsend's big-eared bat habitat. Pierson et al., (1999) characterize this bat as, "primarily a cave dwelling species that also roosts in man-made cave analogues" and cites only one observation of the species roosting in coastal redwood and California bay laurel cavities (PF Doc. WL R99). 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, PF Doc. WL R415).

Affected Environment

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, PF Doc. WL R99). Throughout much of their range they are recognized as species at risk. They are currently listed as an R1 Sensitive Species and considered a species of special concern by most western states' wildlife management agencies. Records of Townsend's bats are found throughout the State of Idaho.

The most serious factor leading to 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, PF Doc. WL R99). As the Forest Service closes more mines with bat-accessible gates, human disturbance would decrease and habitat would be improved for this species and other bats which roost in abandoned mines.

A Townsend's big-eared bat has been documented on the Coeur d'Alene River Ranger District at an adit located over 25 miles away from the Beaver Creek Resource Area. Natural cave habitat is limited or nonexistent on the Coeur d'Alene River Ranger District. There are approximately 29 adits that have potential to be roosts for bats in the Beaver Creek Resource Area (PF Doc. WL 40). Eight have been closed with bat accessible gates and still provide habitat for the Townsend's big-eared bat if present. Except for prescribed burning of unit F4, there are no project activities centered on any of these potential roosts. Timing restrictions have been designed into the project (see Appendix E - Design Features) to limit when this unit can be burned to minimize disturbance to any bats that may be using the roost during summer and/or winter.

Rationale for No Further Analysis

Townsend's big-eared bats have not been documented in the Beaver Creek area. There would be no project activities that would impact bats near any known potential roosting habitat. As a result, the project would have ***no impact*** on the Townsend's big-eared bat. No further analysis and discussion is warranted.

B.4.2.2 Coeur d'Alene Salamander

Habitat Relationships

Coeur d'Alene salamanders are small salamanders that choose seeps and wet sites, usually with rock that contains deep fissures that enable them to moderate their temperature by avoiding outside air. Known populations occur in association with fractured rock formations often found in the Belt rock formations. They have been found in three types of select habitats: seeps and springs, waterfall spray zones, and stream edges (Groves et al., 1989, PF Doc. WL R74). Coeur d'Alene salamanders are usually found above ground at night during moist weather in the spring and fall and retreat into the narrow spaces between fractured rocks to avoid drying out in the summer and freezing in the winter.

Affected Environment

Although they likely were once widely distributed in the northern Rocky Mountains, Coeur d'Alene salamanders currently maintain a disjunct distribution limited to isolated populations in northern Idaho, northwestern Montana, and southeastern British Columbia. Because of its limited range and specific habitat association, this species has been listed as a sensitive species by Region 1 of the Forest Service, and is also a state Species of Special Concern in Idaho and Montana.

Information on Coeur d'Alene salamander population trends in northern Idaho is not available. This species has been found at several sites on the district, however not in the Beaver Creek Resource Area (PF Doc. WL 11). Where they have been investigated, Coeur d'Alene salamanders have been found to be locally abundant but limited to appropriate microhabitats within their range (Groves, 1988, PF Doc. WL R290).

Rationale for No Further Analysis

Although suitable salamander habitat may be present (live stream edges and seeps/springs) within the planning area, impacts to these areas would be avoided through treatment area design and application of the Inland Native Fish Strategy standards (see

Appendix E - Design Features). Furthermore, placing soil on wet rock would be avoided during culvert replacements to further protect salamander habitat. Since design criteria would ensure that suitable habitat is excluded from proposed treatment areas, this project would have ***no impact*** on the Coeur d'Alene salamander. No further analysis and discussion is warranted.

B.4.2.3. American Peregrine Falcon

Peregrine falcons are seasonal migrants, nesting in the northern temperate regions while wintering in the tropics and subtropics. They nest on sheer cliffs with overhanging ledges or potholes and a vertical surface that are typically higher than 100 feet and provide protection from predation. Foraging areas associated with nest sites can include wooded areas, riparian habitats, marshes and open water. There are no known eyries on the Coeur d'Alene River Ranger District. There are no suitable cliffs, known historic or current eyries near the Beaver Creek area. Because of the lack of suitable nesting habitat, the Beaver Creek project would have no impact on peregrine falcons or their habitat. No further analysis and discussion is necessary.

B.4.2.4. Bald Eagle

Bald eagles are winter visitors and yearlong residents of northern Idaho. They are attracted to the area's larger lakes and rivers, which provide most of their foraging opportunities (e.g. fish, waterfowl). Accordingly, bald eagles select isolated shoreline areas with larger trees to pursue such activities as nesting, feeding, loafing, etc. Nesting habitat usually includes dominant trees that are in close proximity to a sufficient food supply and within line-of-sight of a large body of water (usually within one-quarter mile). Nest trees typically are large ponderosa pine, Douglas-fir, western larch or cottonwood trees with open crowns in areas that are relatively free from human disturbance (Montana Bald Eagle Working Group, 1991, PF Doc. WL R108). During migration and at wintering sites, eagles tend to concentrate on locally abundant food and tend to roost communally. Roost sites are usually located in stands of mature or old growth conifers that provide protection from inclement weather.

The majority of active or historic bald eagle nests in Kootenai County are along the shoreline of Lake Coeur d'Alene and the Chain of Lakes area, outside of National Forest System lands. These areas are not within the Beaver Creek Resource Area. Because of the lack of suitable nesting habitat, the Beaver Creek project would have ***no impact*** on bald eagles or their habitat. No further analysis and discussion is necessary.

B.4.2.5. Black Swift

Black swifts are a migratory bird that arrive in late May or early June and depart in September. They typically nest in small colonies, but have also been known to nest as a solitary pair. They have a strong fidelity to past nest sites (Marin, 1997; PF Doc. WL R248) and in Idaho have shown a preference for higher elevation mountains (Montana Partners in Flight, 2000; PF Doc. WL R418). Nest sites are strongly associated with falling or dripping water, high relief, inaccessibility to ground predators, unobstructed flyways in the immediate vicinity of the nest, suitable nest niches (i.e. moss covered ledges) and sites which are in the shade for most of the day (Knorr, 1961, PF Doc. WL R419).

The main risks to this species appear to be the lack of water flow in late summer and decreases in prey densities (Wiggins, 2004; PF Doc. WL R269), with lesser risks including nest site disturbance and the use of pesticides near nest sites (Wiggins, 2004; PF Doc. WL R269, Montana Partners in Flight, 2000; PF Doc. WL R418). Black swift nesting has been documented at only one location on the Coeur d'Alene River Ranger District (Fern/Shadow Falls), but surveys have been undertaken by the USFS specifically for this species only in recent years. There are no waterfalls near proposed activities that would provide suitable nesting habitat, and riparian buffers would eliminate any potential streamflow alteration. Since the proposed alternatives are not expected to alter streamflows or reduce vegetative species diversity, and there are no potential nesting sites near proposed units, the Beaver Creek project would have ***no impact*** on black swift. No further analysis and discussion is necessary

B.4.2.6. Common Loon

Common loons generally nest in clear, fish-bearing lakes surrounded by forest, with rocky shorelines, bays, islands, and floating bogs (McIntyre and Barr, 1997; PF Doc. WL R420). The species constructs ground nests on islands, floating bog islets, or other protected areas. Because of their need for large expanses of water for takeoff and landing, loons generally occur in lakes larger than 10 acres in size (USDA, 1989; PF Doc. WL R421). The primary threats to loons are shoreline developments and recreational activities (i.e. boating, jet skiing) that interrupt nesting. There are no lakes with potential nesting habitat within ten miles of the project area. Therefore, the Beaver Creek project would have ***no impact*** on the common loon. No further analysis and discussion is necessary.

B.4.2.7. Harlequin Duck

Harlequin ducks are seasonal residents of whitewater streams in the northern Rockies. They are small sea ducks that winter in coastal areas and migrate hundreds of miles inland to northern Idaho, western Wyoming and western Montana to breed and rear young. Harlequins nest along clear, clean, swiftly flowing remote mountain streams located away from concentrated human activities. They arrive in northern Idaho between March and May. Nesting begins in mid-May and continues through July, with the females rearing the young through late August or September, after which they return to the coast for the winter (Cassirer and Groves, 1991; PF Doc. WL R237). Management activities that impact stream quality, including those that could increase water yield beyond the stream's capability, have the potential to impact this species. Harlequin ducks can also be affected by disturbance within approximately 200 feet (depending on density of streamside vegetation) of a nesting stream (Casirer et al., 1996, PF Doc. WL R422).

In northern Idaho, breeding streams are usually associated with mature to old growth western red cedar/western hemlock or spruce/fir forest stands; nesting habitat includes very low gradient stream sections with braided channels, intact riparian areas with dense streamside shrub growth, and rich aquatic insect populations (Cassirer and Groves, 1991; PF Doc. WL R237). Turbulent stream sections are used for security and feeding. There are no recent harlequin duck observations on the Coeur d'Alene River Ranger District. There would be no modifications to nesting habitat or disturbance to breeding or nesting ducks, and project activities would not affect water quality in potential breeding streams.

As a result, the Beaver Creek project would have ***no impact*** on harlequin ducks or their habitat, and no further analysis and discussion is necessary.

B.4.2.8. Northern Bog Lemming

Northern bog lemmings are found in sphagnum bogs, wet meadows, moist mixed and coniferous forests, alpine sedge meadows, krummholz spruce-fir forests with dense herbaceous and mossy understory, and mossy streamsides (Streubel, 2000; PF Doc. WL 423). They feed on grasses, sedges, and other herbaceous vegetation, but also snails, slugs, and other invertebrates (Foresman, 2001; PF Doc. WL R424). There is no alpine wet meadow or fen/bog habitat in the project area or documented bog lemming sightings on the Coeur d'Alene River Ranger District and no known sightings on the IPNF; therefore, the Beaver Creek project would have ***no impact*** on the northern bog lemming. No further analysis and discussion is necessary.

B.5. Air Quality

Prescribed burning of forest fuels affects air quality through the production of smoke, which contains particulate matter that can be a human health hazard.

Current direction to protect and improve air quality on National Forests is provided by: the Forest and Rangeland Renewable Resources Act of 1974 (16 U.S.C. 1601), as amended by the National Forest Management Act (16 U.S.C. 1602); 2); the Federal Land Management Policy Act of 1976 (43 U.S.C. 1701); and 3) the Clean Air Act amendments of 1977 and 1990 (42 U.S.C. 7401-7626). The Clean Air Act (Section 110) requires states to develop State Implementation Plans (SIPS) which identifies how the State will attain and maintain national air quality standards. Three elements of the Clean Air Act generally apply to management activities that produce emissions (1) protection of ambient air quality standards, (2) conformity with state implementation plans, and (3) protection of visibility in Class 1 airsheds. The Clean Air Act of 1977 (as revised 1991), requires the Environmental Protection Agency (EPA) to identify pollutants that have adverse effects on public health and welfare and to establish air quality standards for each pollutant. Each state is also required to develop an implementation plan to maintain air quality.

The IPNF is a member of the Montana/Idaho Airshed Group, which is composed of members who conduct a "major" amount of prescribed burning and the regulatory and health agencies that regulate this burning. The intent of the Airshed Group is to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction.

The monitoring unit of the Montana/Idaho Airshed Group coordinates burning and smoke emissions to minimize smoke accumulation and provides smoke dispersion forecasts and air quality monitoring support for burners in the Airshed Group. The Airshed Group operates an Internet-based Airshed Management System that allows Airshed Group member burners to enter, track and report prescribed fire data. Before the spring and fall burn seasons, members build a preseason burn list directly into the program's master database. During the burning season, members propose burns from their lists and report accomplishments for their completed acres.

After 1200 noon Mountain time when all proposed burns for the following day(s) have been submitted, the Program Coordinator evaluates burn information airshed-by-airshed to anticipate cumulative smoke effects for the following day. Key factors include burn elevation, wind speed and direction, type of burn, proximity to smoke-sensitive features, anticipated impacts from non-member burners, and any other pertinent information made available at the time of the decision. The monitoring unit considers proposed burns together with expected ventilation or smoke dispersion conditions and existing air quality to determine burn recommendations for the following day (with concurrence from the Idaho Department of Environmental Quality). These procedures limit smoke accumulations to legal, acceptable limits.

The nearest impact zone to the Beaver Creek Resource Area is the Pinehurst Impact Zone, which is at least 10 miles to the south and west of the resource area. Transport winds will generally take smoke farther away from the impact zone.

The District strictly complies with these procedures, and has had no air quality violations. Proven protocols are already in place to assure compliance with all legal and regulatory requirements regarding air quality.

B.6. Carbon Cycling and Storage

The importance of carbon storage capacity of the world's forests is tied to their role globally in removing atmospheric carbon that is contributing to ongoing global warming. Meaningful and relevant conclusions on the effects of a relatively minor land management action such as the Beaver Creek project on global greenhouse gas emissions or global climate change is neither possible nor warranted.

Forests are in a continual flux, both emitting carbon into the atmosphere and removing it through photosynthesis. The proposed activities may alter the rates and timing of that flux within the individually-affected forest stands. However, these changes would be localized and infinitesimal in relation to the role the world's forests play in climate change, and indistinguishable from the effects of not taking action in the Beaver Creek Resource Area. Therefore, this issue is not addressed further. For additional information, refer to the Forest Carbon Cycling and Storage Report (PF Doc. CC-01).

B.7. Cultural Resources

All known cultural resource sites would be protected under any alternative, as provided for in the Programmatic Agreement between the IPNF, the Advisory Council on Historic Preservation, and the Idaho State Historic Preservation Officer. An appropriate inventory has been conducted for this project and cultural properties are known to be located within the area of potential effect. Based on the design features identified in Appendix E, the Forest Cultural Resource Specialist has determined that this project would have No Adverse Effect to these properties because the project has been designed to avoid significant effects to components/features associated with cultural sites determined to be eligible for listing in the National Register of Historic Places. Implementation would not occur until the forest receives concurrence with this determination from Idaho State Historic Preservation Office.

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 effects to these sites in accordance with the National Historic Preservation Act of 1966. No further analysis of this concern is warranted. For additional information, refer to the Specialist's Report on Cultural Resources (PF Doc. SR-12).

B.8. Minerals

Direction for minerals management comes from the Forest Plan (PF Doc. CR-002) and a variety of mining laws and regulations (PF Doc. MIN-R001). Forest Plan Standards for Minerals (II-34; PF Doc. CR-002) include:

Minerals

> 1. In compliance with mining laws and regulations the IPNF will administer lands in cooperation with developers of the minerals, recognizing its value as a National Forest resource.
>
> 2. Maintain an active liaison with local mining industry and mining associations. Cooperate with federal and state agencies charged with the responsibility of administering laws, rules and regulations pertaining to the minerals resource and mining operations.
>
> 3. Facilitate the exploration and development of critical minerals to the extent practicable, consistent with protection and management of surface resources."

Facilities

> 8. Consider minerals development needs in transportation planning.

There are over 150 mining claims on National Forest System lands within the resource area, with 118 held by one claimant. Three Plans of Operations have been submitted for activities within the project area. Proposed activities include trench excavations, utilization of access roads, and small timber sales. The Forest is currently working on reviewing the Plan of Operations.

Based on the design feature incorporated into both action alternatives (Appendix E), there could be short-term inconveniences to the claimants with claims within the project area; however, neither action alternative would significantly adversely affect mining operations.

Under the action alternatives both road decommissioning and road storage may occur. Road decommissioning would reduce the road network, thereby reducing the area potentially accessed for mining by existing roads; however most of the roads proposed for decommissioning were considered unnecessary because there were other roads in the vicinity accessing the same general area. Additionally, none of the roads proposed for decommissioning or storage are currently open to the public under the District's Motorized Vehicle Use Map (MVUM, 2012). During the Transportation Analysis Process (TAPs), mining activities were taken into consideration when discussing the risk verses benefits of the roads in the project area. There were no roads recommended for

decommissioning that were identified as essential for minerals management. Motorized access for mining and mineral exploration purposes utilizing decommissioned and stored roads can be requested via either a Notice of Intent to mine, or a Plan of Operation.

Additional mineral exploration and development is anticipated within the resource area; however, nothing in this project would preclude the construction of new roads to access potential future claims.

Given the current condition of the roads proposed for decommissioning and storage, and the existing system that would be left in place if the road opportunities were implemented, there would be minimal, if any, affect to mineral resources.

The Forest Minerals Administrator was included as a member of the Beaver Creek project team. Developers with existing mining claims were notified of the proposed action and opportunities Design features have been developed to protect mining access and investments, and ensure coordination with the mineral developer during project activities with the potential to affect mineral resources (Appendix E). Given the nature of the proposed action and opportunities, including design features, there would be a negligible effect to mining operations or minerals management, both individually and cumulatively when considering ongoing and reasonably foreseeable activities.

B.9. Noxious Weeds

Noxious weed treatment on the Coeur d'Alene River Ranger District is guided by the Noxious Weeds Final Environmental Impact Statement (FEIS) and Record of Decision (IPNF 2000; PF Doc. CR-028 and CR-029), which follows the general IPNF strategy outlined in the Forest Plan (1987; PF Doc. NW-18). In accordance with the Noxious Weeds FEIS, the public is notified when weed treatments are planned to occur on National Forest System lands and on lands adjacent to privately-owned lands.

Several species of noxious weeds are documented to occur within the Beaver Creek Resource Area. Since 2001, noxious weed treatment has occurred in the area, (specifically along Roads 24, 429, 933, 1505, 1586 and 3100), with good results. Treatments will continue in the area under any alternative.

Risk of introduction and spread of noxious weeds was evaluated considering the results of noxious weed surveys, the documented distribution of weeds found in proposed treatment sites, and the risk of weed spread/introduction of new invader species from the proposed activities, based on peer-reviewed literature and professional judgment.

Both action alternatives could increase the risk of weed invasion in areas where soil disturbance occurs in association with timber harvest, prescribed burning, road work, and watershed improvement (road decommissioning and culvert work). Direct and indirect effects would be similar, with slightly more risk under Alternative 3 because activities would occur on more acres than Alternative 2, and because there would be permanent road construction (Alternative 2 does not propose permanent road construction). Cumulative effects under either action alternative would be low to moderate.

Weed treatment and prevention practices (identified in Appendix E) used in conjunction with the proposed activities would reduce but not totally eliminate the possibility of weed spread. Forest Plan objectives for noxious weed management would be met under any alternative.

For those reasons, no further analysis or disclosure to effects to noxious weeds is warranted. For additional information, refer to the Specialist's Report on Noxious Weeds (PF Doc. NW-42).

B.10. General Motorized Access

B.10.1 Designated OHV Trails

The Motor Vehicle Use Map (MVUM) serves as the enforcement tool of the 2009 Coeur d'Alene River Ranger District Travel Plan Decision. The MVUM not only displays the routes designated for motorized use, but also identifies the types of motor vehicle classes that can operate upon them.

Within the Beaver Creek Resource Area, only Forest Roads 271, 424, 429, 957, 1505, 2322, and 2361 are designated as open to all vehicles. Routes 933, 1586, 151, 1505, 6003, 6328 and 6328A are designated as seasonally-restricted Off Highway Vehicle (OHV) trails open to motorized vehicles less than 50 inches. These OHV trails lie either within or immediately adjacent to the project area, for a combined total of 40.7 miles.

A 1.3-mile portion of the 6-mile Graham Ridge Trail 17 (a single-track trail used predominantly by motorcycles) lies along the far western boundary of the project area. There are no other motorized routes designated on the MVUM within the project area. There are no District-managed routes within the area that are designated for non-motorized uses only.

Neither Alternatives 2 nor 3 propose a change to the MVUM. Any affects to general motorized access, such as full size vehicles operating on seasonal trails, have been addressed through design features (see Appendices B and E). Since the project proposal will have no effect on generalized motorized access, it needs no further analysis. For a more detailed description, see the Recreation Report (PF Doc. SR-09).

APPENDIX C
Collaboration and Public Involvement

A. Introduction

This appendix describes the collaboration and public involvement activities that occurred during development of the Beaver Creek Draft Environmental Impact Statement (EIS). The project was initiated by the Forest Service to address multiple landscape management needs in the area and to respond to interest in the area by local governments, agencies, and landowners. Public involvement and collaboration efforts were designed and implemented to ensure open communication with a wide range of potentially affected or interested parties.

B. Collaboration and Public Involvement Activities

B.1. Introduction

One of the primary goals of the National Environmental Policy Act (NEPA) is to encourage meaningful public input and involvement in the process of evaluating the environmental impacts of proposed federal actions. Council on Environmental Quality (CEQ) regulations implementing NEPA require agencies to make diligent efforts to involve the public in NEPA process and to give the public notice of NEPA-related public meetings and hearings. The CEQ regulations also require agencies to actively identify parties that might be interested in a proposed federal action, and to give notice to the public through a variety of media such as the Federal Register, local newspapers, or direct mailing.

The following describes how and when the IDT notified the public about the project; invited public participation in developing the proposal; informed potentially interested and/or affected parties about the project area, management needs, proposed activities, and anticipated analysis; and collaborated with diverse interests and organizations in developing a proposed action. Documentation of these efforts is provided in the project files as noted.

B.2. Collaboration

Shoshone Forest Health Collaborative

The Forest Service is a member of the Shoshone Forest Health Collaborative was initiated in 2009 and by September 2010, had over 30 stakeholders, including representatives of the US Forest Service, Idaho Department of Lands, Bureau of Land Management, Idaho Department of Environmental Quality, Idaho Fish and Game, forest industries, soil conservation districts, resource conservation districts, consultants, environmental groups, economic development, legislative representatives and concerned citizens. The Collaborative has two working groups: the forest health group, which focuses on identifying and developing projects to promote forest health and reduce wildfire threats, and the biomass working group, which focuses on economic development and biomass utilization.

At the July 10, 2012 meeting of the Shoshone Forest Health Collaborative, the Forest Service shared information about two forest management proposals (Beacon Light and Beaver Creek); the group decided to collaborate on the Beaver Creek project, which focused on forest health, watershed restoration, and fuels reduction (PF Doc. PI-002).

Current conditions, potential activities, analysis processes and associated public involvement activities for the Beaver Creek Resource Area proposal were discussed during meetings with the Collaborative on September 11, 2012 (PF Doc. PI-003) and October 9, 2012 (PF Doc. PI-007). The group also participated in a field trip to the area on October 24, 2012 (PF Doc. PI-014), looking at potential road decommissioning sites and proposed vegetation treatment units. Also discussed were potential effects of harvest treatments on aquatic resources and wildlife, and long-term transportation needs (for forest management and to access mining claims).

On November 27, 2012, Project Leader Lauren Goschke briefed the Shoshone Forest Health Collaborative (PF Doc. PI-060). She described upcoming steps in the process, as well as review and use of public comments. The group discussed concerns related to fire risk, elk populations, roads, economic returns to the county, minerals, and consideration of other alternatives.

Other Agencies and Organizations

On September 21, 2012, district Wildlife Biologist Gail Worden was accompanied by three representatives from **Idaho Department of Fish and Game** (IDFG) on a field trip to the Beaver Creek Resource Area (PF Doc. PI-004). They discussed proposed harvest treatments, road decommissioning, and watershed restoration activities, and concerns with elk security in the area. They also looked at mineral extraction and mine clean-up sites.

Project Leader Lauren Goschke met with Arnold Howe, president of the **Backcountry ATV Club** on October 30, 2012 (PF Doc. PI-018), and provided maps associated with the proposal. They discussed proposed treatment activities in general, with specific attention to the roads proposed for decommissioning, and the reasons why.

The Forest Service is a member of the **North Fork Coeur d'Alene River Watershed Advisory Group**. Watershed advisory groups (WAGs) are groups of interested citizens that provide local public input and guidance to DEQ during the development of water quality improvement plans or "Total Maximum Daily Loads" (TMDLs) for water bodies that fail to meet water quality standards. Members of the WAG represent the interests and industries affected by management of the watershed; for example, agriculture, environmental interests, forest products, livestock, local government, mining, Native American tribes, point source dischargers, resource management agencies, and water-based recreation. On January 24, 2013, Lauren Goschke shared information about the Beaver Creek project, including the change from an EA to an EIS, public concerns heard during scoping, and upcoming public collaboration and involvement opportunities (PF Doc. PI-067).

B.3. Public Involvement

Scoping is an early and open process for determining the range of issues to be addressed and for identifying significant issues that may need to be addressed when considering a proposed action. Conducted in the early stages of preparing an environmental impact statement, scoping efforts solicit public input to help determine the level of analysis required, the data needed, and the issues to be considered in the development and analysis of a range of alternatives in the environmental impact statement.

October 5, 2012 Letter to the Public

Public involvement in project development began in the fall of 2012. The Forest Service contacted the general public about the proposed Beaver Creek project through a letter dated October 5, 2012 (PF Doc. PI-05). The scoping letter (with maps) was mailed to 312 addresses, including other agencies, tribal representatives, local government offices, organizations, businesses, adjacent landowners, and other interested members of the public. The letter shared

information regarding the need for action in the area, proposed activities, and opportunities for participating in project development, which was initially planned to be documented in an environmental assessment.

The letter explained that Forest Service policy requires Regional Forester approval for development of openings over 40 acres in size (PF Doc. PI-005, page 5). Included was an explanation that some regeneration openings (shelterwood and seed tree harvests) within variable retention areas may exceed the 40-acre size to create more effective fuel reduction treatments and to accomplish the goals of improving species composition, stand structure and landscape structure across the project area. For further discussion of opening size, refer to the Forest Vegetation discussion in Chapter 3.

The letter also included a comment form so interested people could provide input on the proposal and their use of the project area, and notified the public of the upcoming (October 30, 2012) open house meeting for the project. A legal ad briefly describing the project and requesting public comment was published in the *Coeur d'Alene Press* (the newspaper of record) on October 9, 2012 (PF Doc. PI-008).

October 30, 2012 Open House Meeting

On October 30, 2012, an open-house public meeting was held at the Prichard/Murray Fire Station (PF Doc. PI-019). The meeting had been publicized through publication of news articles in the Shoshone News-Press newspaper on October 11, 2012 (PF Doc. PI-010), October 19, 2012 (PF Doc. PI-012), and October 27, 2012 (PF Doc PI-017); and in the Coeur d'Alene Press newspaper on October 25, 2012 (PF Doc. PI-015).

In addition, copies of a flyer announcing the open house meeting were posted at the busier locations (such as post offices and markets) in at least a dozen communities from Coeur d'Alene to the Silver Valley of Idaho (PF Doc. PI-011).

Approximately 50 people attended the meeting, including a couple of candidates for local government offices. Guests were provided with a copy of the scoping letter, and given the opportunity to be added to the project mailing list. Project team members had maps, photos, and other displays related to forest vegetation, fire/fuels, hydrology and fisheries, wildlife, recreation, roads and trails, and minerals. Discussions covered existing conditions and uses of the area, as well as the type and location of proposed activities.

