CHAPTER 1 – PURPOSE AND NEED

Introduction

The Forest Service has prepared the Spring Gulch Revised Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This revised EA displays the analysis of the vegetation management, fuels treatments and roadwork activities proposed for National Forest System (NFS) lands as identified in the Spring Gulch drainage. This revised EA was prepared by Cabinet District personnel with input from agency specialist and external publics. The revised EA discloses the direct, indirect, and cumulative environmental impacts that would result from implementation of the proposed action. This project is consistent with the Sanders County Community Wildland Protection Plan (see Chapter 3, Fire/Fuels section for more information). Additional documentation may be found in project planning records located at the Cabinet Ranger District Office in Trout Creek, Montana.

Project Area Description

The project area is located approximately 10 miles southeast of Trout Creek in Sanders County, Montana (S3, 4, 9 & 10; T23N; R30W; PMM) in the Spring Gulch drainage. The National Forest System (NFS) lands in the project area are bordered by private property to the west, in the Clark Fork Valley that includes homes, structures and rural developments. The adjacent privately owned lands are a mix of non-forested, pastoral or agriculture land. The Lolo National Forest is located to the south and east, while lands north of the project area are still part of the Cabinet Ranger District. The major point of access to the project area is from State Highway 200 to the Blue Slide Road (county maintained road).

Spring Gulch watershed is approximately 1,165 acres in size with 796 acres of Forest Service administered lands. Spring Gulch is a second order stream with less than one mile of perennial flow. The mouth of Spring Gulch is essentially a dry draw that exhibits no active channel characteristics or connectivity to other perennial or intermittent streams. The drainage flows into the Clark Fork River which flows into Pend Oreille Lake in Idaho. A Vicinity Area map of the project area is included on the next page.

The project area is primarily a forested ecosystem, bisected by dry channels and ephemeral streams, with most yearly moisture coming as snow in the winter. A volcanic ash-influenced deposit exists throughout the project area. This layer, along with the uppermost organic layer, is the source of most of the vegetative productivity. Located in the south eastern end of the Cabinet District, Spring Gulch is relatively dry compared to the west side of the district where maritime, moist weather influences are more dominant. The forest cover originated primarily from the large fires of 1889 and 1910 and, due to effective fire suppression efforts since the early 1900’s, fire has been removed from the landscape. These conditions are conducive to accumulation of abundant vegetation and ultimately heavy fuel loadings.

NFS lands in the project area play host to visitors and residents alike, who enjoy hiking, hunting, wildlife viewing, firewood gathering, and huckleberry picking. White-tailed deer, mountain lions, elk, moose, black bear, as well as many other wildlife species inhabit the project area. Native fish are not present due to natural barriers. The project area falls within
the Cabinet-Yaak grizzly bear recovery zone. Project activities would occur in the Vermilion
Bear Management Unit (BMU 8) and Mount Headley Bear Management Unit (BMU 22).

Figure 1-1  Spring Gulch Project Vicinity Map
The Cataract IRA is adjacent to the north boundary of the project area in the Lower Vermilion River drainage. The Cube Iron IRA contains about 600 acres on the Kootenai NF and is contiguous with the Cube Iron IRA on Lolo NF and is approximately 4.5 miles east of the project area and separated by NFSR 367. The IRA’s are located beyond the Wildland Urban Interface boundary and serve as wildlife corridors and provide connectivity for the surrounding forested landscape.

Purpose and Need for Action

Based on information from several broad scale scientific assessments (Interior Columbia Basin Ecosystem Management Project (ICBEMP 2000) and the Northern Region Overview (USDA 1998)) to the site specific field reviews, and surveys in the Spring Gulch project area, the purpose and need for vegetation treatments is generated by the difference between the current condition and the desired condition of resources in the project area.

Current forest conditions in the project area include small diameter timber that is growing in dense and overcrowded stands due to lack of active management and years of fire suppression. Absence of fire has altered insect and disease regimes as well as created more stands of increased density with species composition favoring more shade tolerant and less disease resistant species such as Douglas-fir and grand fir. Overall, there is a decrease in ponderosa pine and western larch trees, and an increase in Douglas-fir and grand fir. Maturing stands dominated by Douglas-fir, ponderosa pine and lodgepole pine are becoming at greater risk of infestation by their respective bark beetle pest. Forest insect and disease activity has been monitored via aerial observations for many years in Region 1. The 2009 and 2010 flight revealed some pockets of Douglas-fir beetle, Western Pine beetle, Mountain Pine beetle, and spruce budworm in the project area (project file).

Historically, fire was the major agent of disturbance in this forested system. The majority of the land area in the project area is comprised of habitat types or vegetation response units (VRUs) that have relatively short fire return intervals (see the Chapter 3, Forest Vegetation and Fire/Fuels sections for more information). 95% of the land area in the project area is made up of short return intervals. These areas would have a tendency to burn quite frequently until they encountered the moist conditions of the other surrounding VRUs.

The valley bottoms contain large blocks of private ownership. Most of the private property is located in the valley bottoms and many structures have cleared defensible space which helps protect them from possible destructive wildfires. However, there is an abundance of hazardous fuels in close proximity to these private lands.

Since approximately 1910, fire suppression has become increasingly effective to the point that fire has been replaced by decomposition as the primary means of natural fuel abatement. The rate of accumulation is exceeding the rate of decomposition, resulting in increased hazardous fuels. Forest succession and insect and disease processes are increasing mortality resulting in an accelerated accumulation of hazardous fuels. The end result is a landscape that is increasingly more susceptible to high intensity stand replacing fire.

Desired forest conditions in the project area include a reduction in the number of tree stems (density) resulting in increased tree spacing, creating more vigorous growing conditions. The
species composition would be dominated by fire-adapted and insect/disease resistant trees. Fuel loading and ladder fuels would be lessened through vegetation management. Predominately smaller diameter trees would be removed, favoring larger western white pine and fire resistant trees such as ponderosa pine and western larch. Tree density would be reduced depending on stand age and site productivity potential. Down woody debris would range from an average of 5 to 20 tons per acre where available. These conditions would significantly reduce the potential for a surface fire to transition into a crown fire, and provide for safer working conditions for firefighters.

Natural resources in the project area such as wildlife habitat and corridors, soil productivity, watershed health, and roadless attributes would be maintained as part of the desired condition.

Based on public input, specialist input and the desired condition for the project area, the following **Purpose and Need** for treatment has been identified.

- **Increase the resistance and resilience of timber stands to natural disturbances, such as fire, insect, disease, and drought;**

- **Reduce hazardous fuels within the Wildland Urban Interface (WUI) complementing the goals in the Sanders County Community Fire Protection Plan;**

- **Contribute forest products to the local and regional economy.**

**Proposed Action**

The proposed action for the Spring Gulch project area includes activities that would restore and maintain diversity across the drainage. Silvicultural treatments would be used on approximately 322 acres of the project area. Proposed treatments would include pre-commercial thinning, regeneration harvest, and intermediate harvest. Logging systems have been identified to minimize ground disturbance. Ground based tractor and skyline are the two proposed logging systems. Fuels treatments would be used on approximately 559 acres in the project area to include abatement of activity created fuels and natural fuels. Approximately 8.84 miles of existing road would have improvement work performed and brought up to State Best Management Practices (BMP’s) standards. Two existing bermed NFS roads would be opened during the life of the project and be brought up to State BMP standards before timber hauling would be allowed. BMP work would include replacement and installation of drain dips and culverts, constructing or cleaning catch-basins, road surface blading, buttressing cut-slopes and fill-slopes, and/or resurfacing as needed on a site specific basis. See Table 1-1 for specifics of the proposed action.

The proposed action includes a project specific Forest Plan amendment to allow for incidental reduction of existing cavity habitat in Management Area 10 (MA 10, big game winter range) on approximately 25 acres. This amendment would be needed to allow incidental removal of some snags within the cutting units; Office of Safety and Health
Association (OSHA) regulations require snags that are hazardous to logging operations be felled to ensure the safety of forest workers. Therefore, we would anticipate the loss of some but not all standing dead timber within the proposed harvest units for both safety concerns and harvest system logistics, and this would reduce "cavity habitat" associated with snags in MA-10. Green replacement trees would remain on site and become “replacement snags” over time.

Table 1-1 Summary of the Proposed Action

<table>
<thead>
<tr>
<th>SUMMARY TABLE OF THE PROPOSED ACTION</th>
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<tr>
<td><strong>Vegetation Management:</strong></td>
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<tr>
<td>Regeneration Harvest</td>
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<tr>
<td>- Shelterwood (90 acres)</td>
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<td>Intermediate Harvest (commercial thinning)</td>
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<td>Precommercial Thinning</td>
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<td><strong>Fuel Treatments:</strong></td>
</tr>
<tr>
<td>Underburn to reduce activity fuel loadings</td>
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<tr>
<td>Burning of Natural fuels</td>
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<td>Machine Piling of activity fuels</td>
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<tr>
<td>Slash and Hand Piling</td>
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<tr>
<td>Underburning in Inventoried Roadless Areas</td>
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<tr>
<td><strong>Road Management:</strong></td>
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<tr>
<td>New Road Construction</td>
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<tr>
<td>Road Reconstruction/BMP’s</td>
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<tr>
<td>Temporary Road Construction</td>
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<tr>
<td><strong>Logging Systems</strong></td>
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<td>Tractor</td>
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<td>Skyline</td>
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<td><strong>Vegetation Mgt Management Area Summary</strong></td>
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<td>MA-5</td>
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<td>MA-10</td>
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<tr>
<td>MA-11</td>
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<td>MA-18</td>
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Natural Fuels Prescribed Burning by Management Area | 231 acres
---|---
MA-5 | 12 acres
MA-10 | 111 acres
MA-11 | 13 acres
MA-18 | 95 acres

Scope of Analysis

National Forest planning takes place at several levels: national, regional, forest, and project. The Spring Gulch Revised EA is a project level analysis; its scope is confined to addressing the issues and possible environmental consequences of the proposed action. It does not attempt to address decisions made at higher levels. It does, however, implement direction provided at those higher levels. The Kootenai National Forest Plan (1987) details the direction for managing the land and resources of the Kootenai National Forest. The Forest Plan embodies the provisions of the National Forest Management Act (NFMA), its implementing regulations, and other guiding documents. In order to eliminate repetition and focus on site-specific analysis, this DEIS is tiered to the following documents as permitted by 40 CFR 1502.20.

- The **Kootenai National Forest Land and Resource Management Plan (Forest Plan) FEIS** and Record of Decision (ROD), 1987 and all subsequent NEPA analysis for amendments, and the accompanying **Land and Resource Management Plan (LRMP) as amended (Forest Plan)**. The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Kootenai National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management.

- The **Biological Opinion for the Implementation of Inland Native Fish Strategy (INFS)** from National Marine Fisheries Service dated January 23, 1995. INFS sets in place certain riparian management goals and management direction with the intent of arresting the degradation and beginning the restoration of riparian and stream habitats.


- The **annual Forest Plan Monitoring and Evaluation Reports** from 2000 through 2010. The main focus of the Kootenai’s monitoring strategy is to ensure consistency in implementing the Forest Plan.

- The Record of Decision and Environmental Impact Statement for the **Kootenai National Forest Invasive Plant Management**, Kootenai National Forest, April 2007,
which Implements a long-term integrated weed management program for projects beginning in 2007.

- The Record of Decision and Environmental Impact Statement for the Forest Plan Amendments for Motorized Access within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (for Kootenai, Lolo, and Idaho Panhandle National Forests) released in November 2011. This is a programmatic decision to change the Forest Plans for these Forests by amending the objectives, standards and guidelines that address grizzly bear management within the Selkirk and Cabinet-Yaak recovery zones.

The policy direction and legal guidance for NEPA analyses start at the national level involving federal laws and Executive Orders. Some examples include:

- National Environmental Policy Act (1970)
- Clean Water Act (1948) and amendments (1972)
- Clean Air Act (1955)
- National Forests Management Act (1976)
- Forest and Rangeland Renewable Resource Act (1974)
- Archaeological Resources Protection Act (1979)
- National Historic Preservation Act (1966)
- Multiple Use Sustained-Yield Act of 1960
- Endangered Species Act (1973) and amendments
- American Indian Religious Freedom Act of 1980

Examples of Executive Orders (EO) include:

- EO 11593 (protection and enhancement of the cultural environment)
- EO 12898 (environmental justice)
- EO 12962 (aquatic systems and recreational fisheries)
- EO 11988 (floodplain management)
- EO 11990 (protection of wetlands)

Other sources, at the national level, that provide direction for site specific management include the following:

National Fire Plan -- The National Fire Plan, enacted by Congress following the 2000 fire season directed the Forest Service to identify high-risk wildland urban interface (WUI) areas, using the National Fire Plan guidelines. The Spring Gulch Revised EA is entirely within the WUI, as identified in the Sanders County Community Wildfire Protection Plan. This project is consistent with the direction to manage and reduce overly dense forest vegetation through development of actions which are designed to restore resilient ecosystems that will sustain the resources through time.

Travel Analysis Final Rule -- In January 2001, the Forest Service Manual, which governs regulations concerning the management, use and maintenance of the National Forest Transportation (Road) System (Chapter 7700) was revised with a “Final Rule”. The revision de-emphasized the development of forest road systems and added a requirement for science-based transportation analyses. An interim directive issued in December 2001
established that all road management decisions signed after January 12, 2002 must be informed with a “roads analysis.” The Final Rule set forth that if a forest level roads analysis has not been completed, the Responsible Official determines whether a roads analysis is needed at the project scale, and if so, what level of analysis is necessary to support a project-level decision. A Roads Analysis was completed for the Spring Gulch Revised EA and is included in the project file.

**Handbooks and Manuals** – The Forest Service maintains handbooks and manuals to provide national and regional direction on management activities. All actions occurring on National Forest System (NFS) lands must adhere to the Forest Service rules, regulations and policies as defined in the Handbooks and Manuals. The Agency has over the years, issued strategic plans (lynx conservation) and restoration and protection strategies that guide management activities across NFS lands. Planning was coordinated with the appropriate federal, state, and local government entities and agencies, and local federally recognized tribes.

**Forest Plan Direction**

The 1987 Kootenai National Forest Land Management Plan (Forest Plan) guides all natural resource management standards for the Kootenai NF. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. The Forest Plan provides Forest-wide goals and objectives (Forest Plan pages II-1 through II-33) that guide land management activities, based on Management Areas (MA). Each MA contains different management goals, resource potential and limitations and provide for unique combination of activities, practices, and uses. “Except for Congressionally established or special administrative boundaries, the MA boundaries are not firm lines and do not always follow easily identified topographic features such as major ridges, rivers, streams, roads, etc. The boundaries represent a transition from one set of opportunities and constraints to another with direction established for each (Forest Plan, III-1).” Table 1-2 below displays a summary of the MA’s in the Spring Gulch project area and their standards.

**Table 1-2. Management Area Descriptions, Applicable Standards, and Acres Proposed For Treatment**

<table>
<thead>
<tr>
<th>MA</th>
<th>Description</th>
<th>Applicable Standards</th>
<th>Acres Treated</th>
</tr>
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</table>
| 5   | Maintain or enhance the landscape for a pleasing view, provide forage for domestic livestock and big-game, and provide old-growth timber and cavity habitat for dependent wildlife species. | **Timber**– Lands are classified as unsuitable for timber production, and timber harvest must be coordinated with big-game requirements, to improve the view, for wildlife habitat improvement, or to minimize the spread of insects or diseases to adjacent MAs.  
**Wildlife and Fish** – Provide for cavity habitat.  
**Prescribed Fire** – Planned ignitions are acceptable within this MA. | 194 acres |
| 10  | Big game winter range. Found at lower elevations in most major drainages.   | **Timber**– Lands are classified as unsuitable for timber production.  
**Wildlife and Fish** – Provide cover/forage in ratios recommended (elk 60/40).  
**Prescribed Fire** – Planned ignitions are acceptable within this MA.  
**Wildfire** – Unplanned Ignitions will not be used as prescribed fire in this MA. | 132 acres |
|     | Big game winter range                                                      |                                                                                      | 56 acres      |
And while three of the four MA’s are classified as “unsuitable for timber production”, this in itself does not preclude management activities occurring on these MA’s. Based on the goals identified for MA 5, MA 10 and MA 18 timberlands, it states “reassign the productive timberlands to a suitable timber base”. Since we are transitioning between two Forest Plans, the ID Team chooses not to take this course of action. Within the standards for these MA’s it states the following:

- “timber harvest is permitted to maintain or enhance the view, for wildlife habitat improvements, or to minimize the spread of insects or disease to adjacent MA’s” (MA 5)
- “salvage harvest may occur to prevent the spread of insects or disease to adjacent MA’s and harvest may occur for wildlife habitat maintenance or enhancement” (MA 10)
- “salvage harvest may occur to prevent the spread of insects or disease to adjacent MA’s” (MA 18)
- “soil and water conservation practice will guide the implementation of any land-disturbing activities” (MA 5, MA 10, MA 18)

### Decisions to be Made

The Spring Gulch Revised EA is not a decision document. The EA discloses the environmental consequences of proceeding with the proposed action. The deciding official (Forest Supervisor) will select a course of action based on the information in this document, on public comments, on financial considerations, and on how well the preferred alternative meets the purpose and need of the project and how well it complies with applicable state and federal laws, agency policy and Forest Plan direction.

Decisions to be made include whether to select the action alternative and, if so:

- Whether to conduct vegetation management activities including timber management, mechanical fuel treatment, prescribed burning activities, and road work associated with the preferred alternative, and if so, the location of these activities;
Purpose and Need

• Whether to approve the specific design criteria and mitigation measures as described in this EA;

• Whether to approve the recommendations in the Travel Analysis Report on the undetermined features in the project area;

• Whether to implement a project-specific Forest Plan Amendment for a reduction in cavity habitat in Management Area 10 associated with removal of hazardous trees during vegetation management activities; and

• What, if any specific project monitoring requirements are needed to assure design criteria and mitigation measures are implemented and effective, and to evaluate the success of project objectives.

Revised Spring Gulch Environmental Assessment: Background

On August 25, 2011, Forest Supervisor Paul Bradford signed the Decision Notice and Finding Of No Significant Impact (FONSI) for the Spring Gulch Timber Sale, selecting Alternative 2, the Proposed Action. This decision was subject to appeal pursuant to 36 CFR 215. There was a 45 day appeal period following the publication date of the legal notice of this decision in the Daily Inter Lake, Kalispell, MT. One appeal was received during the appeal period, stating that the Decision Notice and FONSI are not prepared in accordance with the legal requirements of the National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et seq., and its implementing regulations, the National Forest Management Act (NFMA) 16 U.S.C. 1600 et seq., and its implementing regulations, the Endangered Species Act, the Administrative Procedures Act, (APA) 5 U.S.C. Sec 706, and the Forest Plan for the Kootenai National Forest.

Since an appeal was received on the project, the Forest Service was required to hold an informal resolution meeting and/or a conference call between the Responsible Official and the appellants. An informal resolution conference call was held on October 20, 2011 with representatives from the Alliance for the Wild Rockies from Missoula, MT and the Lands Council from Spokane, WA. There was no agreement on project changes that would reduce the potential of dropping the appeal or filing another appeal.

Upon further discussion between the Responsible Official and Cabinet district personnel, it was determined to be in the best interest of the Forest Service to gather more information pertaining to the project and to better clarify portions of the original Environmental Assessment. On November 1, 2011, a Notice of Decision Withdrawal was placed in the Daily Inter Lake, Kalispell, MT.

What Has Changed Between the Revised and the original Spring Gulch EA?

Changes to the original Proposed Action, as identified in the Spring Gulch Revised EA affect access management to the project area, as well as reasonably foreseeable activities.

- Based on information in the Travel Analysis Report for the Spring Gulch project, the temporary roads (1.16 miles) that would have accessed units 1, 1A, 2, 2A and 8
were identified as “undetermined features with future needs”. The ID Team decided to add these roads, 38123 and 2771A to the National Forest System Roads (NFSR) Database.

- An alternative access route into the project area has been identified. The Kootenai NF and the Lolo NF are working with the Montana State Department of Natural Resources and Conservation (DNRC) on a cost share agreement for a road system across the DNRC section of land to the south of the project area. This road system would join into NFSR 2241 at about the 0.90 mile marker, thus avoiding use of NFSR 1023.

- The Lolo NF is proposing to decommission the Deep Creek Rd, NFSR 1023, which was proposed as the original haul route out of the project area. The road is located adjacent to the creek and is in need of repair. The Spring Gulch EA originally proposed to reconstruct this segment of road. However the proposal was dropped in favor of the new road location through DNRC land (described above) in order to lessen potential environmental impacts.

- Recent logging activity has occurred near the Spring Gulch project area on DNRC lands. During the winter of 2010, commercial harvest activity took place on 10 acres of State Lands above NFSR 2241. The State has informed us they will continue to commercially treat up to 400 acres of their land near the Spring Gulch project area in the next couple of years. None of the DNRC lands being treated drain into Spring Gulch, so there would be no cumulative effects to the Spring Gulch drainage.
CHAPTER 2 – Alternatives

Introduction

This chapter describes the issues and alternative development process, including how public comments helped formulate the alternatives. It also contains a description of each alternative and a comparison between alternatives considered in detail and a brief description of other alternatives that were considered but eliminated from further study. The no action alternative (Alternative 1) is used as a baseline condition to help understand potential impacts that would be associated with implementation of the proposed action (Alternative 2), presented here as the preferred alternative. The desired condition, the purpose and need for action, and the management area objectives, identified in Chapter 1, in conjunction with the issues outlined in this chapter, provide the framework from which the alternatives were developed.

Scoping and Public Involvement

The proposed action was listed on the Kootenai National Forest’s quarterly Schedule of Proposed Actions (SOPA) beginning with the September 2009 issue. A detailed scoping letter explaining the proposed action was mailed out September 14, 2009 to a list consisting of Tribal agencies, County Commissioner, US Fish and Wildlife, and interested publics. The scoping letter was also mailed to 45 local land owners, who were also sent a response postcard asking if they would be interested in a public meeting. We received 11 cards back with three expressing interest in a meeting. All three parties were called to determine a meeting date. One simply wanted clarification of where harvest activities would occur, and the other two commentors wanted to make sure that we would be removing enough trees to be effective at fuels abatement and restoring forest health. After answering their questions, none of the three parties requested a meeting.

This scoping effort also resulted in one letter expressing concern that this project be based upon ecological sustainability, offering a paper published by the Biodiversity Legal Foundation, titled Biocentric Ecological Sustainability: a Citizen’s Guide, by author Reed Noss. A summary of scoping comments received, and the agency responses are in the project file.

Issue Development

Issues identified during internal and external scoping helped define the proposed action to meet the purpose and need, while striving to meet Forest Plan standards and guidelines. All comments received in response to scoping were reviewed by the Interdisciplinary (ID) Team, District staff, and District Ranger to identify the issues. No issues were identified that would lead to an alternative to the proposed action.

There are two issues identified by the ID Team that became the main drivers for alternative development. The issues are:

- Forest health, and;
- Community Fire Protection within the Wildland Urban Interface (WUI).
The ID Team refined the proposed action based on the project purpose and need, Forest Plan objectives, goals and standards, and public and agency concerns. The ID Team consisted of Forest Service personnel who have expertise in different natural resource fields in order to provide a diverse, interdisciplinary approach to the project. The final proposed action was developed through a series of resource evaluations, field visits, ID Team meetings, public interactions, and was designed to avoid adverse impacts to the environment.

**Alternatives Considered but Eliminated from Detailed Study**

Based on public comments, the Interdisciplinary Team considered an alternative that utilized only existing open roads to meet the purpose and need for action. This was recommended as a means to reduce potential effects to grizzly bears in the Spring Gulch project area. There was concern that impacts to core habitat and open motorized route density in Bear Management Unit (BMU) 8 and BMU 22 would have undesirable impacts to bear habitat. Preliminary analysis indicated that opening NFSR 2771 for management activities would result in a slight (0.01%) decrease in core habitat of 29 acres and a slight increase in open road density (0.2%) in BMU 8, and only for the duration of the project. The same analysis showed there would be a slight decrease in core habitat of acres and a slight increase in open road density in BMU 22, and only for the duration of the project.

This analysis indicated that potential effects to bears were discountable due to the low likelihood of grizzly bears being present during harvest operations, the negligible decrease in core habitat in the BMU, and the slight increase in open road density during operations. Informal consultation with US Fish and Wildlife Service (FWS) biologists led the ID Team to negate the need to examine this alternative in more detail. Based on the analysis for the two BMU’s, and the fact that both alternatives are consistent with the Forest Plan Amendments for Motorized Access Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (2011), there is negligible difference between this scenario and the proposed action. Thus additional evaluation of this alternative was unnecessary.

An alternative that would not require a Forest Plan amendment for activities in MA 10 was considered by the ID Team. In this alternative, design criteria would require that existing cavity habitat be retained, where possible, while providing a safe working environment by leaving stable reserve trees, singularly or in clumps within the units, and leaving safe reserve trees (green trees) within the hazard area of an unstable reserve tree or snag to isolate workers from exposure to the hazard tree. This approach would not meet the purpose and need for treatment and would not be compatible with the thinning prescription and underburning. Under the Proposed Action timber harvest and prescribed fire use would affect approximately 132 acres total in MA 10, with the potential to reduce cavity habitat on those acres. No effects to snag levels in riparian zones would be expected due to the required establishment of riparian habitat conservation areas (RHCAs). This reduction would require an amendment to suspend Wildlife and Fish Standard #3 to allow incidental loss of snag habitat identified as hazard or danger trees during harvest operations. In the analysis of the Snag Habitat (Wildlife Resources/Oldgrowth report, ch. 3 pg 66-71) it was found that all units would still meet the 40% minimum snag level. Kootenai Forest Plan forest-wide goal #8 (FP Vol 1 p. II-1) to “manage for sufficient snags and snag replacement trees to maintain viable populations of snag-dependent species” is met.
The commercial thinning proposed in MA 10 in Alternative 2 have been designed to increase the growth and vigor of the residual conifers, which will result in increased potential for large snag production in the future. Canopy reductions resulting from the harvest treatments will provide increased light to the forest floor which will stimulate the growth of understory vegetation, providing forage for big game species. Underburning prescribed with these treatments will reduce natural fuels, interrupt the succession of Douglas-fir, and help ponderosa pine and western larch maintain dominance in treated stands. In addition, some snags would be created due to incidental prescribed fire mortality.

Alternative Descriptions

Alternative 1 - No Action
The no action alternative provides a baseline for comparison of environmental consequences of the other alternatives to the existing condition (36 CFR 1502.14). Under this alternative, management actions in the project area would be limited to the ongoing and reasonably foreseeable actions listed in Chapter 3, representing a “status quo” strategy. This includes wildfire suppression, road maintenance, routine BMP work, noxious weed treatment, special uses, public use on NFS lands, and actions on privately owned lands.

Alternative 2 - Proposed Action/Preferred Alternative
The proposed action would include vegetative treatments in mature and sapling sized timber stands, fuel treatments of natural and activity fuels, haul road improvements, known as Best Management Practices, and long term storage of several road systems. Timber harvest would produce wood products, including saw timber and non-saw timber (pulp or roundwood) which would be removed from the site. Other treatment areas would focus on slashing of smaller material to facilitate use of prescribed fire. Details of the proposed action are described below (See Figure 2-1).

Removal of Wood Products
Removal of saw timber-sized trees would take place on 256 acres and is proposed to modify stand density, and alter species composition. All timber harvest areas would leave snags, live green trees, coarse woody material, and desirable hardwoods. Logging systems would include tractor and skyline yarding systems. Where access is available and slopes are generally less than 35-40 percent slope, tractor yarding would be used. Where slopes exceed 35-40 percent and road access is available, a skyline yarding system would be used.

Pre-commercial Thinning
Thinning of smaller, sub-merchantable trees (pre-commercial thinning) would take place on 66 acres of an older harvest unit that was regenerated in 1966 (Unit 15). This thinning would be done using chain saws and would not require off road equipment. Smaller, less-desirable trees (grand fir, Douglas-fir, and other shade-tolerant species) would be removed, leaving superior trees to occupy the tallest canopy layers, and maintain a fully stocked stand. Excess slash from the thinning would be hand piled, if concentrations exist after pre-commercial thinning is completed.
Figure 2-1  Alternative 2 – Proposed Action Treatment Units
Commercial Thinning
Approximately 162 acres in ten harvest units (Units 1A, 2A, 3, 4, 5, 6, 7, 7A, 8 & 14) would be thinned to increase the spacing between dominant tree crowns, thereby reducing the overall stocking level within the targeted stands and to reduce the probability of crown to crown fire movement. Harvest would remove trees primarily from the lower and intermediate canopy trees that are generally composed of shade tolerant species. Healthy western larch, ponderosa pine, and western white pine are considered fire adapted and insect/disease-resistant species and would be favored for retention where they are found. Target basal areas (a measure of stand density or crowding) after thinning would range between 60 to 80 square feet of basal area per acre, and emphasis would be placed on retaining larger, healthier trees. In areas of concentrated dead lodgepole pine, small openings may be found. In areas with numerous fire resilient tree species or trees of larger diameter, more than 80 square feet of basal area per acre would be retained. By removing trees primarily from the lower and intermediate canopy would lead to reduction of the “ladder” fuel component, decreasing the chance that a ground fire could travel from the forest floor into the tree canopy. Thinning would create spaces between crowns of desirable leave trees, lowering the risk of active crown fire. Thinning also reduces competition within forest stands, increases residual tree growth and vigor, and helps create stands with species compositions and structures that are more ecologically resilient to potential disturbances.

Approximately 46 of these thinned acres (Units 1A, 2A, 3 & 7A) would be excavator piled and jackpot burned post-thinning, when conditions are conducive to meeting fuel reduction goals. Jackpot burning of concentrated accumulations of fuel would be done in conjunction with excavator piling as needed. 116 acres (Units 4, 5, 6, 7, 8 & 14) of the thinning units will be underburned to reduce activity generated fuels.

Regeneration Harvest (Shelterwood)
Approximately 94 acres, in four harvest units (Units 1, 2, 9 & 12A) would be regenerated. Regeneration harvest, through the shelterwood prescription, would occur in overstocked forest stands which are currently experiencing insect attacks.

A shelterwood prescription is proposed where there are enough trees of desirable size or species in good health and vigor to provide a viable seed source or meet other resource values such as aesthetics, hydrology, and wildlife. More than 10 trees per acre would be retained, averaging greater than 40 square feet of basal area throughout the stand. The shelterwood area may have a clumpy distribution because groups of trees rather than solitary trees would be left scattered throughout the stands. Favored species to leave are western larch and ponderosa pine, and larger healthy Douglas-fir and western white pine. Leave trees would be of a larger diameter that are an important structural component in existing stands and may function as important wildlife habitat, future snags, and coarse woody material.

Residual slash associated with regeneration harvest would be treated by excavator piling and burned on 55 acres (Units 1, 2 & 9). On 39 acres (Unit 12A) these activities would be in conjunction with jackpot burning of natural fuels and prescribed underburning.

Reforestation/Planting
The treated areas utilizing a shelterwood prescription, post-harvest and associated fuel treatments, would be planted with western larch, western white pine, and ponderosa pine to
Alternatives

contribute to the long term diversity of species and to provide the greatest opportunity for the recovery of the natural fire regime.

Slash Sub-Merchantable and Underburn of Natural Fuels

Approximately 231 acres of forest stands (Units 300, 301, 302, & 303) would be treated by slashing sub-merchantable trees, followed by prescribed fire. Trees less than 6 inches diameter and of the less than desirable species would be selectively felled using chainsaws; reducing the vertical continuity of fuels and preventing flames from reaching the crowns of the dominant and co-dominant trees. The felled sub-merchantable trees would provide for continuity of ground fuels so that a prescribed fire would continue its burn pattern under the mature canopy.

The prescribed burning operations would be conducted under strict environmental conditions allowing the fire to burn at a low severity or lower mixed severity level primarily keeping flame containment to the surface fuels and lower canopy. The result would release nutrients into the soil that aid in successful re-vegetation and regeneration of seedlings, grasses, shrubs and forbs, as well as enhance wildlife forage. Some trees greater than 6 inches in diameter may be slashed if they are dead or dying, especially if they are adjacent to more desirable tree species such as ponderosa pine and western larch. These trees may increase the crown torching potential if they are not felled. Fire-related mortality of dominate and co-dominate trees is anticipated to be 10 percent or less.

Table 2-1. Alternative 2 – Proposed/Preferred Action Treatment Acres and Volume Estimates

<table>
<thead>
<tr>
<th>Silvicultural Treatment</th>
<th>Wood Product Volume¹ MBF</th>
<th>Acres</th>
<th>Slash/Fuels Treatment</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Thinning</td>
<td>2,150</td>
<td>162</td>
<td>Excavator Pile/Jackpot Burn</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Under Burn</td>
<td>116</td>
</tr>
<tr>
<td>Regeneration Harvest</td>
<td>1,170</td>
<td>94</td>
<td>Excavator Pile/Jackpot Burn</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Under Burn</td>
<td>39</td>
</tr>
<tr>
<td>Slash/Underburn</td>
<td>229</td>
<td></td>
<td>Slashing and Prescribed Burning</td>
<td>229</td>
</tr>
<tr>
<td>Slash/Pile/Burn</td>
<td>2</td>
<td></td>
<td>Hand Pile/Jackpot Burn</td>
<td>2</td>
</tr>
<tr>
<td>Pre Commercial Thinning</td>
<td>66</td>
<td></td>
<td>Lop and Scatter</td>
<td>66</td>
</tr>
<tr>
<td>Total Acres</td>
<td>553</td>
<td></td>
<td></td>
<td>553</td>
</tr>
</tbody>
</table>

¹ volume estimates include sawtimber and non-sawtimber volume (top wood and pulp).

Proposed Road Work

To facilitate harvesting and associated activities, the following NFS roads would be reconstructed to meet State BMP standards, including replacement and installation of drain dips and culverts, constructing or cleaning catch-basins, blading, buttressing cut-slopes and fill-slopes, and/or resurfacing as needed on a site specific basis. This work is designed to
reduce sediment sources by disconnecting road surface ditch runoff from the stream network and to allow for safe timber transport.

- NFSR 2241 = 5.5 miles, currently open year-round
- NFSR 2771 = 2.28 miles, currently closed year-round
- NFSR 38123 = .91 miles, currently closed year-round

An additional 0.15 mile of NFSR road 2771A would be needed for harvest access and would be stabilized upon completion of harvest activities. Included in the haul route is .93 miles of NFSR 68000 which will be a new cost share road through Montana State land. During logging operations and road reconstruction work, road 2241 may be closed for through traffic.

Forest Plan Amendment for MA - 10
This alternative would include a project-specific Forest Plan amendment to allow a temporary reduction in cavity habitat in Management Area 10 - Big Game Winter Range. Any timber harvest operation has the potential to reduce the amount of standing snags, and subsequent reduction in cavity habitat. Safety regulations require the felling of certain types of snags that would be considered a safety hazard, to protect the safety and lives of forest workers. Approval of this amendment is required before timber harvest can proceed in Management Area 10.

Timing of Proposed Activities
The proposed action would be accomplished in part using private contractors and may require 5-7 years to be completed from the time a contract is awarded. The first work item to be accomplished would include required road maintenance. When road work is completed, timber removal can begin. Harvesting schedules for different units may depend on contractor needs or design features developed as part of the project. However, as harvest is completed within each unit slash clean-up and additional fuels reduction work would occur based upon the specific prescription developed for each unit.

Specific Design Criteria and Mitigation Measures for Alternative 2
During the design phase of the project various measures were incorporated to lessen potential impacts and to avoid potential resource damage. These measures are detailed in the descriptions below.

- **Cultural Resources:**

  Cultural Resource surveys have been completed for this project. Known sites have been identified. Timber Sale Contract Provision B6.24, Protection Measures Needed for Plants, Animals, Cultural Resources, and Cave Resources, would be included in the timber sale contract. This clause specifies that the Forest Service may modify or cancel the contract to protect cultural resources, regardless of when they are identified.
• Soils:

Soil Compaction: Grapple pile equipment would operate on slopes generally under 35-40% to avoid potential soil disruption. The timing of the activity would also be controlled by the timber sale contract. Any excavated skid trails constructed for harvest operation would be re-contoured after harvest is completed.

Soil Productivity and Nutrient Cycling: Large down-woody material for soil productivity and nutrient recycling would be maintained by the following measures:

a. Down woody retention levels would be maintained to meet the following objectives; in moist forest habitat treatment areas, Graham et al. (1994) recommends retaining 17-33 tons/acre of down woody material greater than 3 inches in diameter; in drier habitat types the recommended retention level is 7-13 tons/acre of down woody material greater than 3 inches in diameter.
b. Prescribed under burning would generally take place in the spring and pile burning in the fall during periods of relatively high soil moisture.

For tractor-yarded Units 1, 1A, 2, 2A, 3, 7A & 9:

a. Ground-based yarding, processing, and harvester equipment would operate on sustained slopes under 35-40%.
b. All skid trails would be agreed upon and designated on the ground by the purchaser and the Forest Service before felling begins. Utilization of existing skid trails would be required, where feasible.
c. Skid trail spacing would average 75 feet or greater, except where the trails converge to landings and as terrain dictates otherwise.
d. Post-harvest, skid trails with ground disturbance would be covered using randomly placed logs (on contour) to reduce run-off, stabilized with water-bars, or a combination thereof.
e. Operating equipment would avoid moist or wet depressions.

For skyline-yarded Units 4, 5, 6, 7, 8, 12A & 14

a. The leading end of logs will be suspended during skyline yarding in haul.

• Noxious Weed Control:

Timber Sale Contract Provision C6.351#, Washing Equipment, would be included in the timber sale contract. This clause specifies all off road vehicles associated with harvest or post-harvest operations to be cleaned and inspected by Forest Service personnel prior to entering the sale area.

Timber Sale Contract Provision C6.27#, Noxious Weed Treatment would be included in the timber sale contract. This clause requires the purchaser to pre-treat haul routes with herbicides to remove seed-bearing noxious weeds.

• Wildlife:

Timber Sale Contract Provision B6.24, Protection Measures Needed for Plants, Animals, Cultural Resources, and Cave Resources would be included in the contract.
This clause requires additional protection measures for Threatened, Endangered and Sensitive Species that may be found in the area after the contract is awarded.

**Wildlife Tree Retention:** Snags and/or live tree snag replacements would be retained where opportunities exist in treatment units, as needed to meet Forest Plan standards and guidelines. All treated areas would meet or exceed Forest Plan standards for snag retention (minimum of one snag/acre). One to two snags per acre and 2-4 live tree snag replacements will be retained, for a total of 3-6 snags/green replacement trees per acre. The sale administrator would ensure, whenever possible, that the design of skid trails and skyline corridors avoid these desirable trees and snags. Large diameter snags (greater than 16 inches dbh) that are felled for safety reasons would remain on site to provide for large woody debris recruitment and long-term site productivity. High hazard snags and snags in the advanced stages of decay would not be used to meet retention objectives. Retention practices would focus on older and larger ponderosa pine, western larch, and Douglas-fir trees.

**Maintain Stand Structure and Habitat for Snag-dependent species:** No old-growth stands are proposed for treatment. However, to maintain habitat for snag-dependent species, areas within units that contain small pockets of older, large diameter structure will be thinned from below or not at all. These areas would be managed on a case-by-case basis. The tree marking guide would assure a diversity of snag structure classes and the highest probability of long-term retention.

**Retention of Hardwood Trees:** To maintain forest species diversity and wildlife habitat, aspen and birch trees would not be harvested. If trees of these species needed to be cut for safety reasons, they would remain on site for course-woody debris and long-term site productivity.

**Grapple Pile:** Where grapple piling is prescribed for post-harvest fuels reduction, leave an occasional slash pile (i.e. 1 per 3 acres) where deemed appropriate by the District Wildlife Biologist, to provide habitat for small forest animals (e.g. snowshoe hares).

**No Activity during Spring Bear Season:** No operations would occur during the spring bear use period of April 1st until June 16th of each calendar year.

- **Fisheries and Aquatics**

Riparian buffers required by the Inland Native Fish Strategy (INFS) as amended to the Forest Plan in 1995, and these guidelines would be followed under all action alternatives.