Following the meeting, maps were posted to the Forest Service website for the project, which is available to the public through the IPNF webpage (http://www.fs.usda.gov/projects/ipnf/landmanagement/projects). Maps and other materials were also sent to those who requested them. Additional articles regarding the proposed Beaver Creek project were published in the Shoshone News-Press on November 28, 2012 (PF Doc. PI-061) and the Coeur d'Alene Press the following day (PF Doc. PI-062). Two individuals submitted letters to the editor of the Shoshone News-Press commenting on the open house meeting. One enjoyed the meeting and expressed appreciation to the Forest Service (PF Doc. PI-020). The second individual did not attend the meeting but talked to two others who did attend, and shared their comments about the meeting and project (PF Doc. PI-021).

January 1, 2013 Schedule of Proposed Actions

Information about the Beaver Creek project was provided through the IPNF's Schedule of Proposed Actions (SOPA) starting with the January 1, 2013 issue and continuing through the current issue (PF Doc. PI-063). The SOPA, available to the public through the IPNF webpage (http://www.fs.usda.gov/projects/ipnf/landmanagement/projects) provided links to additional information, including the October 5, 2012 scoping letter, maps of existing conditions or features, and maps of proposed activities.

January 18, 2013 Letter to the Public

Based on the high level of public interest in the project, the size and scope of work, and the potential issues associated with the project, the Forest Supervisor made the decision to move from an environmental assessment (EA) process and continue project analysis with an environmental impact statement (EIS).

The change in the level of documentation was shared with the public through a letter dated January 18, 2013 (PF Doc. PI-064) that was mailed to 318 addresses (PI-068) and posted to the project website (http://www.fs.usda.gov/projects/ipnf/landmanagement/projects). The following day, the Shoshone News-Press carried a front-page article announcing the change (PF Doc. PI-065). Since only the level of analysis, not the proposal, was changed, scoping was not re-initiated.

January 22, 2013 Notice of Intent to Prepare an EIS

A Notice of Intent (NOI) to Prepare an EIS was published in the Federal Register (59 FR 4680) on January 22, 2013 (PF Doc. PI-066), and posted to the Forest Service website for the project (http://www.fs.usda.gov/projects/ipnf/landmanagement/projects). The notice provided an overview of the project and anticipated schedule, as well as descriptions of the purpose and need for action in the area, proposed activities, possible alternatives, the nature of the decision to be made, and preliminary issues.

The NOI noted that permits associated with Section 404 of the Clean Water Act are anticipated due to the nature of some of the restoration activities, such as culvert upgrades to facilitate aquatic organism passage or to improve hydrologic function.

The scoping process was explained, including the assurance that comments already submitted in response to the October 5, 2012 scoping letter would be used in preparation of the EIS.

Figure C- 1. The October 30, 2012, open-house public meeting at the Prichard/Murray Fire Station provided an opportunity for the public and project team to discuss the Beaver Creek Resource Area.

C. Persons Consulted on the Proposal

The initial mail list for the project was developed by identifying those groups potentially interested in or affected by the proposal, as well as adjacent landowners, special use permit holders, and those with mining claims in the area.

The following tables identify the agencies, organizations, businesses and individuals who were contacted during project development and scoping. Over 300 were contacted through the October 5, 2012 scoping letter (PI-005) and/or update letter (PI-064); others were contacted through meetings, field trips, telephone calls, or email. Of the scoping letters sent, 21 were returned as undeliverable (PI-006); six of the update letters were also returned (PI-068). Those names are not displayed in the tables below. All contacts are documented in the project files as noted.

Table C- 1. List of agencies, tribes, organizations and businesses contacted during project development and scoping.

Contact	City, State	PF Doc. #
Avista Corp. - Robin Bekkedahl	Spokane, WA	PI-005
Avista Corp. - Sharon Vore	Spokane, WA	PI-005
Avista Corp. - Tim Vore	Spokane, WA	PI-005
Azteca Gold Corp.	Spokane, WA	PI-005
Backcountry ATV Association - Ken Chrisp	Spokane, WA	PI-005
Backcountry ATV Club – Arnold Howe		PI-018
Bonneville Power Administration - Tom Murphy	Mead, WA	PI-005
Brush Bunch Jeff Hildesheim	Rockford, WA	PI-005
Bureau of Land Management - Kurt Pavlat	Coeur d'Alene, ID	PI-005
CDA Snowmobile Club	Hayden, ID	PI-005
Chester Mining Company	Spokane, WA	PI-005
Coeur d'Alene Audubon - Carrie Hugo	Coeur d'Alene, ID	PI-005
Coeur d'Alene Natural Resources Committee - Tim Kastning	Coeur d'Alene, ID	PI-005
Coeur d'Alene Placer Mining Co.	Wellesley Hills, MA	PI-005
Coeur d'Alene Placer Mining Co. - Elizabeth Gardner	Wellesley Hills, MA	PI-005
Coeur d'Alene Tribe - Chairman Chief J. Allen	Plummer, ID	PI-005
Coeur d'Alene Tribe - Cultural Resources Director Jill Wagner	Plummer, ID	PI-005
Coeur d'Alene Tribe - Natural Resources Director Alfred Nomee	Plummer, ID	PI-005
DMW Metal Holdings LLC	Delaplane, VA	PI-005
Eagle City Mining Company	Rathdrum, ID	PI-005
Eastside Highway District - John Pankratz	Coeur d'Alene, ID	PI-005
Elk Unlimited - David Zabel	Osburn, ID	PI-005
Four Square Gold Mines Inc.	Coeur d'Alene, ID	PI-005
Grouse Peak LLC	Coeur d'Alene, ID	PI-005
H&J Pipeline Maintenance LTD	Wallace, ID	PI-005
Hayden Lake Water, Sewer & Recreation Board	Hayden Lake ID	PI-005
HECLA Limited	Coeur d'Alene, ID	PI-005
High Mountain ATV Association	Wallace, ID	PI-005
Historic Wallace Chamber of Commerce	Wallace, ID	PI-005
Idaho Conservation Data Center - Bill Bosworth	Boise, ID	PI-005
Idaho Conservation League - Jonathan Oppenheimer	Boise, ID	PI-005
Idaho Conservation League - Brad Smith	Sandpoint ID	PI-005
Idaho Department of Lands	Kingston ID	PI-005
Idaho Department of Environmental Quality - Kajsa Stromberg	Coeur d'Alene, ID	PI-005
Idaho Departement of Fish and Game - Jim Teare	Coeur d'Alene, ID	PI-004, 005
Idaho Departement of Lands	Coeur d'Alene, ID	PI-005
Idaho Department of Parks and Recreation - Jeff Cook	Boise, ID	PI-005
Idaho Department of Parks and Recreation - Marc Hildesheim	Coeur d'Alene, ID	PI-005
Idaho State Preservation Office	Boise, ID	PI-005
Inspiration Lead Co. Inc.	Portland, OR	PI-005
Intermountain Forest Association - Serena Carlson	Coeur d'Alene, ID	PI-005

Contact	City, State	PF Doc. #
International Basic Res/Mine	Spokane Valley, WA	PI-005
Kootenai Environmental Alliance - Mike Mihelich	Coeur d'Alene, ID	PI-005
Kootenai Co. Snow Groomer Board - Dave Bonasera	Hayden, ID	PI-005
Louisiana Pacific Corp.	Hayden Lake, ID	PI-005
Mine Ventures LLC	Dalton Gardens, ID	PI-005
Missouri Improvement Company - Property Tax Dept	Omaha, NE	PI-005
Mullan School District #392 - Robin Stanley	Mulllan, ID	PI-005
Natural Resources Conservation Service	Boise, ID	PI-005
Natural Resources Conservation Service – Aubrey Woodcock	Coeur d'Alene, ID	PI-005
North Fork Coeur d'Alene River Watershed Advisory Group	Coeur d'Alene, ID	PI-005, 067
North Idaho ATV - Frank Axtell	Hayden, ID	PI-005
North Idaho Flycasters - Bob Bevins	Coeur d'Alene, ID	PI-005
North Idaho Jammers	Cataldo, ID	PI-005
North Idaho Trailblazers - Hans Archer	Cheney, WA	PI-005
Northwest Access Alliance - Dave Vig	Athol, ID	PI-005
Northwest Access Alliance - Don Hull	Coeur d'Alene, ID	PI-005
Office of Raul Labrador	Coeur d'Alene, ID	PI-005
Office of Senator Crapo	Coeur d'Alene, ID	PI-005
Office of Senator Risch	Coeur d'Alene, ID	PI-005
PANTRA	Post Falls, ID	PI-005
Polaris Resources Inc	Hilton Head, SC	PI-005
Prichard Murray Fire Department	Wallace, ID	PI-005
Pulaski Project - Ron Roizen	Wallace, ID	PI-005
R & G Mining Co	Kellogg, ID	PI-005
R.E. Mining Co - Duane Little	Kellogg, ID	PI-005
Righteous LLC	Silverton, ID	PI-005
River Investments LLC	Coeur d'Alene, ID	PI-005
Riverstop Enterprises LLC	Wallace, ID	PI-005
Rock Of Ages LLC	Silverton, ID	PI-005
Rocky Mountain Elk Foundation	Missoula, MT	PI-005
SFCC Life Sciences Dept. - Dr. Albert Wilson	Spokane, WA	PI-005
Shoshone County Noxious Weed Control Board	Wallace, ID	PI-005
Shoshone County Commissioners	Wallace, ID	PI-005
Shoshone County Forest Health Collaborative	Wallace, ID	PI-002, 003, 005, 007, 014, 060
Shoshone County Public Works	Wallace, ID	PI-005
Shoshone County Sheriff's Department	Wallace, ID	PI-005
Shoshone Silver Mining Company	Coeur d'Alene, ID	PI-005
Silver Aurora Mining Co	Cataldo, ID	PI-005
Silver Horizon Mining	Kellogg, ID	PI-005
Silver Valley Rentals LLC	Kellogg, ID	PI-005
Silverore Mines	Portland, OR	PI-005
Stimson Lumber - Barry Dexter	Coeur d'Alene, ID	PI-005
Sunshine Mining Company	Kellogg, ID	PI-005
Sustainable Northwest	Portland, OR	PI-005
The Lands Council - Jeff Juel	Spokane, WA	PI-005
Union Pacific Land Res Corp.	Omaha, NE	PI-005
University Of Idaho - Denim Jochimsen	Moscow, ID	PI-005
University of Idaho - Tammi Laninga	Moscow, ID	PI-005
US Environmental Protection Agency – Ed Moreen	Coeur d'Alene, ID	PI-005
US Environmental Protection Agency	Seattle, WA	PI-005
US Fish & Wildlife Service	Spokane, WA	PI-005
US Silver Inc	Wallace, ID	PI-005
Vertical Earth - Mike Gaertner	Coeur d'Alene, ID	PI-005
WCT – Ed Lider	Coeur d'Alene, ID	PI-005
WildWest Institute	Missoula, MT	PI-005

Table C- 2. List of individuals contacted during project development and scoping.

Contact	City, State	PF Doc. #
Clyde C. Adcox, Jr.	Murray, ID	PI-005, 019
Dale Adickes	Athol, ID	PI-005
James Ahlman	Athol, ID	PI-005
James and Deanna Anderson	North Bend, WA	PI-005
Michael Andrewson	St Maries, ID	PI-005
Amy Arave-Eixenberger	Kellogg, ID	PI-005
Dick Artley	Grangeville, ID	PI-005
Terry Auten	Athol, ID	PI-005
Greagory and Randal Babin	Spokane, WA	PI-005
Harold and Joanne Babin	Spokane, WA	PI-005
Kenneth and Sandra Babin	Sandpoint, ID	PI-005
Randall and Netta Babin	Murray, ID	PI-005, 019
Bob Baker	Hayden, ID	PI-005
Fred, Guido, And John Bardelli	Osburn, ID	PI-005
Lloyd Joseph Bardswich	Whitehall, MT	PI-005
Al Beauchene	Hayden, ID	PI-005, 064
John Bentley	Post Falls, ID	PI-005
Casey Berg	Spirit Lake ID	PI-005
Jim C. Best	Kellogg, ID	PI-005, 019
Michael, Sean and Brian Biotti	Pinehurst ID	PI-005, 019
Mike Biotti	Pinehurst, ID	PI-005, 019
Raeanne Bohn	Kingston, ID	PI-005
James Boisseranc	Athol, ID	PI-005
Dave Bonasera	Coeur d'Alene, ID	PI-005
Rowene Bond	Kingston, ID	PI-005
James Bonham	Rathdrum, ID	PI-005
James and Laurie Bonham	St. Maries, ID	PI-005, 019
Fred Brackebusch	Kellogg, ID	PI-005
Michael and Nancy Branstetter	Osburn, ID	PI-005, 019
Allen and Lonnie Brown	Wallace, ID	PI-005
Wayne Brown	Kingston, ID	PI-005, 019
Robert and April Bumbaugh	Post Falls, ID	PI-005
Bob Burke	Kingston, ID	PI-005
Alice Burnell	Eagle, ID	PI-005
Edwin and Gertrude Bush	Coeur d'Alene, ID	PI-005
Jeff Cantamessa	Wallace, ID	PI-005, 019
Jon Cantamessa	Wallace, ID	PI-005, 019
Shirley Capparelli & Gene Mahouer	Smelterville, ID	PI-005, 019
Jerry and Jackie Carlson	Hayden, ID	PI-005
Chapin Residence	Wallace, ID	PI-005
Randy and Claudia Childress	Wallace, ID	PI-005, 019
Luther Church, Jr.	Osburn, ID	PI-005
Dolores Clancy	Athol, ID	PI-005
Bob Clark	Coeur d'Alene, ID	PI-005
Dave Clark	Bellevue, WA	PI-005
Ed Clark	Bellevue, WA	PI-005
Karen Clark	Wallace, ID	PI-005
William and Tamara Clark	Coeur d'Alene, ID	PI-005
Bonnie Clouse	Wallace, ID	PI-005
Stephen Coyle	Wallace, ID	PI-005, 019
Jeanine Crain	Athol, ID	PI-005
Tom Crimmins	Hayden Lake, ID	PI-005
Summer Crosby	St. Maries, ID	PI-005
Mavis Curtis		PI-019

Contact	City, State	PF Doc. #
Richard Dechand and Stacy Nickerson	Wallace, ID	PI-005
Doris Dilday c/o Jack Thompson	Roundup, MT	PI-005
Robert Dittner	Smelterville, ID	PI-005
Garry Dodge	Osburn, ID	PI-005
Lynda Dolan	Athol, ID	PI-005
Larry Domingo	Spokane, WA	PI-005
Ron Dorchuck	Osburn, ID	PI-005
Marie Doughty	Coeur d'Alene, ID	PI-005
Richard Doughty	Athol, ID	PI-005
Bill Douglas	Bellevue, WA	PI-005
Tom DuHamel	Harrison, ID	PI-005
Brian Dunham	Ponderay, ID	PI-005
Logan Dyckhoff	Rathdrum, ID	PI-005
Tammy and Ray Eberhard	Pinehurst, ID	PI-005
Nina Eckberg	Coeur d'Alene, ID	PI-005
James and Susan Edwards Family Trust	Coeur d'Alene, ID	PI-005
Douglas and Bonnie England	Osburn, ID	PI-005
Roy Faler	Kingston, ID	PI-005
James Fenley	Athol, ID	PI-005
John Frederick	Soap Lake, WA	PI-005
Dan Frigard	Wallace, ID	PI-005
Frank and Sarah Garci	Post Falls, ID	PI-005
Alan and Malinda Gilda - GMRV	Mullan, ID	PI-005, 019
Ken Gimbel	Coeur d'Alene, ID	PI-005
Richard and Laura Good	Hayden, ID	PI-005
Louise Graffenberger	Osburn, ID	PI-005, 019
Dave Griffiths	Liberty Lake, WA	PI-005
Dan Guy	Kingston, ID	PI-005
Brent Hadfield	Athol, ID	PI-005
Vicki Hahn c/o Melanie Sanchez	Coeur d'Alene, ID	PI-005
William and Ingrid Hale	Wallace, ID	PI-005, 019
Kimberley Hammeren	Wallace, ID	PI-005
Peg Hammeren	Prichard, ID	PI-019
Melvin Harbison Jr	Athol, ID	PI-005
Tarita Harjy	Kingston, ID	PI-005, 019
Annette and Steve Hart	Rathdrum, ID	PI-005, 019
Gregory Hart	Post Falls, ID	PI-005
Mark Hartmann	Wallace, ID	PI-005
Geoff Harvey	Hayden, ID	PI-005
Cecil Hathaway	Coeur d'Alene, ID	PI-005
George and Vicki Hemphill	Wallace, ID	PI-005
William Henderson	Rathdrum, ID	PI-005
John & Claire Hendrix	Tumtum, WA	PI-005
John Hern	Hayden, ID	PI-005
Tom Herron	Coeur d'Alene, ID	PI-005
Ron Heyn	Wallace, ID	PI-005, 019
Eldon Hindberg	Athol, ID	PI-005
G.A. (Nick) Hogamier	Wallace, ID	PI-005, 019
Mark Hogen	Coeur d'Alene, ID	PI-005
Frank Holzer	Athol, ID	PI-005
Art and Joan Hostetler	Coeur d'Alene, ID	PI-019
Mark Howard	Athol, ID	PI-005
Don Hughes	Athol, ID	PI-005
Jack Hull	Wallace, ID	PI-005
Pamela and John Hull	Wallace, ID	PI-005
Carol Hunt		PI-019
Steve and Vonnie Hutchison	Coeur d'Alene, ID	PI-005
Larry Isenberg	Coeur d'Alene, ID	PI-005

Contact	City, State	PF Doc. #
Katie James	Kingston, ID	PI-005
Larry Jamison	Coeur d'Alene, ID	PI-005
Jake Jenkins	Wallace, ID	PI-005
Kevin and Sandee Jennings	Post Falls, ID	PI-005
Bev Johnk	Wallace, ID	PI-019
Alfred Johnson	Wallace, ID	PI-005
Georgia Johnson	Nine Mile Falls, WA	PI-005
Jonathan Jolley	Rathdrum, ID	PI-005
William and Barbara Jones	Post Falls, ID	PI-005
Robert Kees	Spokane, WA	PI-005
Kristin Keith	Coeur d'Alene, ID	PI-005
Kendrick Family Trust	Hayden Lake, ID	PI-005
Michael Kilmer	Eureka, SD	PI-005
Robert Kilmer	Eureka, SD	PI-005
Sherry Klaus	Plummer, ID	PI-005
Fred and Dorthy Krewson	Murray, ID	PI-005
Jeffrey and Roxanne Lambert	Pinehurst, ID	PI-005
John Lane	Bellevue, WA	PI-005
Carol LaPan	Coeur d'Alene, ID	PI-005, 019
Daniel Laudeman	San Marcos, CA	PI-005
Lucky and Patricia Lawrence	Wallace, ID	PI-005, 019
Forry LeDue	Wallace, ID	PI-005, 019
Harold and Shirley Lee	Coeur d'Alene, ID	PI-005
Bob Leisenring	Dalton Gardens ID	PI-005
Duane E. Little	Kellogg, ID	PI-005
Douglas and Roberta Loper	Hayden Lake, ID	PI-005
Robert Lowe	Rathdrum, ID	PI-005, 019
Ingrid Madsen	Coeur d'Alene, ID	PI-005
Melo Maiolie	Coeur d'Alene, ID	PI-005
Gene Marquer	Smelterville, ID	PI-019
Don Martin	Coeur d'Alene, ID	PI-005
Dan Martinson	Wallace, ID	PI-005
Elmer Matilla and Perry Family Trust	Wallace, ID	PI-005
Ashley McFarland	St. Maries, ID	PI-005
William McPeak	San Jose, CA	PI-005
Cindy and William Metlow	Chewelah, WA	PI-005
John Miller	Spokane, WA	PI-005
Wayne Miller	St Maries, ID	PI-005
Wendy C. Miller	Silverton, ID	PI-005, 016
Eric Molter	Athol, ID	PI-005
Peggy Morris	Kingston, ID	PI-005
Dennis Murphy		PI-069
Brad Musch	Post Falls, ID	PI-005
John Nichols	Post Falls, ID	PI-005
Michael and Joan Nicholson	Wallace, ID	PI-005
Jack O'Brien	Hayden, ID	PI-005
Linda Ogren	Medford, OR	PI-005
Oliver Family Trust	Sagle, ID	PI-005
Paula Olson	Osburn, ID	PI-005
Joe Peak	Kingston, ID	PI-005
John Pickard	Cataldo, ID	PI-005
Sandy Podsaid		PI-019
Bob Quinn	Hayden, ID	PI-005
Bob Ranells	Wallace, ID	PI-005
Janna Richardson		PI-009
Jack and Geneva Riddle	Wallace, ID	PI-005, 019
Charles Robnett	Athol, ID	PI-005
Willis and Elaine Rogers	Lake Almanor, CA	PI-005

Contact	City, State	PF Doc. #
Larry and Linda Runkle	Coeur d'Alene, ID	PI-005
Davis and Christine Rust	Wallace, ID	PI-005
W.C. (Bill) Rust	Wallace, ID	PI-005
Don Schaffier	Dalton Gardens, ID	PI-005, 019
Sandy Schlepp	Cataldo, ID	PI-005
Charles Schwartz and Francene King	Wallace, ID	PI-005
Leroy Scott	Wallace, ID	PI-005
Neil Seerley	Athol, ID	PI-005
Eric Shanley	Hayden, ID	PI-005
Bill Sharp	Murray, ID	PI-005, 019
Elnora Sharp, Heidi Hill, and Michael Hill	North Pole, AK	PI-005
Chris Shawver	Athol, ID	PI-005
Ben and Monica Sheppard	Cataldo, ID	PI-005
Dennis and Judy Sheppard	Wallace, ID	PI-005
George and Louise Sheppard	Pinehurst, ID	PI-005
John Sint	Pinehurst, ID	PI-005, 019
Louise Smith	Osburn, ID	PI-005, 019
Lynn Smith	Hayden, ID	PI-005
Terry E. Smith	Pinehurst, ID	PI-005, 019
Dennis Sobotka	East Amherst, NY	PI-005
Leslee Stanley	Silverton, ID	PI-005, 019
Robin Stanley		PI-019
Bob Steed	Coeur d'Alene, ID	PI-005
Debbie Stempf	Spokane, WA	PI-005
Bonnie Stewart		PI-019
Dwight, Mabel and Eric Suitter	Smelterville, ID	PI-005
Mark Sverdsten	Cataldo ID	PI-005
John Thomas	Wallace, ID	PI-005
Guy, Jacob, Joni, and Cortney Thompson	Rathdrum, ID	PI-005
Kay Thompson	Wallace, ID	PI-005
Robert Thompson	Coeur d'Alene, ID	PI-005
Tim Thompson	Wallace, ID	PI-005, 019
Richard Thouragood	Hayden, ID	PI-019
Tim Trout and Wendy Carpenter	Coeur d'Alene, ID	PI-005
Glenn Truscott	Coeur d'Alene, ID	PI-005
Pat Way	Coeur d'Alene, ID	PI-005
Timothy and Sandra Wheeler	Post Falls, ID	PI-005
Brian White	Coeur d'Alene, ID	PI-005
Becki Witherow	Coeur d'Alene, ID	PI-005
Erve Wolfgam		PI-019
Woody Woodford	Kellogg, ID	PI-005
Andrew Wright	Post Falls, ID	PI-005
Leonard Wright and Judith Lane	Kennewick, WA	PI-005
Tom Wuest	Dalton Gardens, ID	PI-005
Larry Yergler	Wallace, ID	PI-005, 019

D. Comments Received on the Beaver Creek Proposal

Comments were received as a result of the October 30, 2012 open house meeting and during scoping (PF Doc. PI-022 through PI-058). Comments were used to help identify issues and define the analysis of effects and proposed treatments. The project interdisciplinary team considered concerns identified through the scoping process and incorporated ideas presented by the public and other agencies into alternative design, as noted in Chapter 2 and the environmental effects disclosures in Chapter 3.

The following tables identify the agencies, organizations, businesses and individuals who commented. Copies of the comments are included in the project files, as noted in the tables. A thorough analysis of comments was conducted, and a preliminary response was prepared (PF Doc. PI-59). For each specific comment, the team determined whether/how that concern was addressed in the analysis, whether any new issue was raised, and whether any new alternative was recommended for consideration.

Table C-3. Federal, state and county agencies who commented during scoping on the Beaver Creek proposal.

Name	Agency	Project File Document
Erik Peterson, Environmental Review and Sediment Management Unit	US Environmental Protection Agency, Region 10	PI-057
Kajsa Stromberg, Watershed Coordinator	Idaho Department of Environmental Quality	PI-049
Charles Corsi, Regional Supervisor	Idaho Department of Fish and Game	PI-051
Jeff Cook, Outdoor Recreation Analyst	Idaho Department of Parks and Recreation	PI-045
	Shoshone County Forest Health Collaborative Group	PI-052, 053
	Shoshone County Board of Commissioners	PI-052, 054
	Shoshone County Fire Mitigation WUI Manager	PI-052, 055

Table C-4. Organizations and businesses who commented during scoping on the Beaver Creek proposal.

Name	Organization/Business Represented	Project File Document
Alan Gilda, Field Engineer	GMRV	PI-033
Jeff Juel	The Lands Council (and on behalf of the Alliance for the Wild Rockies	PI-043
Mike Mihelich, Forest Watch Coordinator	Kootenai Environmental Alliance	PI-044
Thomas Murphy, Natural Resource Specialist	Bonneville Power Administration	PI-028
Brad Smith, North Idaho Conservation Associate	Idaho Conservation League	PI-029
Robin Stanley, Superintendent	Mullan School District #392	PI-050
Dwight Suitter, Idaho State Office Manager	Public Land for the People (and Shoshone Natural Resources Committee member)	PI-023
Wendy C. Miller, Manager	Rock of Ages L.C., Righteous L.C., Stone Hedge L.C., and Star L.C.	PI-024

Table C-5. Other members of the public who commented during scoping on the Beaver Creek proposal.[1]

Name	City, State	Project File Document
Dick Artley	Grangeville, ID	PI-025
Fred Bardelli	Osburn, ID	PI-058
Claudia Childress	Wallace, ID	PI-037
Randy Childress	Wallace, ID	PI-036
Louise Graffenberger	Osburn, ID	PI-032
Bill and Ingrid Hale Neidig	Wallace, ID	PI-034
Annette and Steve Hart		PI-042
Geoff Harvey	Hayden, ID	PI-047
Lucky Lawrence		PI-041
Trisha Lawrence		PI-035
Duane E. Little	Kellogg, ID	PI-048
John Miller	Spokane, WA	PI-031
John Pickard	Cataldo, ID	PI-026
W.C. Rust	Wallace, ID	PI-056
William Sharp	Murray, ID	PI-038
Louise Smith	Osburn, ID	PI-030
Leslee Stanley	Silverton, ID	PI-027
Robert Stanley		PI-022

[1] *In addition to those listed in the table, three sets of comments were submitted anonymously (PF Doc. PI-039, PI-040, and PI-046.*

APPENDIX D
Specific Proposed Activity Information

D.1. Introduction

The following tables provide specific unit information under the action alternatives, including design features specific to units, and road-related management.