Buffer zones for streams, wetlands and other riparian habitat have been included in and adjacent to harvest units as designed by the project fish biologist, hydrologist, botanist and soil scientist utilizing INFS standards and other site-specific recommendations. Treatment area boundaries have been identified to exclude the RHCA (there are no activity units that overlay RHCA areas). RHCA widths are as follows:
Alternatives

a. Fish Bearing Perennial Streams - 300 feet from the edge of both stream channel banks (there are no fish bearing streams near harvest or treatment areas);

b. Non Fish Bearing Perennial Streams – 150 feet from the edge of both stream channel banks;

c. Ponds, Lakes, Reservoirs, Wetlands greater than 1 acre – 150 feet from the edge of the riparian vegetation or seasonally saturated soil;

d. Seasonally flowing or intermittent streams and wetlands less than 1 acre – 50 feet slope distance.

- Roads and Improvements

Timber Sale Contract Provision B6.22, Protection of Improvements and B6.23, Protection of Land Survey Monuments would be included in the contract. These clauses would require the purchaser to protect specified improvements, such as roads, fences, and property lines identified on the sale area map.

- Public Safety

Timber Sale Contract Provision B6.33, Safety and C6.332, Safety, Timber Hauling would be included in the contract. These clauses require the purchaser to provide adequate signing to warn the public of logging activities and truck hauling.

Monitoring and Evaluation

The Kootenai Forest Plan was approved in 1987. It established management direction that became effective on October 1, 1987. This direction was the result of a comprehensive analysis of land capabilities, public issues, and environmental effects along with a balancing of legal requirements. Monitoring and evaluation comprise the management control system for the Forest Plan.

Monitoring and evaluation entails comparing the end results being achieved to those projected in the Forest Plan. Monitoring is conducted on a sample basis to evaluate the overall progress in implementing the Forest Plan, the assumptions on which the Forest Plan is based, and to provide a feedback loop for determining effectiveness of project design criteria and mitigation implementation (USDA Forest Service, 1987).

Monitoring requirements are outlined in the Forest Plan, Table IV-1, Forest Plan Monitoring Requirements. Most of the monitoring items are applicable to specific Management Areas, as identified in the direction for each Management Area (Chapter III). For this project, monitoring and evaluation would be conducted tiered to the Forest Plan. Additional monitoring of activities associated with this proposed action would include the following:

Road storage effectiveness: The effectiveness of erosion control and long term road storage would be periodically checked by district road maintenance or timber personnel.
Soil compaction: The effectiveness of prescribed Best Management Practices (BMPs) to redistribute slash over skid trails to help prevent erosion would be monitored by agency soils and hydrology personnel by use of randomly placed transects.

Down Woody Debris: During contract administration the amount of woody debris left in the mechanical treatment units would meet recommended minimum levels while also being consistent with fuels reduction objectives. Accomplishment of this objective would be monitored by timber, fuels, and/or soils personnel.

Noxious Weeds: Monitoring by district personnel (noxious weed program manager, botanist, and others) for noxious weed occurrence within the project area would continue during and after project implementation. Any newly discovered noxious weeds would be treated as funding becomes available.

Sensitive plants: Monitoring by district personnel (botanist) for sensitive plant occurrence within the project area would continue during and after project implementation. Any newly discovered sensitive species individual or group would be avoided or otherwise protected, as allowed by use of specific contract provisions.

Alternative Comparison

The following table summarizes and contrasts the proposed action with the no action alternative, facilitating a clear comparison by the deciding officer and the public. The two driving issues are forest health and community fire protection and each can be measured in acres treated. The unit of measure or Metric is used to determine how each alternative would meet the purpose and need described in Chapter 1.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Proposed Action</th>
<th>No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does this alternative address the purpose and need?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>How many acres of stocking density reduction?</td>
<td>316</td>
<td>0</td>
</tr>
<tr>
<td>How many acres would be planted to desirable tree species (those more resistant to fire, insects and diseases)?</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td>How many acres would be burned using prescribed fire to enhance decadent big game forage areas?</td>
<td>233</td>
<td>0</td>
</tr>
<tr>
<td>How much acres treated in the Wildland Urban Interface (WUI)?</td>
<td>553</td>
<td>0</td>
</tr>
<tr>
<td>How much timber volume would be provided to the local economy (in mmbf)?</td>
<td>3.4</td>
<td>0</td>
</tr>
</tbody>
</table>
CHAPTER 3 – Affected Environment and Environmental Consequences

Introduction

This chapter describes the environment in and around the project area, and discusses the environmental consequences that may result from implementation of each of the alternatives. This information provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2.

The Council on Environmental Quality recognizes three types of environmental effects:

1. **Direct effects** are those caused by an action and occur at the same time and place.
2. **Indirect effects** are caused by an action but occur later in time or elsewhere in space.
3. **Cumulative effects** result from incremental impact of an action when added to other past, present, or reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions (40 CFR 1508.7-8). As past actions are already included in the existing condition or effected environment, the cumulative effects analysis builds upon this existing condition assessment by considering the incremental addition of direct and indirect effects of the proposed actions as well as ongoing and reasonably foreseeable actions.

Past, Present and Reasonably Foreseeable Actions

The environmental analysis required under National Environmental Policy Act is forward-looking in that it focuses on the potential impacts of the proposed action that an agency is considering. Thus, review of past actions is required to the extent that this review informs agency decisionmaking regarding the proposed action (Council on Environmental Quality, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005 Memorandum). Specific past actions considered in the affected environment and cumulative effects analysis are summarized below. The past actions summary is not necessarily exhaustive, as records may not exist for all past activities by project. This is particularly true for those actions that predate the passage of the National Environmental Policy Act in 1970. Nonetheless, the effects of such past actions are accounted for in the assessment of the existing condition, as the current condition assessment necessarily reflects any relevant impacts of such actions.

Reasonably foreseeable actions include those management activities that are ongoing or scheduled to occur within the next 5 years. These activities may occur regardless of which alternative is selected for implementation.
### Table 3-1. Summary of Past, Current, and Reasonably Foreseeable Actions

<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>PAST</th>
<th>PRESENT</th>
<th>REASONABLY FORESEEABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fire/ Fuels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historical Fires &amp; related suppression activities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 1889 Fire</td>
<td>1889 Fire - 796 acres (the entire drainage of National Forest System Lands) burned within the Spring Creek drainage.</td>
<td>Natural recovery.</td>
<td>Based on cataloged fire records starting in the 1940’s, the fire occurrence rate for the project area is 1 fire every 15 - 20 years. All fires within the project area have been lightning caused. It is anticipated that fires would continue to occur at this frequency for the reasonably foreseeable future. It is anticipated that existing roads would be used for fire suppression activity.</td>
</tr>
<tr>
<td>• 1910 Fire</td>
<td>1910 Fire - 796 acres (the entire drainage of National Forest System Lands) burned within the Spring Creek drainage. Since 1950 there have been 4 fires in the project area.</td>
<td>Natural recovery.</td>
<td></td>
</tr>
<tr>
<td><strong>Hazardous fuels reduction &amp; Prescribed Fire Use Burning</strong></td>
<td><strong>Harvest Activities:</strong></td>
<td>No current prescribed burning.</td>
<td>Future fuel reduction is planned on 549 acres within the Spring Creek drainage in association with the Spring Creek project. This includes 231 acres of wildlife enhancement or ecosystem burning. 155 acres of underburning, 101 acres of pile burning, and 66 acres of natural abatement associated with the harvest activities.</td>
</tr>
<tr>
<td>1910-1980’s:</td>
<td>• 435 acres were harvested, of which 70 acres were underburned.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The remaining slash treatments used during this time period included: limbing and lopping to reduce slash depth to 18”, window piling and burning, landing clean-up, and natural abatement.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Timber</strong></td>
<td><strong>1950’s (name of Timber sales unavailable)</strong></td>
<td>There is no timber harvest currently taking place within the project area.</td>
<td>There is the potential to Harvest approximately 90 acres of Regeneration timber harvest and approximately 166 acres of Intermediate Timber Harvest, and 66 acres of pre-commercial thinning with the proposed action.</td>
</tr>
<tr>
<td></td>
<td>Thinning and individual tree selection harvest. Actual acres unknown. ~ 117 acres</td>
<td></td>
<td>Montana State Dept of Natural Resources and Conservation plan to conduct a timber sale on approx. 400 acres near the Spring Project area. The harvest.</td>
</tr>
<tr>
<td></td>
<td>Total harvest Approx. ~ 117 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>1960’s (Some names of Timber sales unavailable)</strong></td>
<td>Total Regeneration Harvest ~ 58</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Timber sale Names</strong></td>
<td>Total Liberation Harvest</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spring Gulch Clearcut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTIONS</td>
<td>PAST</td>
<td>PRESENT</td>
<td>REASONABLY FORESEEABLE</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Total Harvest 114 acres</td>
<td></td>
<td>would include mostly regeneration harvest and include new road construction.</td>
</tr>
<tr>
<td></td>
<td>1970’s (Some names of Timber sales unavailable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Timber sale Names</strong></td>
<td>Spring Gulch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Liberation Harvest 46 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Harvest 46 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1980’s</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Timber sale Names</strong></td>
<td>Spring Gulch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Intermediate Harvest 158 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Harvest 158 acres</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish/ Hydrology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private land clearing and development</td>
<td></td>
<td></td>
<td>No foreseeable activities</td>
</tr>
<tr>
<td>Instream activities on private lands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watershed/Fisheries Improvement Activities on NFS lands.</td>
<td></td>
<td></td>
<td>Road reconstruction with the project would address 8.84 miles of existing road BMPs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heritage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historic Settlement Access</td>
<td>Historic (?) irrigation system on Lolo NF (Rd. #68000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weeds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weed Spraying Activities</td>
<td>No treatments known (Lolo NF)</td>
<td>Project roads will be treated prior to activity</td>
<td>Project roads will be monitored/treated</td>
</tr>
<tr>
<td>Other Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation</td>
<td>Recreation in this area limited to dispersed camping, hunting, hiking, berry picking, and viewing from the open roads. No developed trail systems.</td>
<td>Same current activities with less open roads. Use has likely increased to some extent with increase of population in the local area.</td>
<td>Recreational use will likely increase in the future to some extent. No future development of trails or other facilities is expected.</td>
</tr>
<tr>
<td>Private Land Development</td>
<td>The area is bordered by state and private lands on the west side. Private lands were in the rural setting with little development.</td>
<td>Some development with new homes, but still remains in a rural setting. State and private (company) lands continue to be managed for timber production</td>
<td>Development of new homes will continue and state and private timber lands will likely be managed for timber production</td>
</tr>
<tr>
<td>Special Uses</td>
<td>No Special Uses</td>
<td>No special uses</td>
<td>Unlikely special uses would occur.</td>
</tr>
</tbody>
</table>
### Affected Environment

<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>PAST</th>
<th>PRESENT</th>
<th>REASONABLY FORESEEABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Livestock Grazing</strong></td>
<td>Some historic grazing may have occurred.</td>
<td>No grazing is authorized and none is occurring.</td>
<td>No grazing is expected</td>
</tr>
<tr>
<td><strong>Minerals exploration</strong></td>
<td>Some historic mining claims were active until early 1980’s</td>
<td>There are no active mining claims</td>
<td>No mining is expected</td>
</tr>
<tr>
<td><strong>Firewood gathering</strong></td>
<td>Fire wood gathering by local residents.</td>
<td>Fire wood gathering by local residents is an ongoing activity from open roads.</td>
<td>Fire wood gathering will continue and may slightly decrease following harvest activities.</td>
</tr>
<tr>
<td><strong>Travel Routes - Roads</strong></td>
<td>Estimated Miles of Road Construction by Decade: FS Road #1023 1940’s - 1.3 Miles</td>
<td>No current road construction on National Forest System land is presently occurring.</td>
<td>New road construction on State lands.</td>
</tr>
<tr>
<td><strong>Road Construction</strong></td>
<td>FS Road #2241 1960’s – 5.2 Miles 1970’s – 1.2 Miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Road Re却onstruction</strong></td>
<td>FS Road #2771A 1960’s – 1.1 Miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Road Maintenance</strong></td>
<td>FS Road #2771 1970’s – 3.7 Miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Road Maintenance</strong></td>
<td>FS Road # 38123 1960’s – 1.0 Miles</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Road Reconstruction</strong></td>
<td>Past activities would have included reconstruction of the roads utilized for the activity. This could have included blading, brushing, resurfacing, and drainage dip and culvert installation and replacement. In the mid to late 1980’s, Best Management Practices (BMPs) were implemented as part of road reconstruction.</td>
<td>No road reconstruction activities on National Forest System roads.</td>
<td>There is the potential to perform road reconstruction on approximately 8.84 miles of road for this project.</td>
</tr>
<tr>
<td><strong>Road Maintenance</strong></td>
<td>Annual road maintenance performed on open road systems and seasonally restricted road systems.</td>
<td>Annual road maintenance performed on Maintenance Level 1, 2 and 3 roads including brushing and blading as funding allows on a 2-3 year cycle. Spot maintenance as needed for culvert and drainage maintenance.</td>
<td>Annual road maintenance performed on Maintenance Level 1, 2 and 3 roads including brushing and blading as funding allows on a 2-3 year cycle. Spot maintenance as needed for culvert and drainage maintenance.</td>
</tr>
<tr>
<td><strong>Rights of way</strong></td>
<td>In process to acquire from the State of Montana for FS roads #68000 and #2241 for Section 16 in T23N R30W.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Travel Routes - Trails</strong></td>
<td>No trails are known to have existed.</td>
<td>NONE – no trails in project area</td>
<td>No new trail construction is planned.</td>
</tr>
</tbody>
</table>
VEGETATION

Introduction

Forests of the Inland Northwest, including the Spring Gulch drainage, are ecologically diverse, stemming from complex ecological interactions between forest tree species and climate, geology, soils. Disturbance patterns such as logging, insects, disease, fire history and extreme weather events also influence the forests. These aspects combine with growing conditions and ample moisture to create some of the most varied and productive forest communities in the Inland Northwest. Conifer trees such as grand fir, Douglas-fir, western larch, western white pine, lodgepole pine, ponderosa pine, subalpine fir and associated shrub and herbaceous plant species define the forest communities within the Spring Gulch and surrounding areas. This vegetation analysis addresses the treatments identified in the purpose and need:

1.) Limit forest and tree damage occurring from insects and diseases to specific timber stands.
2.) Contribute forest products to the local and regional economy

Regulatory Framework

Federal
The regulatory framework providing direction for the management of forest vegetation is the National Forest Management Act of 1976 (NFMA) and the Forest Plan for the Kootenai National Forest (1987). NFMA provides for balanced consideration of all resources and requires the Forest Service to plan and manage for diversity of plant and animal communities. The Kootenai Forest Plan, in compliance with NFMA, establishes Forest-wide management direction, goals, objectives, standards and guidelines for the management for forest vegetation and plant communities. Silvicultural Practices Handbook (FSH 2409.17) gives direction on vegetation management practices.

State
HB-731, Montana Stream Management Zone Law for vegetation management within Stream Management Zones, defines sideboards for management activities within the stream-side management zone (SMZ). In general, this act is overshadowed by the Inland Native Fish Strategy (INFS) on NFS lands because INFS requires even larger protection zones for streams than that prescribed by the Montana Stream Management Zone Law.

Analysis Area

This analysis area for vegetation effects covers approximately 796 acres, all within the boundary of the Spring Creek drainage (Figure 1.1), which lies within timber stand data base compartment 33. A discussion of potential environmental effects (direct, indirect, and cumulative) of the proposed action and alternatives on the vegetation communities within the analysis area are included in this chapter.
Defined boundaries provide an appropriate analysis area for the vegetation resource related to characteristics such as species composition, forest structure and patterns, and disturbances such as fire and insect and disease risk. This scale of analysis also provides an appropriate size area to monitor changes in vegetation trends over time, natural or human-caused. Expected ecological rotation age of the typical forested communities in the area is the time frame used for this analysis.

Analysis Methods

District vegetation databases (FACTS, FSVeg Spatial, and a R1 Summary Database), and field reconnaissance were utilized to generate information on forest vegetation attributes such as age class, forest cover type, stand size class, vegetation response unit (VRU) classification, incidents of insect and disease, as well as information on past activities. Aerial observations of insect and disease activities were evaluated to facilitate understanding of longer fluctuations in insect and disease dynamics across the landscape. Scientific literature, field reviews, and subsequent silvicultural assessment were used in the analysis to identify site-specific treatment needs that address the purpose and need for the project.

Diagnosis and analysis of stands within the area were augmented using stand summary data, basic stand data, stand component data and stand activity data (project file) for affected stands. Existing stand exam data from R1 FSVeg provides information on site characteristics, species composition, stocking levels and incidents of insect and disease as well as information on past activities. The inherent limitations of the data base are recognized. Not all surveys and subsequent data come from the same time period, with some surveys over 20 years old. Regardless, the data represents the most comprehensive data available for the analysis area. No aspect of the following evaluation of effects requires tests for significance or analyses of variation, either linear or multivariate. FSVeg Spatial has adequate resolution and accuracy for applications required in this effects analysis discussion.

The natural fire regime is a classification of the role fire would play across a landscape in the absence of modern human intervention, but does include the influence of aboriginal burning. Fire regimes are based on the average number of years between fires, combined with the severity of the fire on the dominant overstory vegetation. Fire severity is related to the intensity of fire in terms of fire effects to vegetation. Data gathered in the field and knowledge of current frequency of fire and expected fire severity has led to the determination that the Fire Regime Condition Class (FRCC) at the project landscape is moderately altered from the natural range across the Spring Gulch Analysis area (Condition Class 2). The main contributors to this rating are fire exclusion, species composition (some moist forests once had white pine compositions of >30% and now it is often less than 6%), and previous timber harvest resulting in uncharacteristic forest structures, and lack of age class diversity.

This effects analysis relies in part on Forest Habitat Types of Northern Idaho: a Second Approximation (Cooper et al, 1991) which outlines the classification and characteristics of habitat types found in the analysis area. The maritime weather patterns found in this part of Montana are better represented in the Idaho habitat types than the Montana
Habitat Types. Habitat type information guides stand-level diagnosis and analysis, development of proposed treatments, and better understanding of potential effects.

For more broad scale evaluations and planning, habitat types were grouped to facilitate landscape-level analysis based on similar environments and vegetation characteristics such as productivity, disturbance regimes, stand dynamics, susceptibility to insect and disease, forest cover types, structural stages and successional pathways.

*Vegetation Response Unit Characterizations and Target Landscape Prescriptions* (USDA, 1999) are used to define groupings of Habitat Types into Vegetation Response Units (VRUs). Given the abundance of available water in our ecological zone, geologic material is weakly correlated with vegetation patterns and processes. VRUs were used to facilitate landscape level analysis based on similar environments and vegetation characteristics.

A VRU is intended to be an aggregation of land having similar capabilities and potentials for management. As mapped polygons these units have similar patterns in potential natural communities (habitat types), soils, hydrologic function, landform and topography, lithology, climate, climate air quality, and natural disturbance processes (fire regimes, succession, productivity, nutrient cycling). The interaction of all these processes creates a mosaic across the area landscape. Within individual polygons of any VRU over time, the proportion of age and size classes, succession stage, and impacts of fire and/or disease will be dynamic as natural and managed disturbances occur (USDA, 1999).

Proposed treatments were then identified by a silvicultural forester based on observed insect and disease activity and potential risk; existing vegetation conditions; desired stand conditions based on interdisciplinary evaluation; and potential contribution to the larger landscape (Project File – silvicultural diagnoses). Desired stand conditions and potential treatments to obtain them are ecologically compatible with the site, and the current and historic disturbance patterns and successional pathways of the landscape’s vegetation. These desired stand conditions have basis on the KNF Forest Plan management area direction, and site-specific objectives recommended by the Interdisciplinary Team. Recommendations from site visits by Region 1 Forest Health Protection specialists, Forest Silviculturist, and Forest Leadership Team were incorporated into the proposed treatments.

*Indicators* are used to examine how management actions would address the purpose and need, and aid in analyzing potential environmental effects to vegetation. These indicators and the units of measure are:

- **Forest Structure** - Stand-level changes in the horizontal and vertical distribution along with relative stand component sizes as measured by acres treated.

- **Species Composition** - Stand-level changes trending toward long-lived early seral species such as western larch and ponderosa pine as measured by trees per acre.

- **Successional Stages** - Changes in the percent distribution of successional stages as they relate to historic range of variability. Changes in successional
Vegetation

stages stem from regeneration of these stands to create early successional areas, or intermediate harvests to accelerate development of more mature stand characteristics.

Reference Conditions

Reference conditions refer to past or historic conditions of an ecosystem. This information provides insights to important questions such as natural frequency, intensity and scale of disturbances, abundance and rareness of plant and animal species, and the age-class and composition of trees (Kaufman et al., 1994). Fire, wind, insects and disease are important disturbance processes which create a dynamic mosaic of forest conditions. Natural events can occur in small, localized areas or impose changes over broad landscapes. Species composition, habitat diversity, age class distribution, and forest structure are direct results of disturbances, which includes natural and human influenced.

As stated by Morgan et al (1994), "The utility of historical circumstances as reference conditions are in describing the dynamics of ecosystems undergoing continual change.... The status of an ecosystem variable...may have varied dramatically over time, but it did so at characteristic rates that reflect important ecosystem processes.... The rate of change affects the ability of species to adapt to new conditions.... Thus, the rate of change is likely to have as great an influence on biodiversity as the ecosystem conditions themselves."

Knowledge of historic conditions and natural disturbance processes, as described in the VRUs later in this analysis, can help clarify the types, extent, and causes of ecosystem changes, and can help identify management objectives and restoration priorities (Brown, 2004). It is important to note that ecosystem function cannot be maintained by restoring the vegetative structure, composition and patch size without restoring fire on the landscape. No mechanical means alone can duplicate the unique ecological effects of wild land fire, such as soil heating, nutrient recycling, and the resulting effects to the community composition and structure (Kauffman 2004).

Forest Structure

Forest structure is defined as “the physical and temporal distribution of plants in a stand” (Helms, 1998). Structure changes as forests age, move across successional stages, and endure disturbance. Since flora and fauna adapt to their habitat, often evolving with disturbances, it’s favorable to manage for a range of conditions. Historical ranges are used as a baseline to evaluate how existing conditions deviate from the sustainable, natural processes.

Oliver and Larson (1996) categorize forest structures into four categories as stand initiation, stem exclusion, understory reinitiation, and old-growth. Similarly Losensky (1994) categorizes forest structure into stand initiation, stem exclusion-open canopy, stem exclusion-closed canopy, understory reinitiation, young forest-multi strata, old forest-multi strata, and old forest-single strata. Table 3-1 links Oliver and Larson’s structural stage into those stages defined by Losensky; which will be used throughout this document.
Table 3-2 Correlations between Oliver and Larson, and Losensky as they relate to structure.

<table>
<thead>
<tr>
<th>Oliver and Larson Structure Stage</th>
<th>Losensky’s Structure Stage</th>
<th>Losensky’s Age Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand Initiation</td>
<td>Stand Initiation</td>
<td>Seedling/Sapling (0-40 yrs)</td>
</tr>
<tr>
<td>Stem Exclusion</td>
<td>Stem Exclusion-Open Canopy</td>
<td>Pole (41-100 yrs)</td>
</tr>
<tr>
<td>Stem Exclusion</td>
<td>Stem Exclusion-Closed Canopy</td>
<td>Pole (41-100 yrs)</td>
</tr>
<tr>
<td>Understory Reinitiation</td>
<td>Understory Re-initiation</td>
<td>Mature (101-150 yrs)</td>
</tr>
<tr>
<td>Understory Reinitiation</td>
<td>Young Forest Re-initiation</td>
<td>Mature (101-150 yrs)</td>
</tr>
<tr>
<td>Old Growth</td>
<td>Old Forest Multi-Strata</td>
<td>Over-mature (150+ yrs)</td>
</tr>
<tr>
<td>Old Growth</td>
<td>Old Forest- Single Strata</td>
<td>Over-mature (150+ yrs)</td>
</tr>
</tbody>
</table>

The amount of forest structure which occurred prior to Euro-American settlement is not precisely known. In Losensky’s report he depicts forest conditions pre-1900 for a large geographic area that includes the analysis area as largely dominated by western larch/Douglas-fir of: 15% non-stocked, 22% seedling (1-40 years), 13% pole (41-100 years), 13% mature (101-150 years), and 37% over-mature (150+ years).

While the historic patch size has not been precisely determined, it is known to vary due to the nature and intensity of past disturbances. Fire history and behavior studies, and associated literature review are the basis for assumptions about landscape pattern. Most fire evidence across the Spring Gulch Analysis area was masked by the stand replacing fires of 1889 and 1910. Literature findings indicate that on moderately dry sites impacted by low severity wildfire, areas of similar origin and composition (patches) were irregular in shape and pattern, averaging 20-200 acres with small openings within. Mixed severity fires occurring in the lower elevation, cooler, moist types created non-uniform yet extensive stands anywhere from less than one acre to as much as a 1,000 acre, much larger where insects and disease, fuels or weather were a stronger influence. Within characteristic, large stand replacement fires in the mid elevation cool moist sites and the higher elevation cool and moderately sites large uniform patches of 5,000 to 100,000 acres were not unusual. Much smaller non-uniform patches occurred within some of these patterns.

Referenced forest conditions were not static but shifted across the landscape in these relative proportions in response to disturbance processes. For example, young and old growth stands had a different structure and composition in low elevation, dry, south aspects compared to that of high elevation, cool, northerly aspects. The intensity and frequency of fire was also different across the landscape.

Fire Ecology and Forest Succession
Fire has been a major influence on vegetative patterns, composition, structure, function, age and development of both individual stands and the larger landscape (Habeck and Mutch, 1973; Arno, 1976; Arno, 1980; Fischer and Bradley, 1987). Historic fire intensity and frequency, and the resulting patch size and vegetative succession are predictable based on the biological, physical, and climatic factors of the landscape. Forest vegetation adapted to these disturbance processes. For example, fire adapted species like western larch, Douglas-fir, and ponderosa pine have evolved thicker bark and deep root systems that withstand frequent fires of higher intensity more effectively than species with thin bark and shallow roots such as lodgepole pine and true firs. Stand-replacing fires historically often left the fire-adapted species as single standing trees or groups with an open canopy (Smith and Fisher, 1997). These stands would then reproduce under the open canopy, thereby perpetuating the seral fire-adaptive species.
Prior to European settlement of the western states, the landscapes of western Montana were largely characterized by the natural fire regime; influenced by varying moisture, temperature, and vegetative composition. Historical fire regimes in the analysis area are evident based on fire scar analysis, but largely masked by the 1889 and 1910 fires, which consumed the entire analysis area. Regeneration of relatively pure lodgepole pine stands under scattered overstory larch on cool, moist sites; and stands dominated by Douglas-fir with some ponderosa pine on warmer, drier sites resulted from the 1889 and 1910 fires. Today's effects of fire suppression should be viewed with a consideration of the associated effects of weather and climate factors in years following 1910, as well as the development road infrastructure that provided access to logging, mining or other resource operations over time.

Throughout the analysis area we know that open slopes were slow to reforest. These areas were prone to scattered or variable stocking due to shallow soils, heavy rock component, short growing season, or lack of a seed source. Landscape resiliency was improved where seed reservoirs occurred. Increased stocking did occur on the wetter, more productive sites where moderate topography and better soil development prevailed. Seed availability from lodgepole pine with serotinous cones meant rapid restocking of burned sites in the upper elevations. Persistent, large diameter fire survivors of larch and Douglas-fir helped to maintain a mix of species.

Three Fire Regimes occur in the analysis area. Refer to Fire and Fuels Figure 3-3 for fire regime attributes.

Other Disturbance Agents
Forest communities are dynamic, changing, living systems. Disturbances characterize all forest types. In addition, continuous landscape alterations range from small to very large, encompassing thousands of acres. Species composition, habitat diversity, age class distribution, and forest structure are direct results of such disturbances.

Disease, drought, fire, insects, and wind have been some of the most pervasive causes of disturbance affecting terrestrial ecosystems in the analysis area. Disturbances exist in most ecosystems, occurring as individual events or in concert with other disturbances but not with equal frequency. For example, insect outbreaks are often associated with drought, which can exacerbate the adverse effects of insect activity. Root disease can predispose trees to attack by bark beetles or other insects, which can lead to outbreak levels triggered by other disturbance agents. Historically, root diseases most commonly acted as thinning agents, causing the greatest mortality in Douglas-fir followed by true firs (Bollenbacher et al., 2012). Ponderosa pine and western larch have a high level of resistance and were able to capitalize on the reduced competition. Fire exclusion and the loss of these species through selective harvest and white pine blister rust have reduced the opportunity for early seral species to become established in root disease areas.

Human Influences
The dramatic change in frequency, distribution, and magnitude of fire since European settlement has had major impacts on many forest types in northwestern Montana. Loss of forest burning by all mechanisms during the late 19th century initiated dramatic changes in the physiognomic conditions (Hessburg, Agee, 2003). Periods of high-grade logging, selection harvest, and fire suppression upset the biological “balance” that existed over thousands of years. Seral Ponderosa pine and western larch were replaced
by shade tolerant conifers such as Douglas-fir, grand fir, and western hemlock to name a few. This balance upset has influenced damage occurring from insects and disease and increased the probability of larger more intense fires with the accumulation of horizontal and vertical fuels within the analysis area.

In 1882, the Northern Pacific Railroad was constructed along the Clark Fork River which facilitated trade, commerce, and development within the western lower Clark Fork River valley. Local communities of Thompson Falls, Trout Creek, Noxon, Heron, and others were soon established. Logging activities increased with the railroad needing railroad ties, homesteading and communities needing rough sawn and dimensional lumber. By 1906, the US Forest Service was also established in the area. Prior to 1910, the young communities, counties, railroad and the Forest Service had very few rules, regulations, or policies effectively dealing with fire. Fire suppression policies were a direct result of the stand replacing fire of 1910 and were further heightened during the two world wars as demand for resources increased and protection of available forest resources were paramount.

Affected Environment

The analysis area lies within a large ecosystem that stretches across the Northern Rocky Mountains, and is subdivided into Section M333B-Flathead Valley. More specifically, the area is included in the Northwestern Montana Forest Region described by Pfister and others (1977) and refined by Arno (1979). The Vegetation Response Unit Characterizations and Target Landscape Prescriptions (USDA, 1999) reflects these landscape conditions and is a useful reference to describe the departure from historical conditions in the following sections and develop target stand conditions. Figure 3-1 shows the distribution of the vegetation response units (VRUs) within the analysis area.
Change is fundamental and the only constant in our ecosystems where disturbances are inevitable. Vegetation community patterns over northwestern Montana reflect the combined influence of these disturbances along with the effects of settlement, timber management and fire suppression. Resulting plant communities vary considerably with site characteristics such as: topography; solar radiation; precipitation; elevation and soils; and plant species distribution and development patterns. Natural processes, such as fire, insect and disease activity, and forest succession will continue to change the plant communities. On a local scale, management activities can affect the course of these changes, to some degree, and protect the integrity of the ecosystem while providing for human needs.

**Historic Range of Variability**

Disturbance processes together with landform and other environmental elements formed the major factors influencing the patterns of vegetation types across the landscape. Species abundance, distribution, and viability resulted from this dynamic pattern. Native plants and animals throughout time and prior to changes brought about by modern day settlement and management, adapted to the rate of these climatic and disturbance regimes.

The HRV is the context in which current and future conditions can be evaluated. For example, the condition and treatments of vegetation can affect the

- Departure from species composition,
• Departure from forest structure,
• Departure from successional stages.

Departures from HRV result in changes to one or more ecological components including vegetation characteristics, fuel composition, fire frequency, severity and pattern and other associated disturbances such as insect and disease, grazing, harvesting, etc.

Existing Conditions

Existing vegetative patterns are influenced by both cool, Canadian air masses and the inland maritime weather systems. The maritime system moderates the cold winter temperatures, otherwise typical of a montane environment; and produces the climate necessary for coastal species, such as western hemlock, pacific yew and western redcedar to survive. Average annual precipitation ranges from 25 to 56 inches. At higher elevations, most of the precipitation falls as snow. Rain-on-snow events strongly influence the climate.

As described in the reference conditions section, the cumulative influence of natural and human caused disturbances define species composition, forest structure and health of the Spring Gulch landscape. Wildfire, namely the 1910 fire and subsequent fire suppression activities, played a role in forest succession and existing vegetative diversity.

Cumulative influences of natural and human-caused disturbances define the species composition, forest structure and function of the landscape. Wildfire historically played a role interrupting forest succession and creating much of the existing vegetative diversity.

Species Composition,
Douglas-fir occupies a wide elevational range, growing on all aspects and diverse topographical situations (Arno, 1991). Where ponderosa pine, western larch, and lodgepole pine have failed to reproduce or declined, Douglas-fir will dominate all stages of forest development (Smith and Fischer, 1997). The stand replacing fire of 1910 provided such an environment where Douglas-fir has been able to dominate (See Table 3-3).

Southerly aspects are characterized by fairly open-grown Douglas-fir and ponderosa pine, with incidental western larch and grand fir. The upper aspects are composed of many pure to mostly pure stands of lodgepole pine and multistoried western larch/Douglas-fir. This composition transitions to subalpine fir with red alder and Rocky Mountain maple.

Northerly aspects are characterized by Douglas-fir, western larch, grand fir, and scattered western white pine. Some areas are predominately lodgepole pine with western larch overstory and lesser amounts of subalpine fir/Engelmann spruce. The upper aspects are composed mostly of western larch, Douglas-fir, subalpine fir, Engelmann spruce, and lodgepole pine. The latter composition is seen mostly in moist basins.
In addition to conifer trees, understory vegetation of various shrubs, forbs, and grasses are present. Over 75% of the analysis area lies within the moderately warm and dry VRU2S and VRU3, where understory vegetation includes: common snowberry, ninebark, dwarf huckleberry, ocean-spray, Rocky Mountain maple, spirea, kinnikinnick, Oregon grape, queen cup beadlilly, round-leaved violet, sweetscented bedstraw, coolwort foamflower, western serviceberry, pachistima, Utah honeysuckle, common snowberry, and twinflower. Upper elevation cool VRUs include fool’s huckleberry, beargrass, and Pacific yew.

**Forest Structure**

Existing size classes range from seedling/sapling to mature sawtimber, but dominated by immature sawtimber stands originating post 1910 fire. Definitions for size classes are found in Forest Service Handbook 2409.12e. Stands exhibit a range of stand ages, a reflection of its natural and human-influenced disturbance history. The variation in structural attributes relates to the mosaic of natural disturbance, past harvest, and the resulting habitat characteristics.

Table 3-3. Existing Forest Cover Type Distribution

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Amount (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas-fir</td>
<td>78</td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>8</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>7</td>
</tr>
<tr>
<td>Subalpine fir</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3-4 displays the existing forest structure distribution in comparison to the distribution that is thought to have occurred historically. The current distribution is based on stand data and year of origin. It is evident from the comparison table that only the pole (41-100 years) age class is within the historic range of variability. Active fire suppression efforts since and the fire of 1910 are largely responsible for the lack of diversity in the current age distribution.

Table 3-4. Structure Distribution Comparison within the Analysis Area

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Historical Reference Conditions</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling/Sapling (1-40 years)</td>
<td>15-25%</td>
<td>0%</td>
</tr>
<tr>
<td>Pole (41-100 years)</td>
<td>15-35%</td>
<td>16%</td>
</tr>
<tr>
<td>Mature (101-150 years)</td>
<td>10-30%</td>
<td>77%</td>
</tr>
<tr>
<td>Over-mature (151+ years)</td>
<td>20-50%</td>
<td>7%</td>
</tr>
<tr>
<td>Non-stocked</td>
<td>20-50%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Forest structure in the upper elevations of the Spring Gulch Analysis area are dominated by large patches of single-storied, uniform lodgepole stands with scattered overstory western larch, subalpine fir, and Douglas-fir. Mid to lower elevation forest structure is comprised of large single-storied uniform Douglas-fir stands with limited inclusions of non-uniform ponderosa pine, western larch, grand fir, and lodgepole pine. Areas that may have formerly been composed of merely grasses, forbs, and shrubs have begun to fill in with conifers, as well.
Successional Stages
Forest succession is the basic process of change in composition, structure, and function of plant communities over time. A simplified illustration of succession can be described as a forest progresses through structural stages (stand initiation, stem exclusion, understory reinitiation, and old growth) each stage generally describes the current developmental pattern. How rapidly a forest changes from one stage to another varies greatly depending on the site and disturbance regime.

Vegetative Response Units (VRUs)
VRU use is an important link to understanding the existing condition and the potential for management activity in this area (USDA, 1999). The relative VRU distribution occurring within the analysis area is displayed in Table 3-5 and is characterized in the subsequent description. Although no treatment areas are proposed in VRU 9, at this time, it is important to describe and understand the existing vegetative conditions in these settings.

<table>
<thead>
<tr>
<th>Biophysical Setting</th>
<th>VRU</th>
<th>Acres</th>
<th>% of Analysis area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderately Warm and Dry</td>
<td>VRU2S</td>
<td>418</td>
<td>52%</td>
</tr>
<tr>
<td>Moderately Warm and Moderately Dry</td>
<td>VRU3</td>
<td>189</td>
<td>24%</td>
</tr>
<tr>
<td>Moderately Warm and Moist</td>
<td>VRU4S</td>
<td>148</td>
<td>19%</td>
</tr>
<tr>
<td>Cool and Moderately Dry</td>
<td>VRU9</td>
<td>41</td>
<td>5%</td>
</tr>
</tbody>
</table>

VRUs and Departure from Reference Conditions
Refer to Table 3-13 for a summary of VRU attributes. This section lists those attributes specific to the Spring Gulch Project and the departure from reference condition for the VRU.

Moderately Warm and Dry Habitats Settings VRU2S- Fire Regimes I
This vegetation response unit (VRU) is found on 52% of the analysis area and is characterized as moderately warm and dry but is a transitional setting that includes warm, dry grasslands and moderately cool and dry upland sites. The dry, lower elevation open ridges are composed of mixed Douglas-fir and ponderosa pine in well stocked and fairly open grown conditions. Moist, upland sites and dense draws also include western larch and lodgepole pine, with lesser amounts of ponderosa pine. Multi-storied stands representing late successional stages also occur as stringers in protected areas that burned less frequently. Patches of even-aged, single storied stands develop after severe burning conditions within a dense understory or an overstocked pole stand after a long fire-free period (USDA, 1999). Tree regeneration occurs in patches and is largely absent in the understory.

Prior to intensive fire suppression, fire helped control density and species composition. According to fire history research in Western Montana/Northern Idaho low-to-moderate intensity fires on a frequency of 15 to 45 years were the predominant disturbance, playing a major role in maintaining the seral community of conifers. These low-intensity fires would burn non-uniformly consuming the litter and undergrowth. Stands were usually left with an open overstory of western larch, ponderosa pine and Douglas-fir largely intact and created small canopy gaps. Average stand basal area was 60-100 and structural diversity remained high under these mosaic conditions.
Table 3-6. Age Class Distribution for VRU2

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Historical Reference Conditions</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling (1-40 years)</td>
<td>15-25%</td>
<td>0%</td>
</tr>
<tr>
<td>Pole (41-100 years)</td>
<td>15-35%</td>
<td>16%</td>
</tr>
<tr>
<td>Mature (101-150 years)</td>
<td>10-30%</td>
<td>82%</td>
</tr>
<tr>
<td>Over Mature (151+ years)</td>
<td>20-50%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Departure from Reference Conditions: Note that reference conditions refer to past or historic conditions of an ecosystem, of which the fires of 1889 and 1910 masked. Fire suppression efforts since 1910 and timber harvest have essentially replaced the frequent, low intensity underburn fires as the primary disturbance agent. The effect of missed fire intervals is evident given a lack of the seedling age class in this VRU as seen in table 3-6 above. Also evident is the large proportion of the mature age class, which has a higher density of mature trees, with a more closed canopy and uniform forest structure. Some areas are experiencing increased tree mortality and fuel loading due to root disease in the Douglas-fir and grand fir, and bark beetle attacks in the lodgepole pine.

Moderately Warm and Moderately Dry Habitat Setting VRU 3- Fire Regime III

VRU 3 occurs on 24% of the analysis area, occurring on the southeast portion of the Spring Gulch Analysis area. Being a transitional setting, this VRU includes characteristics of the moderately warm and moderately dry habitat between the drier, warmer sites featuring the Douglas-fir series (VRU 1, VRU 2) and the warmer and moist sites featuring western redcedar and hemlock (VRU 5). Fire has been an important agent in shaping the species composition of this landscape. Characteristic low to moderate severity fires favor western larch and ponderosa pine over Douglas-fir. Severe fires were less common and favored the development of single species stands, especially lodgepole pine. Although characterized as a moderately warm and moderately dry grouping, this vegetation response unit contains a highly variable assemblage of habitat types, reflective of its wide environmental distribution (USDA, 1999). Diversity within this transitional VRU is reflected in the range of associated fire intervals and severities. Western larch, Douglas-fir and ponderosa pine are dominant species at lower elevations and western larch, Douglas-fir and lodgepole pine dominate the moist uplands. This VRU does include grand fir and lesser amounts western white pine and occasional western redcedar.