No management activities are proposed under Alternative 1; therefore there is no information provided here regarding that alternative. Please refer to Chapter 2 for a complete description of alternatives.

D.2. Vegetation Management

D.2.1. Management Units

Under both action alternatives, management units were delineated around proposed harvest areas based on stand boundaries, logging systems, and topographic features such as roads, ridges, and drainages. These management units are comprised of proposed harvest units and areas proposed for full retention (forested areas that are specifically excluded from harvest for the foreseeable future, some of which is within delineated INFS buffers). Table D-1 and Table D-2 display proposed activity information for management units under each action alternative.

Table D-1. Management (Mgmt) Unit Information, Alternative 2.

Alt. 2 Mgmt Unit	Alt. 2 Mgmt Unit Acres	Alt. 2 Proposed Harvest Treatment	Alt. 2 Proposed Yarding System	Alt. 2 Proposed Slash Treatment	Alt. 2 Design Feature Information
1	7	improvement cut	skyline	yard tops attached and underburn	
2	41	improvement cut	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype. Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
4	38	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype. Highbank where possible. Whole-tree yard to protect white pine component. Activities will occur only Aug. 15-Apr. 1 to protect nesting goshawks and the post-fledgling area
6	42	commercial thin	skyline	yard tops attached with no burning	Slope restrictions for mechanized felling due to sensitive landtype.
7	17	shelterwood	skyline	underburn	
8	35	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype. Activities will occur only Aug. 15-Apr. 1 to protect nesting goshawks and the post-fledgling area
9	25	improvement cut	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
10	41	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
10a	13	shelterwood	ground	underburn	
12	21	commercial thin	skyline	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
13	27	shelterwood	skyline	underburn	Leave tops.
13	21	shelterwood	skyline	yard tops attached and underburn	Whole-tree yard in the south half of the unit to protect white pine component.
14	35	commercial thin	skyline	yard tops attached and underburn	
14b	20	shelterwood	skyline	underburn	
15	53	shelterwood	skyline	underburn	
15a	14	shelterwood	ground	underburn	

Alt. 2 Mgmt Unit	Alt. 2 Mgmt Unit Acres	Alt. 2 Proposed Harvest Treatment	Alt. 2 Proposed Yarding System	Alt. 2 Proposed Slash Treatment	Alt. 2 Design Feature Information
16	18	improvement cut	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
16t	12	shelterwood	ground	underburn	
17	36	seed tree	skyline	jackpot burn	
18	18	seed tree	ground	masticate	
20	21	commercial thin	skyline	yard tops attached and underburn	
21	8	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
22	8	commercial thin	skyline	yard tops attached and underburn	
23	12	commercial thin	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
24	23	commercial thin	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
25	3	seed tree	skyline	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
25a	1	seed tree	ground	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
26	7	commercial thin	cable	underburn	Highbank from Road 271. Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
27	45	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
27a	7	commercial thin	ground	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
27b	23	commercial thin	skyline	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
28	4	commercial thin	ground	yard tops attached and underburn	
29	25	seed tree	skyline	underburn	Highbank above temporary road.
30	32	shelterwood	skyline	underburn	
31	26	shelterwood	skyline	underburn	Highbank above temporary road.

Alt. 2 Mgmt Unit	Alt. 2 Mgmt Unit Acres	Alt. 2 Proposed Harvest Treatment	Alt. 2 Proposed Yarding System	Alt. 2 Proposed Slash Treatment	Alt. 2 Design Feature Information
32	13	shelterwood	skyline	yard tops attached and underburn	Whole-tree yard to protect white pine component.
33	32	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
34	15	commercial thin	escaliner	yard tops attached and underburn	No-activity buffer to protect round-leaved rein orchid occurrences
34a	7	shelterwood	ground	underburn	
37	10	improvement cut	escaliner	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Ground-based operations excluded from sensitive landtypes in the southwest third of the unit.
38	18	shelterwood	ground	underburn	Highbank where possible. Slope restrictions for mechanized felling due to sensitive landtype. Ground-based operations excluded from sensitive landtypes in the southwest third of the unit.
39	26	shelterwood	ground	underburn	may require excavated skid trail
40	19	shelterwood	skyline	underburn	
41	7	commercial thin	ground	yard tops attached	
42	29	commercial thin	skyline	yard tops attached	
43	10	shelterwood	skyline	underburn	
44	14	shelterwood	skyline	yard tops attached and underburn	Whole-tree yard to protect white pine component.
45	7	commercial thin	ground	yard tops attached and underburn	
46	24	commercial thin	skyline	yard tops attached and underburn	
47a	3	seed tree	cable	underburn	Highbank above primary road.
48	7	seed tree	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Whole-tree yard to protect white pine component.
49	13	seed tree	skyline	yard tops attached and underburn	Whole-tree yard to protect white pine component.

Alt. 2 Mgmt Unit	Alt. 2 Mgmt Unit Acres	Alt. 2 Proposed Harvest Treatment	Alt. 2 Proposed Yarding System	Alt. 2 Proposed Slash Treatment	Alt. 2 Design Feature Information
50	8	seed tree	ground	underburn	Highbank with forwarder.
51	39	improvement cut	escaliner	yard tops attached and underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Tractor to road.
52	10	seed tree	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Whole-tree yard to protect white pine component.
53	7	improvement cut	skyline	yard tops attached and underburn	
54	28	improvement cut	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
55	22	shelterwood	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Whole-tree yard to protect white pine component. No-activity buffer to protect round-leaved rein orchid occurences.
55a	16	shelterwood	ground	underburn	Leave tops.
56	11	shelterwood	skyline	underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Leave tops.
57	60	improvement cut	skyline and escaliner	yard tops attached and underburn	Some jump downs required.
58	11	improvement cut	ground	yard tops attached and underburn	
59	16	shelterwood	skyline	underburn	
60	38	seed tree	skyline and escaliner	underburn	
60a	4	seed tree	ground	underburn	
61	32	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.

Alt. 2 Mgmt Unit	Alt. 2 Mgmt Unit Acres	Alt. 2 Proposed Harvest Treatment	Alt. 2 Proposed Yarding System	Alt. 2 Proposed Slash Treatment	Alt. 2 Design Feature Information
62	2	shelterwood	ground	underburn	
63	25	shelterwood	skyline	underburn	
63a	19	shelterwood	ground	grapple pile	
64	68	improvement cut	skyline	underburn	
65	17	shelterwood	skyline	grapple pile slopes <40%, underburn slopes >40%	
65a	16	shelterwood	ground	grapple pile	
66	21	shelterwood	skyline	yard tops attached, slash regen, and underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Whole-tree yard to protect white pine component.
66a	3	shelterwood	ground	yard tops attached, slash regen, and underburn	
67	16	shelterwood	skyline	slash regen, and underburn	Leave tops.
68	54	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
69	54	shelterwood	skyline	slash regen, and underburn	Leave tops.
70	39	improvement cut	escaliner	yard tops attached and underburn	No skidding/tracking of Escaliner down the ridge; skidding confined to short trails at intervals necessary for yarding.
71	31	improvement cut	skyline	yard tops attached and underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Slope restrictions for mechanized felling due to sensitive landtype.

Alt. 2 Mgmt Unit	Alt. 2 Mgmt Unit Acres	Alt. 2 Proposed Harvest Treatment	Alt. 2 Proposed Yarding System	Alt. 2 Proposed Slash Treatment	Alt. 2 Design Feature Information
72	15	improvement cut	skyline and escaliner	yard tops attached and underburn	
73	14	commercial thin	skyline	yard tops attached and underburn	
74	29	shelterwood	skyline	underburn	
75	21	shelterwood	skyline	underburn	Leave tops.
75a	7	improvement cut	ground	yard tops attached and underburn	
76	23	improvement cut	skyline	yard tops attached and underburn	
77	28	improvement cut	skyline	yard tops attached and underburn	
78	36	seed tree	skyline	yard tops attached and underburn	Whole-tree yard to protect white pine component.
79	26	seed tree	skyline	underburn	
80	16	improvement cut	skyline and escaliner	yard tops attached and underburn	
81	4	improvement cut	skyline	yard tops attached and underburn	
82	7	seed tree	skyline	underburn	
82a	5	seed tree	ground	underburn	
83	14	improvement cut	skyline	yard tops attached and underburn	
84	15	seed tree	skyline	underburn	
84a	8	seed tree	ground	underburn	

Table D-2. Management (Mgmt) Unit Information, Alternative 3.

Alt. 3 Mgmt Unit	Alt. 3 Mgmt Unit Acres	Alt. 3 Proposed Harvest Treatment	Alt. 3 Proposed Yarding System	Alt. 3 Proposed Slash Treatment	Alt. 3 Design Feature Information
1	7	improvement cut	skyline	yard tops attached and underburn	
2	41	improvement cut	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype. Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
4	38	shelterwood	skyline	underburn	Highbank where possible. Slope restrictions for mechanized felling due to sensitive landtype. Whole-tree yard to protect white pine component. Activities will occur only Aug. 15-Apr. 1 to protect nesting goshawks and the post-fledgling area.
6	42	commercial thin	skyline	yard tops attached with no burning	Slope restrictions for mechanized felling due to sensitive landtype.
7	17	shelterwood	skyline	underburn	
8	35	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype. Activities will occur only Aug. 15-Apr. 1 to protect nesting goshawks and the post-fledgling area.
9	25	improvement cut	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
10	41	aggregate retention	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
10a	13	aggregate retention	ground	underburn	
12	21	commercial thin	skyline	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
13	27	shelterwood	skyline	underburn	
13	21	shelterwood	skyline	yard tops attached and underburn	Whole-tree yard in south half of the unit to protect white pine component.
14	35	commercial thin	skyline	yard tops attached and underburn	
14b	20	shelterwood	skyline	underburn	
15	53	aggregate retention	skyline	underburn	

Alt. 3 Mgmt Unit	Alt. 3 Mgmt Unit Acres	Alt. 3 Proposed Harvest Treatment	Alt. 3 Proposed Yarding System	Alt. 3 Proposed Slash Treatment	Alt. 3 Design Feature Information
15a	14	aggregate retention	ground	underburn	
16	18	improvement cut	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
16t	12	shelterwood	ground	underburn	
17	22	seed tree	skyline	jackpot burn	
18	18	seed tree	ground	masticate	
20	21	commercial thin	skyline	yard tops attached and underburn	
21	8	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
22	8	commercial thin	skyline	yard tops attached and underburn	
23	12	commercial thin	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
24	23	commercial thin	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
25	3	seed tree	skyline	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
25a	1	seed tree	ground	underburn	Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
26	8	commercial thin	cable	underburn	Highbank from Road 271. Slash will be left untreated 9-15 months (overwinter) to increase soil nutrients.
28	4	commercial thin	ground	yard tops attached and underburn	
29	17	seed tree	skyline	underburn	
30	32	shelterwood	skyline	underburn	
31	5	shelterwood	cable	underburn	
32	13	shelterwood	skyline	yard tops attached and underburn	Whole-tree yard to protect white pine component.
33	17	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.

Alt. 3 Mgmt Unit	Alt. 3 Mgmt Unit Acres	Alt. 3 Proposed Harvest Treatment	Alt. 3 Proposed Yarding System	Alt. 3 Proposed Slash Treatment	Alt. 3 Design Feature Information
34	15	commercial thin	escaliner	yard tops attached and underburn	No-activity buffer to protect round-leaved rein orchid occurrences.
34a	7	shelterwood	ground	underburn	
37	10	improvement cut	escaliner	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Ground-based operations excluded from sensitive landtypes in the southwest third of the unit.
38	18	shelterwood	ground	underburn	Highbank where possible. Slope restrictions for mechanized felling due to sensitive landtype. Ground-based operations excluded from sensitive landtypes in the southwest third of the unit.
39	26	shelterwood	ground	underburn	May require excavated skid trail.
41	7	commercial thin	ground	yard tops attached	
42	29	commercial thin	skyline	yard tops attached	
43	10	shelterwood	skyline	underburn	
44	3	shelterwood	cable	yard tops attached and underburn	Whole-tree yard to protect white pine component.
46	10	commercial thin	skyline	yard tops attached and underburn	
46a	2	commercial thin	cable	yard tops attached and underburn	
47a	3	seed tree	cable	underburn	Highbank above primary road.
48	7	seed tree	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Whole-tree yard to protect white pine component.
49	13	seed tree	skyline	yard tops attached and underburn	Whole-tree yard to protect white pine component.
50	8	seed tree	ground	underburn	Highbank with forwarder.

Alt. 3 Mgmt Unit	Alt. 3 Mgmt Unit Acres	Alt. 3 Proposed Harvest Treatment	Alt. 3 Proposed Yarding System	Alt. 3 Proposed Slash Treatment	Alt. 3 Design Feature Information
51	39	improvement cut	escaliner/ forwarder	yard tops attached and underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Tractor to road.
52	10	seed tree	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Whole-tree yard to protect white pine component.
53	7	improvement cut	skyline	yard tops attached and underburn	
54	28	improvement cut	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype.
55	22	shelterwood	skyline	yard tops attached and underburn	Slope restrictions for mechanized felling due to sensitive landtype. Whole-tree yard to protect white pine component. No-activity buffer to protect round-leaved rein orchid occurrences
55a	16	shelterwood	ground	underburn	Leave tops.
56	11	shelterwood	skyline	underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Leave tops.
57	60	improvement cut	skyline and escaliner	yard tops attached and underburn	Some jump downs required.
58	11	improvement cut	ground	yard tops attached and underburn	
59	16	aggregate retention	skyline	underburn	
60	38	aggregate retention	skyline and escaliner	underburn	
60a	4	aggregate retention	ground	underburn	
61	32	shelterwood	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.

Alt. 3 Mgmt Unit	Alt. 3 Mgmt Unit Acres	Alt. 3 Proposed Harvest Treatment	Alt. 3 Proposed Yarding System	Alt. 3 Proposed Slash Treatment	Alt. 3 Design Feature Information
62	2	shelterwood	ground	underburn	
63	25	aggregate retention	skyline	underburn	
63a	19	aggregate retention	ground	grapple pile	
64	68	improvement cut	skyline	underburn	
65	17	shelterwood	skyline	grapple pile slopes <40%, underburn slopes >40%	
65a	16	shelterwood	ground	grapple pile	
66	21	shelterwood	skyline	yard tops attached, slash regen, and underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Whole-tree yard to protect white pine component.
66a	3	shelterwood	ground	yard tops attached, slash regen, and underburn	
67	16	shelterwood	skyline	slash regen, and underburn	Leave tops.
68	54	aggregate retention	skyline	underburn	Slope restrictions for mechanized felling due to sensitive landtype.
69	43	aggregate retention	skyline	slash regen, and underburn	Leave tops.
69a	3	aggregate retention	cable	slash regen, and underburn	Leave tops.
70	39	improvement cut	escaliner	yard tops attached and underburn	No skidding/trackingof Escaliner down the ridge; skidding confined to short trails at intervals necessary for yarding.

Alt. 3 Mgmt Unit	Alt. 3 Mgmt Unit Acres	Alt. 3 Proposed Harvest Treatment	Alt. 3 Proposed Yarding System	Alt. 3 Proposed Slash Treatment	Alt. 3 Design Feature Information
71	31	improvement cut	skyline	yard tops attached and underburn	Retain large snags/ broken-topped trees > than 12 inches diameter for flammulated owl/pygmy nuthatch nesting trees within confines of OSHA safety standards. During layout, a minimum 25-35% canopy cover, basal area-weighted average diameter greater than 14 inches and, where available, small pockets of young/sapling Douglas fir would be marked for retention to provide post-fledgling habitat. Slope restrictions for mechanized felling due to sensitive landtype.
72	15	improvement cut	skyline and escaliner	yard tops attached and underburn	
73	14	commercial thin	skyline	yard tops attached and underburn	
74	29	shelterwood	skyline	underburn	
75	4	shelterwood	cable	yard tops attached and underburn	
77	28	improvement cut	skyline	yard tops attached and underburn	
78	36	aggregate retention	skyline	yard tops attached and underburn	Whole-tree yard to protect white pine component.
81	2	improvement cut	cable	yard tops attached and underburn	
82	1	seed tree	cable	yard tops attached and underburn	
82a	5	seed tree	ground	underburn	
84	3	seed tree	cable	underburn	
84a	10	seed tree	ground	underburn	

Table D-3. Specific description of prescribed burning (without commercial treatment) under either action alternative.

Burn Unit	Acres	Type of Burning	Design Feature Information
F1	175	Landscape Burns	
F2	317	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F3	38	Landscape Burns	
F4	49	Landscape Burns	Burning would occur between Sept. 15-Nov.1 or Mar. 15-Apr.15; otherwise, no fire would be allowed within 200 feet of the mine adit to protect bats that could potentially be using the adits.
F7	7	Landscape Burns	
F8	147	Landscape Burns	
F9	44	Landscape Burns	
F10	190	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F11	291	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F12	63	Landscape Burns	
F13	391	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F14	61	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F15	75	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F16	55	Landscape Burns	
F17	44	Landscape Burns	
F18	18	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F19	86	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
F20	35	Landscape Burns	No more than 20% soil exposure to ensure protection of sensitive landtypes.
Total	**2086**		
FB1	2	Fuel Break	
FB2	2	Fuel Break	
FB3	2	Fuel Break	
Total	**6**		

D.2.2. Road Management

As discussed in Chapter 2, the IDT analyzed the existing road system in the Beaver Creek Resource Area within the scope of existing and future vegetation and fuel treatment activities in addition to other resource needs. Road work needed in support of activities (including new road construction) is described in Chapter 2 (Table 7). Table D-4 and Table D-5 identify the roads where proposed new construction, reconstruction, and reconditioning (pre-haul maintenance) would occur under each of the action alternatives. Road lengths may vary up to one-tenth of a mile due to rounding.

Table D-4. Roads with proposed construction, reconstruction, and reconditioning under Alternative 2.

Road #	Alt. 2 New construction (miles)	Alt. 2 Reconstruction (miles)	Alt. 2 Reconditioning/pre-haul maintenance (miles)
271	0.0	4.2	0.0
424	0.0	2.2	6.8
424-NR2	0.3	0.0	0.0
424UAA	0.0	0.2	0.0
429	0.0	3.0	0.0
429B	0.0	0.5	0.0
933	0.0	3.6	4.2
933F	0.0	0.0	1.6
957	0.0	0.0	3.9
958	0.0	0.0	2.8
958A	0.0	1.7	0.0
958C	0.0	0.0	2.5
958UB	0.0	0.4	0.0
958UB.2	0.2	0.0	0.0
1505	0.0	2.0	4.3
1505A	0.0	0.4	0.0
1505B	0.0	0.2	0.4
1505UE	0.0	0.6	0.0
1505UE.2	0.2	0.0	0.0
1586	0.0	2.0	7.6
1586C	0.0	0.4	0.0
1586H	0.0	1.0	0.0
1586J	0.0	1.4	0.4
1586UO	0.0	0.4	0.0
1588	0.0	0.1	0.3
2322	0.0	0.0	0.3
3100	0.0	0.5	4.2
3100A	0.0	0.0	0.7
3100C	0.0	1.1	0.0
3100D	0.0	1.2	0.0
3100E	0.0	0.0	0.5
3100E.2	0.2	0.0	0.0
3101	0.0	0.0	1.8
3102	0.0	0.0	2.2
6003	0.0	0.0	0.6
6328	0.0	0.0	1.2
6535	0.0	0.0	0.6
6536	0.0	1.4	0.0
6541	0.0	0.2	1.2
6541B	0.0	0.1	0.5
6625	0.0	0.4	0.0
6627	0.0	0.0	0.2
6627A	0.0	0.0	0.2
6628	0.0	0.0	0.8
6630	0.0	0.0	0.4
Total	0.9	29.2	50.2

Table D-5. Roads with proposed construction, reconstruction and reconditioning under Alternative 3.

Road #	Alt. 3 New construction (miles)	Alt. 3 Reconstruction (miles)	Alt. 3 Reconditioning/pre-haul maintenance (miles)
271	0.0	4.2	0.0
424	0.0	0.0	8.0
424-NR2	0.0	0.0	0.0
424UAA	0.0	0.0	0.0
429	0.0	3.0	0.0
429B	0.0	0.5	0.0
933	0.0	3.6	4.2
933F	0.0	0.0	1.6
957	0.0	0.0	3.9
958	0.0	0.0	2.8
958A	0.0	1.7	0.0
958C	0.0	0.0	2.5
958UB	0.0	0.0	0.0
958UB.2	0.0	0.0	0.0
1505	0.0	2.0	4.3
1505A	0.0	0.4	0.0
1505B	0.0	0.2	0.4
1505UE	0.0	0.4	0.0
1505UE.2	0.0	0.0	0.0
1586	0.0	2.0	7.6
1586C	0.0	0.4	0.0
1586H	0.0	1.0	0.0
1586J	0.0	1.4	0.4
1586UO	0.0	0.4	0.0
1588	0.0	0.1	0.3
2322	0.0	0.0	0.3
3100	0.0	0.5	4.2
3100A	0.0	0.0	0.7
3100C	0.0	1.1	0.0
3100D	0.0	0.5	0.0
3100E	0.0	0.0	0.0
3100E.2	0.0	0.0	0.0
3101	0.0	0.0	1.8
3102	0.0	0.0	2.2
6003	0.0	0.0	0.6
6328	0.0	0.0	1.2
6535	0.0	0.0	0.6
6536	0.0	1.4	0.0
6541	0.0	0.2	1.2
6541B	0.0	0.1	0.5
6625	0.0	0.0	0.0
6627	0.0	0.0	0.2
6627A	0.0	0.0	0.2
6628	0.0	0.0	0.8
6630	0.0	0.0	0.4
Total	0.0	25.1	50.9

APPENDIX E
Design Features

E.1. Introduction

The Project interdisciplinary team developed design features to minimize or avoid adverse effects which could occur as a result of implementing proposed activities in the Beaver Creek Resource Area. The design features are based on Forest Plan direction and policy, best available science, and site-specific evaluations, and would be applied to both action alternatives (except where specifically stated) during project implementation.

Project implementation includes the physical on-the-ground design of the project completed by layout crews; timber sale contract administration; and reforestation activities such as site preparation and planting. Design features are applied on the ground through physical design as instructed in silvicultural prescriptions, marking guides, and cruise plans. Some features address conditions found on-the-ground during project activities, and are applied through the timber sale contract, which includes both standard and site specific provisions.

Design features applicable to specific units are included in the tables in Appendix D (Specific Unit Information).

E.2. Features Related to Fuels Management

- When prescribed burning is used to treat surface or understory fuels in harvest units, post-harvest assessment of fuel conditions would be made by a fire/fuels specialist and a silviculturist to determine if additional modification of fuels is necessary prior to burning. A determination would then be made as to whether the burn could be implemented safely and effectively without further fuels treatment, or if some modification of the fuels using other methods is required to meet the objectives of the silvicultural prescription. Depending on the objective for the unit, these methods could include slash piling, leave tree protection, or slashing brush and small trees.
- Fireline would be constructed when necessary to contain prescribed burns. Topographic and vegetative features of the landscape may also be used for containment of prescribed fires when possible.

E.3. Features Designed to Protect Forest Vegetation

- Woody debris retention guidelines would be followed (USDA, 1994; PF Doc. VEG-R61, PF Doc. VEG-21).
- White pine retention guidelines would be followed (USDA, 1994; PF Doc. VEG-R58).

- All regeneration areas would be planted with site-adapted species/seed source.
- To reduce residual stand damage, log length skidding and yarding would be required in units designated for improvement cut harvest, unless otherwise approved by the sale administrator in consultation with the district silviculturist.
- Harvest unit layout would 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.
- All vegetative treatments would have silvicultural prescriptions approved by a Certified Silviculturist prior to treatment.
- Where feasible, no slash pile would be created within 20 feet of any overstory leave trees, with an emphasis on keeping slash piles far away from white pine leave trees.
- Gopher abatement may be required to ensure successful regeneration establishment in some portions of the proposed regeneration harvest units. Treatments are anticipated to be through use of poison grain; however, other treatments such as trapping may be used. Gopher abatement treatments would consist of an initial treatment and up to two follow up treatments. Pocket gopher control may be utilized if pre-planting inspection or first-, third- or fifth- year regeneration surveys indicate a need. Low application rates of pesticide would be applied. Pesticide is delivered in a highly targeted fashion by probing for gopher tunnels and delivering measured amounts of bait underground directly into pocket gopher tunnels in order to reduce and/or eliminate effects to non-target species. Application of pesticides is completed in mid to late spring, after snowmelt and runoff are completed. There are no above ground, broadcast applications of pesticide for the purpose of gopher abatement. White pine and western larch appear to be the species most affected by pocket gopher activity and controlling gopher activity would mitigate the potential that seedlings would need to be replanted. It is anticipated that pocket gopher control would be needed on less than 10% of the acreage proposed for regeneration harvest.

E.4. Features Designed to Protect TES Plants

- Botanical field surveys would be completed in all planned activity areas within suitable Threatened, Endangered and Sensitive (TES) plant habitat.
- TES plant occurrences in activity areas would have protection measures designed and implemented by the project Botanist to ensure that activities do not contribute to the decline of the species or the need for federal listing. One or more of the following protective measures would be implemented: 1) drop the proposed unit from activity; 2) modify the proposed unit or activity, 3) implement appropriately designed buffers, and/or 4) implement Timber Sale Contract provisions for Protection of Threatened and Endangered Species.

- Prescribed fire ignition would not occur within riparian habitats, although fire would be allowed to back down into riparian areas. Higher fuel moistures in riparian habitats during prescribed burning conditions would likely limit the spread of any prescribed fire. To limit ground disturbance, fire line would be minimized in riparian areas to those occasions when a line is needed to contain the burn. Fuelbreaks would be used in riparian areas to reduce the amount of fire line while still allowing safe and efficient implementation of prescribed burning.
- Units 34 and 55 would have no -activity buffers implemented to protect round-leaved rein orchid occurrences.