Table 3-7. Age Class Distribution for VRU3

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Historical Reference Conditions</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling (1-40 years)</td>
<td>15-25%</td>
<td>0%</td>
</tr>
<tr>
<td>Pole (41-100 years)</td>
<td>20-40%</td>
<td>0%</td>
</tr>
<tr>
<td>Mature (101-150 years)</td>
<td>15-35%</td>
<td>91%</td>
</tr>
<tr>
<td>Over Mature (151+ years)</td>
<td>15-40%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Departure from Reference Conditions: VRU3 has similar departures from reference conditions as effects as VRU2. Evident is the large proportion of mature age class resulting from the 1910 fire. Again, these stands have a higher tree density with a more closed canopy and uniform forest structure. Some areas are experiencing increased tree mortality and fuel loading due to root disease in the Douglas-fir and grand fir, and bark beetle attacks in the lodgepole pine.
Moderately Warm and Moist Habitat Settings VRU4S-Fire Regimes III

Nineteen percent of the analysis area lies within VRU 4 where it occupies some of the moderately warm and moist sites along lower slopes and valley bottoms. VRU4 is ecologically influenced by the moderating effects of the inland maritime climate where characteristic distribution and diversity of forest communities was less than uniform, varying by topographic position and habitat type (USDA, 1999). Large valley bottoms were often composed of fairly open grown, mature western larch with younger lodgepole pine, Douglas-fir, and grand fir in the understory. Upland sites had a mixed species composition with a narrow age class distribution and few canopy strata.

Mixed with the wide moisture gradients and surrounding stand influences, VRU4 experienced a wide range of fire free intervals. These gradients and influences created a natural disturbance regime of primarily mixed severity fires with infrequent lethal fires, in addition to mortality-caused root disease, created a mosaic of horizontal and vertical forest structure across this landscape.

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Historical Reference Conditions</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling (1-40 years)</td>
<td>15-25%</td>
<td>0%</td>
</tr>
<tr>
<td>Pole (41-100 years)</td>
<td>20-40%</td>
<td>63%</td>
</tr>
<tr>
<td>Mature (101-150 years)</td>
<td>15-35%</td>
<td>37%</td>
</tr>
<tr>
<td>Over Mature (151+ years)</td>
<td>10-40%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Departure from Reference Conditions: The 1910 fire reset the successional clock across the landscape. As the fire return interval is 30-85 years within VRU4 (Table 3-13) the mature age class is minimally departed from reference conditions. Past harvest activities are reflected in the relatively high number of stands in the pole age class, which are enduring increased tree mortality due to stress from overstocking.

Abundance of western larch in mature stands has been reduced due to the successional reset of the 1910 fire and the lack of mixed severity fires. The increased composition of Douglas-fir, grand fir, and western hemlock has increased the occurrence of root disease in some areas. These species are also better adapted to establish without site disturbance.

Moderately Warm and Moist Habitat Settings VRU9-Fire Regimes IV

VRU 9 occurs on 5% of the analysis area, with its location in the upper elevations, exceeding 5200 feet, of the Spring Gulch analysis area. Climate is characterized by a short growing season with early summer frosts. Due to generally shallow soils (low water holding capacity), slope position, and aspect, soil moisture is often limited during late summer months. These settings are very suitable to lodgepole pine, Engelmann spruce, subalpine fir, as well as Douglas-fir and western larch. Vegetation productivity is moderate to high depending on the aspect and soil moisture-holding capacity. Soils are generally from loess overlying glacial tills.

Historically, fire was the predominant disturbance type in these fire regimes and played a major role by regularly interrupting succession and perpetuating the presence of lodgepole pine. This is especially true following large scale; stand replacing fires that generally occurred on the moist lodgepole pine sites, the fire of 1910 for example. Patch
size resulting from stand-replacement events were typically 5,000 to 100,000 acres (Table 3-13).

Table 3-9. Age Class Distribution for VRU9

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Historical Reference Conditions</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling (1-40 years)</td>
<td>10-20%</td>
<td>0%</td>
</tr>
<tr>
<td>Pole (41-100 years)</td>
<td>10-20%</td>
<td>0%</td>
</tr>
<tr>
<td>Mature (101-150 years)</td>
<td>15-35%</td>
<td>100%</td>
</tr>
<tr>
<td>Over Mature (151+ years)</td>
<td>10-30%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Departure from Reference Conditions: The current age distribution is in contrast to reference conditions for all age classes (Table 3-9) as a result from the 1910 fire. In many areas, there is minimal natural western larch and lodgepole pine regeneration as fire exclusion favors Douglas-fir, subalpine fir, and spruce regeneration. Western Spruce budworm is common, which is a typical result of dense stocking of shade tolerant trees.

Table 3-10: Summary of Existing Condition by VRUs

<table>
<thead>
<tr>
<th>VRU % of PA</th>
<th>Existing Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>VRU2S 52%</td>
<td>85% DF cover types, 10% SAF, 2% LP, and 2% NF 2%. Forested stands even-aged, continuous crown cover dominated (82%) by mature trees (101-150 years old). No multi story or age or small patch grouping. Tree densities are higher and more continuous than historic reference. Root rot appears to be endemic. Missing up to two non-lethal, low intensity fire intervals. No recruitment in seedling age class. Normal fuels attributed to coarse woody material 5-9 tons/acre on south slopes and 12-25 on north slopes.</td>
</tr>
<tr>
<td>VRU3 24%</td>
<td>88% DF cover types, and 12% LP. Forested stands even-aged, continuous crown cover dominated (91%) by mature trees (101-150 years old), 9% representation by over-mature trees. Densities in number of trees per acre above historic reference. Root rot appears to be more prevalent. Continuous even-aged crown cover in over large areas, no multi-storied, or multi-aged stands. Normal fuels attributed to coarse woody debris are 10-20 tons/acre.</td>
</tr>
<tr>
<td>VRU4S 19%</td>
<td>63% PP cover types, and 37% DF, with limited representation of GF, WL, and LP. Forested stands even-aged, continuous crown cover dominated (63%) by pole trees (41-100 years old). No multi-age or storied structure. No recruitment in seedling or over mature age classes. Pattern of tree densities, number of trees per acre exceed historic reference. Coarse woody debris within normal 15-30 tons/ac.</td>
</tr>
<tr>
<td>VRU9 5%</td>
<td>43% LP cover types, 22% WL, 22% SAF, 9% DF, and 4% MH. Forested stands even-aged, continuous crown cover dominated (100%) by mature trees (101-150 years). No multi-age or storied structure. No recruitment in early, late, or very late succession stands.</td>
</tr>
</tbody>
</table>

Abbreviations: PA = analysis area, DF=Douglas-fir, SAF=subalpine fir, LP=Lodgepole pine, NF=non forested, WL=western larch, GF=grand fir, PP=ponderosa pine, and VRU= Vegetation Response Unit

Human Influences
Shade-tolerant species are increasing across the analysis area due to the long (greater than 100 year) fire return interval. Longer fire intervals have allowed stand biomass, ladder fuels, and downed woody fuel loadings to increase beyond what sites likely experienced historically. It’s important to emphasize the wide range of conditions in
these forest types, and extreme conditions are not unusual. These stands are more likely to experience high intensity fires with greater mortality due to high biomass, less heterogeneity, increased ladder fuels and crown bulk densities, and high down woody fuel loadings. Such densely stocked stands are also more susceptible to insect and disease problems such as root disease, dwarf mistletoe, and bark beetle mortality. The greatest change to this area has been a combination of effects from the 1910 fire, logging, and the disruption of historic fire regimes as a result of effective fire suppression efforts during the last 80 years or more. Absence of nonlethal low severity fires across the drier sites (VRU2 and VRU3) have altered insect and disease regimes due to increased stand density, and species composition favoring more shade tolerant and less disease resistant species such as Douglas-fir and grand fir. Maturing stands dominated by Douglas-fir and lodgepole pine become at risk as hosts to their respective bark beetle pests of Douglas-fir beetle or mountain pine beetle. Long fire return intervals in the moist VRUs (VRU9) have maturing stands dominated by lodgepole pine which are now enduring a mountain pine beetle infestation.

Although major harvest activities did not begin until the 1950s, the effects of timber harvest throughout the Spring Gulch Analysis area are still evident today. As shown in Table 3-10, both regeneration and intermediate harvests were utilized. Overstory trees in well-stocked stands were thinned or widely spaced to relieve competition. All harvest decades focused mainly on intermediate harvests, where the intention was to enhance growth, quality, vigor, and composition of the stand. Operations focused on commercially viable larger Douglas-fir, western larch and ponderosa pine. Following commercial thinning operations in the 1970's and 1980's stands began to show increased signs of root disease. Overall, there is a decrease in ponderosa pine and western larch cover types and increase in Douglas-fir and grand fir cover types. Current forest management practices for intermediate harvests are much different than historical practices, in that large, fire tolerant trees are targeted for retention.

<table>
<thead>
<tr>
<th>Decade of Harvest</th>
<th>System or Type Harvest</th>
<th>Acres of Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>Intermediate Harvest*</td>
<td>117</td>
</tr>
<tr>
<td>1960</td>
<td>Regeneration*</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Liberation Harvest*</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Total Decade Harvest</td>
<td>114</td>
</tr>
<tr>
<td>1970</td>
<td>Liberation Harvest</td>
<td>46</td>
</tr>
<tr>
<td>1980</td>
<td>Intermediate Harvest</td>
<td>158</td>
</tr>
<tr>
<td>All</td>
<td>Total Liberation</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Total Regeneration</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Total Commercial Thinning and Intermediate Harvest</td>
<td>275</td>
</tr>
<tr>
<td></td>
<td>Total All Harvest</td>
<td>435</td>
</tr>
</tbody>
</table>

Liberation Harvest* was primarily the removal of larger canopied trees to release younger smaller trees. Regeneration harvest* use of clearcut, seed tree, shelterwood or group selection harvest systems to initiate stand regeneration (early succession). Intermediate Harvest and Commercial Thinning* are harvests that leave the stand with a full stocking of commercial size trees.

It was common practice prior to the 1980s to harvest the older, larger trees; which was thought the best way to manage the forest. Since then understanding of ecosystems and the importance of other Forest resources such as wildlife, water, and soils have improved. The 1987 Forest Plan provides standards and guidelines for balancing the various resource values across the Forest. Additional research and publications in
subsequent decades provides the basis for current harvest practices designed to manage multiple Forest resources.

Stand structure from past regeneration harvests are different than after a natural disturbance such as wildfire. Typical post fire-disturbance conditions are large amounts of standing live and dead trees, the majority of which would eventually fall down. Regeneration would slowly capture the site under the partial shade of the standing trees while the dead trees that fall down would also damage some of the seedling/sapling trees, effectively thinning some of the trees in the stand. These conditions with high fuel loading and generally high stocking would be receptive to a high severity fire. A harvested stand will generally have far fewer standing trees, may re-forest faster than naturally due to planting, and may need thinning to prevent stagnation and favor seral species.

Past intermediate harvest reduced stand density to allow more growing space for leaf trees while favoring seral species. These actions can resemble a mixed severity fire by removing much of the small to medium size vegetation while favoring the overstory. Effects to various age classes were to maintain the stands progression towards maturity. Intermediate harvest in the 1970s and before often targeted removal of the overstory seral trees, which effectively reduced the seral component and converting stands to a more shade tolerant stand. Beginning in the late 1970s and early 1980s, emphasis was to promote seral species as understanding of forested ecosystems expanded.

**Forest Health**

The long-term health of ecosystems is linked to disturbance. Recurrence of disturbance and recovery within ecosystems is an important mechanism for energy flow, maintenance of habitat diversity, vegetative succession, canopy reduction, etc. In most sustainable forest ecosystems, insects and pathogens are the major nutrient recyclers and often are the most evident disturbance.

Major insects and diseases found within the analysis area affecting forest composition, stand structure, and fuel loads are described below. Many agents found affect species composition, but are considered within the "normal or endemic range" of a natural process.

The Northern Region 2009 forest insect and disease activity flight revealed some scattered pockets of Mountain Pine Beetle, Douglas-fir beetle, Western Spruce Budworm, and root disease in the analysis area (project file). There are a number of other active insects and diseases associated with the ecosystem; however, their occurrence is minimal and not considered as threatening to species composition or stand structure. Our consideration of forest health emphasizes prevention as opposed to suppression as a management strategy for insects, pathogens and natural disturbances that are considered detrimental to resource production. This emphasis is made with recognition of their beneficial role with regard to resources and ecosystem functions.

Observations over past years reveal the ebb and flow of these and other organisms in the Spring Gulch area. We do see that current stand attributes are setting the stage for future outbreaks given favorable weather and conditions. One example would be the mature lodgepole pine stands which originated post-1910. Lodgepole pine stands have a high number of under 9" DBH (Diameter at Breast Height) trees growing in crowded conditions, an ideal condition for mountain pine beetle outbreaks, one organism currently
on the landscape at moderate or endemic levels. Trends in insect and disease behavior will be monitored into the future.

Mountain Pine Beetle (*Dendroctonus ponderosae*) is a bark beetle that generally attacks mature and over mature stands of lodgepole pine and other pine species. Outbreaks usually develop where average tree diameters are greater than 8" DBH, average stand age is 80 years or more, and stands with extreme stocking. During major outbreaks, like those experienced on the Kootenai National Forest between 1978 to 1985, the majority of pine trees over 7" DBH are generally attacked.

The relationship between lodgepole pine and mountain pine beetle has been extensively researched and is fairly well understood. Endemic populations allow for natural thinning of lodgepole pine stands, resulting in large expanses of mortality. Lodgepole pine surviving large infestations continued to grow until another beetle infestation occurred. This cycle continued on a 20- to 40-year interval, depending on the size and growth of trees, until lodgepole pine was eventually eliminated (Amman, 1977). When infestations occurred in these lodgepole pine areas, heavy fuel accumulations resulted. Since the most significant fuel component in these lodgepole pine forests is dead, woody material (Lotan, Brown and Neuenschwander, 1984), heavy fuel accumulations resulted in very hot fires spreading over large areas (Amman, 1977). Stand development, vegetation mortality, fuel accumulations, and fire interacted dynamically in lodgepole pine forests. Large amounts of jack-strawed fuel created from beetle epidemics often resulted in large, extensive fires (Lotan, 1985).

Douglas-fir Bark Beetle (*Dendroctonus pseudotsugae*) is a bark beetle that generally attacks large diameter, mature and over mature Douglas-fir in dense stands. Characteristics of an outbreak are: stands with a component of Douglas-fir greater than 14" DBH; over 100 years old; and overstocked (greater than 140-150 basal area). Conditions that contribute to Douglas-fir bark beetle epidemics are any that weaken the tree and make it more susceptible to attack such as fire, windthrow, and root disease. Attacks are most successful on trees that are mature or over-mature, largest in diameter, and found in more densely stocked stands. A very high stand density may increase the susceptibility of younger and smaller diameter trees (Gibson and Schmitz, 1999). Epidemic prevention is almost always more easily and economically achieved than suppression. Salvage of downed or damaged trees should occur before they are infested, or before beetles emerge from material that has been attacked (USFS 1999).

Occurrence of Douglas-fir beetle on the Kootenai National Forest has been recorded since about 1950. The recent outbreak slowly dissipated and beetle populations are endemic now, although surrounding forests are still reporting beetle populations. Current Douglas-fir beetle numbers are at endemic levels and the near normal precipitation levels for the past 2 years is presumed to be a factor. Douglas-fir Beetle infestations are expected to increase with the predicted climate change. Though numbers are now endemic, it should be noted that a large portion of the Spring Gulch analysis area is composed of Douglas-fir that is of age, and size to move into a moderate level of risk.

Western Spruce Budworm (*Choristoneura occidentalis*) is a defoliator that prefers true fir, Douglas-fir, spruce and larch foliage. The larvae mine the buds and old needles in the spring, and then consume new needles as they emerge. After several years of heavy defoliation, branch dieback, and top kill tree mortality can occur (USDA 2003). Mortality
is rare for overstory trees as the larvae’s defense against predators (birds) is to drop out of the tree via a silk thread to the lower canopy or understory trees. If mortality occurs, it is more common in these understory trees. According to the Forest Health Protection Annual Aerial Detection Survey of 2009, approximately 6,500 acres in and around the analysis area are infested with western spruce budworm. Although some understory tree mortality has been observed, little overstory trees have died. The 2008 Kootenai National Forest bark beetle conditions report (USDA, 2009) revealed western spruce budworm-defoliated stands on almost 35,000 acres. Stand conditions that are conducive to the budworm are high density, multi-layered canopies of desired species – a common characteristic in this area. Discussions with regional entomologists indicate that this outbreak could relate to delayed effects of drought in the mid part of this decade, and that a return to normal moisture level may likely help the budworm population to subside.

Dwarf mistletoe (Arceuthobium sp.) is an endemic parasitic plant that depends on a host species (primarily western larch, Douglas-fir and lodgepole pine in this area) for water, carbohydrates and minerals. Effects on the host tree are: reduced height and diameter growth, weakened trees, decreased cone and seed production, and top kill which can lead to mortality. The typical lateral spread within the tree is 1-2 feet per year and seed spread is up to 100 feet from an infected tree. On-the-ground observations show that dwarf mistletoe is moderate in the western larch and as an occasional infection of Douglas-fir and lodgepole pine in the analysis area. Though present in western larch throughout the area, it is not affecting every stand.

Root Diseases Of all the forest insect and disease agents, root diseases are a special concern. Root diseases are considered a site pathogen which cannot be eradicated. The best management strategy for the future on such sites focuses on retention or establishment of those species most resilient to the diseases. An intermediate harvest can minimize the impacts of root disease if less than one third the basal area in Douglas-fir and grand fir is retained. If stands are largely stocked with Douglas-fir and grand fir then regeneration may be more suitable or desirable.

Diseases of concern are Armillaria spp, Phellinus weirii, Fomes annosus, and Phaeolus schweinitzii. Root disease decays and kills cambium in roots and root collars, causing mortality in groups or scattered individual trees. Douglas-fir and grand fir are primary hosts for Phellinus weirii and Armillaria spp (McDonald, 1991; Hagle, 2010). Armillaria (Armillaria spp.) is the most common and widely distributed root pathogen in the analysis area as well as the Northern Region.

There is evidence of root disease infection in many of the proposed units, which is reflective of the ubiquitous nature of these pathogens. Seventy-eight percent of the analysis area is Douglas-fir and Douglas-fir dominated mixed conifer cover types. Approximately 10% of the analysis acres exhibit some level of root disease based on aerial photo interpretation. On site reviews suggest that root disease is more prevalent than the aerial observations suggest, impacting all stands dominated by Douglas-fir and grand fir. Root disease damages have a strong tendency to increase with decreased site productivity as root diseases are largely dependent on habitat types, site productivity, and stand history (McDonald et al.,1987).
Climate Change
Disruption of natural fire cycles and the associated reduction of stand density and tolerant conifer species have likely contributed to increased incidence of insects and disease across the landscape. Combined with the predicted climate change, this disruption may contribute to an acceleration of the insect and disease infestations. Warming climatic conditions appear to be accelerating seasonal insect growth and development (Logan, 2003). Northern and high-elevation species are expected to experience greater effects than southern or low elevation ones. The majority of research on the climate change effects on forest insect pests indicates that insect attacks will intensify in severity, frequency, and size (acreage) (Logan, 2003). Results are logical because stressed trees are more likely to succumb to insect and disease attacks, and climate change will likely stress a portion of the current forest. Current research on mountain pine beetle, gypsy moth, spruce beetle, and spruce budworm confirm this prediction.

Environmental Consequences
This section will summarize the changes in species composition, stand structure and forest successional conditions that are likely to occur as the result of implementing the alternatives described in Chapter 2. Successional conditions predicted represent the most logical pathways given the existing stand conditions within the analysis area. Where the effects of the proposed treatments are very similar, disclosures are combined. These potential effects include direct, indirect, and cumulative effects, in full compliance with the National Environmental Policy Act (NEPA) and related law, regulation and policy. Also addressed are the effects to management from any proposed road decommissioning, storage as well as road development. This section will display how each alternative addresses the purpose and need of the project and the major issues identified.

The basis for this project is the stand-specific silvicultural diagnosis and field review of the areas proposed for treatment. Existing stand conditions and proposed treatment options were site-specifically identified and reviewed. Additional information can be found in the stand summaries and stand diagnosis records in the project files.

Removal of vegetation during harvest and fuel treatments is considered under the action alternatives. These effects and the resulting change in vegetation will vary with the timing, size, number, and spatial arrangement of harvest units and associated road systems. Effects of the action alternative will be different from those expected to occur under a no action alternative.

Changes to vegetation from the proposed treatments have many direct and indirect effects on other resources. Specific resources affected would include wildlife, scenery, soils, water and fish, recreation, and fire. Detailed effects on these individual resources are disclosed in the respective sections in this chapter.
EFFECTS BY ALTERNATIVE

ALTERNATIVE 1 – NO ACTION
Direct and Indirect Effects

No activities would take place with this alternative. Only natural processes and fire suppression would occur, affecting the forest succession and health. Age classes and species composition would continue to trend away from reference conditions. Conditions in untreated stands would change over time with continued mortality, declining growth, and increasing wood decay as a result of insect mortality. In many areas shade-intolerant species will be replaced by shade-tolerant species that are more prone to insects and disease and less fire-adapted. The no action alternative would not contribute to the purpose and need of; limiting forest and tree damage occurring from insects and diseases, reducing hazardous fuels within the WUI, and contributing forest products to the local and regional economy.

Fire Ecology and Forest Health
With continued fire suppression and lack of prescribed fire, the understory trees would continue to develop, reaching into the general canopy as well as expand in scope. This, in addition to continued encroachment of fire intolerant species, would potentially increase fire severity. Quality and quantity of wildlife forage would continue to decline as increased tree densities shade out forbes, grasses, and shrubs. It is important to clarify that not all fires are extinguished or actively suppressed. Some fires are monitored, managed, and allowed to burn depending on wildfire conditions.

The mature overstocked stands of lodgepole currently impacted by bark beetles would not be treated in this alternative and options to recover economic value and increase species diversity would be deferred. Douglas-fir and grand fir would continue to mature and succumb to root disease as stands would not be considered for treatments to enhance non-host species. Western spruce budworm would likely remain as an endemic insect in the project area. Defoliation of understory trees would continue, but little mortality is expected in the overstory of most stands. Stands with dwarf mistletoe would not be entered for restoration. Overstocked pole stands would not benefit from stocking control and future management options would be reduced, as poor quality and excess trees are not removed and shade intolerant species continue to be impacted by high stand densities.

Ecological integrity of the open dry slopes would continue to decline without prescribed fire to minimize encroachment by shade tolerant species and rejuvenate grass and forb species. As a result the dry open slopes would continue to decline in forage, browse, and hiding cover.

Forest Structure and Succession
The description of successional pathways outlines stand development that would ordinarily follow natural disturbance processes that include wildfire, insect and disease impacts, wind events, etc. Mosaic and patchy conditions are recognized within the descriptions that represent variation in species composition, forest type, and stocking levels. Assuming that traditional fire suppression would continue, the successional development described for the No Action Alternative would be inconsistent with ecological processes and may not create long-term, sustainable forest conditions. A
comparison of historical and existing distribution (Table 3-13) shows structure distribution by age class. Under the No Action alternative, trends would continue as described previously under the existing conditions section.

**Moderately Warm/Dry and Moderately Warm/Moderately Dry Habitat (VRU2S and VRU3):** These forest settings historically experienced frequent, low intensity and mixed severity fires as a predominant natural disturbance. It is known that disturbance drives the development of forest structure; there are noticeable trends which can influence ecosystem health and landscape patterns. Without disturbance to open the stands, ponderosa pine and western larch would remain as scattered individuals or very small groups. Douglas-fir and grand fir will continue to establish, trending the stands away from a more open condition that better suits reintroduction of fire as an ecosystem process. Without fire or associated management action that disturb portions of the landscape, the extent and intensity of insects and pathogens will undoubtedly increase and result in a less resilient forest composition. These consequences may lead to a reduction in site quality and continued shift in species composition.

As these conditions border private lands and inventoried roadless areas, the importance of assessing the risks of no action alternative becomes more relevant. A no action decision would prevent the reintroduction of fire as a natural process onto the landscape resulting in more continuous forest patches with increased densities and ladder fuels. Coupled with continued fire exclusion, a no action decision would also increase the numbers of wildlife snags due to continued natural decadence. However, since most of these snags would be Douglas-fir, as opposed to ponderosa pine or western larch, which are preferred for their longevity and suitability, this snag benefit is short term.

**Moderately Warm/Moderately Cool (VRU4S):** In comparison with many of the other habitat settings, the no action alternative and continued fire exclusion in many moist landscapes is less significant in the short term, due to the inherently long fire-free intervals. Moist sites found in VRU4S are characterized as having moderate frequency mixed severity fires (Table 3-13). In time, it is expected that no action alternative and continued fire suppression of ecologically important mixed severity fires would eventually promote larger stand-replacing fires than typical, particularly as forest homogeneity increases and higher stand densities persist. This is particularly true in the many stands dominated by mature, dead or high risk lodgepole pine.

Current levels of root disease are endemic within the project area; however with declining growth and vigor and increased numbers of susceptible species impacts from root disease are expected to increase. These impacts, often resulting in tree mortality, would create small openings due to losses of individual and small groups of medium and large trees throughout the project area. Due to the relative small size of these openings, they would further regenerate with shade-tolerant species, which in turn are susceptible to root disease.

The no action alternative would limit the opportunity to restore impacted areas to a fire-adapted species composition with greater resiliency to root disease, bark beetle and western spruce budworm. In the near future, the stands at risk will likely be those currently in overstocked conditions where tree vigor is typically low. As a result, overall landscape diversity could be reduced for some time due to less age class diversity and more fuels continuity.
Cool and Moderately Dry Habitat (VRU 9): VRU9 comprises mostly of even aged lodgepole with western larch and subalpine fir also present in significant numbers (Table 3-9). As demonstrated by the 1910 fire, mixed severity and lethal fires were the predominant disturbance regularly interrupting succession and perpetuating the presence of lodgepole pine.

The no action alternative will allow shifts in vegetative patterns, increased fuel loadings, and changes in species composition. Lodgepole pine stands would continue to experience considerable mountain pine beetle-caused mortality as mature trees are an optimum food source for the pine beetle (Björklund and Lindgren, 2009). Where management objectives do not include the maintenance of stand vigor, conditions that are very conducive to pine beetle outbreaks are a general result. This condition will greatly increase the probability of a stand replacement fire, as fuel loadings would be significant. Between significant fire events, lodgepole pine would be replaced by western larch and subalpine fir. Douglas-fir will occasionally fill some low elevation sites. With time, surviving lodgepole pine increase in growth and become susceptible again to mountain pine beetle attack. It would not be uncommon for the risk of reburn to be high during early successional stand development due to the amount of available fuels.

Cumulative Effects
Past, present, proposed, and reasonably foreseeable activities were reviewed to determine cumulative effects to forest vegetation. Effects of past management would not be increased under this alternative. Stands would remain unmanaged, forest conditions would change over time, with continued mortality, declining growth and wood decay as a result of insect and disease mortality in high-risk stands. For shade tolerant, climax species, such as grand fir and western hemlock this condition would create available growing space and increased growth. In many areas this change would continue a trend whereby shade-tolerant species, that are more prone to insects and disease and are less fire-adapted, replace shade-intolerant species that have adapted to the influences of fire and are generally less susceptible to insects and diseases.

No action alternative foregoes the opportunity to increase the proportion of root disease tolerant species such as western larch, ponderosa pine, and western white pine that are currently minimal on the landscape. Without active stand management, fire exclusion will likely result in an increase of pathogen and insect activity in the dry and transitional forests (Harvey et al, 1994). Root disease areas will continue to increase as will the presence of shade tolerant, less disease resistant trees. Bark beetles, would at first likely remain endemic, but later the effects of slash build up, and increased competition and stress, as well as increasing age and diameters of species to become of higher risk would later increase beetle activities. Accumulation of fuels from existing and expected deadfall would likely increase the intensity of a fire in the future. Deferring the opportunity to thin previously harvested stands may, in the long term, compromise habitat diversity, tree health and vigor.

Forest Plan Consistency
A decision to forego silvicultural treatment would neither contribute to the sustainability of the forests within the project area, nor meet the purpose and need of this project. High stand densities of fire intolerant species and increasing ladder fuels have some potential negative considerations. Without fuel abatement through harvest, excessive natural fuels accumulate and would likely lead to higher long-term fire suppression costs. Without prescribed fire, the Forest Plan goal of simulating natural ecological processes, creating
chapter 3

habitat diversity for wildlife, and maintaining ecosystems would not be realized. Additionally, the maintenance of diverse age classes would be limited to that which presently exists. The No Action alternative would not acknowledge direction from 16 USC 1604 (g)(3)(B) which requires forest planning to provide for diversity of plant and animal communities and tree species consistent with the overall multiple use objectives of the planning area.

A loss in economic value would occur as dead and diseased ponderosa pine, western larch, Douglas-fir, grand fir, and lodgepole pine deteriorate. Without stand improvement activities or high-risk host tree species removal, additional mortality from insects and disease is likely to occur. The no action alternative would not trend the existing forest conditions towards the desired conditions identified in the purpose and need statement. Stand productivity would be below optimum following a natural successional pattern. Shade tolerant species ingrowth would continue and reduce the option to manage for seral, fire-adapted species. Restoration of white pine would not occur. Future use of fire would be limited due to high fuel loading, ladder fuels weather conditions necessary to carry fire under full canopy closures.

ALTERNATIVE 2

Carbon Flux
The action alternative, alternative 2, would remove carbon stored in treatment area biomass through timber harvest and fuel reduction activities, including prescribed burning. A portion of the carbon removed would remain stored for a period of time in wood products (USEPA 2009, Depro et al 2008). As the stands continue to develop, the strength of the carbon sink in the stand would increase until peaking at an intermediate age and then gradually decline but remain positive (Pregitzer and Euskirchen 2004). Carbon stocks would continue to accumulate, although at a declining rate, until impacted by future disturbances. The short-term change in carbon stocks and sequestration rates resulting from the proposed action are minute on global and national scales, as are the potential long-term benefits. Management actions, such as those proposed with this project, that maintain the vigor and long-term productivity of forests, reduce the likelihood of high severity fires and insect outbreaks, and store carbon in harvested wood products, increase the capacity of the forest to sequester carbon in the long-term. Even though some management actions may initially reduce total carbon stored below current levels, they improve the overall capacity of the forest to sequester carbon in the future, while also contributing other multiple-use goods and services.

Direct and Indirect Effects
Harvest Effects on Forest Health
The proposed alternative would improve forest health by treated acres listed in table 3-12. Proposed activities would meet the project’s purpose and needs of: limiting forest and tree damage occurring from insects and diseases to specific timber stands, and provide wood fiber to support the local and regional economies.
Where forest conditions are outside historic range of variability, concerns for forest health, species viability, ecosystem integrity and sustainability are addressed by improving species and structural diversity in a variety of forest settings. Even-aged stands dominated by mature Douglas-fir or lodgepole pine with moderate to high levels of insects or disease would be harvested. Following harvest, species diversity planting would provide an opportunity to increase the amount and distribution of fire-adapted and root disease tolerant species (i.e. western larch, western white pine, and ponderosa pine). Some natural regeneration would occur in the upper elevations dominated by lodgepole pine. These treatments would contribute to the overall goal of maintaining historic vegetative patterns through retention of most larger, overstory trees, especially western larch, ponderosa pine, and healthy western white pine.

Intermediate harvest treatments, slashing and prescribed burning as designed, would not convert the current age class to another age class, but accelerate development of more mature stand characteristics. Proposed regeneration harvests would initiate age class changes by converting treatment areas from a mature developmental stage to a seedling stage with reserve overstory; essentially re-setting the successional clock. Regeneration harvests are located in areas with declining health and vigor conditions, where thinning would not benefit stand condition or composition. Openings created by harvest would be reforested through a mix of conifer planting and monitoring of natural regeneration. Following any proposed burning, browse would be rejuvenated and expand in coverage and nutritional value. Certainly, challenges and unplanned results are part of any project with complex objectives in a natural environment. Monitoring and adaptive management is an important part of restoring functioning ecosystems.

Additionally, silvicultural treatments are expected to improve forest conditions that have resulted from the interruption of a natural fire cycle. Other areas will be managed to reduce stand density, improve tree growth, and promote a more open stand structure that is conducive to the potential, future use of prescribed fire. These stands are generally located in key wildlife winter range areas that historically have relied upon disturbance to maintain habitat functions and specific forest structure.

**Harvest Effects on Forest Structure and Succession**

As a result of past fires, the analysis area has large areas dominated by stands of even-aged Douglas-fir. Higher stocking increases environmental stress on trees; both diameter and height growth decreases, accompanied by a gradual decline in tree vigor. Stresses such as these gradually increase a trees susceptibility to disease and insect attack. Stands dominated by lodgepole pine would remain vulnerable to mountain pine beetle and fire, whereas stands dominated by Douglas-fir will slowly succumb to root disease. In the absence of fire or other disturbance, these stands will succeed to more shade tolerant species, and continue to sustain high fuel loadings.
Regeneration harvest would reset the successional clock. Most regeneration harvest occurs in stands with declining health conditions, generally poor growth, loss of seral species, undesirable forest structural trends and demonstrates a need for restoration. Openings would be reforested through a mix of planting and natural regeneration. This new recruitment would help trend the forest age structure toward the distribution of historical reference by redistributing 94 acres to younger age classes. In areas planned for underburning browse is expected to increase in nutritional value for the first several years.

Exposing bare soil through burning or other means is fundamental for natural regeneration of seral species such as ponderosa pine, western larch, and lodgepole pine. While natural seeding is expected in regenerated areas, the timing, distribution and species is not assured. On moderately warm and dry sites (VRU2) through the moderately warm and moist sites (VRU4) ponderosa pine, western larch, and western white pine would be planted the year following harvest and/or fuels treatment where adequate natural regeneration is not expected to occur within desired timeframes. Post-harvest monitoring exams would provide feedback on whether or not planned artificial reforestation is needed to the extent prescribed, and whether planned natural regeneration would be successful.

In regenerated areas, plants associated with early successional stages would be reestablished in response to day-lighting, decreased competition, and site preparation. Anticipated understory species on the warm, moist sites include Sitka alder, redstem ceanothus, shinyleaf ceanothus, sticky currant, fireweed, bracken fern, aspen, serviceberry, thimbleberry, bunchberry dogwood, rocky mountain maple and Scouler willow. From a wildlife standpoint, functional hiding cover occurs anywhere from five to fifteen years following harvest and establishment of vegetation.

Intermediate harvest would retain desirable species within the limits of the existing stand characteristics. These treatments would increase the relative proportion of early seral tree species (western larch, ponderosa pine, and western white pine) and decrease the proportion of Douglas-fir, grand fir, and lodgepole pine across the 162 acres treated. This species composition would closely mimic historic stand conditions, based on our understanding of regional forest ecology. Tree vigor of residual ponderosa pine, western larch, and other desirable species would be maintained or increased through intermediate harvest. Harvest would also allow development of mature and over-mature characteristics as the residual stand changes over time.

Burning is proposed in the action alternative as a means to restore and maintain ecosystem processes across 231 acres. Stands currently dominated by shrubs, grasses and/or forbs with a few scattered large trees would be maintained in this structural stage by killing encroaching trees in the smaller size classes and rejuvenating new growth that is beneficial as browse to wildlife. Other stands are denser yet underburning would provide for the growth of shrubs, grasses and forbs. Underburning may also provide a seed bed for regeneration and establishment of some early seral tree species. Non-forested shrub/grasslands and open-canopy ponderosa pine/Douglas-fir stands are important elements in the ecosystem that are currently below the reference levels. Areas such as the wildland-urban interface would have the understory saplings removed, retaining the large diameter overstory. This is designed to reduce ladder fuels and promote maintenance of the older age class. Felled saplings will be limbed, lopped and
scattered to reduce fuel concentrations and depth while increasing the rate at which this material decomposes on the site. Retention of the overstory post underburn is increased with such treatments, which also promotes sprouting of browse species for wildlife benefit.

**Harvest Effects on Reserve Trees**

All harvest prescriptions emphasize development and retention of trees to function as big game hiding cover, seed reservoirs, and future down woody debris, forest structure, relic overstory and future snag recruitment. Specific number and distribution of trees would vary with existing species composition, logging system, safety considerations, and site-specific resource objectives. Generally a minimum of 4-12 trees per acres (tpa) would be left in regeneration harvests with considerably more (50 to 100 tpa) in improvement harvests. In addition to providing long-term vertical diversity, these efforts would benefit snag-dependent wildlife species and associated interior habitat dwellers that require security in the form of cover.

Monitoring of past logging projects indicates that the amount of damage to residual trees varies upon the number and distribution of the reserve trees, topography, species selection, logging system, and operator. Some reserve trees are expected to die or blow down, providing additional snag and down woody debris recruitment. While this does occur naturally, management activities can increase this risk within and adjacent to treatment areas. The wind throw hazard on predominant landtypes within proposed treatment areas is low to moderate.

All harvest units would retain recommended (Graham, 1994) levels of downed woody material to provide habitat for small mammals, invertebrates, and enhance soil productivity. The volume and distribution of material will be specified in the silvicultural prescription and incorporated into the timber sale contract.

The effect on the stands not selected for treatment in the action alternative would be the same as in Alternative 1.

**Effects of Road Construction on Forest Vegetation and Management**

Approximately nine miles of existing road would be brought up to Best Management Practices (BMP) standards through road reconstruction/reconditioning. All miles are needed to access proposed harvest units.

**Effects of Road Closures on Forest Vegetation and Management**

Following all post treatment activities, access to closed roads proposed for use would be controlled post treatment by a berm and put into stored service. These closure devices allow for motorized access sometime in the future, which may help fire suppression and stand-tending operations such as pre-commercial thinning.

**Cumulative Effects**

**Past Actions and their Effect on Current Conditions**

Historically, fire has been an important factor in maintaining or enhancing seral species across the analysis area, reducing tree competition, regenerating lodgepole pine stands, and nutrient cycling. The fire of 1910 consumed the entire analysis area, initiating vast acres of even aged forest structure, namely Douglas-fir with some lodgepole pine and western larch. Since 1910, natural disturbances have been replaced by fire suppression, which has been most effective in extinguishing low to mixed severity fires. The loss of
these fires has resulted in increased tree canopy layers, higher surface and ladder fuels, and more shade intolerant species.

Harvest entries in the analysis area generally began after 1950, with intermediate harvest the preferred method of treatment. Road construction and associated removal of larger diameter trees resulted. The 1950’s Spring Gulch Clearcut resulted in 58 acres of mixed conifer pole age class timber. Artificial (planting) and natural regeneration were used to increase the abundance of seral species, which are better adapted to fire, insects and diseases, and under represented on the landscape. Species composition within this stand is more in-line with reference condition.

Significant intermediate harvest decades occurred between 1950 and 1990. Tree removal was focused on salvage of dead or dying trees, and/or thinning to emphasize a specific species composition, promote tree growth, vigor, and yield. To date approximately 55% of the analysis area has been previously harvested, 7% via regeneration harvest systems and 47% via intermediate systems.

**Contrasting Effects of Proposed Actions with Past Actions**

With the Spring Gulch Timber Sale silvicultural treatments are expected to improve forest conditions that have resulted from stand replacing fire of 1910 and subsequent intermediate harvests and fire suppression efforts. As compared with harvest activities that occurred prior to the past decade, the project emphasizes improving forest health by reducing stand densities, increasing age class diversity in lodgepole pine dominated stands, and improving forage production for big game animals. Where specific concerns occur, units would be harvest in winter to protect soils and leave trees.

Even-aged stands, with a significant component of uniform mature Douglas-fir and increased fuel loadings would be replaced as would stands of moderate to high levels of insects and disease. Treatments are designed to allow artificial regeneration of tolerant species within Douglas-fir dominated stands currently infected with root disease, natural regeneration within stands dominated by lodgepole pine currently infested with mountain pine beetle, and intermediate harvest within stands were densities are negatively impacting growth and yield.

Silvicultural treatments such as these would contribute to the overall goal of maintaining historic vegetation patterns through promoting mature and over-mature age classes by retaining larger diameter seral species and increasing proportions of early successional stands through regeneration harvest.

Unlike past actions, which responded primarily to individual stand treatment needs, proposed activities are a reflection of landscape-level strategies. This effort is directed at trending stand conditions towards a more sustainable and resilient level.

**Effects of Ongoing and Reasonably Foreseeable Actions**

Greater than 75% of the analysis area is composed of even-aged mature Douglas-fir that is vulnerable to insects and disease, specifically root disease. Bark beetles would likely remain endemic in areas at first, but would later increase as the effects of slash build up, increased competition, age, and size would increase stress on the stands. Lodgepole pine stands are also vulnerable to increased attacks by insects, primarily
Vegetation

mountain pine beetle. The current infestation is not expected to subside until the majority of the lodgepole pine over 8” DBH has been infested. Regeneration harvest would reduce acres of susceptible Douglas-fir and lodgepole pine, and thinning should provide improvement of general vigor in the long run. Some units with underburn treatments may experience a short term rise in Douglas-fir beetle populations due to environmental stress from release and added stress related to underburning. Generally, trees greater than 12 inches at DBH have a higher probability of surviving prescribed fire, but the best success is in trees greater than 15 DBH. Stands currently infested with root disease may surpass a 10% loss of residual trees if they are under-burned.

Root disease will remain endemic within untreated areas. In treated areas fewer trees would be exposed to infection from surrounding resident populations of root disease. Regeneration harvest units may exceed the 10% loss if stress conditions, such as logging and fuel treatments, affect the residual trees. As the stands recover from stress, the risk in intermediate harvested stands can be initially higher than untreated stands. With respect to root disease, intermediate harvest would occur with opportunities to thin the stands while retaining a larger component of root disease tolerant species, such as western larch, ponderosa pine, or western white pine. Research has shown that intermediate harvest does not improve the survival or increase the volume of Douglas-fir, even if the most vigorous trees are retained (Hagle, 2009). Two sets of permanent plots for monitoring the effects of commercial thinning have been monitored for a number of years in the Northern Region. In one set of plots monitored for 22 years (Byler and others, in preparation), the volume of Douglas-fir decreased by 25% in the control plots and 31% in the thinned plots and the 10-year mortality rate for Douglas-fir was 30% in the control plots and 35% in the thinned plots. Grand fir was also affected in this same study. In the short term, grand fir had a low mortality rate for the first 15 years, and then the rate nearly doubled between 15 and 22 years. This same trend is reflected in the change in volume. Grand fir volume increased in the first 15 years, and then declined rapidly, ending up with a net volume loss 22 years after thinning. Grand fir appears to respond positively to thinning in the short term, but the mortality eventually becomes comparable to that found in Douglas-fir. In the second set of plots (Hagle, 2006), the volume of Douglas-fir decreased by 36% in the control plots and 33% in the thinned plots. Although these two rates are not that different, it’s still important to point out that thinning did not increase the volume of Douglas-fir like you would expect in the absence of root disease. In this same set of plots, the mortality rates for grand fir in the thinned plots were higher than in the un-thinned plots. These results vary, but it can be stated unequivocally that thinning did not improve the survival of remaining Douglas-fir or grand fir.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions:
Regeneration harvest as proposed would overlap with previous actions due to their extent, placement of treatments on the landscape, and the vegetative and functional recovery of past harvest units. Regeneration harvest would increase the seedling age class (1-40 year) by the 94 acres, or 16%. Following implementation of proposed regeneration harvest, stand-level improvement in overall seral species sustainability is expected. By treating existing fuels and trending these specific stands towards greater species, age class and structural diversity, incremental improvement in resiliency is expected.
The proposed action would increase the level of intermediate harvest in the project area by 29%, or 166 acres. By design, the proposed intermediate treatments are expected to make an incremental contribution towards maintaining the desired seral species composition, creating conditions more typical of a mixed severity fire regime, and trending towards a more open stand structure with improved growth potential. Unlike regeneration harvest, proposed intermediate harvests would not change the age class distribution, although the average tree diameter does increase in treated stands. The silvicultural prescriptions prepared prior to implementation provide details of the target stand conditions and unit-specific treatment methodology.

Regulatory Consistency

Consistency with the Regulatory Framework
All proposed treatments are consistent with the Forest Plan standards (USDA, 1987) for timber management and meet or exceed the standards and guidelines for vegetative management. Forest Plan direction provides that timber management activities would be the primary process used to minimize the hazards of insects and diseases and would be accomplished by maintaining stand vigor and diversity of plant communities and tree species.

Consistency with the National Forest Management Act
The National Forest Management Act and the implementing regulations require specific findings to be made when implementing the Forest Plan (16 USC 1600 ET SEQ). Those findings include the following:

*Suitability for timber production:* No timber harvest, other than salvage sales or sales to protect other multiple-use values, shall occur on lands not suited for timber production {16 USC 1604(k)}. This proposal includes timber harvest on MA-5, MA-10, and MA-18 which are not considered part of the suitable land base (area treated by alternatives are displayed in Chapter 2). However, for this project timber would not be harvested in this MA for production purposes, but rather to meet goals set forth in the 1987 KNF Forest Plan.

Harvest units proposed have been reviewed by a silviculture forester and determined that they are located on suitable lands and capable of being regenerated within five years of timber harvest.

*Clearcutting and even-aged management* (16 USC 1604(g)(3)(F)(i)): The Kootenai National Forest Plan direction favors use of even-aged silvicultural systems with the Management Areas proposed for harvest in this assessment. The ID Team has determined that prescribing even-aged systems on specified units is optimal in order to increase representation of desirable, fire and insect/disease-resistant species in areas where current stand attributes limit options. Some stands proposed for regeneration harvest are lodgepole pine dominated stands with moderate mortality, due to the current and ongoing mountain pine beetle attacks. Other stands proposed for regeneration harvest currently have moderate to high incidence of root disease. The best way to increase representation of desirable species in either of these instances is to create growing conditions conducive to establishment and growth; exposed seed bed, more sunlight, and less competition for nutrients and water from other trees, brush and
Vegetation

herbaceous growth. Current insect and disease conditions in the proposed treatment units justify the need to treat these areas now. The decision path for this rationale is displayed in the silvicultural diagnoses in the project file.

Most of the target stands for regeneration harvest units would result in two-storied stands, yet would be considered even-aged under accepted silvicultural terminology (SAF). In order to meet the purpose and need of the project, shelterwood with reserves prescriptions would be utilized. No clear cutting is proposed for this project. The decision path for this rationale is displayed in project file. Further information on proposed silvicultural treatments is described in Chapter 2.

Vegetative Manipulation: The National Forest Management Act provides that timber harvest and other silvicultural practices shall be used to prevent damaging population increases of forest pest organisms and treatments shall not make stands susceptible to pest-caused damage levels inconsistent with management objectives. Harvest of trees provides social and economic benefit, reduces potential losses attributed to insects and diseases, and manipulates forest vegetation to enhance wildlife habitat and/or meet associate objectives. Silvicultural prescriptions which direct the vegetative management process are designed to meet Forest Plan goals, objectives, and guidelines for forest productivity, visual quality objectives, and wildlife habitat improvement while achieving ecosystem-based management.

Improvement and regeneration harvests are proposed to break-up crown continuity and reduce canopy bulk density to lower the risk of crown fire, to improve tree vigor of the desired leave trees particularly long-lived fire adapted species such as western larch, ponderosa pine and Douglas-fir as well as maintain or enhance plant diversity. NFMA provides for these treatments where they increase the growth rate of residual trees, favor commercially valuable species, favor species valuable to wildlife, or achieve some other multiple use objectives.

Regeneration Potential: The National Forest Management Act specifies that "timber would be harvested from National Forest system lands only where there is assurance that such lands can be adequately stocked within five years after final harvest" (16 USC 1604). Determination of adequate stocking is based on reforestation surveys conducted within a five-year period following harvest or site preparation and planting. Results of these stocking surveys are compared with the desired and minimum levels identified in a site-specific silvicultural prescription written for each treatment area. Restocking is considered satisfactory when the harvest area contains the minimum number, distribution, and species composition of vegetation specified.

Proposed regeneration harvests are used to rehabilitate affected areas and move them towards the desired future conditions. These harvest openings would be planted or seeded naturally to create a diverse vegetation community. All harvest units are deemed to be restockable within five years of final harvest. There are no regeneration issues that would preclude successful reforestation either through planting or natural regeneration.

The FACTS database was used to summarize reforestation survey records on the district. All regeneration harvests from 1976 to 2005 were analyzed. Regeneration harvests since 2005 are not required to be restocked until five years post-harvest. Results show that 92% have been satisfactorily stocked within 5 years and 95% are progressing or certified stocked. Poor performance was typically due to poor soils, delay
in planting, or drought like conditions. This information demonstrates assurance that the proposed regeneration harvests can be adequately restocked within the required timeframe.

**Consistency with Forest Plan**

All proposed treatments in all action alternatives are consistent with Forest Plan (USDA, 1987) standards for timber management, and meet or exceed the standards and guidelines for vegetative management. Forest Plan direction provides that timber management activities would be the primary process used to minimize the hazards of insects and diseases and would be accomplished by maintaining stand vigor and diversity of plant communities and tree species, as described below and elsewhere in this analysis.

**Insect and Disease:** The Forest Plan identifies a goal of controlling insects and disease to historic endemic levels (Volume 1, pp. II-4). High stocking levels currently in a number of stands would result in an increased vulnerability to an array of insect and disease agents. The proposed action is consistent with the goal of reducing this risk. Treatments will be used to effectively treat stands with high stand densities, therefore increased resilience or resistance to these agents and lowering the severity of fire effects within the stand. Retention of ponderosa pine, western larch, and western white pine, all fire adapted species relatively resistant to an array of common root diseases and mountain pine beetle would be favored.

**Management Areas Unsuitable for Timber Harvest:** The proposed action includes units where proposed timber harvest is in a Management Area designated as Unsuitable for Timber Harvest. Some lands are identified in the Forest Plan as not suitable for timber production due to either (1) assignment to other resource uses, (2) to meet Forest Plan objectives and management requirements, or (3) not being cost effective in meeting Forest Plan objectives over the planning horizon of the Plan. Timber standards for MAs 5, 10, and 18 state, “Harvest is permitted to maintain or enhance the view, for wildlife habitat improvement, or to minimize the spread of insects or disease to adjacent MA’s”, “harvest may occur for wildlife habitat maintenance or enhancement”, and “salvage harvest may occur to prevent the spread of insects or disease to adjacent MAs and regeneration harvests may occur to test techniques for establishing regeneration”, respectively (Vol. 1, pp. III-14, III-39, and III-80).

MA-5 (182 acres): Harvest is designed to limit damage occurring from insect and diseases while meeting visual quality objectives (VQO) and complying with the standards set forth in the Forest Plan.

MA-10 (21 acres): Harvest is designed to meet specific wildlife habitat enhancement objectives, in full compliance with these standards, as proposed harvesting is designed specifically to meet wildlife habitat improvement objectives.

MA-18 (76 acres) is considered difficult to establish regeneration after timber harvest. Although regeneration harvest is not planned within MA-18, improvement harvests are. These harvests are to prevent the spread of insects and disease to the adjacent MA’s.
<table>
<thead>
<tr>
<th>VRU</th>
<th>Climatic Modifier</th>
<th>Predominant Fire Lethal Regime</th>
<th>Historic Patch Size</th>
<th>Species Composition</th>
<th>Historic Forest Structure</th>
<th>Coarse Woody Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>2S</td>
<td>Moderately Warm and Dry</td>
<td>Non-lethal, low severity 15-45 yr. FRI</td>
<td>Variable size small openings (0-5 ac), within 20-200 ac patches created by mixed and lethal</td>
<td>PP/DF dry lower elevations</td>
<td>Diverse mix, open stand well spaced trees (15-30 TPA) interspersed with larger openings and dense patches, multi-aged and 1-2 stories. North slopes more even-aged and single storied with some variety in size/age</td>
<td>5-9 tons/ac PSME/PHM A 12-25</td>
</tr>
<tr>
<td>3</td>
<td>Moderately Warm and Moist</td>
<td>*Nonlethal, low severity 25-50 yr. FRI *Mixed severity, 70-250 yr. FRI on cool, wet sites. 30 yr. FRI on warm, moist sites 75-80 yrs in LP stands. *Nonuniform, lethal stand replacement 100-250 yr. FRI</td>
<td>5 to 50 ac</td>
<td>WL/DF/PP dry Lower elevation</td>
<td>Variable, gaps to large even-aged single storied patches to larger area multi-aged multistory and single story open grown stands. Avg basal area 80-120 sq ft/ac, more in riparian areas. TPA ranged from 15-60</td>
<td>10-20 tons/ac</td>
</tr>
<tr>
<td>4S</td>
<td>Moderately Warm and Moist</td>
<td>Nonuniform, mixed severity 30-85 yr. FRI</td>
<td>20-75 ac 100-300 ac or more</td>
<td>WL/DF with LP, GF, WP, PP</td>
<td>Varies with topography. Two storied, even and uneven-aged in lowlands. Single and two storied, even aged in upland areas. BA avg 150-200 sq ft/ac and 30-50 overstory TPA in upland areas over 200 sq ft/ac in valley bottoms</td>
<td>15-30 tons/ac</td>
</tr>
<tr>
<td>9</td>
<td>Cool and Moderately Dry</td>
<td>*Nonuniform stand replacement 100-115 yr. FRI *some mixed severity, nonuniform burns 50-71 yr. FRI</td>
<td>5,000 to 100,000 ac 50-300 ac</td>
<td>LP, SAF in frost pockets LP, SAF,ES, DF, WL on moist upland sites.</td>
<td>Even-aged LP with scattered relic overstory WL, some stands mixed with DF, SAF</td>
<td>BA avg 80-120 sq ft</td>
</tr>
</tbody>
</table>

**VRU**=Vegetation Response Unit, **FRI**=Fire Return Interval, **TPA**=Trees/Acre, **PP**=Ponderosa pine, **WL**=western larch, **DF**=Douglas-fir, **GF**=grand fir, **WP**=white pine, **LP**=lodgepole pine, **ES**=Engelmann spruce, **WH**=western hemlock, **WRC**=western redcedar

**PATCH SIZE**=Continuous areas of similar forest structure considered to be the area regenerated, at one time, following a fire.

**FIRE SEVERITY**=Degree of which a site has been altered or disrupted by fire; a product of fire intensity, fuel consumption & residence time.

**FIRE REGIME**=Characteristics of a fire in a given ecosystem, such as frequency, predictability, intensity, seasonality & extent in an ecosystem. At least 3 fire regime classes can be described for forested ecosystems of the analysis area.

**Non-lethal**- low severity of cool fire with minimal impact to site. It burns in surface fuels consuming only litter, herbaceous fuels, foliage & small twigs on woody undergrowth. Little heat travels downward through the duff. Non-lethal fires can be expected to result in up to 20% canopy loss.

**Lethal (Stand replacing)**- High severity fire that burns through the overstory & understory consuming large woody surface fuels and potentially the entire duff layer. Following this fire type, 70-90% of the mature canopy cover is killed, stand development is set back to initiation stage, & stand replacement begins. Despite the intensity of these disturbances, it is common for scattered islands of unburned vegetation to remain in protected areas.

**Mixed**- A broad category of moderate fires which include characteristics of lethal and non-lethal fires. They can consume litter, upper duff, understory plants & foliage on understory trees. Individuals & groups of understory trees may torch out if fuel ladders exist. This fire regime may result in 20-70% loss of tree canopy occurring within a mosaic of stand conditions.
FIRE AND FUELS

Introduction
The fire and fuels analysis describes the potential fire behavior under severe weather conditions (97th percentile weather) and current fuels conditions within the project area. This is compared to potential fire behavior under the same weather conditions post treatment for the action alternative.

Forest Fuels
Fuels are composed of the various components of vegetation, live and dead, that occur on a site. The type and quantity will depend upon the soil, climate, geographic features, and the fire history of the site. An adequate description of the fuels on a site requires identifying the fuel components that exist. These components include the litter and duff layers, the dead-down woody material, grasses and forbs, shrubs, timber and slash. (H.E. Anderson, 1982).

Regulatory Framework
Four guiding documents establish direction and provide the framework for fire management: Forest Plan, Forest Service Manual, Federal Wildland Fire Policy and Program Review, and the National Fire Plan. These documents provide direction for implementing a fire management program. Fire handbooks, guides, research, and technical papers also provide insight.

Forest Plan
The Kootenai National Forest Plan (1987) objective for fire management program is to seek to minimize the number of acres lost to damaging wildfire. Specifically, the program’s aim is to minimize cost plus net value change while providing for the safety of the public and personnel engaged in fire protection activities. The following are the key goals currently guiding the Kootenai NF Fire Management Plan:
- Use prescribed fire to simulate natural ecological processes, prevent excessive natural and activity fuel buildsups, create habitat diversity for wildlife, reduce suppression costs, and maintain ecosystems.
- Protect Forest users, property, and resources from wildfire.

National Fire Plan
The National Fire Plan (NFP) originated after the record-breaking wildfire season of 2000, President Bush requested a national strategy for preventing the loss of life, natural resources, private property, and livelihoods in the Wildland Urban Interface. Working with Congress, the Secretaries of Agriculture and Interior jointly developed the National Fire Plan (www.fireplan.gov) to respond to severe wildland fires, reduce their impacts on communities, and assure sufficient firefighting capabilities for the future. The National Fire Plan (2000) includes five key points:

1. Firefighting/Preparedness
2. Rehabilitation and restoration of burned areas
3. Reduction of hazardous fuels
4. Community assistance
5. Accountability

The NFP is a long-term commitment based on cooperation and communication among federal agencies, states, local governments, tribes and interested publics. The federal wildland fire management agencies worked closely with these partners to prepare a 10-Year Comprehensive Strategy. The four goals of the 10-Year Comprehensive Strategy are to:

1. Improve fire prevention and suppression
2. Reduce hazardous fuels
3. Restore fire-adapted ecosystems
4. Promote community assistance

Community Fire Plan

The Northwest Resource Conservation and Development Area, Inc. received a grant from USDI Bureau of Land Management – State and Private Forestry to facilitate the development of a community based Wildland Fire Risk Mitigation Plan, or “Community Fire Plan” for Sanders County (Available in the project file).

Values and goals of the Sanders County Community Fire Protection Plan are:

1.) Firefighter and Public Safety
2.) Homes and Communities
3.) Healthy Watersheds and Forests

Analysis Area

The fire/fuels analysis coincides with the project area boundary to utilize topographic features. This area encompasses 796 acres within the Spring Gulch drainage. The entire project area boundary is within the WUI. Direct, indirect, and cumulative effects with regards to fire and fuels were analyzed for the Spring Gulch Drainage, and the adjacent state and private property. This is an appropriate analysis area for Fire/Fuels due to the objective of reducing crown fire potential. In addition to modeling crown fire potential within the stand being analyzed, it also displays that if a crown fire enters the analysis area from a different stand or drainage it would transition to a surface fire. The remaining bounds of analysis used are where the project area boundary abuts the private property to the West. This transition to private property exhibits a dramatic change in fuel structure. Private fuel treatments in this area have a positive effect reducing crown fire potential.
Affected Environment

Historical Condition

An analysis was conducted to demonstrate the scope of the major fire event that shaped the Spring Gulch landscape during the past 100 + years. The analysis included a combination of existing stand data information and aerial photo interpretation. The fire of 1910, also known as the big blow-up, burned the entire Spring Gulch drainage encompassing 796 acres of Forest Service managed lands. Fire scar evidence collected in the Little Beaver Creek drainage, 5 miles to SW of the project area, suggests a fire return interval of 35 – 40 years prior to the 1910 fire. By the 1950’s, fire suppression had become more effective which, in part, accounts for a decreased occurrence of stand initiating fires since that time. Based on catalogue fire records starting in the 1940’s there were four fires that occurred in the Spring Gulch project area. All four were lightning ignited.

![Spring Gulch Fire History](image)

Figure 3-2. Spring Gulch Fire History

Existing Conditions

The Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin (PNW-GTR-382, 9/96) includes an assessment of changes in fire regime including the Little Beaver Creek Project area. This was a coarse scale analysis, so it is general in nature. It indicates that the project area has changed from a non-lethal/mixed lethal fire regime (a fire regime under which fires did not generally kill all
trees) to a mixed lethal/stand replacement fire regime (a fire regime under which most trees are killed during a fire episode).

The current fire regime within the project area is the result of a complex series of events that influenced the development of the current vegetation. This includes weather patterns, insect and disease outbreaks, forest succession, and human management. Historically, prior to fire suppression, fires burned over a long period, had a wide range of effects and covered large areas. Currently, fires are small with the occasional large fire; effects are limited due to effective fire suppression efforts therefore reducing the time and area they burn.

The existing condition of fuels in the Spring Gulch project area has changed from the historic condition for several reasons. Fire suppression has become increasingly effective to the point that fire has been replaced by decomposition as the primary means of natural fuel abatement. The rate of accumulation exceeds the rate of decomposition, resulting in an increasing fuel load. Forest succession along with insect and disease processes is increasing tree mortality resulting in an accelerated accumulation of fuel. The end result is a landscape that is increasingly more susceptible to high intensity stand replacing fire due to high fuel loadings.

While we cannot predict precisely when fires will occur, or how impactive they will be, we can generalize about how the current fire regime is different from the historic regime. Historically, a full range of fire intensity occurred, from non-lethal underburning to stand replacing crown fire. Fire size tended to be larger since weather and fuels were the only limiting factors. Today under our existing fire suppression policy, which has been in effect for several decades, fires are aggressively extinguished so they are much smaller. Over a period of time, this has resulted in an increased probability of larger more intense fires as fuels accumulate.

Fire Frequencies and Fuel Characteristics

Fire Regime Condition Class (FRCC) is a qualitative measure describing the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings (Table 3-14). Departure can be caused by any number of sources such as introduced exotic species, introduced insects or disease, interruption in fire return interval, and management activities. Depending on forest type, it can be an indicator for fuel reduction needs and can help prioritize treatments to improve overall landscape condition class (Hann and Strohm 2003).

Data gathered in the field and knowledge of current frequency of fire and expected fire severity has led to the determination that the FRCC at the project landscape is moderately altered from the natural range across the Spring Gulch Project Area (Condition Class 2). The main contributors to this rating are fire exclusion, species composition (some moist forests once had white pine compositions of >30% and now it is often less than 6%), and previous timber harvest resulting in uncharacteristic stand structures. Other than the areas that burned in the early part of the 20th century, it was assumed for the FRCC analysis that fire has been excluded from the remainder of the project area for at least 100 years. Lack of fire has affected Fire Regime Group 1 (Figure
3-4) where at least two fire cycles have been missed and long-lived seral species such as ponderosa pine are the ecosystem components at moderate risk of being lost due to fire regime condition class departure.

Table 3-14 Fire Regime Condition Class Descriptions

<table>
<thead>
<tr>
<th>Fire Regime Condition Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fire regimes are within natural range, and risk of losing key ecosystem components is low. Vegetation attributes are intact and functioning within historic range.</td>
</tr>
<tr>
<td>2</td>
<td>Fire regimes and vegetation attributes have been moderately altered from natural range. The risk of losing key ecosystem components is moderate. Fire frequencies have been departed by one or more intervals.</td>
</tr>
<tr>
<td>3</td>
<td>Fire regimes and vegetation attributes have been significantly altered from their natural range. The risk of losing key ecosystem components is high. Fire frequencies are departed by several return intervals.</td>
</tr>
</tbody>
</table>

Fire return intervals in the project area generally fall into natural fire regime group I, III, and IV, which are described below. The natural fire regime is a general classification of the role fire would play across the landscape in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). The natural or historical fire regimes are classified into groups by the number of years between fires (frequency) and the severity of the fire on the dominant overstory vegetation (Figure 3-3).

**Figure 3-3 Fire Regime Group Definitions**

**Fire Regime Group Definitions:**

- **I** 0-35 years and low to mixed severity
- **II** 0-35 year frequency and high severity
- **III** 35-100+ year frequency and mixed severity
- **IV** 35-100+ year frequency and high severity
- **V** 200+ year frequency and high severity

**Fire Regime Group I** - 0-35 year fire frequency and low to mixed severity fires. Low severity fires would consist mostly of light intensity surface fires, whereas a mixed severity fire could result in up to 75% replacement of the dominant overstory. These include ponderosa pine and dry-site Douglas-fir.

**Fire Regime Group III** - fire frequency of 35-100+ years of mixed severity (defined above). In the project area, these sites would have been moister than fire regime group I. Stands would have been dominated by western larch, ponderosa pine, Douglas-fir, and some lodgepole.

**Fire Regime Group IV** - fire frequency is 100+ years of high severity stand replacing fires. Most of the dominant overstory vegetation could be replaced. These sites would have been moister than fire regime group III with lodgepole pine being the dominate species in most stands with western larch and Douglas-fir occurring as scattered
overstory relics. Detailed discussions of VRUs, and the role of fire in each, are covered under the vegetation report of this document.

Fire Group - concept based on the response of various tree species to fire and the roles these species play in forest succession (Fisher and Bradley 1987).

| Fire Group Four: | Classified as warm, dry Douglas-fir habitat type. Ponderosa pine is the major seral or climax species, especially at lower elevations, maintaining open, park-like stands. Fire return interval ranges from 5 to 25 years. Fuel loads average 11 tons per acre, but tend to increase with stand age. |
| Fire Group Six: | Classified as a moist Douglas-fir habitat type typically having large components of ponderosa pine and western larch where low to moderate fires occurred. Fire return interval varies from a mean of 15 to 42 years. Downed, dead fuel loads average about 12 tons per acre, but can be much heavier. |
| Fire Group Seven: | Classified as cool and moderately dry subalpine fir habitat types. Lodgepole pine is the seral dominant in most stands, with western larch and Douglas-fir occurring as scattered overstory relics. Fire return interval ranges from 100 to greater than 200 years. Fuels loadings average 15-20 tons per acre. |
| Fire Group Eleven: | Classified as warm, moist grand fir, western redcedar, and western hemlock habitat types. Up to 10 species of conifers exist creating a wide range of fuel loadings. Fire return interval ranges from 50 to greater than 200 years. Fuels loadings average 25 tons per acres but may be much higher. Usually exceeds fuels loading of other fire groups in western Montana. |

**Figure 3-4 Fire Group Definitions**

<table>
<thead>
<tr>
<th>VRU</th>
<th>Fire Regime Group</th>
<th>Primary Fire Groups</th>
<th>Fire Return Interval (Yrs.)</th>
<th>CWD Tons/Acre</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>2S</td>
<td>I</td>
<td>4</td>
<td>5-45</td>
<td>5-9</td>
<td>418</td>
</tr>
<tr>
<td>3</td>
<td>III</td>
<td>6</td>
<td>15-45 (75-80 in lodgepole stands)</td>
<td>10-20</td>
<td>189</td>
</tr>
<tr>
<td>4S</td>
<td>III</td>
<td>11</td>
<td>30-85 range</td>
<td>13-38</td>
<td>148</td>
</tr>
<tr>
<td>9</td>
<td>IV</td>
<td>7</td>
<td>110-120</td>
<td>15-20</td>
<td>41</td>
</tr>
</tbody>
</table>

**Table 3-15. Spring Gulch VRU Summary Table**

**Fuel Models:**

Due to slope, aspect, and associated terrain and vegetation, it is possible that several different fuel models were present historically in the project area – representing three of the main fuel model groups where grass, shrubs and brush, or timber litter would have been the main carriers of a surface fire.

Fuel models are used by fire specialists to predict fire behavior and characterize the amount of fuels available to burn during a surface fire. A fuel model is chosen by the primary carrier of the fire (e.g. grass, brush, timber litter, slash) and its fuel characteristics (e.g. fuel loading, surface area to volume ratio, fuel depth, etc). Fuel models are simple tools to help fire managers realistically estimate fire behavior. Rothermel (1983) has a detailed discussion on fuel models and how they are used to predict the spread and intensity of forest and range fires.

Fuels models contained within the project area, as described by Anderson (1982), are defined below and summarized by units in Table 3-16.
Fuel Model 8 (Timber, closed timber litter). A typical stand includes a closed canopy of short-needed conifers, such as Douglas-fir. The compact litter layer consists of needles, leaves and occasional twigs. Surface fuel loading, less than 3 inches in diameter, averages 5 tons per acre. Surface fuel bed depth is 0.2 feet.

Fuel Model 10 (Timber, heavy litter). Dead-down fuels include greater quantities of 3-inch or larger limb wood. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation. Example is insect or disease ridden stands. Surface fuel loading, less than 3 inches in diameter, averages 12 tons per acre. Surface fuel bed depth is 1.0 feet.

<table>
<thead>
<tr>
<th>Fuel Model</th>
<th>Units</th>
<th>Crown Fire Potential?</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>1, 2, 2A, 3, 4, 5, 6, 7, 7A, 8, 9, 12, 12A, 14, 15, 300, &amp; 302</td>
<td>YES</td>
</tr>
<tr>
<td>8</td>
<td>1A &amp; 301</td>
<td>NO</td>
</tr>
<tr>
<td>10</td>
<td>303</td>
<td>YES</td>
</tr>
</tbody>
</table>

Table 3-16: Existing Fuel Models and Crown Fire Potential

Fuel Loading

Excessive fuel loads created through disease, decadence, and fire exclusion now occur over large portions of the project area. Stands where light burn events created a patchy mosaic over the course of many years can experience fire events of high severity and great magnitude. Such events result in areas with very little if any variation in age, patch size, and species composition. If these ecosystems are to experience a disturbance regime similar to that which they are adapted, fuel loads must first be reduced to keep fire effects within a historic range of variability.

Fuels in the analysis area include surface and ladder fuels. Surface fuels include all combustible material lying beneath or on the forest floor, including, roots, rotten buried logs, duff, and woody debris. Ladder fuels consist of shrubs, small trees, and low-growing branches on trees that allow fires to move from the surface to the tree canopy.

Fine fuels are continuous throughout, in the form of twigs, small branches, live and dead brush and grasses, and pine needles. As mentioned, these fine materials will contribute to the overall fire spread, especially on the drier sites where the forest floor is littered with ponderosa pine needles and the dominate surface vegetation is pine grass and brush.

Observation of past fire behavior shows that small woody material, less than 3" in diameter, has the most substantial influence on fire behavior (such as spread rates and fire intensity), which can be accurately predicted with surface fire behavior models. However, large woody fuels greater than 3", can contribute to large fire development and high fire severity. The greater the fuel loading of this large material, coupled with the size and decay rate, can greatly influence fire severity (effects to soil, water, other forest resources) – this is generally due to smoldering and persistent burn periods (Brown, Reinhardt, Kramer 2003).
Canopy Characteristics

In the majority of the project area, a crown fire could be supported due to the combination of current surface, ladder, and crown fuels. The predicted flame lengths coupled with the canopy base heights of < 10 feet would equate to a high probability of torching the canopy (20-80%) and the potential overstory mortality being nearly 100% in some areas.

Analysis Methods

Temporal

Time period covered by the effects analysis includes:

- All recordable fires from 1940’s to present.
- 1995, 2007 and 2009 stand exam and fuels inventory analysis within the project area.
- Analysis methods used analyze current and future fuels conditions by alternative. This time period covers present to forty years into the future to display effects and future treatment opportunities.

Data

Types of data used in the effects analysis includes:

- 1995, 2007 and 2009 stand exams that were conducted in all stands within the project area. Fifteen fuels transects were conducted in areas experiencing high levels of surface fuels adjacent to private property. Each plot as a representative photo and GPS coordinates.

The data collected was appropriate for analyzing the fire behavior measurement indicators for existing conditions and post treatment effects to meet the purpose and need of the project.

Methods and Models

The Forest Vegetation Simulator (FVS) is the Forest Service, U.S. Department of Agriculture, nationally supported framework for forest growth and yield modeling. The Fire and Fuels Extension (FFE) of FVS was used in this analysis to describe the existing condition and the effects of the proposed treatments and the no action alternative on fuels conditions and fire behavior into the future of the stands modeled (summarizes the measurement indicators). Outputs of FVS for modeled stands are comparable to on the ground observations for vegetative characteristics such as species composition, fuel characteristics, and other site conditions. The Fire and Fuels Extension integrates existing models of fire behavior and severity into FVS (Reinhardt and Crookston, 2003). Model outputs display fuels and stand structures, as well as potential fire behavior over time and allows for comparison of various treatment alternatives on a stand. It was used to describe the existing condition, as well as the effects of the proposed treatments within each alternative and effectiveness of treatments on fuels conditions and fire behavior into the future of the stands modeled.
The FVS-FFE simulates vegetative responses based on site specific information and a number of various management actions. It was used to model the current condition and the effects of no action and action alternatives on fire behavior indicators including flame lengths, crowning index, and surface fuel loadings, as well as the effectiveness of treatments into the future.

**General Limitations of Fire Behavior Models**

**Model Applicability/Limitations**

- The model assumes continuous, uniform, and homogeneous fuel beds.
- The model does not estimate fire spread from firebrands or embers.
- Fire whirls and other fire-induced disturbances are not modeled; however, they are usually expected with extreme fire behavior.
- Live fuels (herbaceous plants and shrubs) are poorly represented in FFE-FVS. Their biomass and its contribution to fuel consumption and smoke are only nominally represented as a fixed amount that depends on percent cover and dominant tree species. Live fuels can contribute significantly to the behavior of a fire. Their contribution to fire behavior is represented in the selection of fire behavior fuel models. Canopy cover, overstory composition, habitat type, and stand history influence selection of fire behavior fuel models. Live fuels are not dynamically tracked and simulated in FFE-FVS.
- Decomposition rates are not sensitive to aspect, elevation, or potential vegetation type in FFE-FVS. Decomposition rates can be controlled by the user, however, so it is possible for a knowledgeable user to “tune” the decomposition algorithms and, thus, the fuel dynamics.
- Fire conditions (fuel moisture and wind speed) must be selected by the user. FFE contains no climatologic data and will not estimate site-specific moistures. If you want to look at differences in fire dynamics between north and south slopes, for example, you must be able to give the model different fuel moistures for the different sites.

**Accuracy of Data**

- Some models may be highly sensitive to certain parameters such as wind speed or fuel moisture – the accuracy of the outputs may be highly dependent on the accuracy of the input.

**Monitoring**

All treatment units throughout the project area would be monitored and documented within the site specific burn plan before and after implementation.

**Measurement Indicators:**

1. Fire Behavior Indicators were used to evaluate fire hazard and the associated changes in fire behavior by alternative.
- **Surface Flame length** – used to estimate surface fire intensity and the trends of surface flame lengths over time as a measure of treatment effectiveness over time.

- **Total Flame Length** - overall flame length (includes torching and crowning).

- **Crown Base Height (CBH)** – the lowest height above the ground in feet at which there is a sufficient amount of canopy fuel to propagate fire vertically into the crowns.

- **Crowning Index (CI)** – the wind speed, 20 feet above the canopy at which crowning is possible (Duveneck and Patterson III 2007). The crowning index is the point at which active crowning – a solid wall of flame extending from the fuel bed surface through the top of the canopy (Scott and Reinhardt 2001) – is possible, not necessarily the point at which it can be initiated. Passive crown fire usually happens first, where individual or small groups of trees torch out.

- **Crown Bulk Density (CBD)** – the mass of available fuel per unit of canopy volume (kg/m³). It is a bulk property of a stand, not an individual tree. CBD is an important crown characteristic needed to predict crown fire spread.

2. Total acres treated in the WUI.

**Canopy Characteristics:**

* **Crown Fire Potential**

Crown fire potential is generally based on the amount of surface fuels, the amount of ladder fuels, and the density and spacing of the canopy. Heavy surface fuels generally contribute to longer flame lengths. Low canopy base heights can carry surface fires into the crowns. Once established the crown fire may persist. The more spaced the canopy, the greater the wind necessary to move fire from one crown to the next. Dense canopies would obviously require much less wind speed to support crown fire.

* **Canopy Base Heights**

Canopy base height (CBH) is the lowest height above the ground where there is a sufficient amount of canopy fuel to transition a fire from the surface fuels into the tree crowns. (Scott and Reinhardt 2001), Therefore, low canopy base heights are a critical factor in determining crown fire potential. Fuels treatments should focus on removing some or all of the ladder fuels and other vegetation that contributes to a low canopy base height, especially where reducing crown fire initiation is a priority. The structure and species composition of the stands – specifically Douglas fir and grand fir with low growing crowns, as well as dense understory trees – are contributing to the low canopy base heights observed. Drier sites in the project area tend to have greater variation in stand structure due to small openings in the canopy, but canopy base heights are still low due to the tall shrubs and understory trees. In both forest types, the fuels continuity from the surface fuels to the crown fuels has created the potential for surface fire to propagate to the crowns of the overstory trees.
Canopy Bulk Density

Canopy bulk density (CBD) is the mass of available fuel per unit of canopy volume (kg/m³). It is a bulk property of a stand, not an individual tree. CBD is an important crown characteristic needed to predict crown fire spread. Canopy bulk densities were estimated from a combination of FFE-FVS outputs for representative stands within the project area as well as comparing site-observations to available research such as Scott and Reinhardt (2001). (Canopy photo plots were also taken within the treatment area and are located in the project file). Dense stands can have a CBD of 0.30 kg/m³. It is a difficult canopy characteristic to measure directly (short of cutting down the trees); FVS uses a technique to estimate “effective” CBD in non-uniform stands from a stand inventory that does not assume a uniform vertical distribution of canopy fuel – uniform measurement can be estimated by dividing canopy depth into canopy load (Scott and Reinhardt 2001).

Scott and Reinhardt (2001) describe the criteria necessary for active crown fire: Mass-flow rate is defined by Van Wagner (1977) as the rate of fuel consumption through a vertical plane within the fuel bed and it is a product of CBD and spread rate. CBD affects the critical spread rate needed to sustain active crown fire. If the mass-flow rate falls below a certain threshold, active crowning is not possible. Therefore, the lower the canopy bulk density, the lower the potential for active crown fire. It can be assumed, under extreme conditions that CBD’s above .08 kg/m³ will sustain an active crown fire.

<table>
<thead>
<tr>
<th>Canopy Base Height (feet)</th>
<th>1 – 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canopy Bulk Density (kg/m³)</td>
<td>.05 - .29</td>
</tr>
</tbody>
</table>

Table 3-17. Current CBH and CBD in the treatment areas

Crowning Index:

The crowning index is the wind speed at which active crown fire is possible. When CBD is decreased in a stand, it takes greater winds to sustain an active crown fire. It is assumed that treatments that remove overstory trees would also effectively lower the CBD – for example, if 50% of the canopy is removed, it is assumed the canopy bulk density is decreased by 50% on average. However, this relationship can vary quite a bit depending on species removal, as some species obviously have much more mass in the canopy than others.

Surface Fire Behavior

With the existing fuel conditions, a surface fire in the summer, under extreme weather conditions, would exhibit behavior that limits direct attack to ground machinery and aerial resources. Expected flame lengths would be greater than the limit that can be safely attacked by hand crews. **Predicted flame lengths would exceed 4 feet, which is the limit for safe direct attack by firefighters.** There is an even greater concern in the Wildland Urban Interface (WUI) as these intense fires may threaten homes and other structures as well as compromise egress routes.

3 Key Fuels Factors for Crown Fires

1. How much surface fuels?
2. How close are the trees crowns to the ground?
3. How dense are the tree crowns?

Figure 3-5
Environmental Consequences

ALTERNATIVE 1 – NO ACTION
Direct and Indirect Effects

There are no fuel reduction activities proposed in this alternative. The effect of no action over time would be an increase in the accumulation of surface fuels. This contributes to greater fire intensity, potential for spotting, resistance to control, chance of sustained crown fire, and risk to fire suppression resources. This gradual increase is due to disease, decadence, and natural events such as wind throw and continued insect infestation. Continued growth of the understory would increase the likelihood that ignitions that occur would have the potential to transition from a surface fire to the timber canopy. The drier forest stands would continue to lose vigor due to competition from a dense understory of shade tolerant species. This understory would serve as ladder fuels that would permit a surface fire to expand into the canopy of overstory trees. This would result in the mortality of many of the existing overstory trees that would have otherwise survived a surface fire of lower intensity. Resistance to control under this alternative would be greater than alternatives in which fuels are treated. Heavy down fuels would contribute to increased fire intensity, spotting potential, receptive fuels for firebrands, and extreme fire behavior occurrence, all of which create unsafe firefighting conditions. Any fire start inside the project area or start outside and moving into the project area would likely be more expensive, difficult, and dangerous to suppress. The threat to private property, homes, public safety, and firefighter safety would be much higher under the No Action alternative than the Proposed Action.