E.5. Features Designed to Reduce the Spread of Noxious Weeds

- To help reduce the spread of noxious weeds and prevent the introduction of new invader species, a contract provision for equipment washing would be used in all construction and timber sale contracts.
- A contract provision for herbicide spraying of existing weeds on roads used during the timber sale prior to and after log hauling would be used in the timber sale contract.
- Measures to protect TES plant population viability and habitat capability during noxious weed treatment would be implemented following guidelines provided in the Noxious Weeds Final Environmental Impact Statement and Record of Decision (USDA Forest Service, 2000; PF Doc. CR-028 and CR-029).
- Provisions in the timber sale contract would require the purchaser to seed and fertilize areas of soil disturbance associated with skid trails, and landings.
- Provisions in the road construction contract would require soil disturbance to be seeded and fertilized. Mulching would be done where deemed appropriate by the Project Sale administrator and Botanist.
- All plant materials used in the project, including grass seed and mulch, would be certified noxious-weed free. Grass seed would be certified, blue-tagged seed.
- Native plant materials are required to be used in restoration projects (FSM 2070.3, Amendment 2008). Locally-obtained materials are preferred, but if unavailable or economically unfeasible, appropriate materials may be substituted that meet Region 1 guidelines (Northern Region Native Plant Handbook, 1995; PF Doc. TES-62).

E.6. Features Designed to Protect Soils

E.6.1. Overview

To reduce the impacts to soils and soil productivity, the action alternatives would utilize soil conservation practices as described in the Soil and Water Conservation Practices (SWCP) Handbook (FSH 2509.22; PF Doc. SOILS-R-72 and Appendix F of this document). This handbook and appendix outlines best management practices (BMPs) that protect soil resources at a higher level than do existing Idaho Forest Practices rules and regulations, there by incorporating all Idaho state standards.

The following practices 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. These features would be incorporated into the timber sale contract to protect soils and minimize soil disturbance.

E.6.2. Soil Productivity and Nutrient Cycling

- Fine organic matter and large woody debris would be retained on the ground for sustained nutrient recycling in harvest units consistent with Graham and others (1994; PF Doc. SOIL-R-21). Downed woody retention levels would be maintained wherever practical for both moist and dry forest habitat types. Graham and others (1994; PF Doc. SOIL-R-21) recommended retaining 17-33 tons for moist and 7-13 tons for dry habitat types of downed woody material greater than 3 inches in diameter.
- The latest soil nutrient management recommendations from the Inter Mountain Forest Tree Nutrition Cooperative (IFTNC) and Rocky Mountain Research Center (RMRS) would be applied as appropriate to each activity area where organic material is removed. Slash should be left to over-winter nutrients back into the soil in most cases until fuel treatments occur. Units in which the tops are to be yarded will leave all limbs and breakage and over-winter before other fuel treatments are to occur.
- Those units in which the parent geology is rated relatively poor for nutrient-holding capacity, slash would be left on the ground untreated from 9 to 15 months before prescribed fire activities are to occur (Johnston 2009; PF Doc. Soil-R-116). The length of time slash needs to remain on the ground before the fuel treatments is based on the season in which the harvest occurs. For winter harvest (December-February), logging slash should remain untreated for up to 15 months to enable all the nutrients to leach out and become usable to other vegetation. Likewise for spring harvest (March- May), untreated slash should remain on the ground for up to 12 months; and for summer and fall harvest (June-November), slash should remain on the ground for up to 9 months. The following units fall on parent geology with low nutrient holding capacity: Units 2, 12, 25, 25a, 26, 27a and 27b.

- Whole Tree yarding will be allowed in nine regeneration units (4, south half of 13, 32, 44, 48, 49, 52, 55, 66, 78) in order to protect the white pine component present. Coarse woody debris within these units is at or just below recommended levels (Graham and others 1994; PF Doc. SOIL-R-21). All breakage of limbs and tops will be left to over-winter before further fuel treatments such as underburning or jackpot burning is to occur. Whole tree yarding would also be allowed in most of the commercial thinning and improvement type treatments as the residual stand component and existing levels of coarse woody debris would be adequate to meet nutrient cycling needs. The exception would be those units listed above in which the parent geology is rated poor for nutrient holding capacity. All other treatment areas will at a minimum leave tops and breakage to over-winter before fuel treatments occur.
- When prescribed fire is utilized, post –burn conditions would result in no more than 25 to 30% bare soil (excluding natural conditions) would be exposed within the activity area (burn unit). On sensitive soils or slopes greater than 40%, no more than 20% of bare soils (excluding natural conditions) would be exposed within the activity area. Burn units 2, 10, 11, 13, 14, 15, 18, 19 and 20 all have greater than 25% sensitive landtypes and should have special consideration before ignition.
- The desired prescribed fire outcome includes retention of organic matter (generally not much less than one-quarter inch) that protects the soil from rain splash impacts, erosion, a decrease in soil moisture holding capacity, and increased solar surface heating, especially on south-facing slopes.

E.6.3. Ground-based Yarding

- All scheduling of harvest activities in ground-based units would occur when the soil profile is dry to reduce the effects from compaction (Poff, 1996, p. 482; PF Doc. SOIL-R-47). Ground-based yarding would operate on slopes generally under 35% and use existing skid trails whenever possible. When incidental steeper slopes of up to 40% are encountered, skid trails should not be longer than 200 feet in length along those increased slopes with no turning. Where terrain is conducive, go back trails should be used to minimize impacts wherever possible.
- All new skid trails would be designated and laid out to take advantage of topography and minimize disruption of natural drainage patterns. Where terrain is conducive, trails would be spaced at least 100 feet or more apart. Mechanized felling and skidding would allow skid patterns to be closer provided the soil profile is dry and slash mats are being utilized. Post-harvest, ground disturbance associated with skid trails would be covered with slash and randomly placed logs (on the contour) and seeded with the latest seed mix recommended at time of implementation to help increase the microtopography needed to reduce runoff.
- The use of excavated skid trails would be allowed in areas essential for safe and efficient operations. These skid trails should not exceed 200 feet in length, and excavated only to the width needed to make operations safe. All excavated skid trails would be subject to approval by the timber sale administrator and the District’s soil specialist. After all sale activities have ended, the excavated portions

associated with the ground-based units would be decompacted, top soil and organic material redistributed, seeded with native grasses and available coarse woody debris scattered over the top.

- The use of jump-down pads would be allowed in tractor swing units where essential for safe and efficient operations. The pads would only be excavated to minimal dimensions necessary for safe operations. All excavated jump down pads would be subject to approval by the timber sale administrator and the District's soil specialist. After all sale activities have ended, the excavated portions associated with the tractor swing units would be decompacted, top soil and organic material redistributed, seeded with native grasses and available coarse woody debris scattered over the top.
- Ground-based operations would be excluded from Landtype 447 within Units 37 and 38. This area should be directionally hand felled to the road or to the edges of the buffer and cabled out of this exclusionary area.
- In Unit 70, which is accessed off road 933F, no skidding or tracking of the Escaliner would be allowed down ridge. All skidding to Road 933F would be confined to short trails at intervals necessary for yarding.

E.6.4. Skyline Yarding

- The leading end of logs would be suspended during skyline yarding. No yarding across designated RHCA's would occur with this project.

E.6.5. Mechanized Felling Operations

- Mechanized felling operations would be permitted in all tractor units and in skyline/cable units provided the slopes are under 35 percent and not on sensitive landtypes. Pivoting of mechanized felling equipment would be limited to slopes of generally 25 percent or less to reduce soil displacement. Pivoting on slopes greater than 25% but less than 35% would be allowed providing the turns are short and any areas of displaced soils are returned to natural conditions. Skyline or cable units in which mechanical felling operations would be restricted due to sensitive landtypes include Units 2, 4, 6, 8, 9, 10, 16, 21, 23, 24, 27, 33, 37, 38, 48, 52, 54, 55, 61, 68 and 71.

E.6.6. Grapple Piling Operations

- Any ground-based piling of slash (grapple-piling) would operate on slopes under 35%, would utilize existing skid trails where possible and operate on slash mats wherever possible. Burn piles should be small and numerous rather than large and few. Grapple piling in skyline/cable units would be allowed providing they meet the limitations as mechanical felling operations listed above.

E.6.7. Log Landings

- Existing roads would be utilized as landings where appropriate in order to avoid further disturbance with the creation of new landings. All landings that are free of slash piles, other than existing or newly-constructed system roads, would be decompacted and covered with residual slash within guidelines provided by Graham and others, 1994 for coarse-woody debris by habitat type, and seeded upon completion of the sale following Forest Service Manual 2070.3 for genetically appropriate native plant materials.

E.6.8. Winter Logging Operations

Depending on current site conditions, the following requirements would apply if any ground-based operations are to be conducted in the winter:

- Operate on a snow layer of 18 inches of settled snow or when the ground is frozen to a minimum depth of 3 inches for small equipment and 6 inches for larger equipment.
- Operations would be suspended under wet or thawing conditions.
- Additional recommendations to minimize soil disturbance include plowing snow from (or packing snow onto) travel routes and permitting them to freeze by delaying operations on these travel routes until they have sufficiently frozen.

E.6.9. Temporary Road Decommissioning

- Decompaction of the running surface to a depth not less than 18 inches with as little mixing of horizons as possible shall occur before and side cast upper horizon soil profiles are placed across the road surface.
- After running surface is decompacted, side cast material can be laid over the running surface matching top of cut slope and bottom of fill slope for proper shape.
- Slash and coarse woody debris on site from the temporary road construction and adjacent harvest activity will be placed on the newly recontoured sections to promote nutrient cycling and reduce recovery time.

E.7. Features Designed to Protect Aquatic Resources

E.7.1. Best Management Practices

- All activities would be designed to protect water quality and aquatic resources through the use of Best Management Practices (BMPs), which are the primary mechanism to enable the achievement of water quality standards. 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. The District aquatics staff would also do periodic monitoring to

assess the effectiveness of these practices). Site specific BMPs can be found in Appendix F.

- Road dust abatement treatments would follow the recommendations in the Dust Palliative Selection and Application Guide (US Forest Service 1999, PF Doc. AQ-R51). The recommendations include no dispersal of chemically-derived dust abatements (such as lignin or chloride-based) within 25 feet of surface waters, including surface-water crossings. The dispersal of water would be allowed in these locations. Water drafting sites would be approved ahead of time by either the District fisheries biologist or hydrologist.

E.7.2. Sediment Reduction Activities

- Slash filter windrows would be used at the base of fills on roads proposed for new construction and would require the creation of a wildlife “hole” (i.e. opening).
- During new road construction, culverts would be designed to accommodate 100-year flood events. During reconstruction, non-functioning or undersized culverts proposed for replacement along haul routes would be upgraded to accommodate 100-year flood flows, unless otherwise agreed upon with the District hydrologist.

E.7.3. Inland Native Fish Strategy

- In development of the action alternatives, streamside buffers were used to protect water quality and aquatic biota as prescribed by the Inland Native Fish Strategy (INFS; pages A-6 through A-15, PF Doc. CR-003).
- In the resource area, no-cut buffers for harvest units would be 300 feet wide around all fish-bearing streams, 150 feet around all permanently flowing non fish-bearing streams, and 75 feet around all seasonally flowing or intermittent streams.
- No culvert replacements, culvert removals, and/or in-stream work would be permitted prior to July 15 to protect spawning and incubation periods for westslope cutthroat trout. Any in-stream work occurring after October 1 would be coordinated with the District fisheries biologist to assess site impacts to spawning brook trout, and to determine if weather conditions would permit such activities.
- If Threatened or Endangered fish species are located during project implementation, protective measures would be implemented in accordance with Inland Native Fish Strategy guidelines, and included in the Timber Sale Contract provisions.
- All known or discovered wetlands, seeps, bogs, elk wallows and springs less than one acre in size would be protected from timber harvest or road construction with a minimum 50-foot no-activity buffer for the species, or as prescribed by the district botanist and wildlife biologist. If wetlands, seeps, bogs, elk wallows and springs larger than one acre in size are discovered, buffer size will be determined by the district botanist and wildlife biologist.

E.7.4. Dry Swale Protection

- Timber yarding through, along, or across dry swales in select units should be avoided by falling trees away from, and not into, dry swales. Tractor yarding, or any ground-based harvest methods, should also avoid these areas whenever possible.

E.8. Features Designed to Protect Wildlife Habitat

E.8.1. Wildlife Security and Movement

- To maintain wildlife security during project activities, the timber purchaser would close gates on any road currently closed to the public that is opened, constructed or reconstructed for the project. Gates on all roads would be closed after the passage of each vehicle, and would remain closed at the end of the day. Where barriers are removed during activities and public access is created, gates would be installed.
- Subdivisions will be designated by the timber sale contract. At least one subdivision on each side of the drainage will remain inactive from October 1 to December 1 to insure elk security is retained during the hunting season during sale implementation.
- To maintain wildlife security at the end of project activities, all closure devices that were removed to allow project activities would be replaced, meeting or exceeding the current closure condition.

E.8.2. Wildlife Species and Habitat

- If any Threatened, Endangered or Sensitive (TES) wildlife species are observed in the resource area during implementation, the District wildlife biologist would be notified within 48 hours. The wildlife biologist would determine any project modifications necessary under the timber sale contract provisions to protect the species and its habitat based on applicable laws, regulations and management recommendations for the species.
- If any Sensitive species or northern goshawk (a Management Indicator Species) is found to be nesting in an area scheduled for an activity, the activity may be delayed or modified in the area as recommended by the wildlife biologist.
- In harvest Units #4 and 8, mechanical operations and related activities may be suspended within up to ½ mile of active nest areas from April 1 to August 15 to promote nesting success and provide forage opportunities for adults and fledgling goshawks during the fledgling dependency period. Activity restrictions may be removed after June 30 if the District Wildlife Biologist determines the nest site is inactive or unsuccessful (Maj 1996).
- To protect habitat for Coeur d'Alene salamanders, placing soil on wet, fractured or moss-covered rock should be avoided during culvert replacement and road decommissioning activities.

- Prescribed burning in Unit F4 would occur between September 15 and November 1 or between March 15 and April 15. If burning cannot occur within either of these timeframes, no fire would be allowed within 200 feet of the mine adit to protect bats that could potentially be using the adits. A timing restriction would not be required if a survey for bats is completed prior to burning and no bats are detected.
- Incidental trees charred during prescribed burning operations would be retained on site to provide black-backed woodpecker habitat unless removal is unavoidable for safety or operational reasons.
- To protect wintering big game, subdivisions would be established. If winter logging occurs between December 1 and March 31, no two adjacent subdivisions would be active simultaneously.
- In harvest units where grapple piling is used for reducing activity fuels, at least one grapple pile would be retained for every 5 acres of treatment to provide escape cover for rabbits, furbearers and rodents.
- To ensure habitat still provides for the needs of flammulated owl and pygmy nuthatch, Harvest in portions Units 51, 56, 66 and 71 (exact location provided by wildlife biologist to silviculturist) would retain large snags and broken-topped trees greater than 12 inches diameter for nesting trees within the confines of OSHA safety standards; a minimum of 25-35% canopy cover; a basal area-weighted average diameter greater than 14 inches; and, where available, small pockets of young/sapling Douglas-fir for post-fledgling habitat would be marked for retention during layout.

E.8.3. Snag Retention

- Existing and green trees for future snags would be retained across the management units to meet the Northern Region Snag Management Protocol, within the confines of OSHA safety standards (PF Doc. WL-R006). Existing dead trees that do not meet saw log merchantability standards would remain standing unless needed to be felled for safety reasons. Snags that are felled for safety reasons should remain on site to provide for wildlife habitat and long-term site productivity.
- To maintain habitat for snag-dependent species, the height of “tail trees” or trees to which cable lines are attached would be maintained after harvest, within the confines of OSHA safety standards.

E.9. Features Designed to Protect Cultural Resources

- Although cultural resources surveys are designed to locate all archaeological sites and site components that might be eligible for the National Register, such sites and site components may go undetected for a variety of reasons. Should any previously unrecorded cultural resources be discovered during project implementation, activities that may be affecting that resource would be halted immediately; the resource would be evaluated by an archaeologist, and consultation would be initiated with the SHPO, as well as with the Advisory Council on Historic Preservation, if required, to determine appropriate actions for protecting the resource and for mitigating any adverse effects on the resource. Project activities at that locale will not be resumed until the resource is adequately protected and until agreed-upon mitigation measures are implemented with SHPO approval.
- The Timber Sale Contract provision for Protection of Cultural Resources would be included in all timber sale contracts.
- Buffer zones would be placed around sites that exist in areas where harvest activities may take place. Buffer zones would be delineated by the Forest or District Archeologist where appropriate.
- Cultural sites located in prescribed burning units would have protection measures implemented to prevent effects to the sites. These protection measures would be implemented in coordination with the Forest or District Archeologist where appropriate.

E.10. Features Designed to Protect Recreation Uses

- During burning operations public safety would be protected by signing the trails or blocking traffic as necessary. Following the conclusion of burning operations, trails would be reopened to the public after they are cleared of debris resulting from burning operations and public safety has been assured.
- During the Disabled Hunt period from October 10 – October 31, any burning operation in the Kings Pass – Potosi Gulch area should avoid disruption to the Disabled Hunt Program by entering from Road 6003 at Kings Pass and not from Potosi Gulch.
- Each year from October 1 – October 31, logging activities within the Disabled Hunt Area (Road 1505) would be restricted from use, unless determined absolutely necessary by the timber sale administrator.
- Segments of trails located near or within harvest units would be identified as a protected improvement on the sale area map.

- Provisions in the timber sale contract would require that traffic control signs using standards set forth in the Manual on Uniform Traffic Control Devices (US Department of Transportation, Federal Highway Administration, 2003) be posted on affected routes to alert travelers to haul truck traffic.
- Provisions in the timber sale contract would restrict timber hauling on the weekends and on summer holidays (Memorial Day, 4th of July and Labor Day), unless otherwise agreed
- To reduce impacts to groomed snowmobile trails, snowplowing of Trails 933 and 424 should not be plowed at the same time unless determined absolutely necessary by the timber sale administrator.

E.11. Features Designed to Protect Visual Resources

- To reduce the visual impact of activities as viewed from key viewpoints identified in the Forest Plan (see Chapter 3 Visuals discussion, and PF Doc. VIS-05), the appropriate concepts and techniques identified in the Northern Region Scenic Resource Mitigation Menu & Design Considerations for Vegetation Treatments (PF Doc. VIS-01) would be utilized during layout and implementation to ensure harvest activities remain subordinate to the existing landscape character. Units are designed so that treatment units and associated openings are asymmetrical in shape. Treatments should follow natural topographic breaks and changes in vegetation, edges should be feathered to the extent feasible, and canopy retention should be maximized to the greatest extent possible while still meeting silvicultural needs.

E.12. Features Designed to Protect Mine Claim Monuments

- Per FSM 2814.21 – Respect Claim and Claimants Property; the Forest Service must respect claims and claimants' property by using precautions to avoid damage to claim corner markers, excavations, and other mining improvements and equipment. The project has within its bounds hundreds of mine claims, with multiple forms of monuments to indicate claim corners. Some examples of monuments include blazed trees, posts, stone mounds, and metal posts. Reasonable efforts will be made to preserve corner monuments when discovered, or otherwise made aware of their specific location and disposition.

APPENDIX F
Application of Soil and Water Conservation Practices

F.1. Overview

This appendix identifies Soil and Water Conservation Practices (SWCPs) potentially applicable to the Beaver Creek project, based on the R1/R4 Soil and Watershed Conservation Practices Handbook.

This appendix will be used as a tool to evaluate the appropriate best management practices (BMPs) that should be included for a proposed project, under a preferred alternative, once selected. Once the appendix is completed, it can then facilitate development of contracts or other mechanisms to carry a preferred alternative, developed under NEPA, to implementation. As implementation is occurring, or has been completed, the appendix should also be used to evaluate the effectiveness of the proposed BMPs and provide a feedback mechanism for implementation of the current or future projects, to validate Forest Plan goals and objectives, and provide justification and rationale for the use of these soil, water, and fisheries protection measures.

No other BMPs, mitigation measures, or design criteria have been identified that are not referenced in the R1/R4 SWCP Handbook.

Table F- 1. Watershed Management SWCPs potentially applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
11.01	Determination of cumulative watershed effects	Cumulative effects are considered in the analysis of effects described in the specialist reports for fisheries, hydrology, and soils.	
11.02	Soil and water resource monitoring and evaluation	The implementation chapter of the 1987 Forest Plan (Chapter V) incorporates BMP reviews as part of its annual monitoring and evaluation program (see Forest website for past monitoring reports). Also refer to State BMP audits, for >95% compliance by federal agencies (Idaho Department of Lands 2008).	
11.03	Watershed improvement planning and implementation		Project is site-specific and a soil and watershed resource improvement inventory is not required.
11.04	Floodplain analysis and evaluation	Floodplains and associated riparian have been identified during project development and activities within these areas will be avoided, unless project components are designed to meet specific Riparian Management Objectives (RMOs)	
11.05	Wetlands analysis and evaluation	Wetlands have been identified during project development and activities within wetlands will be avoided. These features have also been buffered according to INFS direction.	
11.06	Public supply watershed management	To protect developed public water supplies, points of diversions for domestic uses will be buffered from mechanized activities by 75 feet. The streams will be treated as Class I streams for 1320 feet upstream of the diversion/well.	
11.07	Oil and hazardous substance spill contingency planning	Oil and hazardous substances will be located 100 feet outside of RHCA buffers. See INFS direction for determining buffer distance for RHCAs.	
11.08	Control of activities under special use permit	Roads with special use permits will be left in a stable condition or as stipulated by the permit.	
11.09	Management by closure to use	During excessively wet periods, roads will be closed to operations, in order to prevent soil displacement. The determination of what constitutes a “wet period” should be made by the Sale Administrator in conjunction with a Hydrologist, Fisheries Biologist, or Soil Scientist, or combination of the three.	
11.10	Water well construction and management		No wells are proposed for construction under the proposed action.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
11.11	Petroleum storage and delivery facilities and management	Do not store petroleum or fuel vehicles within 100 feet of RHCAs.	
11.12	Administrative site planning and management		No new administrative sites are proposed for this project.
11.13	Sanitary guidelines for construction of temporary camps	If temporary camps are to be used, locate them outside of RHCAs.	
11.14	Management of snow survey sites		There are no snow survey sites within the project area, or associated with the proposed action.

Table F-2. Recreation SWCPs potentially applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
12.01	Recreation facilities planning		No new recreation facilities are planned for the project.
12.02	Monitoring and evaluation of water quality at swimming sites		No designated swimming sites are associated with the project.
12.03	Sanitary surveys to augment evaluation of designated swimming waters		No designated swimming sites are associated with the project.
12.04	Providing safe drinking water supplies	To protect developed public water supplies, points of diversions for domestic uses will be buffered from project activities by 75 feet.	
12.05	Documentation of potable water quality data		The proposed action will not affect potable water supplies. See also 12.04
12.06	Management of sanitation facilities		The project does not propose to construct a sewage facility.
12.07	Control of refuse disposal	Refuse generated as a result of implementation, will be removed from the activity area upon completion of the project.	

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
12.08	Assuring proper sanitation and water supplies for special use facilities		Special use facilities are not associated with the project.
12.09	Sanitation at hydrants and water faucets within developed recreation sites		There are no developed recreation sites within the project area.
12.10	Management of off-road vehicle use	Road or trail use will be limited only to those routes described in the design of the project or as needed to implement the objectives of the project.	
12.11	Protection of water quality within developed and dispersed rec. areas		Developed recreation sites are not being used for implementation of the project and dispersed sites will be located outside of RHCAs, as described in 11.13
12.12	Location of pack and riding stock facilities in protected areas		Use of domestic livestock is not being considered under the proposed action.

Table F-3. Vegetation Management SWCPs potential applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
13.01	Operation seeding and land preparation equipment on the contour		No contour operations are planned under the proposed action.
13.02	Slope limitations for tractor operation	Ground based harvest will be limited to slopes less than <40%.	
13.03	Tractor operation excluded from wetlands, bogs, and wet meadows	Tractor operations are not allowed in wetlands, bogs, or wet meadows. Any such features have been included in no-harvest buffers.	
13.04	Revegetation of surface disturbed areas	Disturbed areas such as temporary roads, skid trails and landings will be reseeded with native seed mix upon completion of project according to Forest direction and per District Botanist recommendations.	
13.05	Soil protection during and following slash windrowing	Windrow slash on the contour to reduce erosion will be implemented during new road construction.	

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
13.06	Soil moisture limitations for tractor logging	Contract provisions and management requirements for soil moisture limitations are identified during the environmental analysis. The project supervisor and/or Contracting Officer are responsible for determining when the soil surface is unstable and susceptible to damage and is then responsible for suspending or terminating operations.	
13.07	Pesticide use planning	Herbicide use planning has been done for the Coeur d' Alene River R D Noxious Weeds EIS (2000) and for the Beaver Creek EIS.	No plan to apply pesticides under the proposed action.
13.08	Apply pesticides according to label and EPA registration directions	All herbicide treatments will follow the label restrictions and EPA directions.	No plan to apply pesticides under the proposed action.
13.09	Pesticide application monitoring and evaluation	All herbicide applications will follow Region 1 protocols and direction contained in the Coeur d'Alene River Ranger District Noxious Weeds EIS (2000).	No plan to apply pesticides under the proposed action.
13.10	Pesticide spill contingency planning	Herbicide spill contingency planning will follow IPNF hazardous materials protocols and direction contained in the Coeur d'Alene River R D Noxious Weeds EIS (2000).	No plan to apply pesticides under the proposed action.
13.11	Cleaning and disposal of pesticide containers and equipment	Herbicide container disposal will follow IPNF hazardous materials protocols and direction contained in the Coeur d'Alene River Ranger District Noxious Weeds EIS (2000).	No plan to apply pesticides under the proposed action.
13.12	Protection of water, wetlands, and riparian areas during pesticide spraying	All herbicide applications will follow protocols and direction contained in the Coeur d'Alene River R D Noxious Weeds EIS (2000).	If practices 13.07 and 13.08 are met, then protection of water, wetlands and riparian areas is assumed.
13.13	Controlling pesticide drift during spray application	Herbicide drift will be controlled by following protocols and direction contained in the Coeur d'Alene River R D Noxious Weeds EIS (2000) and by adhering to label directions for use.	Pesticides are likely to be applied by backpack or trailer mounted sprayers and drift is not anticipated to have an effect.

Table F- 4. Timber SWCPs potentially applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
14.01	Timber sale planning	An interdisciplinary team, which included and evaluation of fisheries, hydrologic and soil resource and associated input from specialists in and interdisciplinary team setting. Negative effects to these resources were considered and minimized to the extent possible.	
14.02	Timber harvest unit design	INFS no-harvest buffers are incorporated into each harvest unit. District hydrologist of fisheries biologist should be notified of any perennial or intermittent streams found during layout or harvest that are not documented on harvest contract maps. Also consider: R1-C6.661- Current Operating Areas R1-C6.4 - Conduct of Logging R1-C6.409 – Scarification	
14.03[1]	Use of sale area maps for designating soil and water protection needs	Standard Timber Sale Contract Provision B1.1.	
14.04[1]	Limiting the operating period of timber sale activities	Standard Timber Sale Contract Provision B6.31. Also consider: R1-C6.316 - Limited Operating Period	
14.05	Protection of unstable areas	A review of the units identified as having a higher risk for instability was field investigated by the Soil Scientist and specific mitigations were included within the Soil Report.	
14.06[1]	Riparian area designation	INFISH buffers were applied throughout the project area. See INFISH direction for standard widths for delineating buffers around stream corridors (USFS 1995). Standard Timber Sale Contract Provisions B6.5 and B6.62. Also consider: R1-C6.50 - Streamside Management Zones WO-C6.62 - Site Specific Wetlands Protection Measures	
14.07	Determining tractor loggable ground		
14.08[1]	Tractor skidding design	Standard Timber Sale Contract Provisions B6.42.	
14.09	Suspended log yarding in timber harvesting	See C6.24 (Site specific special protection measures) and C6.41 (special felling requirements) that includes felling away from and avoiding yarding along small headwater intermittent streams or swales. These include known locations in units as well as unknown locations in units found during logging operations.	

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
14.10[1]	Log landing location and design	Standard Timber Sale Contract Provision B6.422.	
14.11[1]	Log landing erosion prevention and control	Landings will be reseeded, using a native seed mix, as approved by a Forest botanist or other qualified specialist, upon completion of the project. Standard Timber Sale Contract Provision B6.6. Also consider: R1-C6.6 - Erosion Prevention and Control R1-C6.601 - Erosion Control Seeding	
14.12[1]	Erosion prevention and control measures during timber sale operations	Standard Timber Sale Contract Provision B6.6. Also consider: R1-C6.6 - Erosion Prevention and Control R1-C6.601 - Erosion Control Seeding	
14.13[1]	Special erosion prevention measures on areas disturbed by harvest activities	Standard Timber Sale Contract Provision B6.6. Also consider: R1-C6.6 - Erosion Prevention and Control R1-C6.601 - Erosion Control Seeding	
14.14[1]	Revegetation of areas disturbed by harvest activities	Standard Timber Sale Contract Provision B6.6. Also consider: R1-C6.601 - Erosion Control Seeding	
14.15[1]	Erosion control on skid trails	Standard Timber Sale Contract Provision B6.6. Also consider: R1-C6.6 - Erosion Prevention and Control R1-C6.601 - Erosion Control Seeding	
14.16[1]	Meadow protection during timber harvesting	Standard Timber Sale Contract Provision B6.61. Also consider: WO-C6.62 - Site Specific Wetlands Protection Measures WO-C6.24 - Site Specific Special Protection Measures	
14.17[1]	Stream channel protection	Standard Timber Sale Contract Provision B6.5. Also consider: R1-C6.50 - Streamside Management Zones WO-C6.24 - Site Specific Special Protection Measures C6.41 - Special Felling Requirements	
14.18[1]	Erosion control structure maintenance	Standard Timber Sale Contract Provision B6.6. Also consider: R1-C6.6 - Erosion Prevention and Control	
14.19[1]	Acceptance of timber sale erosion control measures before sale closure	Standard Timber Sale Contract Provision B6.36.	

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
14.20	Slash treatment in sensitive areas	Slash will be managed to prevent erosion in those units with treatments proposed near RHCAs (see also 11.04).	
14.21	Non-recurring "C" provisions for soil and water protection		No non-recurring "C" provisions are anticipated for implementation of the project.
14.22[1]	Modification of the timber sale contract	Standard Timber Sale Contract Provision B8.3 and B8.33 (i).	
14.23	Reforestation requirement	The Forest must comply with NFMA guidelines regarding leaving the site stocked and erosion control measures will be taken, where applicable.	

[1] *Includes standard timber sale contract provisions (see USFS 2006 – Timber Sale Contract (Division B), Standard Provisions for Scaled Timber Sales and Timber Sale Contract Form 2600-6 and associated C Provisions).*

Table F- 5. Roads and Trails SWCPs potentially applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
15.01	General guidelines for transportation planning	The transportation network was reviewed by the interdisciplinary team (IDT), during project development and the IDT conducted a review of the project area and evaluated alternatives for roads early in the process. Proposed roads which would have created other resource issues or risk were not included in the proposed action.	
15.02	General guidelines for the location and design of roads and trails	Standard Timber Sale Contract Provisions B5.2 and B5.21. Also consider: R1-C5.1- Construction of Temporary Roads in Sensitive Areas R1-C5.102 - Construction of Temporary Roads WO-C5.13 - Road Completion Date R1-C5.312 - Reconditioning of Existing Roads	
15.03[1]	Road and trail erosion control plan	Standard Timber Sale Contract Provisions B6.6 and B6.312.	
15.04[1]	Timing of construction activities	Standard Timber Sale Contract Provision B6.312.	
15.05[1]	Slope stabilization and prevention of mass failures	Mass failure potential was field verified by a soil scientist. Standard Timber Sale Contract Provision B6.6.	
15.06[1]	Mitigation of surface erosion and stabilization	Standard Timber Sale Contract Provision B6.6.	
15.07[1]	Control of permanent road drainage	Standard Timber Sale Contract Provision B6.6. See Hydrology project file for locations. Also consider: R1-C5.23 - Control of Construction	
15.08[1]	Pioneer road construction	Erosion control, including adequate drainage and slash filter windrows apply to the downhill side of all newly constructed road surfaces, including temporary roads and system roads.	
15.09[1]	Timely erosion control measures on incomplete road projects	Standard Timber Sale Contract Provision B6.312.	
15.10[1]	Control of road construction excavation and sidecast material	Sidecast material shall not enter streamcourses of any kind, including dry swale areas that appear to be intermittent. Standard Timber Sale Contract Provision B5.2.	

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
15.11[1]	Servicing and refueling of equipment	Do not fuel vehicles within RHCAs as defined by INFS (300 feet for fisheries streams, 150 feet for perennial non fisheries streams, and 75 feet for intermittent streams). Standard Timber Sale Contract Provision B6.34.	
15.12[1]	Control of construction in riparian areas	Construction activities in riparian areas shall be done in accordance to appropriate timing windows for in-channel work and with the approval of the district fisheries biologist and hydrologist.	
15.13[1]	Controlling in-channel excavation	Excavation of culverts or other structures shall be done during standard timing windows for westslope cutthroat trout (approximately July 15- Sept 15, but may be amended with approval by the district fisheries biologist), and shall be done in dry stream channel conditions unless otherwise specified by the District fisheries biologist. Dry conditions may include periods when the stream channel is naturally dry, or via dewatering operations during timing windows. Standard Timber Sale Contract Provisions B6.5 and B6.6.	
15.14[1]	Diversion of flows around construction sites	Standard Timber Sale Contract Provision B6.6.	
15.15[1]	Stream crossings on temporary roads	Standard Timber Sale Contract Provisions B6.63 and B6.5. Also consider: R1-C6.753 -Temporary Road Construction Slash Disposal	
15.16[1]	Bridge and culvert installation (disposition of material and fish protection)	Standard Timber Sale Contract Provision B6.5.	
15.17[1]	Regulation of borrow pits, gravel sources, and quarries.	If gravelling roads and using on-Forest gravel sources, use sites that have been developed so as to minimize the potential for erosion in pioneer areas. Standard Timber Sale Contract Provision B5.211 and B6.2. Also consider: R1-C5.222 - Stockpiled Material Sources WO-C5.31 - Material Sources	
15.18	Disposal of right-of-way and roadside debris	Standard Timber Sale Contract Provisions B5.3.	
15.19	Streambank protection	Standard Timber Sale Contract Provision B6.5.	
15.20[1]	Water source development consistent with water quality protection	If drafting out of streams for purposes of road construction, maintenance, or dust abatement, consider using water sources directly off of existing roads, and in accordance with any temporary water use permits from the State of Idaho.	

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
15.21[1]	Maintenance of roads	Standard Timber Sale Contract Provision B5.3. Also consider: WO-C5.31 - Road Maintenance Requirements R1-C5.314 - Dust Abatement Treatment	
15.22	Road surface treatment to prevent loss of materials	Standard Timber Sale Contract Provision B5.3. Also consider: R1-C5.419 - System Road Stabilization R1-C5.314 – Surface Preparation	
15.23[1]	Traffic control during wet periods	Standard Timber Sale Contract Provisions B5.12 and B6.6.	
15.24[1]	Snow removal controls	May need consideration for harvest units near Murray and Dubius Creeks. Also consider: R1-C5.316 - Snow Removal	
15.25[1]	Obliteration of temporary roads	Standard Timber Sale Contract Provision B6.63. Also consider: R1-C6-632 - Temporary Road and Tractor Road Obliteration R1-C6.633 - Temporary Road, Skid Trail/Skid Road and Landing Scarification	
15.26	Surface erosion control at facility sites		There are no administrative sites associated with the project.
15.27	Trail maintenance and rehabilitation		There is no trail maintenance associated with the proposed action.

[1] *Includes standard timber sale contract provisions (See USFS 2006 – Timber Sale Contract (Division B), Standard Provisions for Scaled Timber Sales and Timber Sale Contract Form 2600-6 and associated C Provisions*

Table F- 6. Minerals SWCPs potentially applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
16.01	Administration of the 1872 Mining Law for exploration and extraction		There are no mineral exploration or development activities under the proposed action.
16.02	Administration of BLM permits, licenses, or leases		See 16.01
16.03	Administration of common variety mineral operations		See 16.01
16.04	Permits and administration of geophysical operations		See 16.01
16.05	Mineral activity coordination analysis		See 16.01
16.06	Reclamation of oil and gas well sites		See 16.01
16.07	Reserve pit location, design, operation, and reclamation		See 16.01
16.08	Oil and gas well blowout contingency plan		See 16.01
16.09	Abandoned mine land (AML) reclamation		See 16.01

Table F- 7. Range SWCPs potentially applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
17.01	Range analysis, allotment management plan, permit system, and operating plan		There are no livestock operations associated with the proposed action.
17.02	Controlling livestock numbers and season of use		See 17.01
17.03	Controlling livestock distribution		See 17.01
17.04	Rangeland improvements		See 17.01

Table F- 8. Fire Suppression/Fuels Management SWCPs potentially applicable to the Beaver Creek Resource Area project.

Practice #	Practice Name/Description	If applicable, where will the practice be implemented?	If not applicable, why not?
18.01	Fire and fuel management activities	INFS direction (FM-1 through FM-5) applies.	
18.02	Formulation of fire prescriptions	See 18.01	
18.03	Protection of soil and water from prescribed burning effects	See 18.01	
18.04	Minimizing watershed impacts from fire suppression efforts		Wildland fire and any associated need for watershed rehabilitation are beyond the scope of the proposed action.
18.05	Stabilization of fire suppression related watershed damage		See 18.05
18.06	Emergency rehabilitation of watersheds following wildfires		See 18.05

APPENDIX G
Preparers and Contributors

This Draft EIS was prepared by the US Forest Service, Idaho Panhandle National Forest (IPNF), Coeur d'Alene River Ranger District (CDA River RD). A Forest Service Interdisciplinary Team (IDT) identified the purpose and need for action, developed the proposed action and alternatives, prepared the DEIS document, and provided technical review of analysis and documentation.

This appendix identifies the resource specialists and other IPNF personnel who contributed to the overall preparation of the DEIS for the Beaver Creek project on the Coeur d'Alene River Ranger District.

Table G-1. Forest Service contributors to DEIS preparation.

Contributor	Contribution
Mary Farnsworth IPNF Forest Supervisor	Responsible Official.
Karl Dekome IPNF NEPA Coordinator	Process guidance, overall document review.
Lydia Allen IPNF Wildlife Biologist	Process guidance, review of the wildlife analysis and documentation.
Dan Scaife IPNF Aquatics Program Manager	Process guidance, review of the hydrology and fisheries analysis and documentation.
Chad Hudson District Ranger, CDA River RD	Coordination and leadership, responsive to public.
Kimberly Johnson Deputy District Ranger, CDA River RD	Process guidance, overall document review.
Jeanne White Ecosystems Staff Officer, CDA River RD	Process guidance, financial analysis review.
Tera Little Acting NEPA Coordinator, CDA River RD	Process guidance, overall document review.
Lauren Goschke Forester, CDA River RD	Project Leader, process coordination, public involvement, and interdisciplinary team leadership. IDT member.
Jason Jerman Certified Silviculturist, CDA River RD	Forest vegetation analysis and documentation, including field surveys. IDT member.
Sarah Jerome Assistant Fire Management Officer – Fuels, CDA River RD	Fire/fuels analysis and documentation... IDT member.
Aaron Prussian Fisheries Biologist/Hydrologist, CDA River RD	Hydrology and fisheries analysis and documentation, including field/stream surveys. IDT member.
John Ruebke Soils Specialist, CDA River RD	Soils analysis and documentation, including soil surveys. IDT member.
Gail Worden Wildlife Biologist, CDA River RD	Wildlife analysis and documentation, including field surveys. IDT member.

Contributor	Contribution
Ana Cerra-Timpone Wildlife Biologist, CDA River RD	Wildlife analysis and documentation, IDT member.
Valerie Goodnow Botanist, CDA River RD	Botany and noxious weeds analysis and documentation, including field surveys. IDT member.
Andy Boggs Recreation Manager, CDA River RD	Recreation analysis and documentation. IDT member.
Diana Jones IPNF Landscape Architect	Visuals analysis and documentation. IDT member.
Bruce Gibson Archaeologist, CDA River RD	Cultural resources analysis and documentation, including archaeological surveys and coordination with the State Historic Preservation Office (SHPO). IDT member.
Jayme Berard Civil Engineer, CDA River RD	Transportation system analysis, including road surveys. IDT member.
Brent Briggs IPNF Civil Engineering Technician	Transportation system planning and analysis support. IDT member.
Kerry Arneson Writer-Editor, CDA River RD	Overall document writing, editing and review; distribution coordination.

APPENDIX H
MIS Considerations for the IPNFs

October 7, 2011

Management Indicator Species Considerations for the Idaho Panhandle National Forests

Introduction

The purpose of this white paper is to provide recommendations for analyzing management indicator species (MIS) on projects on the Idaho Panhandle National Forests in light of recent court decisions; Native Ecosystems Council et al v. Leslie Weldon (Case:06-35890) and Lands Council v. Jane Cottrell (Case:2:09-CV-164-EJL-REB).

Background

The National Forest Management Act (NFMA) requires the Idaho Panhandle National Forests to provide for and maintain diversity of plant and animal communities to meet overall multiple-use objectives stated in the Idaho Panhandle National Forests Forest Plan (USDA Forest Service 1987).

On December 18, 2009 the Department of Agriculture issued a final rule reinstating the National Forest System Land and Resource Management Planning rule of November 9, 2000, as amended (2000 rule) (74 FR 242 [67059-67075]). The 2000 rule states: Projects implementing land management plans must comply with the transition provisions of 36 CFR §219.35, but not any other provisions of the planning rule. Projects implementing land management plans and plan amendments, as appropriate, must be developed considering the best available science in accordance with §219.35(a). Projects implementing land management plans must be consistent with the provisions of the governing plans.

These requirements are not new; our NEPA analyses have always required a sound technical basis. Projects proposed and carried out must show consideration of "best available science", be consistent with the forest plan, and support maintaining diversity of plant and animal communities.

Management Indicator Species Overview

The 1982 planning rule provided direction for implementing the NFMA when the Idaho Panhandle National Forests Forest Plan was adopted in 1987. The 1982 rule directed forests to manage fish and wildlife habitat to maintain viable populations and directed forests to select MIS as a method to help ensure species viability (36 CFR 219.19). Although the 1982 rule is not applicable now, it is discussed here in order to provide a background and better understanding of how the IPNF MIS were developed.

MIS were defined as "*plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent*" (FSM 2620.5). The role of MIS and the criteria to select MIS were described in 36 CFR 219.19 (a)(1) of the 1982 rule as follows:

In order to estimate the effects of each [Forest Plan] alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species

shall be selected because their population changes are believed to indicate the effects of management activities. In the selection of management indicator species, the following categories shall be represented where appropriate: Endangered and threatened plant and animal species identified on State and Federal lists for the planning area; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; non-game species of special interest; and additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality.

Forest Plan Direction for MIS

Wildlife Goals

The Forest Plan identified goals which are concise statements directed to the future, with no timeline or specific date attached. Specific goals related to MIS are as follows:

- *Provide for a diversity of plant and animal communities (Forest Plan, p II-1-A(8)).*
- *Manage vertebrate wildlife habitat to maintain viable populations of all species (Forest Plan, p. II-1-A(9)).*
- *Manage big game habitat toward achieving the goals of the Idaho Department of Fish and Game (Forest Plan, p II-1-A(10)).*

Wildlife Objectives

The Forest Plan identified objectives that are time specific, measurable, and respond to the goals stated above. Objectives are limited by budget. Specific objectives related to MIS are as follows:

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…to provide for viable populations of old-growth dependent and management indicator species (Forest Plan, p. II-5(g)).

Habitat for vertebrate populations, other than TES, will be managed to maintain viable populations (greater than 40 percent of maximum potential). In order to maintain viable populations of all species, the habitat will be managed for selected indicator species. Habitat for species harvested (big game, small game, and furbearers), except elk, will be managed to meet goals outlined by the Regional Guides (Forest Plan, p. II-5(g)).

Wildlife Standards

The Forest Plan identified standards, when used with prescriptions for the management area (MA); these standards set the overall management direction for the IPNF. Specific standards related to MIS are as follows:

7. Other Wildlife

a. Maintain at least minimum viable populations of management indicator species distributed throughout the Forest (see Appendix L for indicator species selection process Forest Plan, p. II-28).

b. Maintain habitat for cavity nesting species and foraging substrates by implementation of the IPNF Snag and Woody Down Timber Guidelines (Appendix X).

Monitoring and Evaluation

Monitoring and evaluation comprise the management control system for the Forest Plan. They provide information on the progress and results of implementing the Forest Plan. Monitoring and evaluation entail comparing the end results being achieved to those projected in the Plan. When changes occur, they will be evaluated as to their significance (Forest Plan, p. IV-7).

Monitoring requirements for this Forest Plan are outlined in Table IV-2 (see Table 1 below). Other monitoring items are more applicable to broad areas or are Forest-wide in nature, and will be evaluated from such sources as the data base, Forest attainment reports, public involvement processes, and non-Forest Service sources. These items include: ...F-1 (wildlife)... (Forest Plan, p. IV-8).

The Idaho Department of Fish and Game (IDFG) is identified in the Forest Plan as the data source for monitoring population trends of MIS on the Forest. However, IDFG focuses their monitoring efforts mostly on commonly hunted, fished or trapped species and information from IDFG regarding other MIS is limited. Consequently, population trend information for MIS other than those commonly hunted, fished or trapped consists of the best available science drawn from a variety of sources such as Forest Service inventorying and monitoring information, scientific papers, research, the U.S. Fish and Wildlife Service, state natural heritage programs, NatureServe, the U.S. Geological Survey, Avian Science Center and others.

Table 1. – Copy of Table IV-2 Monitoring Requirements from IPNF Forest Plan p. IV-11 for Wildlife item F-1 only

Standards, Practices, Activities, Outputs or Effects to be Monitored	Data source	Estimated Precision	Expected Reliability	Frequency of Measurement	Reporting period	Threshold to initiate further action
WILDLIFE						
Population trends of indicator species	State Fish and Game	Moderate	Moderate	Annually	5 years	Downward population trends

Forest Plan MIS Selection

Important characteristics used for selecting MIS in the Idaho Panhandle National Forests Forest Plan were: they were considered to be sensitive to management activities, they were capable of being effectively monitored, habitat requirements could be quantitatively assessed on the gross scale of Forest planning, and they were larger, more wide-ranging species rather than smaller animals. The assumption was that component elements of the habitat of large animals would produce viable populations of smaller animals (Forest Plan, p. L-2).

Under the 1987 Idaho Panhandle National Forests Forest Plan, Appendix L identified a total of 13 potential MIS that had documented presence on the IPNF (Forest Plan p. L-3). Of these 13 species, 11 were actually selected as IPNF MIS (Forest Plan, p. L-4 through L-6). Table 2 lists potential indicator species with documented presence on the IPNF and shows with a check mark those species that were selected as MIS in the 1987 Forest Plan.

Table 2. – Selecting Indicator Species on the IPNF – Documented Presence on IPNF

Threatened or endangered species on federal or state lists	Species commonly hunted, fished, or trapped which have special habitat needs that are affected by planned management activities	Other species whose population changes are believed to indicate effects of management activities on a major biological group or on water quality
✓ Bald Eagle ✓ Grizzly Bear ✓ Woodland caribou Gray Wolf	✓ Elk ✓ White-tailed deer ✓ Moose Marten ✓ Cutthroat trout ✓ Rainbow trout ✓ Bull trout	✓ Pileated woodpecker ✓ Goshawk

✓ Indicates that the species was selected by the IPNF and reason for selection is identified in the Forest Plan on pages L-4 through L-6

Those **species listed under threatened or endangered** are protected under the Endangered Species Act (ESA) and by definition have viability concerns. The Idaho Panhandle National Forests is committed to ensuring their protection and recovery through compliance with ESA and the Forest Plan (Forest Plan, pp.II-27-28, III-7-16, IV-8-11, V-3, Appendix N, U, and W).

Bald Eagle population trends increased over time, recovery goals were met and this species was delisted in 2008, and is now designated as a regional sensitive species. *Grizzly bear* and *woodland caribou* continue to be federally listed. *Gray wolf* was not selected as a MIS; however, this species has been included as an MIS in past Forest Plan monitoring reports because of its federally listed status. The population trend of this species in North Idaho is increasing. *Bull trout*, a species that was originally chosen because it was commonly fished for, was listed as threatened under ESA in 1998.

The **species listed under species commonly hunted, fished, or trapped** represent important economic species that are of common public interest and are monitored by the Idaho Department of Fish and Game. The species listed in this category are not a proxy for other species. IDFG is responsible for setting the harvest regulations for the species in this category. By having populations that support harvest levels, viability is not a concern for these species. The data source for monitoring these species comes from IDFG (Forest Plan, p. IV-11).

Elk, white-tailed deer, and moose continue to be commonly hunted in North Idaho. Population trends for elk and white-tailed deer are stable to increasing (IDFG 2008a, IDFG 2008b); while the population trend for moose is increasing (IDFG 2008c). Federal listing of westslope *cutthroat trout* was determined to be "not warranted" in 2000 and 2003. This species continues to be commonly fished for in North Idaho. Cutthroat trout population trends on the IPNF overall tend to be stable to increasing (USDA Forest Service 2010a). The vast majority of *rainbow trout* found on the IPNF are non-natives. There is no longer legal harvest of *bull trout*; however, overall population trends on the IPNF are stable to increasing, except in the Priest River drainage (USDA Forest Service 2010a).

Marten are listed under the heading of species commonly hunted, fished, or trapped yet they were not selected as an Idaho Panhandle National Forests indicator species (see Table 2). Although marten were not specifically identified as an MIS in the Forest Plan, the IPNF has treated them as one in the past. The IPNF will no longer identify marten as MIS, but will continue to analyze the effects of projects on marten as a species that is commonly hunted, fished, or trapped.

Because marten are ranked G5 globally and S5 in Idaho, which is defined as "Secure: common, widespread, and abundant" (IDFG 2005) their population is not a concern. Current marten information from Idaho Fish and Game indicates the species to be stable throughout North Idaho and there continues to be a trapping season on them (IDFG 2008d). Based on DNA and remote camera surveys conducted over the past seven years in North Idaho (e.g. over 400 verified marten detections), marten appear to be abundant and well-distributed across the Forest (Albrecht 2009)[1].

Species included under other species whose population changes are believed to indicate effects of management activities on a major biological group or on water quality are listed because it was thought that their populations would be affected by management activities at the forest level, not at the project level. The species listed in this category are considered a proxy for other species. These species are *pileated woodpecker* and *northern goshawk*. While these species met some of the characteristics for selecting MIS, they pose difficulty in surveying and monitoring on a meaningful basis and may not respond to direct habitat changes locally but rather are influenced by many other factors such as predation, weather and competition.

The reasons for selection of pileated woodpecker and northern goshawk stated in Appendix L of the 1987 Forest Plan are as follows:

G. Pileated woodpecker

1. Pileated woodpeckers are the largest primary excavator in the IPNF. They are dependent on large snags for nesting sites. Although past fires have left a temporary abundance of snags on the IPNF, standard logging practice is to cut these snags. As more of the forest comes under timber management, available and suitable nest trees may be severely reduced.

2. Pileated woodpeckers are also generally regarded as old-growth indicators because of their dependence on large old snags for nesting and downed logs for feeding. Snags and down rotten logs are characteristic elements of decadent stands.

3. A wide variety of small mammals and birds are dependent on holes excavated by pileated woodpeckers for denning or nesting.

H. Goshawk

1. Goshawks are proposed as indicators of old-growth habitats. Goshawks prefer multi-layered mature and old-growth stands of about 30 acres on flattish, northern aspects for nesting.

2. Despite their preference for nesting in old-growth stands, goshawks feed largely on seral species. Thus, they are more diverse and interspersion dependent than pileated woodpeckers.

It is important to note that the IPNF no longer conducts timber harvest or any other management that removes allocated old growth stands and has not done so for many years (USDA Forest Service 2010a). However, old growth distribution is not static because forests are living, dying and changing as part of natural communities. Disturbances such as fire, insects, disease and weather events may reduce the amount of old growth in some areas while other areas will grow and age into old growth. The IPNF contains almost 700,000 acres of mature forest (canopy dominated by trees over 100 years old), substantial amounts of which have the potential to develop into old growth in the next few decades (USDA Forest Service 2010a).

[1] The marten data was provided by the Coeur d'Alene Tribe as a courtesy and are not on file with the USDA Forest Service.

Equally important to note is that in contrast to what was stated in the 1987 Forest Plan, snag removal is no longer a standard logging practice. In fact, design features based on Regional guidance, such as the Northern Region Snag Management Protocol (USDA Forest Service 2000) and the Estimates of Snag Densities for Northern Idaho Forests (Bollenbacher et al. 2009) have greatly improved the retention of quality snags and live trees to serve as future snags. Specifications contained in timber sale contracts also typically require the retention of all or most snags, particularly large diameter ones, except those needing to be removed for safety purposes due to Occupational Health and Safety Administration (OSHA) guidelines. Additionally, any larger snags felled per OSHA guidelines must be left on site after they are felled, which provides large downed logs needed for pileated woodpecker foraging and habitat for northern goshawk prey species.