Cumulative Effects

Past fire history, fire suppression policies and actions, timber harvest and grazing since settlement times (1880’s) have had the greatest influence in present conditions of natural fuels and fire hazard in the project area. Other activities and management activities shaping the current condition of the fuels profile include past vegetation management (thinning, reforestation, firewood gathering, road building, and private land development and associated activities. Private land Firewise activities have had positive effects to the fuels situation in the individual stands. However, fire suppression strategies (control) would be increasingly difficult to attain over time due to increased fuel loadings and higher risk of escape. Overall, these recent and ongoing actions have not addressed fuels management on the landscape-level or urban interface protection needs in the Spring Gulch project area.

Foreseeable future actions include Firewise program activity on private lands within Spring Gulch, but no significant activity is planned on National Forest System Lands to address vegetation or fuels. Due to the fact the project area is fully within the WUI, historical fire management actions would continue within the project area.

Cumulative effects associated would be much the same as the direct and indirect effects presented above if a severe crown fire were to occur. Fuel loadings and characteristics across the landscape would be immediately altered in the short term. Crown fire potential would remain low in areas that experienced lethal fire severity for 1-2 decades until regeneration is established, other areas where fire severity was low or did not burn would see the return or continuance of crown fire risk unless other actions were taken to reduce this potential. Characteristics of future prescribed fires or wildfires in the project
area following a severe crown fire would be less intense, less resistance to control, and perhaps provide more of a safety margin for firefighters and residents.

Not implementing the action alternative would allow further increase in fuel build-up across the landscape and lead to further departure from reference conditions and would make fire suppression in this area very difficult and dangerous.

**ALTERNATIVE 2 – Proposed Action**

**Direct and Indirect Effects**

In addition to protecting life, property, and resources within and adjacent to the WUI the purpose and need of the project is to trend the project area landscape toward a more fire resilient condition. The direct and indirect effects of specific treatments on the forest vegetation are covered in the Vegetation Report of this document. This section discusses the effects of the proposed action on fuels and fire behavior.

The direct effects to fire and fuel resources associated with the proposed action implementation include:

- Reduction in surface fuels
- Reduction in ladder fuels
- Reduction of crown bulk density
- Higher Crowning Index (Increase in wind speed needed to sustain an active crown fire)

Alternative 2 would implement commercial and non-commercial fuels reduction activities on approximately 553 acres to accomplish fuels objectives. Fuels reduction treatments would include mechanical removal of trees, hand slashing, hand piling, pile burning, underburning, ecosystem burning, and mechanical slash treatments. The mechanical slash treatments could include excavator piling, chipping, grinding, utilization, or hauling off site.

Proposed treatments are designed to remove the majority of the ladder fuels, thus raising the canopy base heights to greater than 40 feet. This height would inhibit surface flame lengths from readily moving into the tree crowns. The key in treating the crown fuels by removing overstory trees is to effectively reduce the canopy bulk density to a level where active crown fire is not possible or the chances are significantly reduced (Scott and Reinhardt 2001). The direct effects of these fuels treatments would accomplish fire behavior objectives. Removal of the overstory trees would increase the space between tree crowns, reducing the likelihood of crown fire spread from one tree to the next. These fuel reduction methods would result in a probability of torching near zero and a probability of sustained crown runs near zero with extreme wind speeds.

Silvicultural prescriptions would focus on retention of the largest trees in the stand, which are generally the most fire-resistant (Agee and Skinner 2005).

It should be noted that a direct effect of mechanical treatments is the creation of activity fuels. Fire hazard may greatly increase over the existing conditions and could remain high until fuel treatments are accomplished. This could be mitigated partially through utilization during harvest. The remaining material would be mitigated on the roughly 322 acres by treatment of post-harvest related fuels with prescribed fire. The proposed post-
harvest treatments would likely take 1-10 years to accomplish. The 231 acres of non-commercial slashing in the proposed natural fuels units would create an increased surface fire hazard for 1-3 years until underburning is accomplished.

**Direct Effects on Fire Behavior**

The following section summarizes the expected fire behavior based on the current condition of the fuels modeled under extreme weather conditions. A fire risk analysis was conducted for each treatment unit using these conditions.

**Table 3-18. Existing and Post Treatment Fuel Models and Crown Fire Potential**

<table>
<thead>
<tr>
<th>Unit(s)</th>
<th>Fuel Model</th>
<th>Crown Fire Potential?</th>
<th>Fuel Model</th>
<th>Crown Fire Potential?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Action (Alt 1)</td>
<td>Proposed Action (Alt 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 2, 2A, 3, 4, 5, 6, 7, 7A, 8, 9, 12, 301, 302</td>
<td>8</td>
<td>Yes</td>
<td>8</td>
<td>No</td>
</tr>
<tr>
<td>12A, 15</td>
<td>8</td>
<td>Yes</td>
<td>8</td>
<td>Yes/Limited</td>
</tr>
<tr>
<td>303</td>
<td>10</td>
<td>Yes</td>
<td>8</td>
<td>Yes/Limited</td>
</tr>
</tbody>
</table>

The above table is representative of the proposed units under Alternative 2. Fire behavior modeling for each treatment unit is contained within the project file. A couple of points are worth noting: for some fuel models pre and post-treatment do not change. For example, units 1, 2, 2A, 3, 4, 5, 6, 7, 7A, 8, 9, 12, 301, and 302 currently exist as a fuel model 8 and would remain as a fuel model 8 after treatment. These units would be less susceptible to crown fire due to treatment of surface fuels, ladder fuels, and/or canopy fuels; thereby, increasing canopy base height and reducing canopy bulk density. Although the proposed units 12A, 15, and 303 displays crown fire potential post-treatment, they are only vulnerable if an active crown moves in from an adjacent stand. This post-treatment crown fire potential is due to the CBD remaining near levels that can sustain a crown fire.

Peterson and others (2005) suggest there is strong support in the scientific literature and case studies that fuel treatments reduce the probability of crown fire. This has been supported as recently as 2005 with the Camp 32 fire on the Rexford Ranger District of the Kootenai National Forest. However, it is important to recognize that without treatment of slash created by thinning it is possible that wildfire severity could increase (Omi and others 2006).

Another direct effect of the Proposed Action is a trending of the warm and dry habitats (fire regime group 1) from Condition Class 2 toward a Condition Class 1. The moderately warm and moderately dry habitats in fire regime group III would remain stable within the current condition class.

**Indirect Effects**

The intensity, torching, crowning, and resistance to control (fire containment and suppression) of a potential wildland fire within the treated areas would be reduced, resulting in safer conditions for firefighters and the public, and a lower probability that a wildland fire could escape from the treated areas and burn onto adjacent lands.

It is possible that the removal of trees in the overstory and the understory, as proposed with this project, could increase surface winds (Albini and Baughman 1979). This could
also cause drying of both live and dead surface fuels (Pollet and Omi 2002). The effect on fire behavior would be an increase in the flame length and rate of spread of a surface fire. The models used, as well as professional experience show the benefit of reducing surface and crown fuels and removing ladder fuels outweighs the increased winds and drying of surface fuels.

Omi and others (2006) suggests that fuel treatment effects may extend beyond the treated unit. This would most likely occur immediately downwind of the treatments proposed under the Proposed Action alternative.

**Cumulative Effects**

The cumulative effects of the actions identified as reasonably foreseeable, combined with the past and present actions identified (see the introduction to the environmental effects section) would reduce the fuel hazard in the WUI areas within the project area and decrease the threat of a wildfire event on NFS lands moving onto private property or vice versa. The greatest effect from past timber harvests and fire suppression has been a change in the natural fuel loading. Fire suppression and timber harvest have allowed for an increase in ladder fuels and stocking levels, which in turn increase the risk for wildfires to be more intense than what may have occurred historically.

A very effective fire suppression role has all but eliminated natural wildland fire, which was significant in restoring and maintaining ecosystems in this area. As directed by federal wildland fire policy and due to the fact the project area is fully within the WUI, fire suppression will continue in the project area. Without maintenance treatments like ecosystem burning, fire suppression would, over time, return the treated stands to the current conditions.

Although Alternative 2 would alter conditions that occurred naturally, it would provide a result that effectively reduces hazardous fuels near private land providing for public and fire suppression safety concerns.

**Effects of the Proposed Action on the cumulative effects of fire suppression**

Activities under the proposed action would affect the Fire Regime Condition Class by moving the treatment areas towards a condition class 1 or maintaining the existing condition class 2. This is due to modification of vegetation composition/structure towards historic reference condition, modification of fuels to reduce fire severity, and the introduction of fire where fire return intervals are departed from reference values due mostly to successful fire suppression.

**Fuel Accumulation**

Alternative 1 (no-action) does not address the purpose and need to reduce surface, ladder or crown fuels. Alternative 1 allows the continued threat of uncontrolled wildland fire to exist with no proactive management to protect forest resources and wildland-urban interface values. Site-specific fuel and stand inventories have established that high fuel loadings exist in the resource area. These fuel loadings would contribute to extreme fire behavior under certain weather conditions, and would make fires difficult to control even under moderate conditions. Alternative 2 provides fuel reduction protection
in the face of fire seasons that have proven to be longer, resulting in an increased incidence of large wildfires (Westerling et al. 2006).

**Effects of the Proposed Action on the cumulative effects of fire suppression**

The Proposed Action would effectively modify the fuels characteristics of the treated area to be consistent with that of a fuel model 8 (light timber litter, see Figures 3-6 and 3-7). Effective reduction in expected surface flame lengths will best be achieved by post treatment underburning. Fire behavior would be modified as reflected in the tables and text that follow.

**Measurement Indicator 1**

**Flame lengths**

<table>
<thead>
<tr>
<th>No Action</th>
<th>Direct Attack?</th>
<th>Surface Flame Lengths (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-2 Feet</td>
<td>Alternative 2</td>
</tr>
<tr>
<td>No*</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

* The currently low canopy base heights could propagate the surface flame lengths into the crowns of trees, thus overall flame lengths are predicted to be 50-100 feet with passive and active crown fire for the No Action Alternative. Units 12A, 300, and 303 of the Proposed Action would remain susceptible to crown fire due to minimal crown bulk density reduction and the amount of existing regeneration. Direct attack by any means would not be possible under a crown fire scenario.

**Effectiveness depending on the type of post-harvest treatment**

The effectiveness of treatment in reducing fuels and altering fire behavior is dependent on the type and intensity of treatment. Fuels reduction activities that include the use of prescribed fire are generally the most successful in reducing fuels (Graham et al. 1999). Prescribed fire consumes branchwood, duff and other dead material on the forest floor, as well as brush and other herbaceous material, which contributes to fire intensity and severity. Prescribed burning would be the most useful tool on the drier sites where the stands are already more open and the understory vegetation has become established. Prescribed fire would be effective at reducing the surface fire intensities of a wildfire.

Creating more fire resilient stands implies a three-part process of reducing surface fuels, reducing ladder fuels, and reducing crown density (Agee and Skinner 2005). Harvest alone only treats the ladder and canopy fuels and does little to address the surface fuels. Slashing, combined with biomass utilization or grapple-piling and pile burning are also effective methods of treating surface fuels, both natural and activity created – however it is not as effective in reducing the fine fuel loading (the smallest branchwood material) as is prescribed fire.
Fuel Model 8 – Proposed Commercial Thin Treatment

The above figures show an example of effectively reducing the surface, ladder, and crown fuels followed by prescribed fire in a similar forest type on the Cabinet Ranger District through mechanical treatment followed by underburning (Figures 3-6 and 3-7). Units 1A, 2A, 3, 4, 5, 6, 7, 7A, 8, 9, and 14 would reflect this proposed treatment. This treatment type represents approximately 50% of the proposed commercial activities.

Modification of surface fuels through the Proposed Action, to be consistent with a fuel model 8, would lower the fuel loading for the smaller diameter dead fuels. In the treatment units where grapple piling is proposed, almost no fuels would remain where the piles were located after burning. Piles generally produce a lot of intensity and duration due to the large accumulations of fuels, thus near complete consumption of the piled woody material is expected.

Measurement Indicators 2, 3, and 4

Crown Fire Potential – Canopy Base Height, Crowning Index, and Canopy Bulk Density

<table>
<thead>
<tr>
<th></th>
<th>Canopy Base Height (feet)</th>
<th>Crowning Index (mph)</th>
<th>Canopy Bulk Density (Kg/M3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>1 - 40</td>
<td>1 - 33</td>
<td>.05 - .29</td>
</tr>
<tr>
<td>Proposed Action</td>
<td>14 - 50</td>
<td>27 - 37</td>
<td>.05 - .11</td>
</tr>
</tbody>
</table>
Measurement Indicator 5

Acres Treated Within the WUI

Table 3-21. Acres treated in the WUI by Alternative

<table>
<thead>
<tr>
<th></th>
<th>No Action</th>
<th>(Proposed Action)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres Treated</td>
<td>0</td>
<td>553</td>
</tr>
</tbody>
</table>

Effectiveness into the future

The following graphs compare the general effectiveness of the Proposed Action with the no action alternative for the indicators of surface flame lengths, total flame lengths, crowning index, canopy base heights, and canopy bulk index into the future.

Figure 3-8. Comparison of expected Surface Flame Lengths in the proposed treatment areas for No Action and the Proposed Action.

Measurement indicators for both alternatives display the fuel treatment effectiveness into the future. The fuel treatment effectiveness for the Proposed Action would have positive effects that range from 15 to 40 years post-treatment. Maintenance treatments may be evaluated and analyzed during this time period.

From outputs derived in FVS, it is likely that the overall flame lengths for the current condition would actually be much greater than what is shown in the figure above because a fire would be expected to move into the tree crowns through torching or small crown fire runs through several trees at a time (the above figure shows ‘surface’ flame lengths – a fire moving into the crowns would result in greater flame lengths). The following figure shows the trend in overall flame length for both the No Action and the Proposed Action.
Figure 3-9. Comparison of expected Total Flame Lengths in the proposed treatment areas for No Action and the Proposed Action.

The figure below displays how the No Action alternative will have little beneficial effect on the crowning index – it will take winds of approximately 15 mph to sustain crowning into the future. The proposed treatments would focus on spacing the tree crowns to a point where fire spread from one tree to the next becomes virtually impossible, except under the rarest conditions – not just high winds, but sustained high winds of greater than 22 miles/hour. The increase in the crowning index would remain effective for decades into the future, until regeneration becomes incorporated enough into the overstory as to facilitate fire spread.

Figure 3-10. Comparison of expected Crowning Index in the proposed treatment areas for No Action and the Proposed Action.

Crown characteristics (crown base heights and canopy bulk density specifically) will influence whether or not a surface fire stays on the surface or moves into the canopy (Pollet and Omi 2002).
Increasing the CBH will reduce the risk of a fire moving from the surface to the canopy and reducing the canopy bulk density will reduce the risk of a fire moving from tree to tree. The CBHs remain high following treatment for approximately 15 years. Therefore maintenance treatment would be needed in approximately 15 years for the Action Alternative.

**Figure 3-11.** Comparison of expected Canopy Base Heights in the proposed treatment areas for the No Action and the Proposed Action.

The CBD would remain relatively the same for the No Action Alternative. The CBD would decrease dramatically following treatment with the Proposed Action Alternative. Treatments would remain effective for 15 years. The Proposed Action Alternative would show the greatest benefit at reducing the risk of a fire moving from tree to tree.

**Figures 3-12.** Comparison of expected Canopy Bulk Densities in the proposed treatment areas for No Action and the Proposed Action.
Forest Plan and Other Regulatory Direction Consistency by Alternative

Below is a description of how the Proposed Action meets the following Forest Plan standards.

**Alternative 1 (No Action)**
- Use prescribed fire to simulate natural ecological processes, prevent excessive natural and activity fuel buildups, create habitat diversity for wildlife, reduce suppression costs, and maintain ecosystems.
- Protest Forest users, property, and resources from wildfire.

This alternative would not take any action to protect human life and property within the analysis area from an uncontrolled and unwanted wildfire. The No Action Alternative would not use prescribed fire to help meet the goals of the management areas within the analysis area. It would not help develop cost-effective fire programs because it is reasonable to expect more intense fire behavior than in treated stands, thus control would be more difficult and likely require a greater number and type of suppression resources.

The continued succession of fuels and vegetation, mortality from insects and disease, and the exclusion of fire would create areas where the trend in fire behavior characteristics would in time be inconsistent with the goals, objectives and standards established in the Forest Plan.

**Alternative 2 (Proposed Action)**
This alternative would be consistent with the Forest Plan. It proposes to use prescribed fire to help meet the goals of the management areas within the project area. This alternative would take action to reduce potential flame lengths and rates of spread, preventative steps towards the protection of human life and property within the project area in the event of a wildfire. The reduction of fuels would also help the initial attack organization meet their suppression objectives because activity fuels would be treated in order to reduce fire intensities that allow for safe direct attack. This alternative would promote cost-effective fire programs by reducing potential intensities of wildfires and therefore the costs of controlling potential wildfires.

The Proposed Action proposes to reduce fuels across 553 acres in the WUI; therefore, it better meets the goals, standards and objectives of the Forest Plan, as well as meeting the intent of the National Fire Plan. The Proposed Action specifically addresses fuels reduction in the WUI, addresses firefighter and public safety by modifying fuels to reduce fire intensities and the potential for crown fire, and promotes community assistance through utilization of the fuels (biomass) removed as a result of project activities.

**Summary**

In the WUI, there is a high level of risk associated with fire. The primary risk is associated with public and firefighter safety, capital investments and natural resource values. Fire history tells us that all our Forest has experienced fires. It’s not a question of if but when. Implementing the Proposed Action reduces the risk by the largest margin.

The goals of the Sanders County Community Fire Protection and National Fire Plan are to assist fire suppression efforts to protect communities and the people who live in them. By modifying fuels to reduce fire behavior, the Proposed Action would help meet these goals. The No Action will not.
WILDLIFE RESOURCES

Introduction

The Kootenai National Forest provides habitat for over 300 different species of wildlife (KIPZ Analysis of the Management Situation, USDA Forest Service 2003b: 49, 59-64), many of which occur on the Cabinet Ranger District and within the Spring Gulch Analysis Area. The presence or absence of these wildlife species depends on the amount, distribution, and quality of each animal’s preferred habitat. In addition to habitat changes, many of these animals are impacted by hunting or trapping. Montana’s Department of Fish, Wildlife & Parks (MFWP) regulates game animal populations. The Forest Service and the MFWP work together to ensure that an appropriate balance is maintained between habitat capability and population numbers. The Forest Service also works closely with the U.S. Fish & Wildlife Service (FWS) to assist in the recovery of animals listed under the Endangered Species Act (ESA). Proposed federal projects which have the potential to impact species protected by the ESA require consultation with the USFWS.

For the purpose of this Revised Environmental Assessment, a number of wildlife species were selected for detailed analysis. The species chosen represent a combination of fine filter (species specific) and coarse filter (management indicator species) analyses. The U.S. Fish and Wildlife Service requires that endangered, threatened, and proposed species be included in an effects analysis. The Regional Forester designates sensitive species. Any effects to sensitive species present or potentially present in a project area must be disclosed. Management Indicator species (MIS) are identified in the Kootenai Forest Plan (1987, Appendix 12,) and represent a particular habitat or habitat complex. Each MIS represents a group of species that share common habitat components required for sustained growth and successful reproduction. Other species that would not be affected by any of the alternatives are reviewed, but not discussed in detail. The wildlife portion of this chapter is divided into five sections: old growth, MIS, sensitive, threatened and endangered, and neo-tropical migratory birds.

The bounds of analysis for each species were determined using the viability analysis concepts described by Ruggiero et al. (1994). Species viability is tiered to the forest-wide conservation plan (Johnson 2004).

The wildlife analyses include the baseline conditions (created by all past management practices and natural events); direct, indirect and cumulative effects of the proposed actions; and cumulative effects of reasonably foreseeable projects.

Old Growth Habitat

Data Sources, Methods, Assumptions, Bounds of Analysis

Management and characteristics of old growth and stand attributes necessary for a stand to be considered old growth are discussed and summarized in the KNF Forest Plan (Appendix 17, FP II-1, 7, 22, FP III-54), Green et al. (1992, errata corrected 2004), Pfister et al. (2000), Kootenai Supplement No. 85 to FSM 2432.22 (1991), Castenada
(2004) and Bradford (2007). That information is incorporated by reference. Data sources to identify old growth stands include District files and surveys, the KNF old growth GIS layer developed from stand-level old growth inventory that is aggregated and summarized at the Forest scale, and the Forest Inventory and Analysis (FIA) data which collects and reports data at the Forest scale. For the timber compartment 733 found in the Spring Gulch Planning Sub-unit (PSU) field verification of old growth stands was completed using the Region 1 Old Growth Survey Protocol modified to fit conditions found on the Kootenai National Forest.

The KNF Plan identified the pileated woodpecker as the management indicator species for old growth habitat (KNF FP, Vol. II, Appendix 12-1). For effects to old growth associate wildlife species, refer to the pileated woodpecker analysis in the Management Indicator Species (MIS) section of this document.

Criteria used to compare the alternative impacts on old growth include:

1) Percent of designated old growth (OG/ROG) in the planning sub-unit.

The analysis boundary for project impacts is the Spring Gulch sub-unit, while cumulative effects to old growth are analyzed at the Forest level.

**Affected Environment/Existing Condition**

Existing conditions are a result of historic timber harvest and wildfires, which are discussed elsewhere in this document. Old growth surveys within the Spring Gulch Planning Subunit inventoried approximately 1,718 acres. Of those acres initially thought to be old growth, 894 acres did not meet the standards found in Green et al. (1992, errata corrected 2004). This leaves approximately 824 acres of inventoried old growth (OG) or replacement old growth (ROG) in the Spring Gulch PSU. There are approximately 5,991 acres below <5,500 feet in elevation in the PSU. See Figure 3-13, for location of old growth stands within the subunit. All of the old growth in the PSU is designated, there is no undesignated old growth.

Stands designated as replacement old growth have many old growth characteristics and the potential to achieve the missing characteristics. Designating the stands ensures they will be left to develop into old growth.

Table 3-22 also shows the minimum acres required to be designated to meet forest plan standards. Designated old growth stands in the project area support the habitat conditions described in “Old Growth Forest Types of the Northern Region” (Green et al. 1992 errata corrected 2004).

The Spring Gulch PSU contains 5,991 acres of federal land below 5,500 feet. The present allocations (see Table 3-22) in the Spring Gulch PSU meet Forest Plan direction as clarified in FSM 2432.22.

Old growth stands in the analysis area are mainly composed of larch, ponderosa pine, Douglas fir, and other conifers. Old growth management area designations in the subunit were made to conserve the best old growth attributes available and to provide the best distribution, size, habitat type coverage, and quality of what is available. These
old growth stands are physically connected to other old growth stands where possible, or are located within a matrix of mature forest that ensures connectivity among stands.

Figure 3-13: Oldgrowth Habitat in Compartment 733
Table 3-22

<table>
<thead>
<tr>
<th>STATUS</th>
<th>Spring Gulch Planning Subunit Acres (Percent)</th>
<th>Kootenai National Forest Acres (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total NFS lands</td>
<td>6,818</td>
<td>186,920 (10)</td>
</tr>
<tr>
<td>Total NFS lands below 5,500 feet elevation</td>
<td>5,991</td>
<td>1,869,200</td>
</tr>
<tr>
<td>Minimum acre designation required by Forest Plan</td>
<td>599</td>
<td>186,920 (10)</td>
</tr>
<tr>
<td>DESIGNED OG (MA13, or og MA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designated effective OG</td>
<td>129 (2)</td>
<td>138,902 (7)</td>
</tr>
<tr>
<td>Designated ROG</td>
<td>695 (12)</td>
<td>62,605 (3)</td>
</tr>
<tr>
<td>Designated unknown (KNF Forest Plan)</td>
<td>0</td>
<td>19,558 (1)</td>
</tr>
<tr>
<td>Total designated OG and ROG</td>
<td>824 (14)</td>
<td>221,065 (11)</td>
</tr>
<tr>
<td>UNDESIGNED EFFECTIVE OG AND ROG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undesignated effective OG</td>
<td>0</td>
<td>61,192 (3)</td>
</tr>
<tr>
<td>Undesignated ROG</td>
<td>0</td>
<td>36,229 (2)</td>
</tr>
<tr>
<td>TOTALS FOR BOTH DESIGNED AND UNDESIGNED OG AND ROG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total designated and undesignated effective OG</td>
<td>129 (2)</td>
<td>199,865 (11)</td>
</tr>
<tr>
<td>Total designated and undesignated ROG</td>
<td>696 (12)</td>
<td>98,834 (5)</td>
</tr>
<tr>
<td>All old growth acres below 5,500 feet</td>
<td>726 (12)</td>
<td>298,699 (16)</td>
</tr>
</tbody>
</table>

Acres were updated in 2010 for the Spring Gulch subunit. Forest-wide acres as of 2007

*Replacement old growth stands were designated to provide old growth in the future within the subunit

The current Forest Plan Monitoring Report indicates the KNF has 1,869,200 acres below 5,500 feet elevation (minus lakes and highways). Using the stand-level data, there are currently 221,065 acres or 11% of KNF acres below 5,500 feet that are old growth (designated or undesignated). An additional 97,421 acres are replacement old growth (designated and undesignated). Forest-wide, old growth or replacement old growth on the KNF totals 298,699 acres or 16% of acres below 5,500 feet based on the stand-level data. As described in the Monitoring Report, the FIA data is summarized forest-wide and does not measure old growth based on the criteria in the Forest Plan. The FIA data estimates effective old growth forest-wide at 8.8% of the Forest, with a 90% confidence interval of 6.9% to 10.6%. The acres of old growth from the stand-level inventory are just within the confidence interval for the FIA data. However, it must be noted the FIA data is measuring a different land base (all lands, not just lands less than 5500 feet). Also, to account for changes from when the FIA data was collected (1993 to 1995), any plots with disturbance (e.g., wildfire) were excluded from consideration as old growth. This is a conservative estimate, since some wildfires may not have affected old growth characteristics. The Monitoring Report indicates the Forest is meeting its Forest Plan requirements for managing 10% of the forest as old growth habitat well distributed across KNF lands below 5,500 feet elevation.
Block Size
There are a total of 824 acres designated for old growth management. These acres are in 8 blocks ranging from 14 to 457 acres in size. Of these designated old growth blocks, 38% are greater than 50 acres in size.

Stands smaller than 50 acres in size were designated to protect additional attributes unique to old growth where they exist in the subunit. They were designated based on recommendations in Morrison et al. (1992:85), where they state “it is vital to recognize that in heavily fragmented landscapes, the last remaining patches of older or forested vegetation may play an important role. The patches may act as stepping stones for dispersal of many species associated with the specific environmental conditions throughout the landscape. Removal of such patches because they fail to meet criteria for size and provision of interior conditions may result in a network of dispersal for wildlife being severed in the landscape”. These stands are largely surrounded by multi-aged stands, which provide corridor links to larger blocks of old growth.

Distribution
Table 3-23 shows the distribution of old growth by VRU. Old growth is well distributed across the vegetation types.

<table>
<thead>
<tr>
<th>VRU</th>
<th>HRV % OG</th>
<th>VRU Acres (%) NFS Lands</th>
<th>Designated OG Acres (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40-70</td>
<td>1,576 (23)</td>
<td>338 (41)</td>
</tr>
<tr>
<td>2</td>
<td>20-50</td>
<td>2,656 (39)</td>
<td>232 (28)</td>
</tr>
<tr>
<td>3</td>
<td>15-40</td>
<td>196 (3)</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>10-40</td>
<td>287 (4)</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>15-45</td>
<td>353 (5)</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>5-10</td>
<td>1,745 (26)</td>
<td>256 (31)</td>
</tr>
</tbody>
</table>

1 USDA Forest Service 1999: stands > 150 years old

These designated old growth stands represent the best distribution of old growth habitat that remains in the subunit (following forest plan direction), recognizing that these areas and their boundaries may change due to natural events such as windstorms, epidemic insect infestations, and stand replacement fires.

Stand Structure
Old growth stand structure is described by Green et al. (1992, errata corrected 2004). That information is incorporated by reference. In summary Green et al. identifies three structural stages that are useful in describing old growth. They are late seral single story (e.g. ponderosa pine, Douglas-Fir, lodgepole sites); late seral multi-story (e.g. larch,
whitepine) and near climax (e.g. cedar, grand fir, sub-alpine fir sites). Stands identified as old growth contain one of these structure stages described by Green et al.

**Disturbance**

Within compartment 733 there are a total of 11 miles of local roads. Of this, 5 miles are restricted yearlong and 6 miles are open year-round. None of these roads bisect or are adjacent to old growth stands. Roads allow for potential access by firewood cutters to remove standing snags. There are no old growth stands adjacent to existing regeneration units (stands < 30 years old).

**Environmental Consequences**

Table 3-24 displays a comparison of effects to old growth habitat by alternative. These criteria are discussed under each alternative.

<table>
<thead>
<tr>
<th>Measurement Criteria</th>
<th>Existing Condition</th>
<th>Alt. 1</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of designated old growth in Sub-Unit (OG+ROG)</td>
<td>824</td>
<td>824</td>
<td>824</td>
</tr>
</tbody>
</table>

**Alternative 1- No action**

**Direct, indirect, and cumulative effects**

This alternative would have no direct effect on designated old growth or associated plant and wildlife species (also see pileated woodpecker discussion). The conditions for the measurement criteria (see Table 3-24) would remain unchanged. No old growth would be treated through timber harvest or prescribed burning. There would be no risks from these activities, such as soil compaction, weed introduction, or modification of stand structure. All old growth areas would maintain their existing conditions and continue to provide habitat for those species which utilize the area over a long term.

Fire suppression over the last century has altered stands historically maintained by fire disturbance. The affected stands have developed fuel loading levels and ladder fuels that are uncharacteristic for some sites. These conditions will continue to accrue until a disturbance occurs.

Potential natural disturbances (wildfire, insect or disease epidemics, wind) could reduce old growth characteristics or completely remove an area of old growth under extreme conditions. While these events might occur, extreme conditions are not predictable so it cannot be said, with reasonable certainty, whether or not these events would have more or less effect than the action alternatives.

The most recent forest-wide old growth analysis concludes that at least 10% of the KNF below 5,500 feet elevation is designated for old growth management. This alternative would not affect the 10% standard for old growth at either the sub-unit or Forest scale.
Effects of the Action Alternative - 2
Direct and Indirect Effects

Treatments are not proposed in designated effective or replacement old growth in the action alternative. There will be no treatments adjacent to designated old growth. No new roads or temporary roads would be constructed through old growth stands. No portion of any roads (NFSR 2771, 38123 and 2771A) to be opened for timber harvest under the action alternative run through effective or replacement old growth.

Proposed pre-commercial thinning on approximately 66 acres would occur in existing regeneration units which would have no direct, indirect, or cumulative effect on old growth.

No prescribed fire is proposed in any designated old growth stand within the Spring Gulch planning subunit.

Ground disturbing activities in or adjacent to old growth may result in noxious weed invasion. The project design includes measures to reduce this potential risk (e.g. washing equipment).

Cumulative Effects of the action alternative
Cumulatively, the proposed activities (timber harvest, road construction, prescribed fire) would not reduce the amount and distribution of old growth below Forest Plan requirements. There would be no reduction in old growth quality as a result of activities proposed by the Spring Gulch project. Private lands in the Spring Gulch PSU were assumed to not provide any old growth, based on past harvest practices.

The action alternatives, in combination with other proposed and reasonably foreseeable Forest Service, would maintain the designated management level of old growth.

Regulatory Consistency

The action alternative is consistent with Forest Plan direction to maintain a minimum of 10% old growth below 5,500 feet in elevation in each third order drainage or compartment, or a combination of compartments (Kootenai Supplement No 85., supplement to FSM 2432.22).

Based on April 13, 2007 direction (Bradford 2007), old growth will be analyzed on the planning subunit scale. After implementation of the action alternatives, the Spring Gulch PSU will have 12% designated old growth below 5,500 feet elevation. The most recent Forest-wide assessment as documented in the Forest Plan Monitoring and Evaluation Report (USDA Forest Service 2008) shows that the Kootenai National Forest has 11% old growth designated. The Kootenai Forest Plan established that maintaining 10% of old growth habitat is sufficient to support viable populations of old-growth dependent species (Vol. 1, II-1, 7, III-54; Vol. 2, A17).

MA13 Recreation Standards: All alternatives comply with these standards. A forest closure order exists to off-highway vehicles which restricts them to established roads and trails.
MA13 Wildlife and Fish Standards: All alternatives comply with these standards

MA13 Range Standards: All alternatives comply. No active range allotments occur.

MA13 Timber standards: All alternatives comply with standards 1 and 3. Firewood cutting could impact snags located in old growth habitat, and this effect is taken into consideration in the cavity habitat analysis.

MA13 Facilities standards: All alternatives comply with standards 2 and 3. All alternatives would continue to restrict motorized access on local roads where closures exist.

MA13 Fire Standards: Planned ignitions. The proposed slashing and burning is consistent for all alternatives. The Forest Plan (Vol. 1, III-56) states that planned ignitions are acceptable to maintain old growth characteristics, i.e. old growth ponderosa pine.

Snag Habitat

Data Sources, Methods, Assumptions, Bounds of Analysis

There are no site specific snag surveys in the Spring Creek PSU. Thomas (1979: 72-75) was used to determine the percent of the potential population level to maintain primary cavity excavator populations (snag level % times % of area with that snag level). Old growth stands provide 100% snag level (SL) as do untreated forest stands (Tincher 1998). Partial cut stands provide at least 60% SL (Johnson and Lamb 1998). Regeneration units provide 0-80% SL. The percent varies mostly by period of harvest (pre- vs. post Forest plan: 1987). Units harvested prior to Forest Plan and those planned pre-1987 but harvested thru 1992 basically provide no cavity habitat structures (Johnson and Lamb 1998). Post 1987 Forest Plan, (1993-2012) harvest units provide at least 40% SL (USDA Forest Service 2003). Roads provide 0% SL. Roads account for 4 acres per mile (average 33 feet wide times 5,280 feet per mile divided by 43,560 square feet per acre). There is no difference in snag density adjacent to open versus closed roads (Bate and Wisdom 2004). While some snags are lost, due to firewood cutting, within 200 feet of open roads, Tincher (1998) shows this “buffer” area still provides at least a 40% (range 40-80%) snag level. Bate and Wisdom (2004) also shows that snag densities were lower as you come closer to a town. Forest-wide, visual observations suggest SL adjacent to roads can be as low as zero. Since firewood cutting is allowed from any open road, retention of snags within 200 feet of the road over time is highly unlikely. Therefore, a worst case scenario was used where roads were buffered by 200 feet on each side to account for total snag loss. This results in zero potential on an additional 49 acres per mile of road (400’ buffer total width x 5,280’ per mile divided by 43,560 square feet/acre – rounded to next whole acre).

The Kootenai Forest Plan recommends applying minimum cavity excavator potential population levels (PPL) on a drainage or compartment basis at the following levels: maintain at least 40% of the PPL throughout commercial forest lands, and maintain at least 60% of the PPL in riparian areas (Kootenai FP 1987). These recommended percentages equate to snag levels of approximately 0.9 snags per acre for the 40% PPL, and 1.35 snags per acre for the 60% PPL. Due to the need to provide a continuous supply of snags over time, there is also a need to designate green trees as snag
replacements. Usually 2 replacements are needed for every snag needed (USDA Forest Service 1987: A 16-11). This results in the general recommendation of 1-2 snags and 2-4 snag replacements per acre or a total of 3-6 per acre. Meeting the Forest Plan riparian standards, as amended by the Inland Native Fish Strategy (INFISH) (USDA Forest Service 1995), ensure providing adequate snags and replacement trees to meet the riparian 60% SL standard.

New science (e.g. Bull et.al 1997), since the 1987 KNF Forest Plan, has been incorporated into the Northern Region Snag Protocol (USDA Forest Service, 2000). This protocol used the forest inventory analysis data for 1988 to 1995 to estimate snag numbers by Vegetative Response Unit (VRU) cluster. The protocol further recommends Forests use local data to fine tune the protocol recommended snag management levels. The Interior Columbia Basin Ecosystem Management Plan (DEIS Appendix 12) (USDA et al. 2000b) also provides new data on snags. Like the R1 Snag protocol, the ICBEMP document recognizes the need to use local data to fine tune recommended snag management levels. The Kootenai NF has established optional snag management levels based on local data (Johnson 2005). These snag levels are greater than the KNF Forest Plan snag standards. These recommendations were considered in this analysis.

The pileated woodpecker is the management indicator species (MIS) for snags (Forest Plan, App.12) (see MIS section). The Forest Plan assumption is that effects of a proposed action on MIS can be correlated to effects on other species with similar habitat requirements. As habitat for MIS species is being maintained, it is assumed that sufficient habitat, such as snags and other snag associated species are also being maintained.

The effect indicators for snag and down wood habitat are: 1) percent of the maximum population potential by PSU; 2) acres treated that reduce snag and down wood levels.

The analysis boundary for project impacts (direct and indirect) on snags is the PSU. This size is sufficient to cover home range sizes of species associated with snag and down wood habitat structure. Cumulative effects are evaluated at the Forest scale.

Affected Environment/Existing Condition

Historically, within VRU's 1 and 2, Douglas-fir and ponderosa pine snags provided a majority of the cavity habitat, with fire resistant ponderosa pine providing most of the large (>19" dbh) snags. VRU 3 has a higher component of larch snags, which provides an important feature for primary excavators and secondary cavity nesters. The moister VRU's also have a component of larch snags in the early and late seral forest condition, with cedar and grand-fir also providing cavity habitat. The number of snags per acre (>10"dbh) likely approached 5-10 snags per acre within all VRU's. Fire suppression and certain logging practices have changed the amount and distribution of these components across the landscape (USDA Forest Service 2000).

Snags, broken topped live trees, and down logs are used by a great variety of wildlife species for nesting, denning, perching, roosting, feeding, and shelter. On the Kootenai National Forest, forty-two species of birds, fourteen species of mammals, and several species of amphibians are recognized as largely dependent on cavity habitat (snags and
down wood). Table 3-25 summarizes the existing cavity habitat potential on National Forest system (NFS) lands in the Spring Gulch planning sub-unit.

### Table 3-25: Existing Population Potential on NFS lands in the Spring Gulch PSU

<table>
<thead>
<tr>
<th>Habitat Component</th>
<th>Acres</th>
<th>Percent of Sub-unit</th>
<th>Total Snags per Acre</th>
<th>Snag Level (%)</th>
<th>Population Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Growth &amp; Untreated Forest</td>
<td>5,772</td>
<td>85%</td>
<td>2-6 (2.25)</td>
<td>100 (100)</td>
<td>0.85</td>
</tr>
<tr>
<td>Partial Cut Forest</td>
<td>0</td>
<td>0</td>
<td>0 (1.35)</td>
<td>0 (60)</td>
<td>0</td>
</tr>
<tr>
<td>Past Regen. Harvest (1993-present)</td>
<td>0</td>
<td>0</td>
<td>0 (0.9)</td>
<td>0 (40)</td>
<td>0</td>
</tr>
<tr>
<td>Past Regen. Harvest (thru 1992)</td>
<td>706</td>
<td>10%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Roads &amp; Buffer (53 acres per mile)</td>
<td>340</td>
<td>5%</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total PSU</td>
<td>6,818</td>
<td>100%</td>
<td>-</td>
<td>-</td>
<td>0.85</td>
</tr>
</tbody>
</table>

1 Value in parenthesis is based on Thomas 1979 Table 18 (pg. 72) and include all snags ≥ 10” d.b.h.. This number is needed to achieve the Snag Level value in parenthesis in the next column.

2 Percent of sub-unit (expressed as decimal) times snag level percent = proportionate population potential for each component. Sum of proportionate population potentials from all components equals the PSU potential. (Thomas 1979: 72-73)

3 Managed snag level percent

4 Based on Tincher (1998)

5 Based on Johnson and Lamb (1998)

6 Partial cut forest includes TSMRS activity codes: 4150 thru 4241

7 Regeneration harvest includes TSMRS activity codes: 4100 thru 4149

8 Based on Tincher (1988), Bate and Wisdom (2004), and KNF forest-wide observations for worst case scenerio

The existing PPL on NFS lands in the PSU is calculated at 85% (see Table 3-25 above). This PPL meets current Forest Plan direction.

Forest-wide cavity excavator potential population level was shown to be 88.7% in the 1997 Forest Plan Monitoring Report (USDA Forest Service 1998: 43). The 2002 report (USDA Forest Service 2003: 22) shows 95% of the compartments monitored meet or exceed Forest Plan standards for PPL and that Forest-wide the 40% PPL (60% in riparian areas) is being met. Meeting Forest riparian standards, as amended by INFS, also assure the 60% level is being met in those areas.
Wildlife Resources/Oldgrowth

Environmental Consequences

In the Spring Gulch planning subunit (PSU), all action alternatives would provide at least 40% snag levels following management activities (see Table W-5.). Potential Population Levels would be reduced by 4% in the PSU.

Table 3-26: Cavity Excavator Potential Population Level (%) by Alternative based on Forest Plan Standards

<table>
<thead>
<tr>
<th></th>
<th>Existing Condition</th>
<th>Alt. 1 (No Action)</th>
<th>Alt 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPL (%) In PSU</td>
<td>85%</td>
<td>85%</td>
<td>81%</td>
</tr>
<tr>
<td>Acres Treated that Reduce Snag Level</td>
<td>0</td>
<td>0</td>
<td>248</td>
</tr>
</tbody>
</table>

Alternative 1 (No Action)

Direct and Indirect Effects

Under alternative 1, no activities would be proposed, so no direct effect to snags is expected. Wildlife use of cavity habitat would continue at current levels. The addition or loss of snags would be dependent on other factors, such as firewood cutting, wind events, natural attrition or wildfire. The level of impact from these factors cannot be calculated due to the high uncertainty in predicting occurrence and intensity levels.

Cumulative Effects

Alternative 1 (No Action) would not authorize any cumulative snag-reducing activities. Suitable cavity habitat would still occur on National Forest lands. Firewood gathering would continue to remove some snags from the open road corridors.

Activities under the Forest-wide Fuels Reduction and Wildlife Habitat Enhancement EA (FFRWHE) program would not occur in the PSU. These projects use prescribed fire, and as a result some, but not all, snags may be lost in treated areas. However, the burning would also result in the creation of snags (by killing live trees), which could provide both feeding and nesting habitat.

Cumulatively, with all lands considered, and all other reasonably foreseeable actions on private and corporate lands considered, sufficient cavity habitat would remain in the Spring Gulch PSU.

Effects of Action Alternative

Management activities that could reduce snags in riparian areas are restricted by Riparian Habitat Conservation Area (RHCA) standards and guidelines (USDA Forest Service 1995). For the proposed activities, this would ensure meeting the riparian standard for snag levels (60%).

Regeneration harvest would result in a long-term (50-100 years) site-specific reduction in suitable cavity habitat for species (e.g. pileated woodpeckers) that do not utilize open areas for nesting. In the long-term, the green trees retained in regeneration units would provide nesting habitat as the new forest develops into a mature stand.
Under burning and excavator piling are treatments proposed to reduce existing fuels and/or harvest-generated slash. Under burning has the potential to reduce cavity habitat because standing snags can burn up or the bases can burn through, causing them to fall over. Down logs are sometimes partially or wholly consumed by fire. At the same time, under burning also has the potential to create new snags if a green residual tree is killed by fire. The loss or gain of cavity habitat varies widely, and depends on conditions (e.g. weather, fuel loads, and fuel moisture) present when units are under burned. Excavator piling and burning would have less potential for loss or gain of cavity habitat because the burn treatment would be concentrated in pile areas, and piles would generally be located away from snags and leave trees.

**Effects of the Action Alternative 2**

**Direct and Indirect Effects**

Implementation of the action alternative would have direct effects on snag habitat. Table 3-27 summarizes those project activities that would change snag levels. Also see Table 3-26 above for the changes in PPL.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Alt. 1 (No Action)</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regeneration Harvest</td>
<td>0</td>
<td>88</td>
</tr>
<tr>
<td>Partial Cutting</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>New Road Construction</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Prescribed Fire *</td>
<td>0</td>
<td>233</td>
</tr>
</tbody>
</table>

* Acres treated with prescribed fire may increase and/or decrease snag levels
  \( \text{1 the acres in the No Action Alternative are the cumulative effects from other reasonably foreseeable projects. They can be added to the acres in the action alternatives to see cumulative effect acres} \)

Regeneration harvest in Alternative 2 would reduce snag availability specific to the unit areas, and use would change from those species requiring snags with nearby live tree cover (e.g. pileated woodpeckers) to those which will use snags in open sites (e.g. bluebirds, northern flicker, flycatchers). Regeneration harvest can potentially impact long-term cavity habitat, since fewer trees are left on site to be recruited as snags or snag replacements.

Commercial thinning in Alternative 2 would retain higher levels of existing snags than regeneration units, and green replacement trees would be more readily available for future habitat.

In the long term, the proposed improvement harvests identified in the action alternatives are expected to provide for the continuity of large diameter ponderosa pine and Douglas-fir. This in turn provides a long-term benefit to cavity-dependent species, as over time they will become snags. The improvement harvest would follow a basal area reduction prescription. A majority of the ponderosa pine - Douglas-fir stands will retain larger and older trees in the over-story to maintain vertical structure and provide future replacement snags. The prescription would result in the removal of small diameter (less than 7“ dbh) snags and whips in the under-story, which will likely be removed or toppled during logging operations.
On units planned for skyline yarding, snags are expected to be lost due to OSHA safety standards. This may also occur on tractor/skidder units, depending on snag condition, location and size in relation to skid trails and falling personnel. Adequate live trees of larger sizes would be available to provide habitat features needed by snag dependent wildlife in the future.

The subsequent proposed under burning would reduce the small diameter Douglas-fir encroachment, and any trees that may be killed during the burning would result in the creation of snags. Additionally, fire may facilitate decay in surviving trees by proving an entry point for fungi, which increases the likelihood that the trees will be used by cavity excavators (Smith et al. 2000).

Site preparation burning, and prescribed fire on non-harvest units may result in some fire killed trees and subsequent new snag feeding/nesting sites. Within proposed harvest units, retention of all snags greater than 10" dbh is planned. This would help compensate for deficient snag numbers in existing harvest units. Proposed pre-commercial thinning on approximately 68 acres would occur in existing regeneration units. This would have no direct, indirect or cumulative effect on existing snags. Since roads opened for thinning would not be opened to the public, additional removal of snags for firewood gathering should not occur.

**Cumulative Effects**

After implementation of alternative 2 and the reasonably foreseeable activities, the primary cavity excavator potential population level on NFS lands would decrease to 81%. This level of snag habitat is still expected to provide for an associated species population level above 40 percent, which is thought to be the minimum needed to maintain self-sustaining populations of snag-dependent wildlife (Thomas 1979:72).

The 2007 Forest Plan monitoring report (USDA Forest Service 2008) documents results for the past 20 years, and indicates the Kootenai National Forest is providing sufficient cavity habitat at the drainage or compartment as well as the Forest scale.

**Regulatory Consistency**

All proposed units in alternative 2 maintain at least 40% snag level. No alternative causes the Spring Gulch PSU overall PPL to drop below the general forest 40% or riparian 60% primary cavity excavator potential population level. This is consistent with Forest Plan standards.

Kootenai Forest Plan cavity habitat standard (40% PPL) in MAs 11, 12, 15, 16, 17 and 18 is met.

Kootenai Forest Plan cavity habitat standard in MA10 is met. Alternative 2 includes a project-specific amendment to suspend the requirement to retain all existing cavity habitat in MA10. The amendment is for the Spring Gulch project area, only for the duration of this specific project. All units will still meet the 40% minimum snag level. Kootenai Forest Plan forest-wide goal #8 (FP Vol 1 p. II-1) to “manage for sufficient snags and snag replacement trees to maintain viable populations of snag-dependent species” is met.
Management Indicator Species

Regulatory Framework
The Forest Plan identified a number of wildlife species that find optimum breeding and feeding habitat in old growth. The pileated woodpecker requires large diameter trees for nesting and is the management indicator species (MIS) for old growth habitat on the Kootenai National Forest. Federal laws and direction applicable to management indicator species include the National Forest Management Act (NFMA, 1976) and Forest Service Manual (FSM) 2620. The National Forest Management Act specifies that the National Forest System be managed to provide for diversity of plant and animal communities to meet overall multiple-use objectives. The “specific land area” (scale) for providing diversity is established in the framework as the area covered by a Forest Plan. The KNF Forest Plan goal (FP p. II-1 #7) is to “maintain diverse age classes of vegetation for viable populations of all existing native, vertebrate, wildlife species… and in sufficient quality and quantity to maintain habitat diversity representative of existing conditions”. In addition, the KNF Forest Plan includes this wildlife standard relevant to MIS: “The maintenance of viable populations of existing native and desirable non-native vertebrate species, as monitored through indicator species, will be attained through the maintenance of a diversity of plant communities and habitats” (FP Vol. 1 p.II-22).

Other Federal resource laws that provide impetus for managing for viable wildlife populations on public land includes the National Wilderness Preservation Act (1964), the National Environmental Policy Act (1969), and the Endangered Species Act (1973). Information from the landscape assessments conducted in the Columbia River Basin was also reviewed.

Based on direction found in the National Forest Management Act, the Kootenai Forest Plan (FP) (1987, Appendix 12) identifies management indicator species (MIS) (see Table 3-28). The FP states “the maintenance of viable populations of existing native and desirable non-native vertebrate species, as monitored through indicator species, will be attained through the maintenance of a diversity of plant communities and habitats.” (FP II-22)

Elk and Whitetail deer are two MIS species that represent similar habitat. Summerfield (1991) recommends determining which big game species will be featured in a particular area, since species winter requirements differ. Based on Forest plan direction, the biological potential of the area, state wildlife management objectives, public comments during scoping and the information contained within the Kootenai Conservation Plan (Johnson 2004: Appendix H); an emphasis species was identified for this report.

As a general rule the following process was used to determine the featured species. In the Conservation Plan the KNF and MFWP Elk Task Force established management emphasis designations for elk by planning subunit (ibid: Appendix H, Attachment B, page H-12 and 2600 letter of 5-16-1997). In planning subunits with high emphasis for elk, elk will be the emphasis MIS in this report. For planning subunits in which elk are a low emphasis, Whitetail deer will be the indicator for general forest habitat in this report. For planning subunits in which elk are moderate emphasis, the project biologist will designate the general forest indicator, based on site specific information about elk and deer use in the PSU. The Spring Gulch Planning Area is high emphasis for elk; therefore elk will be the general forest indicator in this analysis.
Wildlife Resources/Oldgrowth

Table 3-28: Management Indicator Species

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>HABITAT REPRESENTED</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grizzly Bear ((Ursus arctos))</td>
<td>General Forest</td>
<td>See T&amp;E Section</td>
</tr>
<tr>
<td>Gray Wolf ((Canis lupus))</td>
<td>General Forest</td>
<td>See Sensitive Species Section</td>
</tr>
<tr>
<td>Bald Eagle ((Haliaeetus leucocephalus))</td>
<td>Rivers and Lakes</td>
<td>Populations increasing in the area. See Sensitive Species Section</td>
</tr>
<tr>
<td>Peregrine Falcon ((Falco peregrinus))</td>
<td>Cliffs</td>
<td>No nesting habitat in vicinity of project area, populations increasing in the area. See Sensitive Species Section</td>
</tr>
<tr>
<td>Elk ((Cervus elaphus))</td>
<td>General Forest</td>
<td>Elk are the emphasis species in the drainage. Population stable to increasing. See analysis below.</td>
</tr>
<tr>
<td>White-tailed deer ((Odocoilios virginianus))</td>
<td>General Forest</td>
<td>Elk is the emphasis species in the drainage. White-tailed deer are not analyzed. Populations are stable to increasing based on MFWP surveys.</td>
</tr>
<tr>
<td>Mountain Goat ((Oreamnos americanus))</td>
<td>Alpine</td>
<td>No alpine habitat in project area. Mtn. Goats not found in project area. Project will have no impact on Mtn. Goats. No further analysis required</td>
</tr>
<tr>
<td>Pileated Woodpecker ((Dryocopus pileatus))</td>
<td>Snags, Old Growth</td>
<td>Species common on Forest based on monitoring conducted by Landbird Program. See analysis below and old growth and snag sections</td>
</tr>
</tbody>
</table>

Elk

Data Sources, Methods, Assumptions, Bounds of Analysis

Elk are one of the indicator species for general forest habitat condition. The Spring Gulch project area is located in the Vermilion Planning sub-unit (PSU), which is identified as an area where elk are emphasized over white-tailed deer, another general forest indicator species (KNF MFWP Elk Task Force 1997).

Elk population ecology, biology, habitat description and relationships identified by research are described in Murie (1979) and Toweill and Thomas (2002). That information is incorporated by reference. Elk population and harvest data come primarily from Montana Fish, Wildlife & Parks (MFWP) data. Additional information used is from recent District wildlife observation records and Forest historical data (NRIS WILDLIFE DATABASE). The analysis boundary for project impacts to individuals and their habitat is the Spring Gulch planning sub-unit. The boundary for determining population trend
and contribution toward viability is the MFWP elk hunting district # 121 and the Kootenai National Forest, respectively.

The effects analysis is based on direction provided in the Kootenai National Forest Forest Plan (1987) as amended and Coordinating Elk and Timber Management (MFWP 1985). Additional guidance is provided by Defining Elk Security: The Hillis Paradigm (1991). Potential effects to elk habitat are identified by analyzing four effects indicators; cover/forage ratio, habitat effectiveness, security, and key habitat components.

Cover/Forage Ratios: Cover/forage ratio portrays the percentage of area that meets elk requirements for cover and forage. Cover provides protection from weather, predators, and humans. Two different types of cover have been recognized. Hiding cover is defined as vegetation capable of hiding 90% of an elk from the view of a human at 200 feet. Thermal cover is a stand of conifers that are 40 feet tall with 70% crown closure. Forage areas are those natural or man-made areas that do not qualify as cover (hiding or thermal) (Thomas 1979: 109, 114, 116). Recently, elk use of thermal cover and foraging areas has been reexamined and this research indicates that providing thermal cover is not a suitable solution for inadequate forage conditions (Cook et al. 1998).

The Kootenai Forest Plan (1987) recommends a cover/forage (C/F) ratio of 30/70% for elk winter range (measured on the combined acres in MA 10 and 11 lands). Summerfield (1991) recommends cover to be 60% on winter and summer range (measured on all MAs not winter range). On elk winter range the cover should be at least 40% thermal cover (ibid). Summer range cover may be in any combination of hiding and thermal cover (ibid). The KNF Plan (1987) also identifies the general maximum size for an opening as 40 acres. Summerfield (1991) recommends that the opening size standard be the same as the standard for grizzly bear (a maximum of 600 feet to cover from any point inside an opening).

Cover/forage ratios for summer range in the PSU, C/F ratio for winter range in the PSU, the percent thermal cover on winter range, and the number of regeneration harvest units greater than 40 acres in size at the PSU scale are the measures for effects.

Habitat Effectiveness: The habitat effectiveness of an area refers to the percentage of habitat that is usable by elk outside of the hunting season that does not contain open roads. Numerous studies have shown that there is a strong negative correlation between elk use of an area and the density of open roads, even if those roads are only lightly traveled (Frederick 1991).

On MA 18 the Forest Plan ORD standard is < 3.0 miles per square mile, which equates to 38% habitat effectiveness.

The percent HE for the PSU, ORD for 18 lands in the PSU is the measure for effects.

Security: Security areas are defined as areas that are larger than 250 contiguous acres in size and more than one half mile from an open road (Hillis et al. 1991). These areas offer elk refuge through reduced vulnerability during the hunting season and can greatly influence the age structure and composition of a herd.
The Kootenai Forest Plan has no standard for security. A panel of state and federal wildlife biologists convened in 1996 and produced, “Integrating Kootenai National Forest Plan and Fish, Wildlife & Parks Elk Management Plan Final Task Force Report (Johnson 2004: Appendix H-B). This document identified security as an important component in elk habitat and that the Hillis et al. (1991) method would be used to calculate it. This method recommends a minimum of 30% of an elk’s fall use area be maintained as security habitat. Since elk use in the fall could be any place within a PSU, the 30% minimum is measured against the PSU NFS acres. Appendix H-B (Johnson 2004: p. H-12) also provides the elk management emphasis level by Planning Sub-Unit as well as definitions for security levels (H-B-13).

The percent security in the PSU will be the measure for effects.

Affected Environment/Existing Condition
The Spring Gulch PSU is located in elk hunting district 121. The population in the hunting district is stable (MFWP 2004). Currently, the cover/forage ratio on the winter range is 66/34% and 79% of the project area is secure habitat (Table 3-29). The PSU is managed with a high emphasis for elk (Johnson 2004: App. H-B: p. H-12).

Environmental Consequences
Direct and Indirect Effects

No Action Alternative

Cover/Forage Ratios
Under Alternative 1 (no action) all cover/forage ratios would remain unchanged, in the short-term. However, as trees and shrubs continue to grow and mature the number of acres of productive foraging habitat will decline. As trees continue to encroach upon forage openings and tree canopies close the quality of the forage and number of acres producing forage will decline. The increased tree density and continuous fuel profile from the ground up to the main canopy puts the area at risk of severe wildfire (See Fire section for additional information). If severe wildfires occur, it is likely that forage habitat will be greater than 600 feet from cover, making it less likely to be fully used by elk.

Open Road Density
Open Road Densities (see Table 3-29 below) would remain unchanged under the No Action alternative.

Security
Secure habitat for elk would remain unchanged (79% of the planning area) under the No Action alternative.

Table 3-29 summarizes the effects to elk habitat in the Spring Gulch PSU by alternative.
Table 3-29: Elk habitat components by Alternative

<table>
<thead>
<tr>
<th>Habitat Component</th>
<th>Alternative 1 (No Action) (Existing Condition)</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSU Cover/forage Ratio Summer Range (guide 60/40) (non-winter range MAs)</td>
<td>73/27</td>
<td>72/28</td>
</tr>
<tr>
<td>PSU Cover/forage Ratio Winter Range (MA 10 &amp; 11) (guide 60/40)</td>
<td>66/34</td>
<td>64/36</td>
</tr>
<tr>
<td>Thermal Cover % Winter range (MA 10 &amp; 11) (guide &gt; 40%)</td>
<td>42%</td>
<td>42%</td>
</tr>
<tr>
<td>PSU Security Cover % (guide &gt;30%)</td>
<td>79%</td>
<td>78%</td>
</tr>
<tr>
<td>PSU Open Road Density (mi/mi$^2$) (MA 18) (std. &lt;3.0)</td>
<td>1.1 mi./sq. mi.</td>
<td>2.7 mi/mi$^2$</td>
</tr>
<tr>
<td>Habitat Effectiveness (MA 18) (%) (guide &gt;39%)</td>
<td>60%</td>
<td>51%</td>
</tr>
<tr>
<td># Openings &gt; 40 acres</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Action Alternative**

**Cover/Forage Ratios**
Prescribed burning is included in the proposed action (see Alternative descriptions), and would occur primarily on south and west slopes that make up big game winter range. Burning would improve the palatability and enhance the quality of the forage produced on these acres.

Cover/forage ratios on winter range would shift toward the Forest Plan Standard because of 34 acres of timber harvest in MA’s 10 and 11 (Table 3-29).

Summer range cover/forage ratio would become 72/28 (Table 3-29), under the proposed action. None of the proposed harvest units are larger than 40 acres. There may be short-term disturbances within identified big game travel corridors due to project related activities. Timber management in riparian habitat conservation areas would follow INFS guidelines and the state of Montana Streamside Management Zone law, ensuring the maintenance of travel corridors within riparian zones. Movement corridors would be maintained.

**Open Road Density and Habitat Effectiveness**
There is no MA-12, timber–big game summer range, in the project area. Table 3-29 (above) shows the ORD for MA 18. The proposed action meets the Forest Plan standard of equal to or less than three miles per square mile.
Security
Because of harvest related activity, big game security in the project area may reach 78% (Table 3-29). Reductions in security would be temporary and extend only to the life of the projects. Upon completion of all projects related to this analysis big game security in the project area would return to 79%. Secure displacement habitat exists adjacent to the project-area in the Cataract Creek Inventoried Roadless Area. Access to secure habitat would be maintained throughout the life of the projects.

Summary
In summary, the proposed action proposes activity in big game habitat and begins the process of shifting the cover/forage ratio toward one more suitable for elk with no permanent reduction in security. However, in order to achieve these changes, short-term increases in open road density and reductions in security are required. These changes in ORD and security will be short-lived and security levels will return to pre-project levels. Some short-term displacement of big game may occur when harvest occurs in travel corridors or as security is decreased during the life of the project.

The management activities and resulting changes in habitat conditions disclosed above are likely to result in short-term displacement effects on elk. Elk numbers are not expected to change dramatically, however with increased forage availability and maintained security levels the population could show a slight increase.

Cumulative Effects
The cumulative effects of past and present land use patterns as well as random natural events have been taken into consideration in describing the existing condition. There are no reasonably foreseeable activities planned that could change the magnitude or scope of effects described above.

Hunting activities within the PSU will cumulatively contribute to minor short term effects (during the general hunting season) to habitat security. Effects from hunting vary with activity levels and can include short-term disturbance. Mortality risk to elk is increased through hunting. The level of hunting within the analysis area is not expected to change significantly due to the proposed action.

REGULATORY CONSISTENCY
Forest Plan
• All Alternatives meet Forest Plan direction for big game species (FP Vol. 1, II-1 #6).

State Elk Plan
• The project area is located in the Lower Clark Fork Elk Management Unit identified in the MFWP Statewide Elk Management Plan. The proposed project is consistent with that document.

SUMMARY GENERAL FOREST MIS STATEMENT
Based on the analysis for elk and the other general forest habitat indicators and the KNF Conservation Plan (Johnson 2004), habitat for general forest species should provide sufficient quality and quantity of the diverse age classes of vegetation needed for viable
populations. Since sufficient general forest habitat is available, the populations of species using that habitat should remain viable.

**PILEATED WOODPECKER**

**Data Sources, Methods, Assumptions, Bounds of Analysis**

Pileated woodpecker (PWP) population ecology, biology, habitat description and relationships identified by research for the northern Rocky Mountains are described in McClelland & McClelland (1999), McClelland (1979, 1977), McClelland et al. (1979), and Warren (1990). This information is incorporated by reference.


Pileated woodpecker occurrence data comes from recent District wildlife observation records, the Region One Landbird Monitoring Program (Avian Science Center, Univ. of Montana), and Forest historical data (NRIS Wildlife Database). The pileated woodpecker is the indicator species for old growth and snag habitat on the Kootenai National Forest. Habitat for this species was modeled using all designated and undesignated old growth habitat and old growth replacement habitat, which has currently been mapped for the Kootenai National Forest.

**Effects Indicators**

The potential population index (PPI) for PWPs on the Kootenai National Forest has been calculated by Johnson (2003). The procedure is based on the assumption that all currently mapped effective and replacement old growth habitat (both designated and undesignated) is providing suitable habitat to support nesting territories. This assumption also includes the premise that all suitable habitat is spatially distributed across the landscape in a pattern that can be incorporated into individual nesting territories. The procedure was based on territory sizes of pileated woodpeckers as described in research by McClelland (1977) for northwest Montana, and Thomas (1979) and Bull and Holthausen (1993) for northeast Oregon. For the PPI analysis on the Kootenai National Forest (Johnson 2003b), replacement old growth habitat was defined as habitat that had some old growth characteristics, but did not meet the Kootenai Forest Plan (USFS 1987 errata corrected 2004) definition of old growth, or the definition found in Green et.al. (1992 errata corrected 2004).

Effective old growth habitat was modeled as supporting one nesting pair per 600 acres, with replacement old growth habitat supporting one nesting pair per 1000 acres. The difference in territory size is based on research that suggests that higher quality habitat can support a breeding pair with fewer acres (McClelland 1977; Bull and Holthausen 1993). Also, allowing for larger territory sizes when habitat becomes fragmented appears reasonable, as territory sizes up to 2,600 acres have been reported for western Oregon (Mellen et al. 1992). Of course, there are numerous and complex interrelated factors that influence the actual size of the home range territory (McClelland 1977).
Project impacts are evaluated based on impacts to important attributes of pileated woodpecker habitat, primarily impacts to designated and undesignated old growth habitat. Specific features of old growth stands evaluated for project impacts include preferred nest tree species, preferred nest tree size, down logs (both size and quantity), basal area (BA), and canopy closure (CC).

The overall assessment of habitat quality also accounts for potential negative factors discussed in the old growth habitat analysis that relate to size and connectivity, and include fragmentation, edge effect, and lack of interior habitat. Risk to firewood cutting is also evaluated. Other stands (not designated as old growth) may have one or more important attributes of old growth forests, or perhaps provide for connectivity and interior habitat. These stands were also reviewed as part of this analysis.

The analysis boundary for project impacts to individuals and their habitat is the Spring Gulch planning sub-unit. The boundary for cumulative effects and determining trend and contribution toward viability is the Kootenai National Forest.

**Affected Environment/Existing Condition**

The modeled minimum PPI for the pileated woodpecker on the Kootenai National Forest is 425 nesting or breeding pairs (Johnson 2003b). This is within the calculated historic range of variation for the minimum potential population index of 335 to 554 breeding pairs (Johnson 1999).

A detailed summary of old growth habitat for the Spring Gulch planning sub-unit is displayed in the Old Growth section of this document. This summary indicates that approximately 129 acres of effective old growth habitat (both designated and undesignated), and about 696 acres of replacement habitat (both designated and undesignated) exist within the PSU. Existing pileated woodpecker nesting territories will likely encompass a significant portion of this old growth habitat. Based solely on the quantity of old growth habitat available, the Spring Gulch planning sub-unit could support about 0.9 nesting territories (PPI).

No population data is available for pileated woodpeckers within the Kootenai National Forest. Breeding bird point count surveys have been conducted on the Kootenai Forest since 1994. In this program, transects consisting of multiple bird monitoring points are set up within a wide range of habitats distributed geographically across the Kootenai National Forest. This survey technique is not specifically designed to census woodpecker species, although all migratory and resident bird species detected by specialists trained in bird identification are recorded at each point on each transect. The rate of detection can vary greatly from year to year, especially for a wide-ranging species like the pileated woodpecker, that may or may not be anywhere near a given point on a given day. During the 1994-2004 periods, the pileated woodpecker was tallied 204 times at the 2,638 individual points surveyed (USFS 2003).

There are no known PWP nest cavities in the Spring Gulch PSU.
Environmental Consequences

Alternative 1 (No Action)
Under Alternative 1 (No Action), natural successional processes will continue to occur throughout existing old growth stands, and stands containing old growth attributes used by pileated woodpeckers. Habitat will be provided for PWP nesting pairs that find suitable feeding and breeding conditions provided by the structural features and overall environment within these stands. There would be no change in PPI (see Table 3-30 below).

Replacement old growth habitat currently provides less suitable stand conditions for territory occupation. Over the next several decades, in the absence of catastrophic fires or windstorms, these stands will develop better habitat features for pileated woodpeckers such as larger trees, larger snags, and more down logs. Also, higher levels of decadence will develop producing better substrate for food resources such as carpenter ants and their larvae, one of the primary prey items for pileated woodpeckers in the Northern Rockies (McClelland & McClelland 1999, 1977) and in the Pacific and Inland Northwest (Bull et al. 1992a; Bull 1987, 1975; and Bull et al. 1980).

Under Alternative 1, no active management is expected within effective or replacement old growth habitat, with the exception of fire suppression activities. Continued disruption of the historic pattern of frequent fires in the drier ponderosa pine/Douglas-fir cover type will continue to result in ecological changes, such as the encroachment of Douglas-fir saplings in the understory. Eventually, these sites will develop a higher percentage of Douglas-fir trees, snags, and down logs more suitable as foraging habitat than nesting habitat for pileated woodpeckers.

Over the next several decades, this successional trend may result in a reduction in quality PWP nest trees (ponderosa pine), since Douglas-fir was not found to be important for pileated woodpecker nest cavity excavation in the northern Rocky Mountains (McClelland & McClelland 1999, 1977), in northeast Oregon (Bull 1987, 1975; Thomas 1979), or in British Columbia (Harestad & Keisker 1989).

Under this alternative, the impact of the existing road system on snags, an important attribute of the pileated woodpecker territory, will remain as described under the analysis for snags and old growth habitat. The effects of edge on pileated woodpecker habitat from adjacent regeneration units will also remain as described under the old growth analysis.

Effects of the Action Alternative
There will be no impacts to old growth habitat as a result of the proposed action. There is no designated or undesignated old growth habitat in the project area. There will no change to pileated woodpecker habitat.

Based on the lack of impact to old growth acres (see Table 3-22 in the old growth section) the PPI is not expected to change as seen in Table 3-30.
Table 3-30: Potential Population Index by Alternative

<table>
<thead>
<tr>
<th>Analysis Area</th>
<th>Existing PPI</th>
<th>Alt. 1 No Action</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Gulch PSU</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Forest-wide</td>
<td>425</td>
<td>425</td>
<td>425</td>
</tr>
</tbody>
</table>

Project activities (e.g. falling and yarding) are likely to cause PWP’s to, at least temporarily, move away from the disturbed areas.

Cumulative Effects
There will be no cumulative effects to pileated woodpecker from either the no action or the proposed action alternative. There will be no impacts to the viability of pileated woodpeckers on the Cabinet Ranger District, Kootenai National Forest or in Region 1 as a result of the Spring Gulch Project.

Regulatory Consistency
Forest Plan
- All alternatives are consistent with Forest Plan direction for old growth (see old growth section)
- All alternatives are consistent with Forest Plan direction for snags and down wood (see snag and down wood section)
- All alternatives are consistent with Forest Plan direction to maintain diverse age classes of vegetation for viable populations (FP II-1 #7).

SUMMARY OLD GROWTH, SNAG AND DOWN WOOD HABITAT MIS STATEMENT
Based on the analysis for pileated woodpecker, old growth, and snags and down wood, and the KNF Conservation Plan (Johnson 2004), habitat for old growth forest species and cavity habitat users should be provided in sufficient quality and quantity to meet the needs for viable populations. Since sufficient old growth forest, and snag and down wood habitat is available, the populations of species using that habitat should remain viable.

Sensitive Species

Regulatory Framework
The sensitive species analysis in this document meets the requirements for a biological evaluation as outlined in FSM 2672.42.

Sensitive species are administratively designated by the Regional Forester (FSM 2670.5) and managed under the authority of the National Forest Management Act. FSM 2670.22 requires the maintenance of viable populations of native and desired non-native species and to avoid actions that may cause a species to become threatened or endangered.

The National Forest Management Act (NFMA) directs the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” [16 U.S.C. 1604(g) (3) (B)]. Providing ecological conditions to support diversity of native plant and animal species in the planning area satisfies the statutory requirements. The Forest Service’s
focus for meeting the requirements of NFMA and its implementing regulations is on assessing habitat to provide for diversity of species.

The Kootenai National Forest Land and Resource Management Plan (1987) establishes forest-wide goals, objectives, standards, guidelines, and monitoring requirements. Direction for sensitive species includes determining the status of sensitive species and providing for their environmental needs as necessary to prevent them from becoming endangered (FP II-1). The FP also requires the maintenance of diverse age classes of vegetation for viable populations of all existing native, vertebrate wildlife species (FP II-1).

Table 3-31: Sensitive Wildlife Species on the Kootenai National Forest (Weldon 2011)

<table>
<thead>
<tr>
<th>SENSITIVE SPECIES</th>
<th>STATUS IN ANALYSIS AREA*</th>
<th>COMMENTS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bald Eagle (Haliaeetus leucocephalus)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Black Backed Woodpecker (Picoides arcticus)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Coeur d’Alene Salamander (Plethodon vandykei idahoensis)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Common loon (Gavia immer)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Fisher (Martes pinnanti)</td>
<td>S</td>
<td>2</td>
</tr>
<tr>
<td>Flammulated Owl (Otus flammeolus)</td>
<td>S</td>
<td>2</td>
</tr>
<tr>
<td>Gray Wolf (Canis lupus)</td>
<td>S</td>
<td>2</td>
</tr>
<tr>
<td>Harlequin Duck (Histrionicus histrionicus)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Northern Bog Lemming (Synaptomys borealis)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Northern Leopard Frog (Rana pipiens)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Peregrine Falcon (Falco peregrinus)</td>
<td>NS</td>
<td>1</td>
</tr>
<tr>
<td>Townsend’s Big-eared Bat (Corynorhinus townsendii)</td>
<td>S</td>
<td>2</td>
</tr>
<tr>
<td>Western Toad (Bufo boreas)</td>
<td>S</td>
<td>2</td>
</tr>
<tr>
<td>Wolverine*** (Gulo gulo)</td>
<td>NS</td>
<td>3</td>
</tr>
<tr>
<td>Bighorn Sheep (Ovis Canadensis)</td>
<td>NS</td>
<td>1</td>
</tr>
</tbody>
</table>

*Status Key:
K = This species is known to occur within the project area.
S = Species is suspected to occur within project area.
NS = Species is not suspected to occur within the project area, and is dropped from further evaluation.

** Select All That Apply
1 = Suitable habitat does not occur in the analysis area
2 = Suitable habitat does occur in the analysis area
3 = Suitable denning habitat does not occur in the analysis area

***Candidate Species for listing as threatened or endangered
Fisher

Data Sources, Methods, Assumptions, Bounds of Analysis
Fisher population ecology, biology, habitat description and relationships identified by research are described in Powell and Zielinski (1994) and Heinemeyer and Jones (1994). That information is incorporated by reference. Fishers are similar in body form to weasels, but larger. Their fur color varies from very dark brown to blackish brown. Young are born in cavities in either live or dead trees. Mature grand fir and Engelmann spruce forests are common fisher habitat (Heinemeyer and Jones 1994). Fisher occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS Wildlife Database) and other agencies (MFWP). The analysis boundary for project impacts to individuals and their habitat is the Spring Gulch planning subunit (PSU). Potential fisher habitat was identified by buffering streams 200 meters. The boundary for cumulative effects and determining contribution toward viability is the Kootenai National Forest.

Affected Environment/Existing Condition
Fisher observation and monitoring data indicates that there have been no observations in the Spring Gulch planning subunit (PSU). Johnson (1999) shows fisher presence confirmed in five of the eight planning units on the Kootenai.

Reudiger (1994) shows the Kootenai National Forest as a primary habitat area for fisher. There are 1,111 acres of potential fisher habitat in the Spring Gulch PSU and 123 acres in the project area. Following the identification process outlined in Reudiger (ibid), the Clark planning unit (major drainage) is assigned as a primary fisher conservation area (Johnson 2004b). The Vermilion planning sub-unit (sub-drainage) is determined to be low quality fisher habitat area (ibid).

Environmental Consequences
Table 3-32 summarizes the changes in habitat acres and PPI due to each alternative.

<table>
<thead>
<tr>
<th>Table 3-32: Habitat and PPI Changes by Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1 (No Action) (Existing Condition)</td>
</tr>
<tr>
<td>Habitat Acres - Planning sub-unit (% change)</td>
</tr>
<tr>
<td>Habitat Acres – Project Area</td>
</tr>
<tr>
<td>PPI – Planning sub-unit (males/females)</td>
</tr>
<tr>
<td>Habitat Acres - Forest-wide (% change)</td>
</tr>
<tr>
<td>PPI - Forest-wide (Males/Females)</td>
</tr>
</tbody>
</table>

Direct and Indirect Effects
The action alternative proposes vegetation management activities that would reduce the amount of fisher habitat in the Spring Gulch Planning Sub-unit (See Table 3-32 for acres by Alternative). While research does not show fisher to be highly sensitive to human activity, the presence of people and machines during project implementation may
displace fishers using the suitable habitat near the proposed units. The displacement would last until the machines are turned off or leave the area and the people are gone.

Thinning (88 acres) and burning (77 acres) will enhance fisher habitat by reducing the amount of competition between overstocked trees.

**Cumulative Effects**
Alternative 1 (No Action) would not contribute to any cumulative effects on fisher or their habitat. The action alternatives, in combination with the baseline conditions and reasonably foreseeable projects (see earlier list) would not contribute to any cumulative effects on fisher or their habitat. There would be no impact on the viability of fisher populations on the Cabinet District, the Kootenai National Forest, or in Region 1.

**Regulatory Consistency**
Forest Plan:
- All Alternatives meet Forest Plan direction for sensitive species (FP Vol. 1, II-1 #6).
- All Alternatives are consistent with Forest Plan riparian standards and guidelines (FP Vol. 1 II-28 thru 33) as amended by INFS.
- All alternatives are consistent with Forest Plan direction for old growth below 5500’ (FP Vol. 1 II-1 #7; II-7; II-22 & 23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).

National Forest Management Act:
- The project complies with NFMA direction to provide for diverse populations of plant and animal communities by compliance with Forest Plan standards and guides (Johnson 2004).

**Statement of Findings**
The proposed action May Impact Individuals or Habitat, But Will Not Likely Result in a Trend Toward Federal Listing or Reduced Viability For The Population or Species. This determination is based on:
1) minimal reduction in potential habitat in the PSU (2%),
2) enhancement of 165 acres of habitat,
3) Suitable undisturbed displacement habitat available.

**Flammulated Owl**

**Data Sources, Methods, Assumptions, Bounds of Analysis**
Flammulated owl population ecology, biology, habitat description and relationships identified by research are summarized in Hayward and Verner (1994). More recent research on nesting, food habits, home range and territories, and habitat quality conducted in Colorado, Idaho, and Montana is discussed in Linkhart (2001), Linkhart and Reynolds (1997), Linkhart et al. (1998), Powers et al (1996), Wright (1996), and Wright et al. (1997). That information is incorporated by reference. They are gray, five to six inches tall with small ear tufts. Nesting begins in early June and nests are located in tree cavities. Primarily, flammulated owls eat insects, moths, beetles, and crickets (Holt and Becker 1990). Flammulated owl occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS Wildlife Database).
The Kootenai National Forest "A Conservation Plan: Based on The Kootenai National Forest Land Management Plan (as amended) (Johnson 2004) determines potential population index (number of potential territories) for breeding pairs by dividing habitat acres by 40 acres. Using changes to habitat and resulting potential population index were used to display the effects of alternatives.

The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Spring Gulch PSU. The boundary for determining contribution toward viability is the Kootenai National Forest.

Affected Environment/Existing Condition
District flammulated owl observation and monitoring data indicates that there have been no observations of owls in the Spring Gulch PSU. A Kootenai National Forest status summary of the flammulated owl was documented by Johnson (1999 unpublished). The summary shows that potential habitat occurs across all eight planning subunits. Forest-wide, there are 237,098 acres of potential habitat (Ibid). Field surveys have confirmed flammulated owl presence in six of eight planning units. The population size on the Kootenai National Forest is unknown (Ibid). The flammulated owl has not been documented to occur in the Spring Gulch PSU.

Forest-wide acreage is from Johnson (1999). Based on the average flammulated owl pair territory size and the modeled habitat acres, the potential population index for the NFS lands within the Spring Gulch PSU is 40 flammulated owl pairs. Using the nesting (modeled) habitat acres from Johnson (1999 unpublished); the minimum PPI for the Kootenai National Forest would be 5,927 flammulated owl pair. These estimates of PPI are considered high based on actual survey results.

Flammulated owl surveys, which consist of taped owl calls being used in an attempt to draw a response from nesting birds, have been conducted intermittently within the Spring Gulch PSU. Surveys in 1995 did not find the flammulated owl in the project area.

Environmental Consequences
Proposed timber harvest has the potential to impact flammulated owl habitat. Selective logging that removes large ponderosa pine or Douglas-fir trees can decrease the availability of early-season feeding sites, song and roost sites, and trees for snag recruitment in areas already limited in large snag abundance (Wright 1996:77). Snag removal during timber harvest for OSHA safety standards also removes suitable habitat for flammulated owls.

Some research has suggested that flammulated owls are not likely to forage further than 300 feet from forest cover (Goggans 1985). Regeneration harvest creating areas greater than 300 feet from cover will likely receive minimal use. This equates to a harvest unit of about 8 acres in size, or a relatively square unit 600 feet on each side. Those proposed regeneration harvest units that are greater than 8 acres in size will likely receive little or no foraging use until under story and mid-story canopies develop.