The remainder of this paper centers on the northern goshawk and pileated woodpecker.

Management Indicator Species Step Down Process

General Considerations

The Ninth Circuit Court has upheld the use of habitat analysis to determine the effects on species from management activities (Lands Council v. McNair). Wildlife surveys conducted within project areas are designed to document species presence, rather than abundance. MIS status is a Forest-level evaluation that requires reconciling disparities in the geographic scale between the management actions and the scale of ecological and species-specific responses. For instance, population viability and trend information is not scientifically feasible, or even appropriate, at smaller scales such as a project area, particularly for species with relatively large home ranges such as the northern goshawk and pileated woodpecker (Beissinger 2002, Samson 2006a). Instead, the IPNF uses habitat as a proxy for population data of MIS, and MIS habitat suitability assessments are conducted within project areas.

In addition, species presence surveys do not determine absence of a species. Many variables impact the ability to detect a species even if they are present such as secretiveness, large home ranges, seasonal detectability, and temporal movements of the species (Bull et al. 1990, Woodbridge and Harris 2006). Therefore, again, a more meaningful and credible approach in conducting an analysis is to assess habitat suitability based on biophysical attributes, using species survey information to help validate suitability of habitats. In many cases, surveys can also identify key habitats (e.g., breeding or nesting sites) that can be protected through project design features.

An important concept in discussing habitat suitability for some species is the distinction between capable habitat and suitable habitat. Capable habitat refers to the inherent potential of a site to produce the necessary biotic and abiotic components to support a given species. Suitable habitat refers to habitat that is currently providing the necessary components to support a species. Therefore, habitat that is unsuitable is capable habitat that has the potential to develop into a suitable condition, but currently does not meet the habitat requirements for a species. Habitat that is not capable has no potential to develop into a suitable condition.

Complex relationships exist among the variables that define the use of suitable habitat by a wildlife species (Pulliam 2000). Among other factors, the size and configuration of habitat, dispersal ability of individuals and interspecific competition can play into the ability of a species to occupy suitable habitat. Consequently, it would not be expected that every acre of suitable habitat will be occupied by a particular wildlife species at any given point in time. Populations of

wildlife species that are abundant and well-distributed across the landscape do not occupy every acre of suitable habitat across a variety of spatial scales. For species that are less common, the likelihood of suitable, but unoccupied, habitat is high, regardless of population status.

> *"Clearly, competition, dispersal, niche size and the distribution of environmental conditions in space and time all play some role in determining species distributions in relationship to the distribution of suitable habitat" (Pulliam 2000).*

However, this does not diminish the importance of recognizing an area as suitable habitat and managing it accordingly. Whether or not the potentially suitable habitat is currently occupied by the species in question, suitable habitat may be occupied by that species in the future so it is important to manage, particularly if it is a habitat that is limited across the landscape.

The Council on Environmental Quality (40 CFR 1502.2) directs that impacts be discussed in proportion to their significance. Some wildlife species require a detailed analysis to determine effects of an action on them. Other wildlife species may not be impacted or impacted at a level that does not increase risk to the species. Some species may be adequately protected by altering the design of the project. Generally, these species 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 a species or its habitat within the project area, the scope and nature of the activities associated with the proposed action and alternatives, and the risk to factors that could ultimately result in a meaningful adverse or favorable effect on the species or habitat being analyzed.

National Overview

The northern goshawk and pileated woodpecker are protected under the Migratory Bird Treaty Act. Executive Order 13186 of 2001 clarified the responsibilities of Federal agencies regarding migratory bird conservation, and these responsibilities include inventory and monitoring. In December 2008, the Forest Service entered into a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service on the Migratory Bird Treaty Act that further clarified the Forest Service's commitment to bird conservation during forest and project-level planning (USDA Forest Service and USDI Fish and Wildlife Service 2008).

Within the National Forest System, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for other land management activities. National forest managers design and collaborate on projects that provide for bird conservation in accordance with numerous laws, agreements and collaboratively-developed comprehensive planning documents. As part of the MOU, the Forest Service agreed to consider the most up-to-date Fish and Wildlife Service list of Birds of Conservation Concern and to evaluate the effects of agency actions on migratory birds within the NEPA process, focusing first on these species of concern along with their priority habitats and key threats. The northern goshawk and pileated woodpecker are not on either the U.S. Fish and Wildlife Service's current list of Birds of Conservation Concern or Birds of Management Concern for the Northern Rockies, which includes northern Idaho (USDI Fish and Wildlife Service 2008, USDI Fish and Wildlife Service 2009).

In 2004, Partners in Flight published the North American Landbird Conservation Plan to identify birds of concern along with recommendations on how to protect these species and their habitat. As part of the Plan, they developed a Species of Continental Importance in the Intermountain

West Avifaunal Biome list, which includes all of Idaho. The northern goshawk and pileated woodpecker were not included on the list of over 30 bird species warranting special concerns within this region (Partners in Flight 2004).

Northern Region Overview

In 1990, the Avian Science Center (ASC) designed a monitoring program to help biologists and managers better understand the habitat relationships and population trends of landbirds breeding in the Northern Region, including northern goshawks and pileated woodpeckers. ASC coordinated efforts to survey birds at permanently marked points on an every-other-year basis. Preliminary ASC analyses suggest that most landbird populations have remained fairly stable during the 12-year period from 1994 to 2006 (Avian Science Center 2009).

In 2006, the Northern Region of the Forest Service released a conservation assessment, which included northern goshawk and pileated woodpecker, to provide a synthesis on the best available science regarding habitat and populations and to analyze the availability of habitat for these species across the region and on the individual Forests (Samson 2006a; updated estimates in Bush and Lundberg 2008). The conservation assessment considered peer-reviewed literature, non-peer-reviewed publications (particularly master's theses and PhD dissertations), research reports and Forest Service data. Peer-reviewed literature published in professional journals was emphasized where possible since they are the accepted standard. Additionally, literature published since 2000 was emphasized since these more recent publications review previously published literature and provide for the best available science.

The conservation assessment is based on a principle-based approach to population viability analysis (PVA). This method uses point observation data and vegetation inventory information based on the Forest Inventory and Analysis (FIA) data to build wildlife habitat relationship models to analyze short-term viability (less than 100 years). It also discusses the use of dispersal distance to assess the distribution of habitat and long-term viability based on the principles of Representation, Redundancy and Resiliency.

The FIA program provides a congressionally mandated, statistically-based, continuous inventory of forest resources. The FIA program is administered through the Research branch of the Forest Service, making it administrated independently of the National Forest System. FIA inventory design is based on the standardized national grid of inventory plots that covers all forested areas of the United States. Both sample plot location and data collection standards are strictly controlled by FIA protocols. The sample design and data collection methods are scientifically designed, publicly disclosed and repeatable. There are also stringent quality control standards and procedures, carried out by FIA personnel. All of this is designed to assure that all measurements are accurate and that there is not bias in sample design, plot location, trees selected for measurement or the measurements themselves. Using FIA data allows the Forest Service to base habitat condition assessments on an unbiased, statistically sound, independently designed and implemented representative dataset.

FIA data provides statistically reliable estimates at the Regional and Forest levels. Estimates of habitat from FIA data provide broad-level cumulative effects information. This information is useful in setting the context for the possible effects of a project. However, finer-level vegetation analysis, such as can be done with stand exam data, is necessary to quantify and map northern goshawk and pileated woodpecker habitat at the project level using parameters similar to those of the FIA model (Samson 2006a). See Samson (2006a) for a detailed description of the methods used to determine the amount of habitat available for each species in question.

The Forest Service Northern Region developed these documents to satisfy the requirements of NFMA and Forest Service regulations. The Forest Service's focus for meeting the requirement of NFMA and its implementing regulation is to assess habitat and provide species diversity (Brewer et al. 2009).

Although the Forest Plan requires maintaining minimum viable populations of MIS at the Forest level, larger scale inventory and monitoring efforts for MIS population trends and habitat suitability at the regional or ecosystem level provide a vital backdrop on which to assess these species. Efforts, such as those described above, undertaken by the Forest Service, other governmental agencies (Federal and State) and other organizations (e.g. Partners in Flight) provide the best possible accumulation of information for determining the population trends for a species by providing a broad context. They are also better able to account for broader scale ecosystem functions such as disturbance processes (e.g. insect and disease outbreaks) and climate change.

Forest Overview

The IPNF considers Samson (2006a, 2006b, and updated habitat estimates in Bush and Lundberg 2008) to be the best available science addressing viability for northern goshawk and pileated woodpecker for the Northern Region. These references are a synthesis and evaluation of available research and information applied to specific management questions relevant to this and other agency decisions and management issues. Wildlife analyses on the Forest appropriately evaluate and consider works like these, along with more recent research and information (much of it peer reviewed), in analyzing and disclosing potential effects of the proposed actions on these species. The analyses use a variety of reliable sources of information including peer-reviewed literature, published reports, monitoring of the Forest Plan and specific projects, General Technical Reports from the Forest Service research branch, and conservation strategies that are based on peer reviewed science and bridge research with resource management.

The amount of mature/old growth habitat on the IPNF is within the historic range of variability, albeit on the low end of the range (USDA Forest Service 2011), and may represent reduced pileated woodpecker nesting habitat compared to historic conditions. More importantly from a goshawk habitat standpoint, the within-stand species composition has changed even more substantially from the historic condition, replacing mature stands dominated by early seral species with dense stands of mid/late seral species and congested understories that diminish both nesting and foraging habitat for goshawks. Additionally, white pine-dominated stands likely made considerable contributions to goshawk habitat historically (due to the presence of large-diameter individual trees, continuous overstory canopy and relatively open understories), but these stands are all but eliminated from today's landscape due to white pine blister rust (Harvey et al. 2008).

Many of the stands now dominated by mid/late successional shade-tolerant species are unlikely to mature into old growth if left alone due to their susceptibility to insects and disease, and other stands that may still contain remnant large early seral fire-adapted individuals have accumulated fuel loads to the point that merely discontinuing fire suppression in these stands is more likely to result in a stand-replacing fire than to recreate the more open stand conditions dominated by large individuals that existed historically.

Consequently, it can generally be assumed that northern goshawk and pileated woodpecker nesting habitat was more prevalent on the IPNF prior to settlement than it is now due to the clearing of land for agriculture, large scale wildfires in 1910, logging, fire suppression, and the introduction of white pine blister rust. Availability of mature and old growth forests probably

reached its lowest level at some point in the years after the late 1970s, when logging reached its peak. Since the late 1980s, the decline in timber harvest has been precipitous. Over the last ten years, the IPNF has harvested less than two percent of the forested acres on the Forest (USDA Forest Service 2010b). In the early 1990s, timber harvest of old growth effectively ended on the IPNF and the blister rust epidemic had largely run its course. The preponderance of forested acres has gradually been maturing since that time.

Based on current FIA data, the estimated percent of old growth on the forested lands of the IPNF is 11.8 percent (USDA Forest Service 2010a). Additionally, based on the IPNF's field examination and assessment at the stand-level to determine how well they meet the old growth definitions in the Forest Plan and Green et al. (2008), the acres of mapped stands allocated and retained for old growth on the IPNF is 12.4 percent (USDA Forest Service 2010a). The stand-level old growth allocation allows the IPNF to distribute old growth across the Forest and landscapes in ways that make ecological sense at the landscape scale.

Northern Goshawk

Background

In 1991 (Babbit et al. 1991, Silver et al. 1991) and in 1997 (USDI Fish and Wildlife Service 1998), the northern goshawk was petitioned to be listed as threatened or endangered in the western United States. On June 29, 1998 (63 FR 35183), in response to the 1997 petition, the U.S. Fish and Wildlife Service (USFWS) concluded based on the best available science that the listing of the northern goshawk was not warranted because:

- There was no evidence of a declining population trend for goshawks in the western United Sates.
- 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.

In 2009, Brewer et al. released a report for the Forest Service Northern Region that summarized the best available scientific information about the ecological status of northern goshawks: the estimated amounts and distribution of goshawk habitat in Region One (Samson 2006a; estimates updated in Bush and Lundberg 2008); the results of the 2005 R1 grid-based inventory of the species (Kowalski 2006); and a consistent methodology for conducting habitat analysis. The methods used to classify goshawk habitat at multiple-spatial levels follows the architecture supported by the R1 Multi-Level Classification, Mapping, Inventory and Analysis System (Berglund et al. 2009). This system provides a consistent methodology to classify vegetation dominance type, tree size class and tree canopy cover for R1-VMap and data inventory information residing in FSVeg. See Brewer et al. (2009) for a detailed description of the methods used.

Species Description and Habitat Associations

The northern goshawk is a forest habitat generalist that uses a wide variety of forest age classes, structural conditions and successional stages, inhabiting mixed-conifer forests in much of the

northern hemisphere (Reynolds et al. 1992). Nesting habitat appears to be the most critical and limiting factor for goshawks. Throughout North America, goshawk nest sites have typically been associated with the later stages of succession (mature and old growth forests) having relatively closed canopies (50 to 90 percent) with open understories located on the lower one-third or bottom of the hill slope and in most cases in areas with less than a 40 percent slope (Hayward and Escano 1989, Warren 1990, Squires and Reynolds 1997, Graham et al. 1999). They nest in a variety of forest types throughout their range and typically nest in one of the largest trees within the nest stand (Squires and Reynolds 1997, USDI Fish and Wildlife Service 1998, Samson 2006a, Squires and Kennedy 2006). The nest area vegetative and structural composition represent a much narrower range of characteristics than the surrounding post-fledgling area (PFA) and foraging areas (Brewer et al. 2009).

In contrast to what is suggested in the Forest Plan, no evidence exists that goshawks depend on large, unbroken tracts of mature forest or old growth or that they specifically select for old growth forests (Whitford 1991, USDI Fish and Wildlife Service 1998, McGrath 2003). However, although goshawks are not considered to be old growth dependent, old growth can be important for goshawks, not only for prey species habitat, but also for the large trees that provide substrate for their substantial nest structures.

The nest area size for goshawks documented in scientific literature ranges from one acre to 148 acres based on local conditions and can include multiple alternate nests (Reynolds et al. 1992, Squires and Reynolds 1997, Patla 1997, Clough 2000, McGrath et al. 2003). Thirty acres was recommended as the minimum nest stand sizes by Reynolds et al. (1992) and was the guideline adhered to by the IPNF for a over a decade. However, based on more recent research conducted in Montana and the subsequent recommendations in Brewer et al., nest stands on the IPNF are currently delineated at a minimum of 40 acres in size (Clough 2000, Brewer et al. 2009).

Goshawk territories contain a post-fledgling area surrounding the nest site that is used by the family group from the time the young fledge until they are no longer dependent on the adults for food (Reynolds et al. 1992, Kennedy et al. 1994, Kennedy and Ward 2003). The PFA and the home range (which includes the nest area, post-fledgling area and foraging area) both contain a more heterogeneous mix of forest age and structural components than the nest area itself (Reynolds et al. 1992). The size of the PFA ranges in the literature from 198 acres to 494 acres. The size, shape, habitat composition and functional importance of the PFA may vary with local conditions, such as disturbance history, prey availability and risk of predation (Squires and Kennedy 2006).

Research indicates the goshawk home range or foraging area varies depending on prey abundance/availability, habitat conditions and other factors, but has been shown to range from approximately 1,400 acres to 8,600 acres (Reynolds et al. 1992, Kennedy 2003, Brewer et al. 2009). These areas typically have one to five nest sites within them. Based on Brewer et al. (2009), a foraging area size of 5,000 to 6,000 acres is used on the IPNF to delineate potential goshawk territories and to provide an adequate cumulative effects area for project-level analysis.

Foraging habitat entails a much wider range of forest age classes and structures that provide a relatively open forest environment for unimpeded movement or flight through the understory. One factor influencing goshawk habitat is the amount of understory vegetation. Because northern goshawks require a combination of adequate overstory to provide prey species and adequate clearance for flight maneuverability, some stands that historically were suitable for foraging are no longer suitable due to an increased density of understory vegetation largely as a result of fire suppression.

Threats

The primary threats to northern goshawk that may result from forest management activities on public land include a reduction in the amount of mature forests and their associated structures (e.g., large-diameter snags and logs) along with the transition of older forests from being dominated by shade-intolerant tree species to being dominated by a dense structure of shade-tolerant tree species, primarily due to fire exclusion (Wisdom et al. 2000). This increase in shade-tolerant species has increased the forest's susceptibility to stand-replacing fires, and has adversely affected habitat suitability by 1) obstructing flight corridors used by goshawks to obtain prey, and 2) reducing herbaceous understory that supports prey species (Wisdom et al. 2000).

Fire exclusion, insects, and diseases have changed the species composition and structure of many stands, reducing their suitability for goshawk habitat. Some capable habitat on the Forest consists of younger, more immature stands that do not contain larger diameter trees used by goshawks for nesting or they are more mature stands, but contain a high density of smaller stems in the understory. As the secondary canopy layer becomes more congested, these stands lose their effectiveness as goshawk habitat.

The primary threats to the northern goshawk that could occur as a result of activities on private land, thus out of the control of the Forest Service, include the conversion of forested habitats to young forest (e.g. regeneration harvest on private timber industry land) or non-forested habitat (e.g. conversion of forest habitat to residential or agricultural development) and human disturbance in close proximity to goshawk nest sites.

Difficulties in Monitoring

Goshawk detectability is highly variable within a breeding season, and nest sites can be difficult to locate. During certain times of the nesting season, goshawks actively defend the nest stand. Additionally, adults and nestlings are vocal in and around nest sites during the later stages of the nesting season and at times will respond to auditory surveys in close proximity to the nest stand. Consequently, if a goshawk survey occurs during this time frame and in close proximity to the nest, the chances of detecting this species are good. Outside of the breeding season, goshawks are largely silent (Woodbridge and Hargis 2006).

However, when monitoring a species with a large home range of potentially more than 6,000 acres, such as the goshawk, locating the nest stand within that territory can be very difficult. Adding to the difficulty of locating an active nest is the goshawk's propensity of maintaining multiple nest sites within their home range and to use different nests from year to year, as well as to create new ones. Although known for aggressively defending their nests, breeding goshawks are typically secretive and nest sites are often difficult to locate (Woodbridge and Hargis 2006). Visual and auditory detectability varies greatly during the reproductive cycle. During incubation and the early nestling stage, adult goshawks tend to remain quiet and do not typically respond to auditory surveys (Woodbridge and Hargis 2006). During these times, detecting goshawks can be extremely difficult, even if you are standing at the base of tree with an occupied nest. Additionally, if a nest failure occurs during the incubation and early nestling stage, surveys initiated after goshawks become more vocal would likely not be able to determine that the stand or a particular nest site had been active.

Topography (e.g. slope and elevation) and habitat structure (e.g. horizontal cover and vegetation density) can also substantially impact the ability of surveyors to hear auditory responses, track the movements of individual goshawks and ultimately locate and verify nest sites. For instance, habitats on gentle slopes with a more open canopy and less dense understory provide favorable

conditions for locating goshawks and their nests. However, in North Idaho, the steep slopes and denser stands characterized by closed canopies increases the difficulty in locating and monitoring northern goshawks and their nest sites.

Another factor affecting the timing of detection is the correlation of the nesting season with seasonal and climatic weather patterns. Late winter and spring weather that is cool and moist, as is typical in North Idaho, hampers early season goshawk surveys that are used to determine if territories are occupied and snow conditions limit access to many areas making completion of transects difficult. Additionally, a late winter can delay the nesting time frame in some areas on the Forest, but may not in all areas, or an early spring can lead to earlier nesting. These differences in the start of nesting season in turn alter the timing on when goshawks are likely to respond to auditory surveys and be detected. These fluctuations make it more difficult to locate and survey a nest stand within the window of time when responses would be expected and goshawk detection is more likely to occur. In the Northern Goshawk Inventory and Monitoring Technical Guide, Woodbridge and Hargis (2006) surmise that when compared to surveys for songbirds, goshawk auditory responses, which rely on eliciting defensive responses, vary greatly and depend highly on the reproductive chronology and status of the goshawk pair.

As a result, while it can be difficult to monitor known, recently occupied goshawk territories from year to year, it is substantially more difficult to locate and confirm goshawk presence in areas with no previously documented territories. This is particularly true since based on the factors discussed above; systematic auditory surveys within suitable nesting habitat may not always be effective in locating active nests. Consequently, conducting goshawk surveys with sufficient intensity on thousands of hectares of suitable goshawk habitat Forestwide for a period of time adequate to establish a statistically sound population trend would be extremely difficult and likely infeasible.

Existing Condition

According to NatureServe (2009) the northern goshawk has a global conservation status rank of G5. This indicates the species is common, widespread, abundant, and therefore secure across its range. Although the vast majority of the IPNF is within Idaho, it also includes some portions of Washington and Montana. All three states list the status of the northern goshawk as S3, which indicates there are some factors posing moderate risks to the species or its habitat, such as insect and disease outbreaks in Montana. The northern goshawk is not a "species of greatest conservation need" in either Idaho or Montana (IDFG 2005, MNHP 2010). In 2011, the State of Idaho will be reviewing the conservation status of this species and the state rank will be adjusted, if necessary, to reflect information that has become available since the last revision in 2005 (Dixon, pers. comm. 2011). Concerns in Washington appear to stem from declines in goshawk populations in the western portions of the state (WDFW 2005).

According to the Partners in Flight Population Estimates Database, there are approximately 62,000 northern goshawks in the Northern Rockies Bird Conservation Region (BCR), which includes North Idaho. Within just the North Idaho portion of the BCR the population is estimated to be approximately 4,000 northern goshawks (Partners in Flight 2007). The North Idaho estimate has a lower data quality rating than the data for the Northern Rockies and therefore a lower accuracy due to a more limited amount of data. *See Guide to the PIF Population Estimates Database: North American Landbird Conservation Plan 2004* for a detailed description of the data used and limitations of these population estimates (Blancher et al. 2007).

Northern Region

Based on methodology discussed briefly in the Northern Region Overview section above and described by Samson (2006a) and updated in Bush and Lundberg (2008) using FIA data, the North Rocky Mountain Ecological Province (NRMEP); comprised of the Idaho Panhandle, Clearwater, Flathead, Kootenai and Lolo National Forests, contains approximately 126,349 acres of goshawk nesting habitat, approximately 400,104 acres of habitat for utilization as post-fledgling habitat and approximately 3,779,928 acres of foraging habitat.

Samson (2006b) concluded, based on the synthesis of the best available science, that to maintain a minimum viable population of the northern goshawk across Region One, there would need to be a minimum of 30,147 acres of PFA habitat, based on a net effective population size of 110 individuals (55 pairs) using an approximately 545 acre PFA per pair. Bush and Lundberg's updated FIA data results in 2008 for northern goshawk habitat indicates that the NRMEP alone provides more than 13 times more acres of habitat than needed for the entire Region to maintain a minimum viable population of the northern goshawk (Samson 2006b, Bush and Lundberg 2008).

Samson (2006b) also determined using a dispersal distance method developed for birds (Bowman 2003) that suitable habitat for the northern goshawk was within the species-specific dispersal distance, indicating that well-distributed habitat is not an issue in the Northern Region.

In 2005, the Northern Region conducted goshawk surveys throughout the region based on the Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006). The primary purpose of the surveys was to estimate the frequency of goshawk presence within grids that approximated a territory size and to better define the geographic distribution of goshawk across the Northern Region. Based on the results of the survey and goshawk nest information provided by the Forests, the frequency of goshawk presence in the accessible portions of the Northern Region suggests they are relatively common and well distributed across the region (Kowalski 2006).

Samson (2006a) concluded the following with regard to the short-term viability of the northern goshawk in the Northern Region of the Forest Service based on his review of the pertinent literature and synthesis of the best available science, as well as his habitat assessments:

- No scientific evidence exists that the northern goshawk is decreasing in numbers.
- Increases in the extent and connectivity of forested habitat have occurred since European settlement.
- Well-distributed and abundant northern goshawk habitat exists on today's landscape.
- Level of timber harvest is insignificant in the Northern Region (in 2009, 4,854 ha of 9,045,255 ha or 0.05% of the forested landscape) and on the IPNF (551 ha of 999,733 forested ha or 0.06% of the forested landscape) (USDA Forest Service 2010c). Over the last ten years, the Northern Region harvested 76,649 ha or 0.85% of the forested landscape and the IPNF harvested 15,367 ha or 1.54% of the forested landscape (USDA Forest Service 2010b). These figures include all types of harvest and does not indicate that all harvested hectares resulted in habitat loss or degradation for northern goshawks.

Until 2007, the northern goshawk was listed as a Sensitive Species in the Northern Region of the Forest Service. Forest Service Manual states that Sensitive Species are those for which there is a significant current or predicted downward trend in population numbers/density and a similar downward trend in habitat capability that would reduce distribution of the species. Regional data collection and analyses demonstrates that neither condition exists for the northern goshawk;

therefore in 2007, the species no longer met the definition for "sensitive" and was removed from the list (USDA Forest Service 2007).

Forest

Based on the analysis performed by the Northern Region, the IPNF contains approximately 32,967 acres of goshawk nesting habitat, approximately 148,354 acres of habitat for utilization as post-fledgling habitat and approximately 918,379 acres of foraging habitat (Samson 2006a, Bush and Lundberg 2008).

Based on Samson habitat thresholds for maintaining a minimum viable population across the Region and the updated FIA information provided by Bush and Lundberg (2008), the IPNF contains just under five times more PFA habitat on this Forest alone than is needed to provide viability at the Region level.

Over the past ten years, there have been 114 documented active goshawk breeding territories on the IPNF (see Project File). This figure is additive because it accounts for a single territory potentially being active in multiple years within that time frame. However, there have been a minimum of 41 different territories active over the past ten year period (see Project File). Although some level of known goshawk territory monitoring occurs on an annual basis across the Forest, all known territories are not surveyed every year. Consequently, the documented number of active territories represents the minimum number of active goshawk territories for a given year when in reality it is likely higher. Some surveys of potentially suitable goshawk nesting habitat are typically conducted on an annual basis in an attempt to locate, document and protect newly found active goshawk territories. Additionally, some suitable goshawk nesting habitat occurs in remote areas within designated roadless and wilderness areas that are not subject to surveys.

Based on information in field notes and nest survey forms for northern goshawk nest sites documented on the IPNF over the past ten years, the known nest sites are generally located in forested stands that fall within the habitat parameters considered to be suitable goshawk nesting habitat in the scientific literature (e.g. more open understory, larger diameter trees) (Hayward and Escano 1989, Warren 1990, Reynolds et al. 1992, Squires and Reynolds 1997, Graham et al. 1999). If there are any disparities between the literature and nest sites on the IPNF it would be the occurrence of some nest sites within fairly dense stands of smaller diameter trees and/or on steeper slopes. However, even within these types of stands goshawks appear to select microsites that contain the largest diameter trees and/or benches with a gentler slope.