Prescribed fires and/or slashing may have short-term (2-3 years) negative effects on the availability of habitat for prey species, but in the long-term habitat for prey species would be maintained and/or increased due to the vigorous shrub/forb layer that would result from the fire. These activities would benefit flammulated owls (Illg and Illg 1995).
Direct and Indirect Effects
Changes in potential flammulated owl habitat caused by the various activities in the proposed project are shown in Table 3-33.

Table 3-33. Acre changes in flammulated owl habitat on NFS land in the Spring Gulch PSU.

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Alt. 1 No Action</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres unsuitable due to regeneration harvest \1</td>
<td>0</td>
<td>34</td>
</tr>
<tr>
<td>Potential acres changed due to improvement harvest</td>
<td>0</td>
<td>107</td>
</tr>
<tr>
<td>Acres impacted by burn</td>
<td>0</td>
<td>136</td>
</tr>
</tbody>
</table>

\1 Includes acres of all regeneration units greater than 8 acres in size as worse case scenario.

Based on the sum of acres impacted from Table 3-33, changes in suitable habitat acres and PPI values on NFS lands are displayed in Table 3-34. Decreases in habitat quality may be less than displayed as not all harvest acres are regeneration, and slashing and burning activity impacts are short term. However, this table displays a worst-case scenario as if all suitable snags, large diameter trees, and other characteristics of suitable flammulated owl habitat were removed, at least in the short term.

Table 3-34: Flammulated Owl Habitat and PPI Changes by Alternative

<table>
<thead>
<tr>
<th>Habitat Acres –Spring Gulch PSU NFS lands (+/- % change)</th>
<th>Alt. 1, no action/ Existing Condition</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,109 acres</td>
<td>832</td>
</tr>
<tr>
<td></td>
<td>(-25%)</td>
<td></td>
</tr>
<tr>
<td>PPI –Spring Gulch PSU (# potential territories)</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td>Habitat Acres – Forestwide – NFS (+/- % Change)</td>
<td>237,098</td>
<td>236,821</td>
</tr>
<tr>
<td></td>
<td>(&lt;0.1%)</td>
<td></td>
</tr>
<tr>
<td>PPI – Forestwide (# potential territories)</td>
<td>5,927</td>
<td>5,920</td>
</tr>
</tbody>
</table>

No activities are proposed under alternative 1, no action, so no direct effect to flammulated owls would occur. Plant succession would continue, resulting in an increasing canopy closure and increasing density of understory conifers. This plant succession could have an indirect effect on flammulated owls if they occur in the area since the owls forage in open areas within the drier ponderosa pine and Douglas-fir forest. An increasing density of understory conifers would decrease the available habitat for prey species, and may also impede flight maneuvers needed for foraging (Illg and Illg 1994:58).

The action alternative proposes vegetation management activities that would reduce or impact the amount of flammulated owl habitat in the Spring Gulch PSU (see Table 3-33 above for acres by alternative). The changes in the amount of available habitat could result in a PPI change in the Spring Gulch PSU (see Table 3-34 above). The improvement harvests will follow a basal area reduction prescription (see Table 3-33 above for acres by alternative). The intention is to favor ponderosa pine and larch by removing smaller Douglas-fir trees that are competing for growing space. These stands are expected to retain the larger and older ponderosa pine and Douglas-fir trees in the over-story while exhibiting a more open under-story. Retaining large trees and snags in the over-story would preserve abandoned flicker and pileated woodpecker cavities,
which are the primary nesting sites for flammulated owls. An upper diameter size limit has been incorporated into the silviculture prescriptions and larger diameter trees may not be removed. On those improvement harvests logged with skyline, few snags are expected to remain due to OSHA safety standards.

The proposed pre-commercial thinning would not impact existing flammulated owl habitat as it occurs in existing regeneration units that currently are not providing foraging habitat.

**Cumulative Effects**

Alternative 1, no action, when considered in association with the planned activities on both public and private lands, is expected to have no cumulative effects that would impact the flammulated owl because alternative 1 would not change the current availability of nesting and foraging habitat, potential nesting territories, or increase predation risk. Suitable nesting and foraging habitat would still occur on NFS lands, and sufficient habitat would or would not remain within the Spring Gulch PSU and Forest-wide to support a number of nesting territories. Cumulatively, the timber harvest activities on public and private lands and the removal of large over-story trees could reduce potential nesting and foraging sites.

The action alternative when considered in association with the planned activities on both public and private lands is expected to have no adverse cumulative effects that would impact the flammulated owl. Potential suitable habitat is distributed across the Kootenai National Forest (Johnson 1999:15-16), and the species is present in five of the eight planning units (Ibid). The proposed regeneration harvest would potentially result in the loss of a nesting territory. Those acres treated with improvement harvest would retain potential for flammulated owl habitat only in the long-term (100 years) due to the loss of snags from harvest activities. Any slash and burn activities that occur in flammulated owl habitat are expected to be beneficial to flammulated owl habitat. Overall, a decrease in PPI on NFS lands may not occur due to activities that may enhance habitat such as improvement harvest and prescribed burning. As Table 3-34 displays, sufficient habitat within the Spring Gulch PSU and across the Kootenai National Forest would remain.

**Regulatory Consistency**

Forest Plan:

- All Alternatives meet Forest plan direction for sensitive species (FP II-1 #6).
- All alternatives are consistent with Forest Plan direction for old growth below 5500’ (FP Vol. 1 II-1 #7; II-7; II-22 & 23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).
- All Alternatives meet Forest Plan standards for snags (FP II-1 #8; II-22 & 23; and Appendix 16).

National Forest Management Act:

- The project complies with NFMA direction to provide for diverse populations of plant and animal communities by compliance with Forest Plan standards and guides (Johnson 2004).
Statement of Findings
The proposed action is May Impact Individuals or Habitat, But Will Not Likely Result in a Trend Toward Federal Listing or Reduced Viability For The Population or Species. This determination is based on:
1) temporary displacement of individuals may occur during period of activity;
2) 3% of potential habitat will become unsuitable,
3) 22% of potential habitat will be enhanced

GRAY WOLF

Data Sources, Methods, Assumptions, Bounds of Analysis
Strategies to protect and manage the recovered wolf populations in Montana, as well as the ecology, biology and habitat descriptions are outlined in the Northern Rocky Mountain Wolf Recovery Plan (USFWS, 1987). The Montana Gray Wolf Conservation and Management Plan FEIS (MFWP 2003) provides additional management considerations. The Northwest Montana (NWMT) Recovery area is one of three wolf recovery areas identified for the Northern Rocky Mountain wolf population (USFWS et al. 2006). The USFWS final rule removing this population segment of the gray wolf from the federal list of endangered and threatened wildlife species was released February 27, 2008 (Federal Register 2/27/2008). The U.S. District Court (Montana District, Missoula Division) reinstated the endangered status on7/18/2008. On May 4, 2009, the USFWS delisted the gray wolf again. Wolves in Idaho and Montana were listed again in August 2010, per Court Order (Molloy, 08/05/2010). Effective May 5, 2011 (Federal Register 5/5/2011), gray wolves in Idaho and Montana were once again removed from the List of Endangered and Threatened wildlife. The Kootenai National Forest is within the NWMT Recovery Area. Information for this population segment is provided by the Rocky Mountain Wolf Recovery Annual Reports. Wolf occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS Wildlife Database), and other agencies (USFWS, MFWP).

Measurement indicators for this wolf analysis include the following key habitat components:

1) Sufficient, year-round prey base for big game or alternate prey: this component can be measured by adhering to Forest Plan big game management recommendations. For this planning area, elk management recommendations were applied. They include cover/forage ratios, road densities, opening sizes, and security levels. See the MIS section for details.

2) Suitable and somewhat secluded denning and rendezvous sites: Sensitivity to disturbance at den sites and subsequent abandonment varies greatly among individual wolves. One incident of human disturbance at the den may cause abandonment for some wolves, while other wolves will tolerate some human disturbance (Thiel et al. 1998) and may not abandon dens unless there are repeated or severe incidents of disturbance (Claar et al. 1999). One recommendation for protection of den sites from human disturbance includes restricting human access within a 1.5 mi. radius of an occupied den from 4 weeks prior to whelping to the end of denning activity. Closure area should be irregular in shape to avoid pinpointing den locations. Rendezvous sites should be similarly protected (Frederick, 1999). MFWP is not recommending any localized closures near wolf den or rendezvous sites on public lands outside national
parks (Sime, 2002), and early surveys in N.W. Montana indicated that public support to recover wolves would dwindle if recreational or public lands were restricted to promote recovery (Tucker and Pletscher, 1989). MFWP encourages land management agencies to consider the locations of wolf den and rendezvous sites and habitat security in their future planning activities in the same context as considering the locations of ungulate winter range or bald eagle nests (Sime 2002). Assumptions with this method would include maintaining the habitat integrity of the denning and rendezvous sites. Recommendations in this paper are to identify the proposed action, and any past actions that have occurred near the den site. Proposed actions may be tolerated if they have occurred during the same time period in the past (example: an open road with similar amounts of traffic as in the past). Identify these actions and discuss with the consultation biologist to determine the course of action for each specific situation. Den and rendezvous sites can also be protected by enacting timing restrictions on proposed activities within the denning/rendezvous site areas. These restrictions would limit operating periods to the fall or winter seasons when these sites are unoccupied.

3) Sufficient space with minimal exposure to humans; this component is associated with reducing the risk of human-caused mortality to wolves. Human disturbance and accessibility of wolf habitats (i.e. road densities) are the principle factors limiting wolf recovery in most areas (Leirfallom 1970, US Fish and Wildlife Service 1987 and 1992 all in Frederick, 1999, Thiel 1978). These components can be generally measured by maintaining open road density standards required by the Forest Plan as well as maintaining any security habitat recommended in the big game habitat recommendations.

The analysis boundary for direct, indirect and cumulative impacts to transient wolves and their habitat is the Spring Gulch PSU.

Affected Environment/Existing Condition
At the end of 2011, there were 130 wolf packs in all of Montana, including 39 meeting breeding pair criteria. These packs contained a minimum estimate of 653 wolves (Hanauska-Brown et al. 2012). There are currently 17 packs using the KNF for all or part of their territories. These packs had a total 63 wolves at the end of 2011 (ibid). There was 24 known mortalities in the KNF packs this past year, including legal harvest. There are no known established packs, denning or rendezvous sites within the Spring Gulch PSU and wolves have not been observed in the area. No human-caused mortalities have been documented in the Planning Area.

Prey Base: Elk are the most abundant big game species found within the Spring Gulch PSU. White-tailed deer, moose, and mule deer are also found in the Planning Area, however in fewer numbers. Together, this mix of species provides a good year-round prey base for wolves. See the MIS species section of this document for more information on elk.

Denning/Rendezvous Sites: There are no known denning or rendezvous sites in the PSU and minimal suitable habitat. No special restrictions are necessary within the Planning Area to avoid disturbance of den or rendezvous sites.
Sufficient Space with Minimal Exposure to Humans: Open road densities by Management Area (MA) currently meet Forest Plan Standards within this Planning Area (see MIS section for details). Security habitat recommendations for elk are within recommended levels (see MIS section for details).

Environmental Consequences
Direct and Indirect Effects to Alternatives

No Action Alternative
No timber harvest would occur in this alternative. Current conditions for prey habitat and human access within the Planning area would be maintained.

Alternative 2
Prey Base: As discussed in the effects analysis for elk, this alternative will improve habitat conditions for the elk, the wolves’ primary prey. Therefore prey conditions for wolves are likely to be improved with this alternative. All habitat management recommendations for elk are being met with this alternative (see Table 3-29 for a summary of the big game habitat parameters by alternative).

Denning/Rendezvous Sites: There are no known denning or rendezvous sites within the Planning Area. Suitable habitat for denning or rendezvous sites would not be impacted by the action alternative.

Sufficient Space with Minimal Exposure to Humans: Open road densities by MA meet Forest Plan Standards in this alternative (see Table 3-29). Some temporary increases in risk from human-caused mortality would accompany localized increases in ORD during harvest activities. This increased risk would be immeasurable during harvest activities. Effects would be limited to avoidance of activity areas and transient use could still occur.

Cumulative Effects
Past timber harvest and road construction projects and natural events have created much of the existing habitat conditions found within the PSU. There are no ongoing timber sales on State land within the Planning Area.

Private land development: Land development, including the construction of roads, the clearing of vegetation, the construction of residences, and the installation of improvements, can create a variety of changes to the landscape. Depending on the magnitude, type and location of developments and the amount of private land on the landscape, these activities can have varied effects, including the loss of hiding cover and localized disturbance on wolves and their prey species.

Hunting: Ongoing hunting activities are regulated by the MFWP. The Forest Service influences hunter access through road management. The Forest Service also identifies areas where disabled hunters are allowed to drive restricted roads. This program includes no roads in the Spring Gulch PSU.

Hunting activities within the PSU will cumulatively contribute to minor short-term effects (during the general hunting season) to habitat security. Affects from hunting vary with
activity levels and can include short-term disturbance. Mortality risk to the wolf is increased through hunting. The level of hunting within the analysis area is not expected to significantly change due to the proposed action.

Hunting activities on State and private land vary with area, but access is limited and use levels are low. With the generally limited amount of these activities on private and State lands, potential effects to the wolf would be minimal.

**Regulatory Consistency**

Forest Plan:
- All Alternatives meet Forest plan direction for sensitive species (FP II-1 #6).

National Forest Management Act:
- The project complies with NFMA direction to provide for diverse populations of plant and animal communities by compliance with Forest Plan standards and guides (Johnson 2004).

**Statement of Findings**

The proposed action May Impact Individuals or Habitat, But Will Not Likely Result in a Trend Toward Federal Listing or Reduced Viability For The Population or Species based on:

1. Mortality risk to the wolf is not expected to measurably increase as a result of the proposed activities,
2. Alternatives will not affect known denning/rendezvous sites,
3. There may be a short-term avoidance of areas of activity however transient use could still continue,
4. Alternatives meet forest plan big game management recommendations.

**Townsend’s big-eared bat**

**Data Sources, Methods, Assumptions, Bounds of Analysis**

Townsend’s big-eared bat population ecology, biology, habitat description and relationships identified by research are described in the following: Reel et al. (1989), Perkins and Schommer (1991), Kunz and Martin (1982), Montana Natural Heritage Program (1993), Christy and West (1993), Ross (1967), Whitaker and others (1977), Thomas and West (1991), and Pierson et al. (1999). That information is incorporated by reference. Townsend’s big-eared bats are medium sized bats with very long ears. Their wings and tail membranes are hairless. They are associated with coniferous forests and use caves as both day roosts and hibernacula (Hendricks et al. 1996). Bat occurrence data comes from recent District wildlife survey records and Forest historical data (NRIS Wildlife Database) and other agencies (MNHP).

Caves, mines and tunnels were located through District records, field surveys, and mineral maps. Old growth stands were identified using the Kootenai National Forest Old Growth Stand Layer.

The analysis boundary for project impacts to individuals and their habitat is the Spring Gulch PSU. The boundary for cumulative effects and determining contribution toward viability is the Kootenai National Forest.
Affected Environment/Existing Condition
District, Forest, and MNHP bat observation and monitoring data indicate that there have been no observations of the species in the Spring Gulch PSU. A Kootenai National Forest status summary of the Townsend’s big-eared bat was documented by Johnson (1999). Surveys of the Kootenai NF (1993-1995) by Hendricks et al. (1995, 1996) have located Townsend’s big-eared bat in all planning units (Johnson 1999) but no key roosting sites such as caves or mines have been located. Population size on the KNF is unknown.

Bats are known to feed along forest edges, and can be associated with either dry or wet type coniferous forests. They show a preference for old growth forest for roosting habitat (Thomas and West 1991). Young and mature forests are used for feeding (Ibid), with primary foraging areas near lakes (Grindal 1996). The species may occur in the Spring Gulch PSU.

No hibernacula or maternity colonies have been located within the PSU. Since they have the potential to roost in tree cavities (Perkins and Schommer 1991, MNHP 1993), the larger diameter snags or trees with cavities in the area could be used for summer roosting. As discussed in the Old Growth section of this document, the Spring Gulch PSU has 2% effective old growth designated, and a total of 14% old growth acres designated. These stands and the remaining timbered habitat provide suitable roosting habitat in the form of large snags with cavities, as well as abundant foraging habitat across the forest landscape. The analysis for cavity habitat within the PSU determined that the cavity habitat potential on NFS lands was 86%. Please see the Snag Habitat section of this document for more detailed discussion.

Environmental Consequences

Direct and Indirect Effects
Under Alternative 1, no action, no activities are proposed, and no Townsend's big-eared bats would be directly disturbed by any timber harvest or associated slashing and/or under burning. No direct effects to the bat species would be expected. Plant succession would continue on many of the sites, resulting in an increasing canopy closure and increasing density of under story conifers. This plant succession may have an indirect effect on bats since they forage in open areas within forests and the increasing density of under story conifers may decrease the available habitat for prey species. It may also impede flight maneuvers needed for foraging. If a wildland fire was to occur, potential key roosting habitat (caves or mines) are not likely to be impacted. There would be no expected change in the existing condition with implementation of the no action alternative. On NFS lands, no direct effect to cavity habitat potential would occur, and CHP would remain at 85%.

Under the action alternative 2, regeneration and improvement harvest activities have the potential to disturb or reduce day roosting habitat (trees and snags with cavities or thick bark). Improvement harvest that opens up suitable habitat, or edge habitat created may improve foraging opportunities for bats that use the area. Under burning could both reduce and create snag habitat. Disturbance or mortality of bats could occur if bats were using a snag that was cut down. Temporary displacement could occur during
prescribed burning. Effects would be site-specific, affecting individuals rather than colonies, and are not likely to affect the viability of Townsend's big-eared bat population.

**Cumulative Effects**
Timber harvest activities and the removal of dead standing trees, as well as the removal of live trees with cavities, depending on their diameter, could reduce potential summer roosting sites for the bat.

Cumulatively, any burning associated with the Spring Gulch Project may result in snags being both lost and created, but no direct effect on key roosting habitat would occur as no caves or mines are known to occur within the PSU. The acres burned would result in a mosaic burn pattern with rejuvenated shrubs over time. Alternative 1, no action, when considered in association with the planned activities on both public and private land, is expected to have no cumulative effects that would impact the Townsend’s big-eared bat.

Implementation of the action alternative and other reasonably foreseeable activities described for federal lands, would not change the estimated CHP. Cumulatively, when other activities including all past, present, and reasonably foreseeable activities on both private and federal lands are considered, habitat on federal lands is considered sufficient to maintain populations of cavity dependant species. The NFS lands CHP at 81% is expected to manage for a population level above the 40 percent level which is thought to be the minimum needed to maintain self-sustaining populations of snag-dependent wildlife (Thomas 1979:72).

**Regulatory Consistency**
Forest Plan:
- All Alternatives meet Forest plan direction for sensitive species (FP II-1 #6).
- All alternatives are consistent with Forest Plan direction for old growth below 5500’ (FP Vol. 1 II-1 #7; II-7; II-22 & 23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).
- All Alternatives meet Forest Plan standards for snags and down wood (FP II-1 #8; II-22 & 23 and Appendix 16).

National Forest Management Act:
- The project complies with NFMA direction to provide for diverse populations of plant and animal communities by compliance with Forest Plan standards and guides (Johnson 2004).

**Statement of Findings**
The proposed action May Impact Individuals or Habitat, But Will Not Likely Result in a Trend Toward Federal Listing or Reduced Viability For the Townsend’s big-eared bat. This determination is based on:
1) potential to temporarily displace individuals using the project,
2) potential for incidental mortality of a bat is roosting in a tree that is felled,
3) no impact to maternity sites or common roosting sites,
4) suitable habitat remains in the Planning Area.
Western Toad

Data Sources, Methods, Assumptions, Bounds of Analysis
Western toad ecology, biology, habitat use, status and conservation are described and summarized in Maxell (2000) and Reichel and Flath (1995). That information is incorporated by reference. The western toad has dry warty skin that is olive, brown, or gray with a white stripe that runs down the middle of the back. They mate between May and July and lay eggs in clean standing water (pond, ditch, gravel pit, lake). Western toads wander miles from their breeding sites through coniferous forests and subalpine meadows (Werner et al. 2004). Western toad occurrence data comes from District wildlife observation records and Forest historical data (NRIS Wildlife Database) and other agencies (MNHP). The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Spring Gulch Planning sub-unit (PSU). The boundary for determining contribution toward viability is the Kootenai National Forest.

Affected Environment/Existing Condition
Western toads require over-wintering, breeding/rearing, and foraging habitat, and may also be dependent on habitats suitable for migration if the three required habitat types are isolated spatially (Maxell 2000:9). As summarized in Maxell (2000), over-wintering may take place in underground cavities or in rodent burrows; breeding/rearing takes place in aquatic sites such as shallow areas of large and small lakes or temporary ponds; and foraging habitat is largely terrestrial uplands. The highest elevation the species has been documented in Montana is 9,220 feet.

A Kootenai National Forest status summary of the western toad was documented by Johnson (1999). The species has been found in seven of the eight planning units. The population size is unknown and direct measures of population trend on the Kootenai are not available (Ibid 1999). However, many surveys have been conducted on the Forest since 1993. Surveys conducted between 1993 and 1995 located only 63 adults. Of the 134 wetland sites surveyed during the 1993-94 field season, only 10 had evidence of successful breeding (Werner and Reichel 1994); five additional sites were confirmed during the 1995 field season (Werner and Reichel 1996). Surveys of approximately 200 potential sites were conducted in the Bull River drainage during the 1997-98 field season, but evidence as a breeding site (tadpoles and eggs) were found at only eight sites (Corn et. at. 1998). Historic and active breeding sites by planning unit on the Kootenai National Forest are summarized by Johnson (1999). Forest-wide, approximately 35 breeding sites were verified between 1995 and 1998 (ibid).

There are no known breeding sites within the Spring Gulch PSU. Potential breeding habitat may occur in temporal ponds and road ditches. The terrestrial habitat within the PSU is considered upland foraging habitat.

Criteria used to compare the alternative impacts on the western toad and its habitat includes:

1) known breeding/rearing habitat impacted
2) acres of upland foraging habitat harvested and burned
3) acres of upland foraging habitat (prescribed burned only)
Environmental Consequences
Quantitative data regarding the western toad's use of upland and forested habitats is limited. Western toads are known to migrate between the aquatic breeding and terrestrial non-breeding habitats (TNC Database 1999). Movement of toads has been documented from 2.5 km to over 5 km between breeding sites (Corn et al. 1998, Bartelt and Peterson 1994). Movement in foraging areas was documented to be significantly influenced by the distribution of shrub cover, and toads may have avoided macro-habitats with little or no canopy and shrub cover (such as clearcuts) (Bartelt and Peterson 1994). Underground burrows and debris were important components of toad selected micro-sites in a variety of macro-habitats. The western toad digs its own burrow in loose soil or uses those of small mammals, or shelters under logs or rocks, suggesting the importance of coarse woody debris on the forest floor (Ibid). Project activities (e.g. timber harvest, prescribed fire) that remove vegetation resulting in reduced canopy and/or shrub cover or reduced coarse woody debris are likely to impact western toad habitat and toad use patterns. Soil compaction from ground based logging machines may impact over-wintering habitat (burrow sites).

Direct and Indirect Effects
Table 3-35 summarizes the direct and indirect changes in habitat acres due to each alternative.

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>Existing Condition/Alt. 1</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known breeding/rearing habitat impacted</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acres upland foraging habitat harvested</td>
<td>0</td>
<td>248</td>
</tr>
<tr>
<td>Acres upland foraging habitat treated by prescribed burned only *</td>
<td>0</td>
<td>233</td>
</tr>
</tbody>
</table>

* Existing condition no prescribed burns or wildfires greater than several acres have occurred in the Spring Gulch PSU in the last 10 years due to fire suppression

Under alternative 1, no action, no Forest Service timber harvest or prescribed burning would take place. No direct effect to the western toad would be expected with this alternative. Plant succession would continue on the sites. Indirectly, this would result in an increase in canopy closure and density of understory conifers. This increase in canopy closure and understory conifer density would have no direct, or indirect effect on breeding habitat, and little if any effect on upland habitat. Fuels would continue to accumulate on the upland sites. Should wildland fire occur, the aquatic breeding habitats would not be expected to be directly affected, however surrounding upland habitat could be burned. Western toads have been noted to re-colonize burned areas the following year with vegetation re-growth (B. Maxell, Herpetologist, State Zoologist with MTNHP, personal communication April 2003, Troy Mt., J. Holifield (Libby District Biologist) personal observation).

Timber Harvest and Road Building
Maxell (2000) showed the effect of timber harvest on amphibians in Montana has been studied only once. A review of the available literature by Semlitsch (2000) in the United States indicates timber harvest and road construction activities can impact aquatic breeding habitat by altering the hydrological cycle of wetlands which can impair completion of larval metamorphosis through early pond drying (hydroperiod shortened), or through increased predation (if hydroperiod is lengthened). Aquatic habitat quality can also be reduced by sedimentation and increased water temperatures.
The effects of timber harvest on upland habitats are summarized in Semlitsch (2000) and include elimination of shade, increase surface temperatures, disruption and compaction of soil structure, reduction in soil moisture, removal of coarse woody debris, and sedimentation of aquatic habitats from logging roads. The fragmentation of natural habitats from timber harvesting and road building may impede dispersal and decreases the probability of wetland re-colonization (Semlitsch 2000). Timber harvest (especially clearcutting) and associated silvicultural practices appear detrimental to terrestrial amphibian populations (Bury et al. 2000). Impacts from intensive forest management (e.g., even-aged harvesting) practices extend beyond the boundaries of harvested stands (deMaynadier and Hunter 1998). Recommendations for buffer zones and terrestrial habitats for corridors of movement for amphibian species are discussed by several authors (Semlitsch 1998, Hannon et al 2002). Western toads are considered to be more terrestrial generalists (deMaynadier and Hunter 1998), and tend to be more tolerant than salamanders of forest edges, tree harvests, and declining patch size (Renkin et al 2004).

The proposed timber harvest and road construction activity could result in incidental mortality to western toads due to ground disturbance.

The action alternative proposes 2.5 miles of reconstruction of roads on existing templates that have become revegetated.

**Fire**

There are currently no studies addressing the effects of fires on terrestrial amphibians in the Pacific Northwest (Bury et al. 2000). A review of the available literature by Russell et al. (1999) indicates that replacement of the fire-adapted vegetation by fire-intolerant associations indirectly leads to concomitant declines in overall herpetofaunal abundance and diversity. Without fire, species that use or can tolerate dense vegetation would be benefited, while those species that prefer open sites would continue to decrease over time.

There are few reports of fire-caused injury to herpetofauna even though many of these animals, particularly amphibians, have limited mobility (Russell et al. 1999). The resultant microsite variation within burns may account for observations that fire has little effect on herpetofaunal species (Lyon et al. 2000). Maintaining preferred or required habitat features presumably outweighs any fire-induced mortality that occurs (Russell et al 1999). Mortality may be associated with the direct and indirect effects of fire that alter prey availability or change shelter and microclimate (Lyon et al. 2000, Russell et al. 1999). Indirectly, although fire-induced disturbance may decrease herpetofauna within a particular patch, the prescribed burning should result in a mosaic of successional stages and habitat structure that should increase diversity on a broader scale (Russell et al. 1999).

*Site preparation burning* in timber harvest units is proposed. The proposed action would treat 256 acres. *Slash/and or burning* activities would occur on 231 acres. All activities associated with timber harvest, road construction and prescribed fire would be consistent with INFS and direct or indirect effects on riparian habitat (potential breeding sites) associated with the western toad would be unlikely. No harvest would occur within Streamside Management Zones.
Cumulative Effects
The risk of direct mortality to toads during burning is low, but it can occur. Toads typically seek refuge in moist habitats such as animal burrows and under rocks and logs where the fires would not burn (Russell et al 1999). The proposed activities are not expected to cause additional in-channel sediment production or cause changes in channel morphology due to INFISH buffers placed on streams, so the proposed actions would not have a measurable effect on aquatic habitat (please refer to the Hydrology section of this document).

Alternative 1, no action, when considered in association with the planned activities on both public and private lands, is expected to have no direct or indirect effects that would impact the western toad because current availability of suitable habitat would not change. Suitable habitat would still occur on National Forest lands. Cumulatively, private timber harvest and federal timber harvest activities and road construction, and the creation of openings could affect upland toad habitat.

The action alternative 2, when considered in association with the planned activities on both public and private land, are not expected to have adverse cumulative effects that would impact the western toad. In the short-term both timber harvest and slash and/or burn units would not provide habitat until shrub cover returned (2-3 years). The temporary reduction in habitat is not likely to result in a declining population trend for this species. Cumulative effects of all past, ongoing, and reasonably foreseeable activities are the same as discussed under alternative 1.

Regulatory Consistency
Forest Plan:
- All alternatives meet Forest Plan direction for sensitive species (FP Vol. 1, II-1 #6).
- All alternatives are consistent with Forest Plan riparian standards and guidelines (FP Vol. 1 II-28 thru 33) as amended by INFS.
- All Alternatives meet Forest Plan standards for snags and down wood (FP II-1 #8; II-22 & 23 and Appendix 16).

National Forest Management Act:
- The project complies with NFMA direction to provide for diverse populations of plant and animal communities by compliance with Forest Plan standards and guides (Johnson 2004).

Statement of Findings
The proposed action is May Impact Individuals or Habitat, But Will Not Likely Result in a Trend Toward Federal Listing or Reduced Viability for the western toad. This determination is based on:
1) the potential for direct mortality of individual toads due to trees falling or fire,
2) localized removal of coarse woody debris,
3) no impact on breeding habitat,
4) suitable habitat available outside of project area,
5) retention of riparian movement corridors.
Sensitive Species Summary
The Spring Gulch Project Area does not provide suitable habitat for bald eagle, black-backed woodpecker, Coeur d’Alene salamander, common loon, harlequin duck, northern bog lemming, northern leopard frog, peregrine falcon, and wolverine. Effects to these species from the proposed project were not analyzed and are assumed to have No Impact.

Suitable habitat is present in the project area for fisher, flammulated owl, gray wolf, Townsend’s big-eared bat, and western toad. The no Action alternative will have No Impact on these species. The proposed action May Impact Individuals or Habitat, But Will Not Likely Result in a Trend Toward Federal Listing Or Reduced Viability For The Population or Species.

Northern Goshawk

Data Sources, Methods, Assumptions, Bounds of Analysis
Goshawk population ecology, biology, habitat description and relationships identified by research are described in Brewer et al. (2009), McGrath et al. (2003) and Reynolds et al. (1992). That information is incorporated by reference.

The northern goshawk is the largest North American member of the genus Accipiter, hawks with short-rounded wings and a long tail. It breeds in coniferous, deciduous, and mixed forests throughout much of North America. In the northern Rocky Mountains, it breeds in even-aged to multi-storied stands of coniferous or deciduous forests (Hayward and Escano 1989). The goshawk is a forest generalist that uses a variety of forest types, forest ages, structural conditions, and successional stages and preys on small- to medium-sized birds and mammals, which are captured on the ground, in trees, or out of the air (Reynolds et al. 1992).

Globally, the species is ranked G5 – common, widespread, and abundant (although it may be rare in parts of its range), not vulnerable in most of its range. In Montana, their state rank is S3 – Potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas (MNHP 2009). Responding to a petition to list the northern goshawk, the USFWS concluded “the goshawk population is well distributed and stable at the broadest scale [63 FR 35183 (June 29, 1998)]. Breeding goshawks and their habitat appear abundant and well-distributed across Region 1 (Kowalski 2006, Samson 2006a; updated in Bush and Lundberg 2008). Each National Forest (including the Kootenai) appears to have more than enough habitat to maintain a minimum viable population (Samson 2006b).

Goshawk occurrence data comes from District wildlife observation records and Forest historical data (NRIS Wildlife). Goshawk habitat was modeled using TSMRS vegetation data. The potential population index (PPI) (habitat acres divided by average territory acres) was calculated using 5,400 acres as the average goshawk pair territory (Reynolds et al. 1992). The analysis boundary for project impacts to individuals and their habitat is the Spring Gulch planning sub-unit. The boundary for cumulative effects and determining contribution toward viability is the Kootenai National Forest.
Affected Environment/Existing Condition
Northern goshawk habitat is abundant and well distributed in Region 1 (Samson 2006). The Northern Region estimates that a minimum viable population of goshawks would require 30,147 acres of habitat (Brewer et al. 2009). Johnson (2004) estimates there are 752,296 acres of goshawk habitat on the Kootenai NF.

Goshawk observation and monitoring data do not contain any records of goshawks nesting in the Spring Gulch project area. Johnson (1999) shows goshawk presence confirmed in all eight planning units on the Kootenai. At the end of 2012, Forest survey records show 36 nest sites, with five sites no longer in use.

Goshawk habitat modeling using stand exam data identifies 3,554 acres of potential goshawk nesting habitat in the Spring Gulch planning sub-unit (See Table 3-36).

Table 3-36. Home Range/foraging area diversity matrix for habitat analysis

<table>
<thead>
<tr>
<th>Tree Size Class (DBH)</th>
<th>Total Acres</th>
<th>% of Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-4.9</td>
<td>93</td>
<td>1</td>
</tr>
<tr>
<td>5.0-8.9</td>
<td>2,952</td>
<td>44</td>
</tr>
<tr>
<td>9.0+</td>
<td>3,162</td>
<td>47</td>
</tr>
<tr>
<td>DBH&gt;5&quot;, canopy cover &gt; 40% *</td>
<td>3,554</td>
<td>52</td>
</tr>
<tr>
<td>Shrub/grass/forb</td>
<td>575</td>
<td>8</td>
</tr>
</tbody>
</table>

*Potential goshawk nesting habitat

Based on the average goshawk pair territory (5,400 acres) and the modeled habitat acres, the potential population index for the Spring Gulch planning sub-unit is 0.7 goshawk pairs. Using the nesting (modeled) habitat acres from Johnson (ibid), the minimum PPI for the Kootenai National Forest would be 139 goshawk pair. The most recent data show 36 known or suspected pairs on the Forest (KNF goshawk data).

Environmental Consequences
Table 3-37 summarizes the changes in habitat acres and PPI due to each alternative.

Table 3-37: Habitat and PPI Changes by Alternative

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1 (No Action) (Existing Condition)</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres of Potential Habitat (% change)</td>
<td>3,554</td>
<td>3,425  (4%)</td>
</tr>
<tr>
<td>PPI - Project Area Pair Territories</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Habitat Acres (Forest-wide) (% change)</td>
<td>752,296</td>
<td>752,167</td>
</tr>
<tr>
<td>PPI - Forest-wide Pair Territories</td>
<td>139</td>
<td>139</td>
</tr>
</tbody>
</table>

Direct and Indirect Effects
There are no northern goshawk nest known to be in the Spring Gulch PSU. Research is divided on the effects of vegetation management within the nest stand of goshawks. Some studies have shown that modification of nest stands has minimal impact on
reoccupancy and productivity of resident goshawks (Penteriani and Faivre 2001, Penteriani et al. 2002, Mahon and Doyle 2005, and Moser and Garton 2009). While other studies have found that vegetation management within the nest stand has a negative impact on reoccupancy and productivity of resident goshawks (Crocker and Bedford 1990 and Patla 2005).

In the Spring Gulch PSU, vegetation management will impact 1% of the project area or less under Alternative 2 (Table 3-37). The potential habitat change includes both regeneration and intermediate harvest. Regeneration harvest creates an opening that likely will not be used by goshawks. The object of intermediate harvest is to remove understory trees and enhance growing conditions for the older, more mature trees. The end result is a more open stand that will be more compatible with the goshawks hunting strategy. Intermediate harvest should improve goshawk foraging habitat in the project area. Additionally, 385 acres of underburning will open up the stands and make them more suitable for goshawk hunting.

**Cumulative Effects**

**Summary of the existing condition**
The existing condition includes the results from all past activities. The existing condition for the project area provides 0.7 potential pair home ranges and 3,554 acres of habitat for northern goshawk. This means that 52% of the project area currently provides suitable nesting habitat for northern goshawk.

**Effects of Current and Reasonably Foreseeable Actions**
A description of past actions in the project area can be found in the introduction of Chapter 3. Cumulative effects from ongoing and foreseeable actions are expected to have minor impacts on the goshawk.

**Noxious Weed Treatment**
Weed treatment activities would not lead to any adverse effects on goshawks or their habitat because treatment of weeds would actually benefit forage species important to many species or their prey (USDA Forest Service 2007). No loss or change in specific habitats (e.g. old growth, mature forests), including snags and down woody debris inhabited by prey species would result from this activity because weed treatments primarily focus on the herbaceous layer along roads and in disturbed areas. Typically, a small fraction of the total PSU acres are treated on an annual basis along roadsides.

**Fire Suppression**
With the direction to suppress all wildland fires on NFS lands, construction of fire lines, safety zones, and other control structures could impact individuals on a site-specific basis. Avoidance of known goshawk nests would be attempted during suppression efforts but some impacts may still occur. Due to the unpredictable nature of wildfires, contributions of fire suppression to the cumulative effect on this species can only be surmised but may certainly include temporary disturbance and loss of potential nest trees. It may also encourage conifer growth in the understory in stands adapted to fire, thereby reducing suitability for nesting and foraging in the future. Also refer to cumulative effects on old growth.
**Road Management / Use Activities**

Road management actions such as road maintenance and administrative use associated with permit administration, data collection, and monitoring of NFS lands are not likely to affect goshawks and specialized habitats (e.g. snags, down woody debris) because they generally do not result in vegetation removal. Although road restoration and maintenance projects (brushing, blading, gate repairs, culvert replacement etc.) may temporarily displace goshawks from a localized area or impact individuals, they typically benefit the species in the long-term, especially if the projects involve closing previously open road systems. Also refer to cumulative effects on old growth. The standing tree and snag component of goshawk habitat would only be affected if considered a hazard to road users. These activities would not result in any change to the quantity of old growth, thus no adverse cumulative effects would be expected to that resource.

**Recreation Maintenance**

Routine maintenance of trails and developed and dispersed recreation sites have the potential to remove nesting and foraging trees for goshawks if they are close to a trail or road and present a safety hazard. Effects would include removing site-specific, individual trees, and would not be expected to contribute measurably to the cumulative effect on the northern goshawk.

**Special Uses**

There are areas previously impacted by special use permits such as mineral material sites (pits quarries, borrow, roadsides), the Troy Mine, water developments, utility corridors, private land access routes, that will continue to be present and utilized. There would be no cumulative effects to goshawks or their habitats associated with these activities other than possible temporary and local avoidance of an area due to the presence of humans. Ground disturbance on resources such as old growth and mature forest stands have been included under the existing condition and would have no additional impacts. Any expansion of existing gravel pits or mining activities would be analyzed for potential impacts on goshawks at that time.

**Public Use**

The temporal occurrence of forest uses such as summer activities (camping, hiking, and berry picking) versus fall (hunting and firewood cutting) or winter (skiing and snowmobiling) activities, and the scheduling of management actions to avoid key time periods (nesting, rearing) when goshawks may be more sensitive to human disturbances, allow for the avoidance of measurable cumulative impacts. There may be some situations where isolated or localized cumulative effects may occur, due to an overlap of forest activities, but these situations are typically short in duration, and do not persist through the lifecycle of the raptor, either temporally or spatially. Other forest product activities occurring presently and typically on an annual basis are the gathering of pine cones, boughs and personal use gathering of Christmas trees. These activities occur throughout the PSU, and have little-to-no effect on the landscape due to the unspecific nature of the use and the low impact on the resources (foot traffic, hand tools). Additionally, Christmas trees are harvested from existing regeneration units, so this activity would have no cumulative effect on the specialized habitats of goshawks, such as old growth and riparian areas.
Private Property
Private activities such as land clearing, home construction, livestock grazing etc. are likely to continue on those private lands within the PSU. Therefore there will likely be a decrease in mature forest within the PSU, but outside of NFS lands. Any cumulative effects to goshawks will be partially dependent on the duration (seasonal versus year-round) of use of these parcels and homes. Anticipated effects include species displacement, nest failure, habitat alteration and/or habitat loss.

Summary of Cumulative Effects
As previously stated, fire suppression over the last century has altered stands historically maintained by fire disturbance. The affected stands have developed fuel loading and ladder fuels that are uncharacteristic for some sites. These conditions would continue to develop until a natural disturbance occurs. Potential natural disturbances (wildfire, insect or disease epidemics, wind) could reduce old growth/mature stand characteristics or completely remove an area of mature forest under extreme conditions. Likewise, there is the potential for human caused fires initiating on private lands to move on to adjacent NFS lands and remove mature forest that has not been, at least partially, managed either by prescribed burning and/or removal of ladder fuels. In either case, if the large tree component of designated old growth is removed then replacement old growth would need to be designated.