During that same ten year time frame there have been 298 documented sightings of goshawks on the IPNF (see Project File). Although some of these sightings are associated with nest sites (e.g. breeding adults, young), some represent individuals present outside the breeding season, transient individuals or sightings outside of known breeding territories. Goshawk sightings and active territories have been documented throughout the Forest over the past ten years.

Project Level

See project level analysis located in project specific NEPA documents.

Forest Plan Compliance

The IPNF Forest Plan (USDA Forest Service 1987) selected the northern goshawk as a management indicator species of old growth habitats and established guidance for managing old growth in part to provide for viable populations of this species. It states, "*Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations*

of old growth dependent and indicator management species." Although it has been shown since the 1987 Forest Plan that northern goshawks are not old growth dependent, old growth is addressed to illustrate continued compliance with the Forest Plan. To obtain the desired distribution, each designated old growth unit is managed to maintain approximately five percent old growth where it exists. The IPNF is meeting and exceeding the Forest Plan standard that calls for maintaining 10 percent of the forested portion of the IPNF as old growth (USDA Forest Service 2010a). FIA data and stand-level allocated old growth also provides evidence that the old growth is well distributed across the IPNF (USDA Forest Service 2010a).

Applicable Forest Plan Standard

7. Other Wildlife

> *a. Maintain at least minimum viable populations of management indicator species distributed throughout the Forest.*
>
> Based on the best available science discussed in the Existing Condition section for this species, the IPNF contains substantially more than enough habitat distributed throughout the Forest to support a minimum viable population of northern goshawk. In addition, the best available science suggests that the goshawk population is, at a minimum, stable if not increasing slowly, and there has been no scientific evidence that the goshawk population is in decline.

Pileated Woodpecker

Background

The pileated woodpecker was originally designated as a MIS because it was generally regarded as an old growth indicator due to its need for large dead trees (snags) for nesting (Bull et al. 1990). Pileated woodpeckers are no longer considered to be a good indicator of old growth, although the importance of large snags remains a key component of their habitat regardless of the stand age. Prior to the implementation of the 1987 Forest Plan, timber harvest activities on the IPNF would have likely reduced snag densities in most cases. The long term impacts of these activities were the reduction of snags in all size classes. However, following the implementation of the Forest Plan and more recently the adoption of the Northern Region Snag Management Protocol (USDA Forest Service 2000) and Regional guidance on snag densities in North Idaho (Bollenbacher et al. 2009), snag retention and snag recruitment (leaving higher densities of green trees to produce good quality snags in the future) in harvested areas has risen dramatically.

Snag habitat on the Forest has been strongly influenced by vegetation succession, fire suppression, firewood cutting and insect and disease, along with natural fire events to a lesser degree. Most of the snags created by past wildfires have since fallen. Since 1910, much of the landscape has progressed and is now dominated by a high density of Douglas-fir, which are more susceptible to insect and disease at a younger age and therefore do not create larger, longer-lived snags.

Snags are an ephemeral resource that varies greatly throughout the life cycle of a forest stand. Most snags remain standing from a few years to a few decades. How long snags remain standing is a function of the structure, species composition, age of the stand, cause of tree mortality (e.g. fire, insects), size of the snag and site characteristics such as soil type and slope. Once they fall, snags become down wood that provide habitat for many wildlife species. Pileated woodpeckers often forage on down wood that is being heavily utilized by insects.

Snag numbers and size distribution can vary considerably within a stand. This high variability makes it more difficult to characterize the snag situation at the individual stand level. However, at large spatial scales the factors regulating snag numbers are more likely to balance out for longer periods of time. Therefore, it is important to look at mid and larger scale snag information to provide context for the snag situation for a specific area (USDA Forest Service 2010a).

Species Description and Habitat Associations

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 both previously harvested stands that contain remnant large trees and snags, and in mature and old growth forests. The presence of large trees for nesting appears to be more important than the age of the stand (Kirk and Naylor 1996, Giese and Cuthbert 2003). The pileated woodpecker is able to do well in young and fragmented forests that retain abundant remnant structure, such as large diameter snags and down woody debris (Mellon et al. 1992). Home range size for pileated woodpeckers varies considerably from approximately 200 acres to over 3,000 acres (Samson 2006b). However, studies in habitats most similar to those on the Northern Region show a home range size of approximately 1000 acres (Samson 2006b, Bull et al. 1992).

Dead trees are preferred over live trees for nesting and roosting, and nest trees are usually over 20 to 25 inches in diameter. The minimum canopy cover selected by pileated woodpeckers for nesting stands ranges in the scientific literature from 15 to 60 percent depending on the habitat type (Bull 1989, Bull et al. 1990, Warren 1990, Bull and Holthausen 1993, Bonar 2001). A large tree is needed because the cavity is typically 10 inches wide and up to 24 inches deep at heights of 20 to 60 feet above ground level (Bull 1989, Warren 1990). Live or dead western larch, and dead ponderosa pine, aspen, or black cottonwood are preferred nest tree species in the northern region (Warren 1990). New nest cavities are excavated each year in stands of approximately 50 to 100 acres of mature/old forest habitat with a relatively closed canopy (Warren 1990).

Most foraging occurs in logs and dead trees at least six inches in diameter, although large diameter (i.e., greater than 12") 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. Natural disturbances such as insect outbreaks, disease, wind and fire are the primary mechanisms that insure a continuum of snags, downed dead wood and live, decaying trees which pileated woodpeckers depend on (Parks 2009).

Pileated woodpeckers forage for insects by gleaning insects from the surface of trees and plants, pecking into bark or by excavating into the interior portions of a tree. Although hairy woodpeckers dig smaller holes less than two inches in diameter or depth, pileated woodpecker excavation are distinguishable from them because they dig large excavations into a tree's interior wood. Because this foraging behavior is exclusive to pileated woodpeckers, it can be readily used to identify the presence of pileated within a stand (Bull et al. 1990). Large chip size (one to three inches) can also be used to indicate pileated woodpecker foraging since no other woodpecker in this area can produce such large chips (Bull et al. 1990).

Recent foraging is distinguished from previous years by the condition of the exposed wood and chips. The wood chips and exposed wood in the excavation from recent foraging are lighter and brighter in color than older foraging sign (Bull et al. 1990). The older the excavation, the duller in color the interior of the excavation and the associated wood chips, as well as chips being more likely to be covered by debris on the ground. To determine the presence of pileated within an

area, Bull et al. (1990) recommends walking transects in areas with the appropriate habitat characteristics and look for signs of recent foraging. In a report outlining pileated woodpecker surveys conducted by the Coeur d'Alene Audubon Society on the IPNF in 2003, it was noted that pileated woodpecker responses correlated very tightly with observations of pileated foraging sign. Although based on a relatively small sample size, the presence or absence of pileated foraging sign appeared to closely predict pileated presence (Coeur d'Alene Audubon 2003).

The pileated woodpecker is ecologically important as a keystone species and primary cavity nester because it excavates nest cavities in large diameter trees, which are later used by more than four dozen other species of migratory birds, bats and other mammals.

Threats

The primary threats to pileated woodpeckers that may be a result of forest management activities on public land include a reduction in the amount of mature forests and their associated structures (e.g., large-diameter snags and logs), forest fragmentation and removing downed wood generated by timber harvest activities.

The transition of older forests from being dominated by shade-intolerant tree species to being dominated by a dense structure of smaller diameter, shade-tolerant tree species, primarily due to fire exclusion (Wisdom et al. 2000) can also negatively impact pileated woodpeckers.

The change in species composition resulting from fire exclusion has slowly and methodically replaced such species as ponderosa pine, white pine and western larch, trending stands toward smaller and younger size and age classes that are more susceptible to insects and disease before reaching maturity. Consequently, snag production has somewhat shifted from the larger, longer-lived species to smaller, shorter-lived species.

The primary threats to pileated woodpecker that could occur as a result of activities on private land, thus out of the control of the Forest Service include 1) the conversion of forested habitats to young forest (e.g. regeneration harvest on private timber industry land) or non-forested habitat (e.g. conversion of forest habitat to residential or agricultural areas), 2) short rotation, even-age forestry (e.g. commercial harvest on private timber industry lands), and 3) forest fragmentation.

Difficulties in Monitoring

Pileated woodpeckers have large home ranges (over 1,000 acres) and individuals can be located a couple of miles away from their location the previous day (Bull et al. 1990 and 1992; Samson 2006b). Consequently, this makes it more difficult to determine if it is the same individual that was previously documented unless you are able to cover an entire area (e.g. home range, subwatershed, patch of contiguous forest) during each survey, which can be difficult in areas such as the IPNF with large patches of continuous forest that are suitable for pileated woodpeckers.

Pileated woodpeckers will respond to recordings or human imitation of their calls. However, it must be a very good imitation of the territorial call or the birds will not respond. Additionally, the call of the northern flicker is very similar and can easily be mistaken for a pileated woodpecker (Bull et al. 1990). Pileated woodpeckers can also be located and identified by listening to their drumming. The drumming of the northern flicker and hairy woodpecker has similar characteristics to pileated and can easily be misidentified. Consequently, it is imperative that the surveys be conducted by people who have been trained and are experienced at distinguishing the difference between pileated woodpecker vocalizations and drumming and woodpecker species with similar characteristics (Bull et al. 1990).

Because so many other species of birds and mammals use nesting holes created by pileated woodpeckers, observing an adult or juvenile pileated woodpecker in the nest is the only totally reliable verification that it is an active pileated nest (Bull et al. 1990). Locating pileated foraging holes can also be a reliable way to document pileated woodpecker presence. However, determining the age of the foraging, particularly if it is not recent can be more difficult in areas with a lot of precipitation, such as North Idaho, because moisture increases the speed at which the excavated wood and wood chips darken in color (Bull et al. 1990).

Topography and habitat structure, such as horizontal cover and vegetation density, can also substantially impact the ability of surveyors to hear auditory responses, track the movements of individual pileated woodpeckers and consequently to locate and verify nest sites. Forested habitats typical of North Idaho comprised of fairly dense stands with high canopy closure on steeper slopes, increases the difficulty in locating, verifying and monitoring pileated woodpeckers and their nest cavities.

Existing Condition

According to NatureServe the pileated woodpecker has a global conservation status rank of G5. This indicates the species is common, widespread, abundant, and therefore secure. Although the vast majority of the IPNF is within Idaho, it also includes some portions of Washington and Montana. The pileated woodpecker is listed S4 by Idaho and Washington and S3 by Montana, which indicates the species is apparently secure, but in Montana there may be some factors posing a potential risk (IDFG 2005, WDFW 2005, MNHP 2010). However, the pileated woodpecker is not a "species of greatest conservation need" in either Idaho or Montana. In 2011, the State of Idaho will be reviewing the conservation status of this species and the state rank will be adjusted, if necessary, to reflect information that has become available since the last revision in 2005 (Dixon, pers. comm. 2011).

According to the Partners in Flight Population Estimates Database, there are approximately 71,000 pileated woodpeckers in the Northern Rockies Bird Conservation Region (BCR), which includes North Idaho. Within just the North Idaho portion of the BCR the population is estimated to be approximately 9,000 pileated woodpeckers (Partners in Flight 2007). The North Idaho estimate has a lower data quality rating than the data for the Northern Rockies and therefore a lower accuracy due to a more limited amount of data. *See Guide to the PIF Population Estimates Database: North American Landbird Conservation Plan 2004* for a detailed description of the data used and limitations of these population estimates (Blancher et al. 2007).

Northern Region

Based on methodology discussed briefly in the Northern Region Overview section above and described by Samson (2006a) and updated in Bush and Lundberg (2008) using FIA data, the Northern Rocky Mountain Ecological Province, of which the IPNF is a part, contained approximately 1,052,905 acres of pileated woodpecker nesting habitat and approximately 1,674,119 acres of foraging habitat.

Samson concluded (2006b), based on the synthesis of the best available science, that to maintain a minimum viable population of pileated woodpecker across Region One, there would need to be 95,382 acres of habitat, based on a net effective population size of 180 individuals (90 pairs) using an approximately 1,005 acre territory per pair. Even if only nesting habitat is used to meet the criteria for habitat to maintain a minimum viable population, Bush and Lundberg's updated 2008 FIA data results shows that the NRMEP alone contains over 11 times more acres of habitat

than needed for the entire Region to maintain a minimum viable population of pileated woodpecker (Samson 2006b, Bush and Lundberg 2008).

Samson (2006b) also determined using a dispersal distance method developed for birds (Bowman 2003) that suitable habitat for the pileated woodpecker was within the species-specific dispersal distance, indicating that well-distributed habitat is not an issue in the Northern Region.

Samson (2006a) concluded the following with regard to the short-term viability of the pileated woodpecker in the Northern Region of the Forest Service based on his review of the pertinent literature and synthesis of the best available science, as well as his habitat assessments:

- No scientific evidence exists that the pileated woodpecker is decreasing in numbers.
- Increases in the extent and connectivity of forested habitat have occurred since European settlement.
- Well-distributed and abundant pileated woodpecker habitat exists on today's landscape.
- Level of timber harvest is insignificant in the Northern Region (in 2009, 4,854 ha of 9,045,255 ha or 0.05% of the forested landscape) and on the IPNF (551 ha of 999,733 forested ha or 0.06% of the forested landscape) (USDA Forest Service 2010c). Over the last ten years, the Northern Region harvested 76,649 ha or 0.85% of the forested landscape and the IPNF harvested 15,367 ha or 1.54% of the forested landscape (USDA Forest Service 2010b). These figures include all types of harvest and does not indicate that all harvested hectares resulted in habitat loss or degradation for pileated woodpeckers.

Population information based on the Breeding Bird Surveys compiled by the U.S. Geological Survey show a clear increase in the population trend for pileated woodpecker over the past 38 years both at the scale of the Northern Rockies and specific to Idaho. See Figure 1 and Figure 2 for a graph displaying this information. The time frame covered by this data is significant in that it covers a minimum of 4 to 5 generations of pileated woodpeckers over almost four decades including the time period where the most intensive timber harvest activities occurred, and consistently reflects an increasing trend in their population (Bull and Jackson 1995, USDI Geological Survey 2010).

Figure 1. Population trend graph for pileated woodpecker from 1968 through 2006 in the Northern Rockies, including Idaho, based on USGS Patuxent Wildlife Research Center North American Breeding Bird Surveys (USDI Geological Survey 2010).

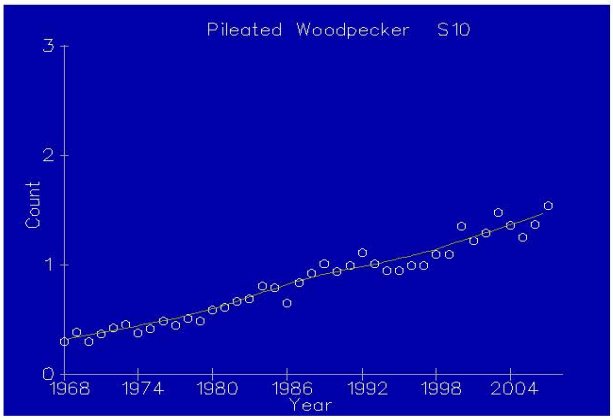
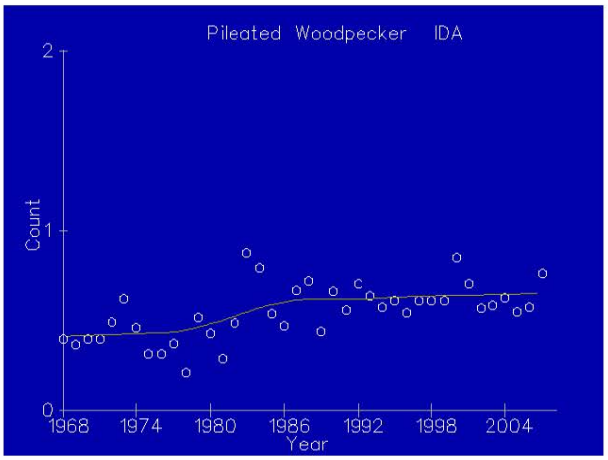


Figure 2. Population trend graph for pileated woodpecker from 1968 through 2006 in Idaho based on USGS Patuxent Wildlife Research Center North American Breeding Bird Surveys (USDI Geological Survey 2010).



Forest

Based on the analysis performed by the Northern Region, the IPNF contains approximately 430,932 acres of pileated woodpecker nesting habitat and approximately 729,994 acres of foraging habitat (Bush and Lundberg 2008).

Based on Samson habitat thresholds for maintaining a minimum viable population across the Region and the updated FIA information provided by Bush and Lundberg (2008), the IPNF contains over four times more pileated woodpecker nesting habitat on this Forest alone than is needed to provide viability at the Region level.

Based on FIA data collected on the IPNF, there are an estimated average of 10.4 snags per acre with a dbh between 10 inches and 19.9 inches. For snags 20 inches or larger there is an estimated average of 1.4 snags per acre (USDA Forest Service 2010a). Bull and Meslow (1977) concluded that to maintain a pileated woodpecker population in northeast Oregon, 0.14 snags per acre 20 inches dbh or greater were needed. The IPNF currently has 10 times more large snag habitat than that based on the FIA analysis.

According to Appendix X of the 1987 Forest Plan titled Snag and Woody Debris Management Guidelines, to support 100 percent of the maximum population of pileated woodpeckers in the habitat communities where they occur, the IPNF would need to maintain 1.4 snags per acre 20 inches dbh or greater. This recommendation is to reach 100 percent maximum population, which is a target far and above the standard of maintaining minimum species viability as required by the Forest Plan. Regardless, the FIA data shows the average number of snags per acre greater than 20 inches dbh on the IPNF meets the 100 percent maximum population requirement in Appendix X and therefore greatly exceeds the requirement of snags needed to maintain a minimum viable population of pileated woodpeckers.

Bull and Holthausen (1993) recommend maintaining a minimum of 0.65 snags per acre greater than 20 inches dbh. Again, the FIA data shows that the average number of snags per acre greater than 20 inches dbh is more than double the minimum recommendation.

Based on information from field notes and surveys, there have been 70 documented sightings, auditory detections and sign (e.g. feeding sites, excavated holes) of pileated woodpeckers on the IPNF in the past ten years (see Project File). Field going Forest Service personnel anecdotally report commonly seeing pileated woodpecker sign in most forested areas. Documented sightings, auditory detections and sign have increased over the past few field seasons (based on the IPNF wildlife data bases). However, the increase can likely be attributed to an increased emphasis on making sure pileated woodpecker sightings and sign are reported and documented. Because pileated woodpeckers and their sign are commonly seen across the Forest, the documenting of their presence has not occurred as frequently as more rare species. The documenting of their presence has occurred most often in project-related field visits by biologists and foresters. The lack of more documented pileated woodpecker presence on the Forest more closely reflects the absence of documentation rather than the absence of the species itself. Despite the lack of consistent reporting, pileated woodpeckers and their sign have been documented throughout the Forest over the past ten years. Additionally, documented pileated woodpecker sightings on the IPNF are generally located in forested stands that fall within the habitat parameters considered to be suitable pileated woodpecker habitat in the scientific literature (e.g. forested stands that retain large snags and down woody debris).

Project Level

See project level analysis located in project specific NEPA documents.

Forest Plan Compliance

The IPNF Forest Plan (USDA Forest Service 1987) selected the pileated woodpecker as a management indicator species for old growth habitats and established guidance for managing old growth to provide for viable populations of this species. It states, "*Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations of old growth dependent and indicator management species*." Although it has been shown since the 1987 Forest Plan that pileated woodpeckers are not old growth dependent, old growth is addressed here to illustrate continued compliance with the Forest Plan. To obtain the desired distribution, each designated old growth unit would be managed to maintain approximately five percent old growth where it exists. The IPNF is meeting and exceeding the Forest Plan standard that calls for maintaining 10 percent of the forested portion of the IPNF as old growth (USDA Forest Service 2010a). FIA data and stand-level allocated old growth also provides evidence that the old growth is well distributed across the IPNF (USDA Forest Service 2010a).

Applicable Forest Plan Standards

7. Other Wildlife

a. Maintain at least minimum viable populations of management indicator species distributed throughout the Forest (see Appendix L for indicator species selection process Forest Plan, p. II-28).

Based on the best available science discussed in the Existing Condition section for this species, the IPNF contains substantially more than enough habitat distributed throughout the Forest to support a minimum viable population of pileated woodpecker. Pileated woodpeckers and their foraging sign are also seen and documented across the Forest. In addition, the best available science indicates that the pileated woodpecker population is likely increasing in the Northern Rockies and there has been no scientific evidence that the pileated woodpecker population is in decline.

b. Maintain habitat for cavity nesting species and foraging substrates by implementation of the IPNF Snag and Woody Down Timber Guidelines (Appendix X).

Based on the best available science discussed in the Existing Condition section for this species, the IPNF contains substantially more large snags per acre than are required by the IPNF Snag and Woody Down Timber Guidelines for maintaining a minimum viable population of pileated woodpeckers.

List of Preparers

Shanda Dekome – IPNF Ecosystem Staff

Kimberly Johnson – Central Zone Deputy District Ranger

Nancy Kertis – North Zone Planning Staff

Joe Madison – North Zone Wildlife Biologist

References

Albrecht, N. 2009. Personal communication; Email correspondence with J. Madison regarding forest carnivore surveys. October 29, 2009. Unpublished document.

Avian Science Center. 2009. Avian Science Center: Promoting science, education and outreach. Online. Available: http://avianscience.dbs.umt.edu [2011, February 2].

Babbit, C., P. Galvin, S.M. Hitt, S.W. Hoffman, A. Macfarlane, K. Rait, C.I. Sandell, M. Sauber, M.T. Schulke and G. Wardwell. 1991. Letter to the U.S. Department of Interior requesting to amend petition to list the northern goshawk. Maricopa Audubon Society. Phoenix, AZ. In Brewer, L.T., R. Bush, J.E. Canfield and A.R. Dohmen. 2009. Northern goshawk Northern Region overview: key findings and project considerations. USDA Forest Service. Missoula, MT. 57 pp.

Beissinger, S. R. 2002. Population viability analysis: past, present and future. Pages 5-17 in Population viability analysis. S. R. Beissinger, and D. R. McCullough, editors. University of Chicago Press, Chicago, Illinois, USA. In Samson, F.B. 2006. Habitat estimates for maintaining viable populations of the northern goshawk, black-backed woodpecker, flammulated owl, pileated woodpecker, American marten and fisher. Unpublished report. USDA Forest Service, Northern Region, Missoula, MT.

Berglund, D., R. Bush, J. Barber and M. Manning. 2009. R1 multi-level vegetation classification, mapping, inventory and analysis system. Region One Vegetation Classification, Mapping, Inventory and Analysis Report #09-01 2.0.

Blancher, P.J., K.V. Rosenberg, A.O. Panjabi, B. Altman, J. Bart, C.J. Beardmore, G.S. Butcher, D. Demarest, R. Dettmers, E.H. Dunn, W. Easton, W.C. Hunter, E.E. Inigo-Elias, D.N. Pashley, C.J. Ralph, T.D. Rich, C.M. Rustay, J.M. Ruth and T.C. Will. 2007. Guide to the Partners in Flight Population estimates database. Version: North American Landbird Conservation Plan 2004. Partners in Flight Technical Series No. 5.

Bollenbacher, B., Bush, R. and R. Lundberg. 2009. Estimates of snag densities for northern Idaho Forests in the Northern Region: Region One Vegetation Classification, Mapping, Inventory and Analysis Report 09-06 v1.3.

Bonar, R.L. 2011. Pileated woodpecker habitat ecology in the Alberta foothills. University of Alberta. Edmonton, AB. Doctorate Thesis. 84 pp.

Bowman, J. 2003. Is dispersal distance of birds proportional to territory size? Canadian Journal of Zoology 81: 195-202.

Brewer, L.T., R. Bush, J.E. Canfield and A.R. Dohmen. 2009. Northern goshawk Northern Region overview: key findings and project considerations. USDA Forest Service. Missoula, MT. 57 pp.

Bull, E. L. 1989. Pileated Woodpecker (*Dryocopus pileatus*) *In* Clark, T.W., A. H. Harvey. 1989. Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. Northern Rockies Conservation Cooperative.

Bull, E. L., and J. A. Jackson. 1995. Pileated woodpecker (*Dryocopus pileatus)*. The Birds of North America No. 148. A. Poole editor. Cornell Lab of Ornithology. Ithaca, NY. Online. http://bna.birds.cornell.edu/bna/species/148.

Bull, E. L. and R. S. Holthausen. 1993. Habitat use and management of pileated woodpeckers in northeastern Oregon. Journal of Wildlife Management 57:335-345.

Bull, E. L., R. S. Holthausen and M. G. Henjum. 1990. Techniques for monitoring pileated woodpeckers. General Technical Report PNW-GTR-269. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. 13 pp.

Bull, E.L, R.S. Holthausen and M.G. Henjum. 1992. Roost trees used by pileated woodpeckers in northeastern Oregon. Journal of Wildlife Management 56:786-793.

Bull, E.L. and E.C. Meslow. 1977. Habitat requirements of the pileated woodpecker in northeastern Oregon. Journal of Forestry 75:335-337.

Bush, R. and R. Lundberg. 2008. Wildlife habitat estimates updates for the Region One Conservation Assessment: Region One Vegetation Classification, Mapping, Inventory and Analysis Report 08-04 v1.0.

Clough, L.T. 2000. Nesting habitat selection and productivity of northern goshawks in west-central Montana. Missoula, MT: University of Montana. M.S. Thesis. 87 pp.

Coeur d'Alene Audubon. 2003. Pileated woodpecker survey report. Coeur d'Alene, ID. 17 pp.

Dixon, R. 2011. Personal communication; Email correspondence with J. Madison. January 18, 2011.

Giese, C.L. and F.J. Cuthbert. 2003. Influence of surrounding vegetation on woodpecker nest tree selection in oak forests of the upper Midwest. Forest Ecology and Management 179:523-534.

Graham, R.T., R.L. Rodriguez, K.M. Paulin, R.L. Player, A.P. Heap and R. Williams. 1999. The northern goshawk in Utah: habitat assessment and management recommendations. General Technical Report RMRS-GTR-22. USDA Forest Service. Rocky Mountain Research Station. Ogden, Utah. 48 pp.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack and B. Naumann et al. 2008. Old-growth forest types of the northern region. USDA Forest Service, Northern Region. Missoula, MT.

Harvey, A.E., J.W. Byler, G.I. McDonald, L.F. Neuenschwander and R. Jonalea. 2008. Death of an ecosystem: perspectives on western white pine ecosystems of North America at the end of the twentieth century. General Technical Report RMRS-GTR-208. Rocky Mountain Research Station. Fort Collins, CO. 10 pp.

Hayward, G.D. and R.E. Escano. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. *In*: The Condor. 91:476-479.

Hutto, R.L. 1995. USDA Forest Service Northern Region Songbird Monitoring Program Distribution and Habitat Relationships. USDA Forest Service contract #R1-95-05. Second Report. Division of Biological Sciences. University of Montana. Missoula, Montana. 21 pp.

Idaho Department of Fish and Game. 2005. Idaho Comprehensive Wildlife Conservation Strategy. Idaho Conservation Data Center, Idaho Department of Fish and Game. Boise, ID.

Idaho Department of Fish and Game. 2008a. Elk Report. Project W-170-R-32s. Boise, ID. 143 pp.

Idaho Department of Fish and Game. 2008b. White-tailed Deer Report. Project W-170-R-32. Boise, ID. 51 pp.

Idaho Department of Fish and Game. 2008c. Moose Report. Project W-170-R-32. Boise, ID. 73 pp.

Idaho Department of Fish and Game. 2008d. Furbearers Report. Project W-170-R-32. Boise, ID. 32 pp.

Kennedy, P.L., J.M. Ward, G.A. Rinker and J.A. Gessaman. 1994. Post fledgling family areas in northern goshawk home ranges. Studies in Avian Biology 16:75-82.

Kennedy, P.L. 2003. Northern goshawk (*Accipiter gentilis atricapillus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Denver, CO.

Kennedy, P.L. and J.M. Ward. 2003. Effects of experimental food supplementation on movements of juvenile northern goshawks (*Accipiter gentilis atricapillus*). Oecologia 134:284-291.

Kirk, D.A. and B.J. Naylor. 1996. Habitat requirements of the pileated woodpecker (*Dryocopus pileatus*) with special reference to Ontario. Ontario Ministry of Environment, South Central Science and Technology Report 46. Toronto, Ontario, Canada.

Kowalski, S. 2006. Frequency of northern goshawk presence in R1. Unpublished report. USDA Forest Service, Region One. Missoula, MT.

McGrath, M.T., S. DeStefano, R.A. Riggs, L.L. Irwin and G.J. Roloff. 2003. Spatially explicit influences on northern goshawks nesting habitat in the interior Pacific Northwest. Wildlife Monographs 124:1-63.

Mellon, T.K., C.E. Meslow and R.W. Mannan. 1992. Summertime home range and habitat use of pileated woodpeckers in western Oregon. Journal of Wildlife Management 56:96-103.

Montana Natural Heritage Program. 2010. Animal species of Concern. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Online. Available: http://FieldGuide.mt.gov/detail_ABNKC12060.aspx [2011, March 4].

NatureServe. 2009. NatureServe: A network connecting science and conservation. Online. Available: http://www.natureserve.org [2011, January 21].

Parks, N. 2009. Looking out for the pileated woodpecker. USDA Forest Service, Pacific Northwest Research Station. Science Findings Issue 109. 6 pp.

Partners in Flight. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY. 36pp.

Partners in Flight. 2007. Partners in Flight Landbird Population Estimates Database. Online. Available: www.rmbo.org/pif_db/laped/default.aspx [2011, February 2].

Patla, S.M. 1997. Nesting ecology and habitat of the northern goshawk in undisturbed and timber harvest areas on the Targhee National Forest, Greater Yellowstone Ecosystem. M.S. Thesis, Idaho State University. Pocatello, ID. 164 pp.

Pulliam, H.R. 2000. On the relationship between niche and distribution. Ecology Letters 3:349-361.

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. USDA Forest Service, Southwestern Region. 184 pp.

Samson, F.B. 2006a. A conservation assessment of the northern goshawk, black-backed woodpecker, flammulated owl and pileated woodpecker in the Northern Region, USDA Forest Service. Unpublished report. Northern Region, Missoula, MT.

Samson, F.B. 2006b. Habitat estimates for maintaining viable populations of the northern goshawk, black-backed woodpecker, flammulated owl, pileated woodpecker, American marten and fisher. Unpublished report. USDA Forest Service, Northern Region, Missoula, MT.

Silver, R.D. et al. 1991. Letter to Department of the Interior petitioning to list the northern goshawk (Accipiter gentilis) in Utah, Colorado, New Mexico and Arizona under the Endangered Species Act. Maricopa Audubon Society. Phoenix, AZ. 61 pp. In Brewer, L.T., R. Bush, J.E. Canfield and A.R. Dohmen. 2009. Northern goshawk Northern Region overview: key findings and project considerations. USDA Forest Service. Missoula, MT. 57 pp.

Squires, J.R. and P.L. Kennedy. 2006. Northern goshawk ecology: an assessment of current knowledge and information needs for conservation management. Studies in Avian Biology 31:8-62.

Squires, J.R. and R.T. Reynolds. 1997. Northern goshawk (Accipiter gentiles). In The birds of North America, Number 298. A. Poole and F. Gill, eds. Philadelphia, PA.

USDA Forest Service. 1987. Idaho Panhandle National Forests Forest Plan. Coeur d'Alene, Idaho.

USDA Forest Service. 2000. Northern Region snag management protocol. Region One. Missoula, MT. 27 pp.

USDA Forest Service. 2007. Project Analysis in Region 1. Forest Service Region One. Missoula, MT.

USDA Forest Service and USDI Fish and Wildlife Service. 2008. Memorandum of understanding between the U.S. Department of Agriculture Forest Service and the U.S. Fish and Wildlife Service to promote the conservation of migratory birds. FS Agreement# 08-MU-1113-2400-264.

USDA Forest Service. 2010a. Idaho Panhandle National Forests Forest Plan Monitoring Reports 2007, 2008 and 2009. Supervisor's Office. Coeur d'Alene, ID. 150 pp.

USDA Forest Service. 2010b. Acres harvested by cutting method. Unpublished report. Regional Office. Missoula, MT. 40 pp.

USDA Forest Service. 2010c. Region One annual silvicultural accomplishment report. Unpublished report. Regional Office. Missoula, MT. 22 pp.

USDA Forest Service, 2011. Summary of the analysis process used to determine the Historic Range of Variability and Existing Condition for Forest Structure on the IPNF. Idaho Panhandle National Forests, Coeur d Alene, ID. 7 pgs.

USDI Fish and Wildlife Service. 1998. Northern goshawk status review. Office of Technical Support: Forest Resources. Portland, OR. 250 pp.

USDI Fish and Wildlife Service. 2008. Birds of Conservation Concern. U.S. Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management. Arlington, VA. 85 pp.

USDI Fish and Wildlife Service. 2009. Birds of Management Concern. U.S. Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management. Arlington, VA. 11 pp.

USDI Geological Survey. 2010. Patuxent Wildlife Research Center: Bird population studies. Online. Available: http://www.mbr-pwrc.usgs.gov [2010, November 26].

Warren, N., tech. ed. 1990. Old growth habitats and associated wildlife species in the northern Rocky Mountains. Northern Region Report #R1-90-42. USDA Forest Service. Missoula, MT. 47 pp.

Washington Department of Fish and Wildlife. 2005. Washington Comprehensive Wildlife Conservation Strategy. Online. Available: http://wdfw.wa.gov/conservation/cwcs/cwcs.html [2011, January 21].

Whitford, T. 1991. Defining old-growth Douglas-fir forests of central Montana and use of the northern goshawk (Accipiter gentilis) as a management indicator. Master's Thesis. University of Montana. Missoula, MT. In Brewer, L.T., R. Bush, J.E. Canfield and A.R. Dohmen. 2009. Northern goshawk Northern Region overview: key findings and project considerations. USDA Forest Service. Missoula, MT. 57 pp.

Wisdom, M.J., R.S. Holthausen, B.C. Wales, C.D. Hargis, V.A. Staab, D.C. Lee, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy and M.R. Earnes. 2000. Source habitats for terrestrial vertebrates of focus in the Interior Columbia River Basin: broad-scale trends and management implications. Volume 2 – Group Level Results. General Technical Report PNW-GTR-485. USDA Forest Service, Pacific Northwest Research Station.

Woodbridge, B. and C.D. Hargis. 2006. Northern goshawk inventory and monitoring technical guide. General Technical Report WO-71. USDA Forest Service, Washington D.C. 80 pp.

APPENDIX I
Distribution of the DEIS

I.1. Introduction

This Draft EIS and associated maps are available on the Idaho Panhandle National Forests website at http://www.fs.usda.gov/projects/ipnf/landmanagement/projects (scroll down the page to "**Idaho Panhandle National Forest Current and Recent Projects**").

Additional copies of this document are available by request, either in printed format or on CD, by contacting Project Leader Lauren Goschke at (208) 769-3046 (lgoschke@fs.fed.us).

I.2. List of Recipients

The following is a list of the businesses, agencies, and individuals to whom this Draft EIS was sent. The list includes those who requested copies, required agencies, and other involved parties.

I.2.1. Federal Agencies and Officials

Advisory Council on Historic Preservation – Director, Planning and Review (Washington, DC)
Animal and Plant Health Inspection Service PPD/EAD – Deputy Director (Riverdale, MD)
Bureau of Land Management - Kurt Paviat (Coeur d'Alene, ID)
Chief of Naval Operations – Energy and Environmental Readiness Division (Washington, DC)
Department of Energy – NEPA Policy and Compliance (Washington, DC)
Federal Aviation Administration – Northwest Mountain Region (Renton, WA)
Federal Highway Administration (Boise, ID)
National Agricultural Library (Beltsville, MD)
Natural Resources Conservation Service (Washington, DC)
Natural Resources Conservation Service (Boise, ID)
Natural Resources Conservation Service - Aubrey Woodcock (Coeur d'Alene, ID)
National Oceanic and Atmospheric Administration - Fisheries Service, NW Region (Seattle, WA)
Northwest Power Planning Council (Portland, OR)
Office of Environmental Policy and Compliance (Washington, DC)
Office of Raul Labrador (Coeur d'Alene, ID)
Office of Senator Crapo (Coeur d'Alene, ID)
Office of Senator Risch (Coeur d'Alene, ID)
US Army Corps of Engineers – Northwestern Division (Portland, OR)
US Coast Guard – Office of Environmental Management (Washington, DC)
US EPA Basin Environmental Imprvoement Project Commission - Ed Moreen (Coeur d'Alene, ID)
US EPA - Region 10 (Seattle, WA)
US Fish & Wildlife Service (Spokane, WA)

I.2.2. State Agencies and Officials

Idaho Conservation Data Center - Bill Bosworth (Boise, ID)
Idaho Department of Lands (Kingston, ID)
Idaho Department of Environmental Quality - Donna Harvey (Coeur d'Alene, ID)
Idaho Department of Environmental Quality - Kajsa Stromberg (Coeur d'Alene, ID)
Idaho Department of Fish and Game - Jim Teare (Coeur d'Alene, ID)
Idaho Department of Fish and Game - Mary Terra-Berns (Coeur d'Alene, ID)
Idaho Department of Lands (Coeur d'Alene, ID)
Idaho Department of Parks and Recreation - Jeff Cook (Boise, ID)
Idaho Department of Parks and Recreation - Marc Hildesheim (Coeur d'Alene, ID)
Idaho State Preservation Office (Boise, ID)

I.2.3. Local Agencies and Officials

Eastside Highway District - John Pankratz (Coeur d'Alene, ID)
Historic Wallace Chamber of Commerce (Wallace, ID)
Kootenai County Natural Resource Advisory Group - Tom DuHamel (Harrison, ID)
Kootenai County Snow Groomer Board - Dave Bonasera (Hayden, ID)
North Fork Coeur d’Alene Watershed Advisory Group (Coeur d'Alene, ID)
Prichard Murray Fire Department (Wallace, ID)
Shoshone County Noxious Weed Control Board (Wallace, ID)
Shoshone County Commissioner Jim Best (Wallace, ID)
Shoshone County Commissioner Leslee Stanley (Wallace, ID)
Shoshone County Commissioner Larry Yergler (Wallace, ID)
Shoshone County Forest Health Collaborative (Wallace, ID)
Shoshone County Public Works (Wallace, ID)
Shoshone County Sheriff's Department (Wallace, ID)

I.2.4. Tribal Governments

Coeur d'Alene Tribe - Chairman Chief J. Allen (Plummer, ID)
Coeur d'Alene Tribe - Natural Res. Director Alfred Nomee (Plummer, ID)
Coeur d'Alene Tribe - Cultural Res. Director Jill Wagner (Plummer, ID)

I.2.5. Businesses and Organizations

Avista Corp. - Robin Bekkedahl (Spokane, WA)
Avista Corp. - Sharon, Vore (Spokane, WA)
Avista Corp. - Tim, Vore (Spokane, WA)
Azteca Gold Corp. -, , (Spokane, WA)
Backcountry ATV Association - Ken Chrisp (Spokane, WA)
Bonneville Power Administration - Tom Murphy, Mead, WA)
Brush Bunch - Jeff Hildesheim (Rockford, WA)
Coeur d’Alene Natural Resource Committee - Tim Kastning (Coeur d'Alene, ID)
Coeur d’Alene Placer Mining Company (Wellesley Hills, MA)
Coeur d’Alene Placer Mining Company - Elizabeth Gardner (Wellesley Hills, MA)
Coeur d’Alene Snowmobile Club -, , , Hayden, ID)
Chester Mining Company (Spokane, WA)
Coeur d'Alene Audubon - Carrie Hugo (Coeur d'Alene, ID)
DMW Metal Holdings LLC (Delaplane, VA)
Eagle City Mining Company (Rathdrum, ID)
Elk Unlimited - David Zabel (Osburn, ID)
Four Square Gold Mines Inc. (Coeur d'Alene, ID)

GMRV - Alan and Malinda Gilda (Mullan, ID)
Grouse Peak LLC (Coeur d'Alene, ID)
H&J Pipeline Maintenance LTD (Wallace, ID)
Hayden Lake Water, Sewer & Recreation Board (Hayden Lake, ID)
HECLA Limited (Coeur d'Alene, ID)
High Mountain ATV Association (Wallace, ID)
Idaho Conservation League - Jonathan Oppenheimer (Boise, ID)
Idaho Conservation League - Brad Smith (Sandpoint, ID)
Inspiration Lead Company Inc. (Portland, OR
Intermountain Forest Association - Serena Carlson (Coeur d'Alene, ID)
International Basic Res/Mine (Spokane Valley, WA)
KEA - Mike Mihelich (Coeur d'Alene, ID)
Louisiana Pacific Corp. (Hayden Lake, ID)
Mine Ventures LLC (Dalton Gardens, ID)
Missouri Improvement Co. (Omaha, NE)
Mullan School District #392 - Robin Stanley (Mullan, ID)
North Idaho ATV - Frank Axtell (Hayden, ID)
North Idaho Flycasters - Bob Bevins (Coeur d'Alene, ID)
North Idaho Jammers (Cataldo, ID)
North Idaho Trailblazers - Hans Archer (Cheney, WA)
Northwest Access Alliance - Don Hull (Coeur d'Alene, ID)
Northwest Access Alliance - Dave Vig (Athol, ID)
PANTRA (Post Falls, ID)
Polaris Resources Inc. (Hilton Head, SC)
Prichard Murray Fire Department (Wallace, ID)
Pulaski Project - Ron Roizen (Wallace, ID)
R&G Mining Company (Kellogg, ID)
R.E. Mining Co. - Duane Little (Kellogg, ID)
Righteous LLC (Silverton, ID)
River Investments LLC (Coeur d'Alene, ID)
Riverstop Enterprises LLC (Wallace, ID)
Rock of Ages LLC (Silverton, ID)
Rocky Mountain Elk Foundation (Missoula, MT)
SFCC Life Sciences Dept. - Dr. Albert, Wilson (Spokane, WA)
Shoshone Silver Mining Company (Coeur d'Alene, ID)
Silver Aurora Mining Company (Cataldo, ID)
Silver Horizon Mining (Kellogg, ID)
Silver Valley Rentals LLC (Kellogg, ID)
Silverore Mines (Portland, OR)
Stimson Lumber - Barry Dexter (Coeur d'Alene, ID)
Sunshine Mining Company (Kellogg, ID)
Sustainable Northwest (Portland, OR)
The Lands Council - Jeff Juel (Spokane, WA)
Union Pacific Land Res. Corporation (Omaha, NE)
University Of Idaho - Denim Jochimsen (Moscow, ID)
University of Idaho - Tammy Laninga (Moscow, ID)
US Silver Inc. (Wallace, ID)
Verticle Earth - Mike Gaertner (Coeur d'Alene, ID)
WCT - Ed Lider (Coeur d'Alene, ID)
WildWest Institute (Missoula, MT

I.2.6. Individuals

Adcox, Clyde C. Jr. (Murray, ID)
Adickes, Dale (Athol, ID)
Ahlman, James (Athol, ID)
Anderson, James and Deanna (North Bend, WA)
Andrewson, Michael (St. Maries, ID)
Arave-Eixenberger, Amy (Kellogg, ID)
Artley, Dick (Grangeville, ID)
Auten, Terry (Athol, ID)
Babin, Gregory and Randal (Spokane, WA)
Babin, Randall and Netta (Murray, ID)
Babin, Kenneth and Sandra, Sandpoint, ID)
Babin, Harold and Joanne (Spokane, WA)
Baker, Bob (Hayden, ID)
Bardelli, Fred, Guido and John (Osburn, ID)
Bardswich, Lloyd Joseph (Whitehall, MT)
Beauchene, Al (Hayden, ID)
Bentley, John (Post Falls, ID)
Berg, Casey (Spirit Lake, ID)
Best, Jim C. (Kellogg, ID)
Biotti, Michael, Sean and Brian (Pinehurst, ID)
Bohn, Raeanne (Kingston, ID)
Boisseranc, James (Athol, ID)
Bonasera, Dave (Coeur d'Alene, ID)
Bond, Rowene (Kingston, ID)
Bonham, James and Laurie (St. Maries, ID)
Bonham, James (Rathdrum, ID)
Brackebush, Fred (Kellogg, ID)
Branstetter, Michael and Nancy (Osburn, ID)
Brown, Wayne (Kingston, ID)
Brown, Allen and Lonnie (Wallace, ID)
Bumbaugh, Robert and April (Post Falls, ID)
Burke, Bob (Kingston, ID)
Burnell, Alice (Eagle, ID)
Bush, Edwin and Gertrude (Coeur d'Alene, ID)
Cantamessa, Jeff (Wallace, ID)
Cantemessa, Jon (Wallace, ID)
Capparelli, Shirley & G. Mahouer (Smelterville, ID)
Carlson, Jerry and Jackie (Hayden, ID)
Chapin Residence (Wallace, ID)
Childress, Randy and Claudia (Wallace, ID)
Church, Jr., Luther (Osburn, ID)
Clancy, Dolores (Athol, ID)
Clark, Ed (Bellevue, WA)
Clark, Bob (Coeur d'Alene, ID)
Clark, Dave (Bellevue, WA)
Clark, Karen (Wallace, ID)
Clark, William and Tamara (Coeur d'Alene, ID)
Clouse, Bonnie (Wallace, ID)
Coyle, Stephen (Wallace, ID)
Crain, Jeanine (Athol, ID)
Crimmins, Tom (Hayden Lake, ID)
Crosby, Summer (St. Maries, ID)
Decker, Michael and Mary (Wallace, ID)
Dilday, Doris (Roundup, MT)
Dittner, Robert (Smelterville, ID)
Dodge, Garry (Osburn, ID)
Dolan, Lynda (Athol, ID)
Domingo, Larry (Spokane, WA)
Dorchuck, Ron (Osburn, ID)
Doughty, Richard (Athol, ID)
Doughty, Marie (Coeur d'Alene, ID)
Douglas, Bill (Bellevue, WA)
Dunham, Brian (Ponderay, ID)
Dyckhoff, Logan (Rathdrum, ID)
Eberhard, Tammy and Ray (Pinehurst, ID)
Eckberg, Nina (Coeur d'Alene, ID)
Edwards Family Trust (Coeur d'Alene, ID)
England, Douglas and Bonnie (Osburn, ID)
Faler, Roy (Kingston, ID)
Fenley, James (Athol, ID)
Frederick, John (Soap Lake, WA)
Frigard, Dan (Wallace, ID)
Garci, Frank and Sarah (Post Falls, ID)
Gimbel, Ken (Coeur d'Alene, ID)
Good, Richard and Laura (Hayden, ID)
Graffenberger, Louise (Osburn, ID)
Griffiths, Dave (Liberty Lake, WA)
Guy, Dan (Kingston, ID)
Hadfield, Brent (Athol, ID)
Hahn, Vicki (Coeur d'Alene, ID)
Hale, William and Ingrid (Wallace, ID)
Hammeren, Kimberley (Wallace, ID)
Harbison, Melvin Jr. (Athol, ID)
Harjy, Tarita (Kingston, ID)
Hart, Gregory (Post Falls, ID)
Hart, Annette and Steve (Rathdrum, ID)
Hartmann, Mark (Wallace, ID)
Harvey, Geoff (Hayden, ID)
Hathaway, Cecil (Coeur d'Alene, ID)
Hemphill, George and Vicki (Wallace, ID)
Henderson, William (Rathdrum, ID)
Hendrix, John and Claire, TumTum, WA)
Hern, John (Hayden, ID)
Herron, Tom (Coeur d'Alene, iD)
Heyn, Ron (Wallace, ID)
Hindberg, Eldon (Athol, ID)
Hogamier, G.A. “Nick” (Wallace, ID)
Hogen, Mark (Coeur d'Alene, ID)
Holzer, Frank (Athol, ID)
Hostetler, Art and Joan (Coeur d'Alene, ID)

Howard, Mark (Athol, ID)
Hughes, Don (Athol, ID)
Hull, Pamela and John (Wallace, ID)
Hull, Jack (Wallace, ID)
Hutchison, Steve and Vonnie (Coeur d'Alene, ID)
Isenberg, Larry (Coeur d'Alene, ID)
James, Katie (Kingston, ID)
Jamison, Larry (Coeur d'Alene, ID)
Jenkins, Jake (Wallace, ID)
Jennings, Kevin and Sandee (Post Falls, ID)
Johnson, Georgia (Nine Mile Falls, WA)
Johnson, Alfred (Wallace, ID)
Jolley, Jonathan (Rathdrum, ID)
Jones, William and Barbara (Post Falls, ID)
Kees, Robert (Spokane, WA)
Keith, Kristin (Coeur d'Alene, ID)
Kendrick Family Trust (Hayden Lake, ID)
Kilmer, Robert (Eureka, SD)
Kilmer, Michael (Eureka, SD)
Klaus, Sherry (Plummer, ID)
Krewson, Fred and Dorthy (Murray, ID)
Lambert, Jeffrey and Roxanne (Pinehurst, ID)
Lane, John (Bellevue, WA)
Lapan, Carol (Coeur d'Alene, ID)
Laudeman, Daniel, San Marcos, CA)
Lawrence, Lucky and Patricia (Wallace, ID)
LeDue, Forry (Wallace, ID)
Lee, Harold and Shirley (Coeur d'Alene, ID)
Leisenring, Bob, Dalton Gardens, ID)
Little, Duane E. (Kellogg, ID)
Loper, Douglas and Roberta (Hayden Lake, ID)
Lowe, Bob (Rathdrum, ID)
Madsen, Ingrid (Coeur d'Alene, ID)
Maiolie, Melo (Coeur d'Alene, ID)
Martin, Don (Coeur d'Alene, ID)
Martinson, Dan (Wallace, ID)
Matilla, Elmer c/o Perry Family Trust (Wallace, ID)
McFarland, Ashley (St. Maries, ID)
McPeak, William, San Jose, CA)
Metlow, Cindy and Bill, Chewelah, WA)
Miller, Wayne (St. Maries, ID)
Miller, John (Spokane, WA)
Miller, Wendy C., Silverton, ID)
Molter, Eric (Athol, ID)
Morris, Peggy (Kingston, ID)
Murphy, Dennis L.,,)
Musch, Brad (Post Falls, ID)
Nichols, John (Post Falls, ID)
Nicholso, n, Michael and Joan (Wallace, ID)
Nickerson, Stacy & Richard Dechand (Kingston, ID)
O'Brien, Jack (Hayden, ID)
Ogren, Linda (Medford, OR)
Oliver Family Trust (Sagle, ID)
Olson, Paula (Osburn, ID)
Peak, Joe (Kingston, ID)
Pickard, John (Cataldo, ID)
Quinn, Bob (Hayden, ID)
Ranells, Bob (Wallace, ID)
Riddle, Jack and Geneva (Wallace, ID)
Robnett, Charles (Athol, ID)
Rogers, Willis and Elaine (Lake Almanor, CA)
Runkle, Larry and Linda (Coeur d'Alene, ID)
Rust, W.C. “Bill” (Wallace, ID)
Rust, Davis and Christine (Wallace, ID)
Schaffier, Don (Dalton Gardens, ID)
Schlepp, Sandy (Cataldo, ID)
Schwartz, Charles & Francene King (Wallace, ID)
Scott, Leroy (Wallace, ID)
Seerley, Neil (Athol, ID)
Shanley, Eric (Hayden, ID)
Sharp, Bill (Murray, ID)
Sharp, Elnora & H. & M. Hill (North Pole, AK)
Shawver, Chris (Athol, ID)
Sheppard, Ben and Monica (Cataldo, ID)
Sheppard, Dennis and Judy (Wallace, ID)
Sheppard, George and Louise (Pinehurst, ID)
Sint, John (Pinehurst, ID)
Smith, Lynn (Hayden, ID)
Smith, Louise (Osburn, ID)
Smith, Terry E. (Pinehurst, ID)
Sobotka, Dennis (East Amherst, NY)
Stanley, Leslee (Silverton, ID)
Steed, Bob (Coeur d'Alene, ID)
Stempf, Debbie (Spokane, WA)
Suitter, Dwight, Mabel and Eric (Smelterville, ID)
Sverdsten, Mark (Cataldo, ID)
Thomas, John (Wallace, ID)
Thompson, Robert (Coeur d'Alene, ID)
Thompson, Guy and Family (Rathdrum, ID)
Thompson, Tim (Wallace, ID)
Thompson, Kay (Wallace, ID)
Trout, Tim and Wendy Carpenter (Coeur d'Alene, iD)
Truscott, Glenn (Coeur d'Alene, ID)
Way, Pat (Coeur d'Alene, ID)
Wheeler, Timothy and Sandra (Post Falls, ID)
White, Brian (Coeur d'Alene, ID)
Witherow, Becki (Coeur d'Alene, ID)
Woodford, Woody (Kellogg, ID)
Wright, Andrew (Post Falls, ID)
Wright, Leonard and Judith Lane (Kennewick, WA)
Wuest, Tom (Dalton Gardens, ID)