When all past actions are combined with the current proposal, goshawk PPI in the project area would remain at 2 project area potential pair home ranges. The amount of change is so small as to have no change on the potential pair home ranges when reviewed at the Forest scale, with 161 forest-wide pair home ranges for both no action and Alternative B modified. Since sufficient habitat is maintained in the project area, the small amount of habitat affected will not affect the ability of goshawk to use and breed in the area and continue to contribute to the stable and well distributed populations across the KNF and Northern Region.

Because the Spring Gulch project retains the project area old growth at 10% of acres below 5,500 feet elevation, and because harvest and fuel treatments in the project area treat only 1% of the project area and prescribed burning treats only 3% of the project area (DEIS pg. 3-27), cumulative effects to goshawk habitat will not result in vegetation patterns outside historic conditions.

The most recent Forest-wide old growth analysis concludes that at least 10% of the KNF below 5,500 feet elevation is designated for old growth management. The proposed activities would not affect the 10% standard for old growth at either the PSU or Forest scale.

Regulatory Consistency
Forest Plan
- All alternatives are consistent with Forest Plan direction for old growth below 5500' (FP Vol. 1 II-1 #7; II-7; II-22 & 23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).

National Forest Management Act:
- The project complies with NFMA direction to provide for diverse populations of plant and animal communities by compliance with Forest Plan standards and guides (Johnson 2004).
Statement of Findings
Alternative 2 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. This determination is based on: 1) no known goshawk nesting in the PSU, 2) project area will continue to provide nesting habitat, 3) intermediate harvest and underburning will enhance foraging habitat conditions.

Threatened, Endangered, And Proposed Species

Regulatory Framework
The Endangered Species Act (ESA) of 1973 declares that all Federal agencies ... “utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act.” The ESA (Section 7) requires federal agencies to ensure that any agency action (any action authorized, funded, or carried out by the agency) are not likely to jeopardize the continued existence of any threatened, endangered, or proposed species. Agencies are further required to develop and carry out conservation programs for these species.

The National Forest Management Act (NFMA) directs the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives”.

Species List
A current species list for the Kootenai National Forest (KNF) was obtained from the U.S. Fish and Wildlife Service (here after FWS) web site (http://montanafieldoffice.fws.gov) on 2/13/2012. The FWS concurred with potential listed species distribution maps and resulting consultation areas for the KNF in 2001 (USDI FWS: Wilson). Species status in the influence area of the proposed project is shown in Table 3-38.

Table 3-38: Threatened, Endangered, and Proposed Wildlife Species: Project Area Status

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>ESA STATUS</th>
<th>STATUS IN ANALYSIS AREA</th>
<th>COMMENTS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grizzly Bear</td>
<td>Threatened</td>
<td>K</td>
<td>2</td>
</tr>
<tr>
<td>Canada Lynx</td>
<td>Threatened</td>
<td>S</td>
<td>2</td>
</tr>
</tbody>
</table>

*Status Key:
K  = This species is known to occur within the analysis area.
S  = Suitable habitat exists and species is suspected to occur within analysis area.
NS = No Suitable habitat, species is not suspected to occur within the analysis area. No further analysis required.
** Select All That Apply
1 = Analysis Area is outside Recovery Zone or reoccurring use area, or FWS agreed to consultation area
2 = Analysis area is inside Recovery Zone or reoccurring use area, or FWS agreed to consultation area
Grizzly Bear

Data Sources, Methods, Assumptions, Bounds of Analysis
Grizzly bear population ecology, biology, habitat description and relationships identified by research are described in USFWS (1993), the annual progress reports for the Cabinet-Yaak grizzly bear research (Kasworm et al. 1989-2009) and Kasworm and Manley (1988). That information is incorporated by reference. Grizzly bear occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS Wildlife Database), and other agencies (USFWS, MFWP). The analysis boundary for project impacts to individuals and their habitat is the bear management unit in the recovery zone.

The grizzly bear is one of two subspecies of the brown bear (Ursus arctos) which occupy North America. Coloration varies from light brown to almost black. Grizzly bears are generally larger than black bears (Ursus americanus), ranging between 200 and 600 pounds (lbs), and can be distinguished from them by longer, curved claws, humped shoulders, and a more concave face. Although relatively long-lived (20-25 years in the wild), the grizzly bear has a low reproductive rate due to the late age of first reproduction (4-7 years), small litter size (two cubs), long intervals between litters (three years), and limited cub survival (less than 50 percent).

Grizzly bears are year-round residents of the coniferous forests of northwestern Montana. They are habitat generalists that use a wide variety of habitats, generally dictated by food availability and distribution. Most areas currently inhabited by the species are represented by contiguous, relatively undisturbed mountainous habitat exhibiting high topographic and vegetative diversity. Because grizzly bears have large home ranges, large areas of habitat are required. Home range sizes vary, and the home ranges of adult bears frequently overlap. Grizzly bears occupy low-elevation riparian areas, snow chutes and meadows in the spring and late fall, and move up to higher sub-alpine forests in the summer, early fall and winter. In the Cabinet Mountains, use of spring range occurs mostly below 5,200 feet in southerly facing snow chutes, alder shrub fields, grassy hillside parks, and closed timber (Kasworm et al. 2009). Natural caves or excavated dens, often above 6,000 feet, are entered after the first snowfall and occupied for four to five months. A majority of their diet is comprised of vegetation (forbs, sedges, grasses, roots, berries, pine nuts), but also includes fish, rodents, ungulates and insects. Berry production (huckleberries, buffaloberries, serviceberries and mountain ash berries) is an important late summer and fall food source. A more complete discussion of the biology and ecology of this species may be found in the Grizzly Bear Recovery Plan (Recovery Plan) (USFWS 1993).

Originally distributed in various habitats throughout North America from central Mexico to the Arctic Ocean, grizzly bears were thought to number approximately 50,000 in the early 1800s. However, westward human expansion and development during the 1800s led to a rapid reduction of grizzly bear populations. Bear numbers and distribution in the lower 48 States dropped precipitously during this period, due to a combination of habitat deterioration, commercial trapping, unregulated hunting, and livestock depredation control. On July 28, 1975, the grizzly bear was listed as threatened in the conterminous U.S., at which time the species occupied less than two percent of its former range south of Canada and was distributed in five small populations totaling an estimated 800-1,000 bears (USDI Fish and Wildlife Service 1975). The five remaining self-perpetuating or
remnant populations occurred primarily in mountainous regions, national parks and wilderness areas of Washington, Idaho, Montana and Wyoming.


**Affected Environment/Existing Condition**

The proposed project is in the Cabinet-Yaak grizzly bear recovery zone (USFWS 1993). Habitat conditions in the Cabinet-Yaak Recovery zone have been improving steadily since 1987 as documented by Johnson (2002), Summerfield et al. (2004), and the annual Kootenai Forest Plan monitoring reports (monitoring item C7). The grizzly bear population for the CYE is currently estimated at 42 animals with a 78% probability of a downward population trend (Kasworm et al. 2010). Causes of grizzly bear mortality have generally been due to factors beyond Forest Service control (e.g management removal due to food attractant on private land, hunter mistaken identity or defense of life, and illegal kill by a human).

Project activities would occur in the Vermilion Bear Management Unit (BMU 8) (Figures 14 and 15). Bear activity in the impacted BMU includes: 4 grizzly bears killed, all prior to 1986. There have been no sightings of females with young in the BMU since 1990 and no sightings of any grizzlies since 2006.

The project area is located adjacent to the Lolo National Forest (LNF) and is accessed by roads that begin on the LNF. The primary road through the project area (NFSR 2241) is a yearlong open road. NFSR 2771 is currently closed to motorized traffic by an earth berm where it joins NFSR 2241. This road will be opened temporarily for administrative use (FS employees and contractors) while the timber sale is active. Once the timber harvest is completed the road will be returned to its previous condition, closed with an earth berm where it joins the 2241. On the south end of the project area, NFSR 38123 will be opened to access harvest units. This road is also currently closed with an earth berm and is approximately 1 mile long. It will access the lower elevation units close to private land. Administrative traffic will be the only traffic permitted on the road and upon completion of the harvest activity the road will be closed with an earth berm.
Figure 3-14. BMU – 8.
Figure 3-15. Spring Gulch Project Area.
The will be some reduction in core habitat in BMU-22 due to the influence of the activities in BMU-8, however this reduction will be less than 0.001% of core habitat and does not result in a measureable change. There will be no vegetation management activities in BMU-22 and no change to any of the other grizzly bear habitat components (Table 3-39). 

The goal for grizzly bear management on the Kootenai National Forest is to provide sufficient quantity and quality of habitat to facilitate grizzly bear recovery. An integral part of the goal is to implement measures within the authority of the Forest Service to minimize human-caused grizzly bear mortalities. This goal is accomplished by achieving five objectives common to grizzly bear recovery as described by Harms (1990). A number of measures are used to gauge whether the objectives are being met. The following analysis describes the potential effects, including cumulative effects of the selected action by examining how these measures are implemented and, thus, how the objectives relating to grizzly bear recovery are met. 

Summary Table
Table 3-39: Habitat components before, during, and after project implementation.

<table>
<thead>
<tr>
<th>BMU</th>
<th>Habitat Component</th>
<th>Before</th>
<th>During</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Habitat effectiveness (%)</td>
<td>72.5</td>
<td>72.3</td>
<td>72.5</td>
</tr>
<tr>
<td></td>
<td>Linear ORD (miles/square mile)</td>
<td>0.57</td>
<td>0.57</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>Core (% of BMU)</td>
<td>54.8</td>
<td>54.8</td>
<td>54.8</td>
</tr>
<tr>
<td></td>
<td>OMRD (% BMU &gt; 1 mi./sq.mi.)</td>
<td>32.6</td>
<td>32.8</td>
<td>32.6</td>
</tr>
<tr>
<td></td>
<td>TMRD (% BMU &gt; 2 mi./sq.mi.)</td>
<td>21.6</td>
<td>21.8</td>
<td>21.6</td>
</tr>
<tr>
<td>22</td>
<td>Habitat effectiveness (%)</td>
<td>67</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Linear ORD (miles/square mile)</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Core (% of BMU)</td>
<td>51</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>OMRD (% BMU &gt; 1 mi./sq.mi.)</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>TMRD (% BMU &gt; 2 mi./sq.mi.)</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
</tbody>
</table>

Objective 1. Provide adequate space to meet the spatial requirements of a recovered grizzly bear population.

A. Habitat Effectiveness: Habitat effectiveness (HE) should be maintained equal to or greater than 70 percent of the BMU. Habitat effectiveness is calculated as a percentage of the BMU. It is the total BMU acres minus MS-3 lands and all land further than ¼ mile from open roads and major activities.

BMU 8: The existing open road density within Management Situation 1 land in the BMU is 0.57 miles/sq. mile. Habitat effectiveness is 72 percent currently. During project related activities ORD in the BAA will change from 0.25 miles per square mile to 0.40 mi./mi.² due to the use of barriered roads to access harvest units. Upon completion of
the project ORD will return to 0.25 mi./mi.² with the closure of the barriered roads. Habitat effectiveness will decrease 0.2% during activities and return to 72.5% post-project.

**B. Core Areas:** The requirements of a core area include: no motorized access (roads or trails) during the active bear season, and be at least 0.3 miles from open or gated roads. The goal is that federal agencies will work toward attaining a core area of at least 55% in the BMU. Another goal is that no net loss of core area will occur on federal ownership within the BMU. Core habitat blocks function as displacement areas.

**BMU 8:** Existing core is composed of 8 areas that meet the core area definition and comprise a total 55% of the BMU. Project activities will result in a 0.01 percent reduction in core habitat for the life of the project.

**C. OMRD: Open Motorized Route Density (OMRD)** is calculated on a BMU basis using moving window analysis. The goal is for no net increase in OMRD on National Forest lands within the BMU.

The existing OMRD is 32.6%. OMRD would increase to 32.8% during project activities. After project completion, OMRD would return to 32.6.

**D. TMRD: Total Motorized Route Density** is calculated on a BMU basis using moving window analysis. The goal is for no net increase in TMRD on National Forest lands within the BMU.

The existing TMRD of BMU 8 is 21.6%. During project activity, TMRD would increase to 21.8, due to the opening of barriered roads. Upon completion of project-related activities TMRD would return to 21.6%.

Research conducted by Wakkinen and Kasworm (1997) in the Selkirk and Cabinet-Yaak Ecosystem (SCYE) that examined the concepts of OMRD, TMRD and core habitat is considered “best science” applicable to this area. Allen et al. (2011) supports this position.

**E. Linear Road Density:**

Linear road density is calculated on MS-1 lands for the BMU and should not exceed 0.75 miles per square mile. Individual bear analysis areas (BAA) may exceed 0.75 miles per square mile if the entire BMU meets the standard and the BAA is where the activity is occurring or prior consultation has established a different level for the BAA. The linear open road density (ORD) in BMU 8 and its associated bear analysis areas (BAA) is displayed in Table 3-40.
Table 3-40: BMU 8 Linear Open Road Densities

<table>
<thead>
<tr>
<th>BEAR ANALYSIS AREA (BAA)*</th>
<th>Existing ORD-mi/sq.mi.</th>
<th>ALT 2 ORD-mi/sq.mi.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-8-1</td>
<td>0.54</td>
<td>---</td>
</tr>
<tr>
<td>7-8-2</td>
<td>0.25</td>
<td>0.40</td>
</tr>
<tr>
<td>7-8-3</td>
<td>0.64</td>
<td>---</td>
</tr>
<tr>
<td>7-8-4</td>
<td>0.60</td>
<td>---</td>
</tr>
<tr>
<td>7-8-5</td>
<td>0.66</td>
<td>---</td>
</tr>
<tr>
<td>7-8-6</td>
<td>0.74</td>
<td>---</td>
</tr>
<tr>
<td><strong>Total BMU</strong></td>
<td><strong>0.57</strong></td>
<td><strong>0.60</strong></td>
</tr>
</tbody>
</table>

* See the Bear Management Unit maps (FIGURE *) for specific locations.

Under the action alternative, a slight increase in linear ORDs would occur during project activities in BAA 7-8-2. The ORDs are well below the recommended maximum of 0.75 miles/square mile of open roads for BMUs. The effect to grizzly bears would be that bears may be temporarily displaced due to human presence and project activities. Post-project linear ORDs for these BMUs would return to their pre-project existing condition.

F. Best Available Science

The 1997 Wakkinen and Kasworm report provides the only available science specific to the Selkirk and Cabinet-Yaak Ecosystems (SE and CYE) for setting motorized access standards. This research was completed in response to the 1994 Interagency Grizzly Bear Committee (IGBC) direction (IGBC 1994) to develop site-specific habitat security parameters using local female bears in regards to motorized access in all grizzly bear recovery zones. In 1998 and 1999, the Selkirk/Cabinet-Yaak Ecosystem (SCYE) IGBC subcommittee reviewed the Wakkinen and Kasworm (1997) effort which was, in turn, used by the U.S. Fish and Wildlife Service (USFWS) as the “best available indication of habitat conditions used by grizzly bears in the Selkirk and Cabinet-Yaak Ecosystems” in completing their 2001 amended Biological Opinion regarding the continued implementation of the Idaho Panhandle National Forest Plan (USDI Fish and Wildlife Service 2001). To date, there are no other analyses quantifying these parameters using local grizzly bear data for these two ecosystems.

However, since the issuance of this report 15 years ago, there has been an on-going debate as to its merits and limitations. As a result, some have questioned the validity of using the report’s conclusions as a basis for developing motorized access standards in these two recovery zones. Critics of the 1997 report specifically point to the following in their disparagement of the results:

1. limited sample size of female grizzly bears;
2. inclusion of a subadult female for portions of the analysis;
3. lack of reproductive success and/or mortality of radio-collared bears after the study was over;
4. the lack of a second-order analysis which would help explain if these bears had the opportunity to select greater levels of unroaded habitat elsewhere in the recovery zone;
5. use of individual multi-annual home ranges versus composite home ranges in the resource selection analysis; and
6. the lack of a minimum core block size in establishing core areas.

Allen et al. (2011) examined each of these points and found that the Wakkinen and Kasworm report (1997) provides the best
data available for determining recommendations for the management of grizzly bear habitat in relationship to motorized routes for the Selkirk and Cabinet-Yaak Ecosystems.

**Objective 2. Manage for an adequate distribution of bears across the ecosystem.**

A. **Opening size:** Proposed timber harvest units, either individually or in combination with existing unrecovered units should normally be designed to be less than or equal to 40 acres.

The Spring Gulch project area includes timber sales that were harvested in the 1960s through the 1980s. Some of these units were larger than 40 acres, but have recovered to the point that they are currently providing hiding cover. Design criteria of the current project leaves riparian areas and ridgelines intact. The proposed project will not create any openings larger than 40 acres. The units will include patches of live and dead trees and shrubs and the effect will be a mosaic of harvested area, non-harvested areas, and groups of standing dead and live trees. The topography of the area will also provide some cover due to the broken nature of the land.

B. **Movement corridors:** Unharvested corridors >600 feet in width should be maintained between proposed harvest units and between proposed and unrecovered existing harvest units.

Due to unit design, it is not necessary to maintain unharvested corridors greater than 600 feet in the project area. All existing harvest units provide security cover and none of the proposed regeneration harvest units are adjacent to each other. There are no linkage zones in the area.

In the short term, the Spring Gulch project may temporarily displace grizzly bears that are using the project area. In the long term, as the proposed activities are completed the project area would be available for bear use.

C. **Seasonal components:** In areas with important seasonal components such as spring range, the guideline is to schedule proposed timber harvest activities to avoid known spring habitats during the spring use period (April 1 to June 15) and known denning habitats during the winter (December 1 through March 31).

No den sites are known to exist within the analysis area. All proposed project activities that take place in bear spring range would avoid the spring bear use period (4/1-6/15).

D. **Road density and displacement (core) areas:** These are discussed under Objectives 1 and 6.

**Objective 3. Manage for an acceptable level of mortality risk.**

Most human-caused grizzly bear mortalities on the Kootenai National Forest have resulted from interactions between bears and big game hunters (Kasworm and Manley 1988). Grizzly bear vulnerability to human-caused mortality is partially a function of habitat security. Therefore, mortality risk can be partially assessed by the use of habitat factors that maintain or enhance habitat security.
A. Opening size. See Objective 2.

B. Movement corridors. See Objective 2.

C. Road density. See Objective 1 and 6.

D. Displacement. See Objective 1 and 6.

E. Attractants. In 2011, the Kootenai National Forest adopted a Food Storage and Sanitation Special Order. This order requires that human, pet, livestock food, and refuse be stored in a bear resistant manner by employees, contractors and visitors on the Kootenai National Forest.

Taking into consideration the status of the habitat components listed above, mortality risk to the bear is generally low throughout most of BMU 8. It is important to note that human-caused grizzly bear mortality is also a function of other factors, such as the regulation of big game hunting, which are beyond the authority of the Forest Service to control. Regulation of hunting is the responsibility of the State of Montana. Cumulatively, risk-of-mortality would not change appreciably due to implementing Alternative 2.

**Objective 4. Maintain/improve habitat suitability with respect to bear food production.**

Timber harvest and post-harvest treatments such as prescribed burning, when conducted within Forest Plan standards, would generally have a positive effect on the growth of forage plants important to bears. Additional habitat improvement projects conducted with sale receipts (forage seeding, prescribed burning, etc.) would further improve foraging conditions. Prescribed burning will be accomplished with hand ignition.

Riparian habitats are generally considered to be valuable feeding sites. The proposed timber harvest does not include any riparian harvest and would follow other Kootenai Forest riparian management guidelines, Montana Streamside Management Act (HB 731), and INFISH guidelines. Adherence to riparian area standards would ensure protection of the food resources in this important zone.

**Objective 5. Meet the management direction outlined in the Interagency Grizzly Bear Guidelines (51 Federal Register 42863) for management situations 1, 2, and 3.**

Meeting Objectives 1-4 has been determined to meet the intent of the Interagency Grizzly Bear Guidelines (Buterbaugh 1991). Habitat Effectiveness will be lowered slightly during the project, but would return to pre-project levels upon completion of activities. There is no measureable change in core levels and only a short-term less that 1% increase in OMRD and TMRD. In addition the project improves forage conditions in the project area.
Cumulative Effects

Christensen and Madel (1982), in *Cumulative Effects Analysis Process* chose a 515,000 acre cumulative analysis area which represented 56% of the Cabinet Yaak recovery zone and was the focal point of mineral exploration and development on the forest. In this analysis it was assumed that if each smaller bear unit within that analysis area is maintained in a viable condition the total of all bear units, would remain a viable habitat. Based on that well established premise, the BMU has been consistently identified as the analysis area for analyzing and monitoring effects to the grizzly bear (IGBC 1994, McMaster 1995, IGBC 1998, KNF 2009)(BA p. 8). BMU 8, in which the project is located, meets or exceeds standards for habitat effectiveness, open road density, open motorized route density, total motorized route density, and core (BA, pp. 14-15).

The Spring Gulch analysis area has had management activities in the last 40 years. The result of this management is a landscape that is a mosaic of various stages of succession. In addition to the harvested areas, there are unharvested areas including roadless areas and areas that have had natural disturbances like insect and disease infestations, and blowdown. The most recent harvest occurred in the 1980s. These sales treated approximately 435 acres with a variety of harvest types; clearcut with reserves, shelterwood, and seed tree. The harvest associated with the above projects has been complete for at least 20 years. The Spring Gulch action alternative was designed to meet grizzly bear standards and guidelines. Cumulatively, the potential exists to temporarily displace grizzly bears to core areas and other areas not affected by the activities.

Past harvest has resulted in a variety of age classes and successional stages across the project area. This is providing habitat conditions favorable for grizzly bear and for forage such as huckleberries and big game. Open road densities have dramatically dropped in the past several years as a result of closing roads through decisions intended to facilitate grizzly bear recovery. Core habitat has increased across the landscape, providing large core areas from Canada south to the Clark Fork River.

Basic road maintenance, pre-commercial thinning, mushroom picking, prescribed burning, timber hauling, wildlife habitat improvement projects and various recreational uses are additional activities that have occurred and will continue to occur within the project area. These activities are generally not considered to have adverse impacts on wildlife species. These activities may incidentally affect wildlife use within some areas on a temporary basis, but are not likely to affect the viability of this species.

Environmental Consequences

Table 3-41 summarizes the effects to core, OMRD and TMRD by each alternative.
Table 3-41: Grizzly Bear Habitat Effects by Alternative

<table>
<thead>
<tr>
<th>BMU</th>
<th>Habitat Component</th>
<th>Alt. 1 No Action (Existing Condition)</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>% Core</td>
<td>During 54.8</td>
<td>After 54.8</td>
</tr>
<tr>
<td></td>
<td>% BMU OMRD &gt; 1 mi/sq.mi.</td>
<td>During 32.6</td>
<td>After 32.6</td>
</tr>
<tr>
<td></td>
<td>% BMU TMRD &gt; 2 mi/sq.mi.</td>
<td>During 21.6</td>
<td>After 21.6</td>
</tr>
</tbody>
</table>

* for No Action Alt. - Existing condition changes shown in “After” column are due to projects other than proposed activity.

**Direct and Indirect Effects**
The No Action alternative includes reduced habitat effectiveness on 1,130 acres due to disturbance from existing point source disturbances, such as human use on currently open roads. The existing core areas provide displacement habitat for on-going projects. Alternative 2 will not cause additional incidental take because OMRD, TMRD, and core standards are met in BMU 8.

**Effects of Timber Harvest Activities (includes felling through loading)**
The point source disturbance from timber harvest actions may temporarily displace grizzly bears from approximately 236 acres during the period of activity.

**Effects of Road Construction and Use (includes hauling and all other types of road use)**
During hauling on previously closed roads, grizzly bears may be temporarily displaced from approximately 350 acres. The effects of road use have been accounted for through the road density and core standards and any specific associated mitigation for this project.

**Cumulative Effects**
Alternative 1 (no action) would not contribute any cumulative effects to grizzly bear or their habitat. The overall percent core for the Cabinet-Yaak recovery zone remains at 58 percent. The action alternatives, in combination with the baseline conditions and reasonably foreseeable projects (see earlier list) do not change the overall recovery zone core from 58 percent.

Continual development of private land in the Clark Fork valley is expected. Although considered unsuitable for grizzly bear occupancy, these private lands can contribute to the risk of grizzly bear mortality if landowners do not properly dispose of trash and manage pet and/or livestock food sources. Any additional cumulative effects to grizzly bears would be partially dependent on the duration (seasonal versus year-round) of use of these parcels and homes. Anticipated effects include displacement, habitat alteration, and/or habitat loss. Many of the activities that may occur on the private property parcels can only be estimated and are outside of the control of the Forest Service.

It is reasonable to assume that some corresponding increase in human use of National Forest System lands is likely to occur over time. This increase is likely to be gradual and
tend to be focused on areas along or near roads open to motorized traffic. Bears may, over time, experience more frequent disruption of their daily activities if they are in proximity to roads. The relationship of this project to increased recreational use of the area centers on the potential for illegal shooting of grizzlies. It is reasonable to assume that loss of cover from this project coupled with increased recreational use may increase mortality risk. The rate of increase in recreation in the area has been modest thus far. By the time there is a noticeable increase in recreationists the harvest units treated under this project will have recovered and will likely provide security cover.

**Regulatory Consistency**

**Endangered Species Act**
The project is in compliance with ESA. This statement is based on: 1) Project meets all terms and conditions established by FWS (2004). 2) Consultation with FWS completed and concurrence received.

**Forest Plan**
The proposed action meets Forest Plan (FP) guidelines and standards as they apply to grizzly bear:

1. **Evaluate Cumulative Effects** – FP Appendix page 8-9
   a. All proposed timber and fire management activities will be evaluated for their effects on grizzly bears and their habitat. A cumulative effects perspective will be used in the evaluation.
      i. See **Data Sources, Methods, Assumptions, and Bounds of Analysis** for discussion on analysis area and **Environmental Consequences** for direct, indirect, and cumulative effects sections.

2. **Project Design** – FP Appendix 8-10
   a. Timing constraints, scheduling, shortened contract periods:
      i. See **Objective 2C**– Proposed harvest would avoid the spring use period.
   b. Maintenance of Movement Corridors
      i. See **Objective 2B** – maintenance of hiding cover within units and/or within 600 feet to cover and maintenance of riparian corridors.
   c. Provision of displacement areas
      i. See **Objective 1A** – Several large core blocks are within the affected BMU and project activities would not reduce Core percentage.
   d. Access management will be considered and implemented as needed
      i. See **Objective 1A, B, and C** and **Effects of Road Reconstruction and Use** – There would be no change in access management, habitat parameter levels would be maintained throughout the life of the project. Roads temporarily opened for administrative traffic would return to current management status post-project.

3. **Browse Enhancement; Prescribed burning** – FP App. 8-11
a. Prescribed burning in those habitat situations where increased succulence or improved fruit production will result or grizzly foods will be improved or made available.
   i. See **Objective 4, Maintain/improve habitat suitability with respect to bear food production.** Huckleberry, where present, and other forage species would respond to increased sunlight and increased nutrient levels that will result from the proposed vegetation management.

4. Attractants FP App. 8-12.
   a. There will be strict regulations of garbage, pets, and human waste to minimized grizzly/human conflict.
      i. The Forest Service has no sources of attractants within the project-area
      ii. Forest Service employees and contractors would be required to properly handle activity bear attractants in compliance with the 2011 Kootenai NF Food Storage and Sanitation Special Order.

5. Addendum to Appendix 8 - Forest Plan Amendments for Motorized Access Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (2011)
   a. Adherence to the Amendment’s features and design elements. See **Objective 6** – Road use would not change habitat parameter levels, public use would not be allowed on restricted roads, routine forest management does not change core percent, and roads that may exceed administrative trips were modeled as open for the bear year.

6. Assumes that grizzly bear habitat standards and guidelines will be adapted based on consultations with USFWS (PF App 8-7). Consultation with USFWS would continue.

7. Forestwide Management Direction – FP II-1 #3, #5, #7, II-22 and 23
   a. #3 – **Maintain a balance of open and closed road…(to) insure grizzly bear security to meet recovery goals…** Access management direction would be met and would insure grizzly bear security.
   b. #5 – **Maintain or enhance sufficient grizzly bear habitat:** Maintaining habitat parameter levels as well as moving stand towards a more natural vegetative condition will stimulate forage species.
   c. #7 – **Maintain diverse age classes of vegetation for viable populations of all existing native, vertebrate, wildlife species:** Maintaining existing, large, fire adapted tree species, reducing stocking density in uncharacteristic high density stands, and moving stands towards the desired vegetative condition based on historic range of variation with the stands in the area.
   d. 22 – **Identify and protect important habitats:** Core percent would not change, riparian areas are not impacted, movement corridors maintained, and activity restrictions in spring foraging areas.
   e. 23 – **Apply elements of Appendix 8, appended by the 2011 Access Amendment:** See Objective 6 and 5.a. above.

**National Forest Management Act:** The project would comply with NFMA direction to provide for diverse populations of plant and animal communities by applying Forest Plan standards and guides (Johnson 2004).
Statement of Findings
The proposed action May Effect, - Not Likely to Adversely Affect the grizzly bear. This determination is based on: 1) Standards for core, TMRD, OMRD, HE, ORD are met, 2) no project related activities during the spring season (4/1-6/15), 3) sufficient displacement habitat available, 4) no aerial activities.

CANADA LYNX

Data Sources, Methods, Assumptions, Bounds of Analysis
Lynx population ecology, biology, and habitat description and relationships are described in Ruggiero et. al. (2000) and Ruediger et al. (2000). That information is incorporated by reference. Lynx occur primarily in boreal forests of Canada and Alaska. Their range extends south into the upper elevations of western mountains (Idaho, Montana, Washington, Wyoming, Colorado) where boreal conditions exist. They are built to live in snow, with long legs, large feet, and dense fur. Snowshoe hare are their primary prey. Lynx breed in January/February and 2 offspring are born March/April (Koehler and Aubry 1994). In addition, the final lynx listing rule (Clark 2000) gives population and habitat status on a national scale. The most recent lynx distinct population segment status is found in the Biological Opinion on the effects of the Northern Rocky Mountains NRLMD (USFWS 2007c). Lynx occurrence data comes from Forest historical records (NRIS Wildlife Database), and other agencies (MNHP, MFWP, USFWS).

The Final EIS for the Northern Rockies Lynx Management Direction (NRLMD) was completed in March 2007 with the ROD signed March 23, 2007. This decision amends the 1987 Kootenai Forest Plan by providing lynx habitat management objectives, standards and guidelines. The decision replaces the interim application of the Lynx Conservation Assessment and Strategy (LCAS). The direction provided in the NRLMD is applied to lynx habitat at the lynx analysis unit (LAU) scale. The KNF has delineated 47 LAUs which approximate a lynx home range size. Forest-wide lynx habitat has been updated to reflect the lynx habitat terminology from the NRLMD.

The effects analysis follows the standards and guidelines established in the NRLMD. Only the standards and guidelines applicable to the proposed project are analyzed, and they are only applied to lynx habitat on Federal lands (in compliance with the ROD). Those considered but found “not applicable” are found in the project file. Lynx habitat, in impacted LAUs, was mapped using the timber stand database version of the Kootenai National Forest model. Connectivity was evaluated by visually examining lynx habitat and past management activities to determine possible movement areas and potential areas where lynx travel may be hindered. Ridge lines and draws were considered high value movement areas.

The scale for direct effects analysis is the impacted Lynx Analysis Unit(s) (LAU) and for indirect effects it is the impacted LAUs, and adjacent LAUs for connectivity effects.

Affected Environment/Existing Condition
On March 24, 2000 the U.S. Fish and Wildlife Service listed the contiguous U.S. distinct population segment of the Canada lynx as Threatened (Clark 2000). National population and habitat status descriptions in that document are incorporated by reference. There are no occurrences of lynx found in the historical records that are within the Spring Gulch planning sub-unit (PSU).
On February 25, 2009 the U.S. Fish and Wildlife Service designated critical lynx habitat (Fed. Reg. 50CFR Part 17). This project area does not fall in proposed critical lynx habitat.

Currently, all LAUs meet the NRLMD standards (USDA Forest Service 2008). Lynx habitat in the impacted LAU was modeled in terms consistent with the NRLMD (see Figure 4). Table 3-42 displays the current lynx habitat conditions in the PSU.

Figure 3-16. Lynx Habitat in Vermilion LAU.
Table 3-42: Lynx Habitat by LAU in the Spring Gulch PSU

<table>
<thead>
<tr>
<th>LAU</th>
<th>Total Lynx Habitat In LAU Acres</th>
<th>Unsuitable Habitat Acres (%) (^1)</th>
<th>Habitat Changed to Unsuitable Over past 10 years by timber management with regeneration harvests Acres (%) (^2)</th>
<th>Number of adjacent LAUs that exceed 30% lynx habitat in an unsuitable condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>14703</td>
<td>40,027</td>
<td>16 (&lt;0.01)</td>
<td>0 (0)</td>
<td>0</td>
</tr>
</tbody>
</table>

\(^1\) these acres are lynx habitat that currently do not provide sufficient vegetation quantity or quality (height) to be used by snowshoe hare and lynx. No additional regeneration harvest allowed if more than 30% of lynx habitat in an LAU is in a stand initiation structural stage that does not provide winter snowshoe hare habitat.

\(^2\) percent is the percent of total LAU acres that provide lynx habitat (suitable + unsuitable acres). No more than 15% of lynx habitat on NFS lands in an LAU may be changed by regeneration harvest in a 10 year period.

Environmental Consequences
Direct and Indirect Effects

Objectives, Standards and Guidelines applicable to ALL management projects in lynx habitat

Objective ALL 01: Maintain or restore lynx habitat connectivity in and between LAUs and in linkage areas.

No activities are proposed in areas that provide connectivity or linkage, therefore this guideline does not apply.

Standard ALL S1: New or expanded permanent development and vegetation management projects must maintain habitat connectivity in and LAU and/or linkage area.

This standard is met because this proposed project will maintain suitable lynx habitat. Connectivity with other LAUs is good to the north, east and south, but poor to the west due to the presence of private property and the Montana Rail Link railroad, and Noxon Reservoir.

There are no identified linkage corridors (USDA Forest Service 2004: Figure 1-1; KNF Lynx Taskforce 1997: 6) in or adjacent to the Planning sub-unit or potentially impacted LAUs.

Guideline ALL G1: Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses or overpasses.

No highway or forest highway construction or reconstruction activities planned, therefore this guideline does not apply.
Standard LAU S1: Changes in LAU boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.

No changes in LAU boundaries are proposed, therefore this standard does not apply.

Objectives, Standards and Guidelines applicable to vegetation management projects in lynx habitat within LAUs

Standard VEG S1: If more than 30 percent of the lynx habitat in an LAU are currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects. Exception: Fuel treatment projects in the WUI, as defined by HFRA, subject to the following limitation – fuel treatment projects in the WUI that do not meet Standards VEG S1, S2, S5 and S6 shall occur on no more that 6 percent (cumulatively) of lynx habitat on each National Forest. In addition, fuel treatment projects may not result in more than three adjacent LAUs exceeding this standard. For fuel treatment projects in the WUI, see guideline VEG G10.

See Table 3-43 for how the impacted LAU meets or exceeds the 30% standard.

Table 3-43. Percent habitat not providing winter snowshoe hare habitat within impacted LAUs

<table>
<thead>
<tr>
<th>LAU</th>
<th>Existing Condition</th>
<th>Alt. 1</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>14703</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

The proposed activities would not increase the existing level of lynx habitat not providing snowshoe hare winter habitat in LAU 14703. Cover surveys indicate that stands proposed for treatment within lynx habitat, currently do not meet the cover requirements to support snowshoe hare. This does meet the standard.

Standard VEG S2: Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within a LAU within a 10-year period. The same exception described in standard VEG 01 for fuels projects in the WUI applies to this standard.

This standard is met in all affected LAUs. Table 3-44 provides a comparison, by Alternative, of how the impacted LAU(s) comply with this standard.

Table 3-44. Regeneration Harvest in Lynx Habitat in the last 10 years in Impacted LAUs

<table>
<thead>
<tr>
<th>LAU</th>
<th>Existing Condition Acres (%)</th>
<th>Alt. 1</th>
<th>Alt. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>14703</td>
<td>0</td>
<td>0</td>
<td>&lt;0.001 (22 ac.)</td>
</tr>
</tbody>
</table>
**Standard VEG S5:** Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only:
1.) Within 200 feet of administrative sites, dwellings, or outbuilding; or
2.) For research studies or genetic tree tests evaluating genetically improved reforestation stock; or
3.) Based on new information that is peer reviewed and accepted by the regional level of the Forest Service and state level FWS, where a written determination states:
   a. that a project is not likely to adversely affect lynx; or
   b. that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long term benefits to lynx and its habitat; or
4.) For conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline; or
5.) For daylight thinning of planted rust-resistant white pine where 80% of the winter snowshoe hare habitat is retained; or
6.) To restore whitebark pine.

**Exceptions 2 through 6 shall only be utilized in LAUs where standard VEG S1 is met.**

This standard does not apply since no pre-commercial thinning is proposed in lynx habitat. The proposed action meets the standard.

**Standard VEG S6:** Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only:
1.) Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or
2.) For research studies or genetic tests evaluating genetically improved reforestation stock; or
3.) For incidental removal during salvage harvest (e.g. removal due to location of skid trails).

**Exceptions 2 and 3 shall only be utilized in LAUs where standard VEG S1 is met.**

Note: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed under stories that lack dense horizontal cover.

Timber harvest is proposed in two stands identified as mature/late successional lynx habitat by the Kootenai National Forest Lynx Habitat model. Horizontal cover surveys conducted in both of the stands demonstrate that they currently do not meet the standard for suitable snowshoe hare habitat. Stand 733-01-010 has an average of 23.7% cover and stand 733-01-012 has 18.5% cover. Both are well below the winter standard of 35% (Bertarm and Claar 2008). Therefore, Standard VEG S6 does not apply. Timber harvest in these stands will move these stands back to a young structural stage and result in a dense understory of seedlings and shrubs in approximately 10 years that will provide suitable snowshoe hare habitat for the forseeable future.
Objectives VEG 01, 02, 03, 04:
The proposed project meets VEG O1, VEG 02, and VEG O4 by maintaining habitat components for lynx in stands where they currently exist. The stands proposed for treatment under this project currently do not have the horizontal cover necessary to support populations of snowshoe hare. The treatments proposed will promote the development of a vigorous understory, more suitable for hares. VEG 03 does not apply to this project.

Guidelines VEG G1, G4, G5, G10 and G11
Guideline VEG G1 is met by the proposed action because treatment will occur in stands that are currently in the stem exclusion phase. They have a closed canopy and generally a depauperate understory. A result of the treatment will be the development of an understory more suitable for snowshoe hare.

There will be no permanent travel routes or firebreaks created as a result of the prescribed burning proposed with this project, VEG G4 is met. Habitat for other lynx prey species is maintained in the project area and the LAU, VEG G5 is met. This project is not an HFRA project, VEG G10 does not apply.

Denning habitat does not appear to be lacking in LAU 14703, VEG G11 is met. Most of the LAU (38,000 acres) is in one four Inventoried Roadless Areas (Cataract Creek, Cube Iron, Galena, and Allen Peak). Inventoried Roadless Areas are largely unmanaged, therefore large woody debris should be common.

Cumulative Effects
A description of past actions in the project area can be found in Appendix D. Historic timber harvest typically focused on regeneration of mature and overmature stands that likely provided suitable Canada lynx habitat. Approximately 160 acres of regeneration harvest has occurred in the project area. Additionally, another 275 acres of intermediate harvest occurred. The effects of these types of treatments on lynx would have been similar to those discussed above for this project. Past regeneration harvest areas likely provide stand initiation summer foraging habitat and may provide winter foraging habitat. Past intermediate harvest provides different structure and functions as it ages and likely serves as non-forage lynx habitat. Past activities have reduced the amount of available foraging habitat but provided for habitat diversity in the short and long term.

The No Action Alternative does not directly contribute any cumulative effects. Other actions, previously identified, that would still take place do not add to the cumulative effects.

The action alternatives, in combination with the existing condition and reasonably foreseeable actions (see list provided earlier) would not result in cumulative changes in or loss of lynx habitat. The affected LAU would continue to meet LCAS standards and guidelines.

Regulatory Consistency
Endangered Species Act
The project is in compliance with ESA. This statement is based on: 1) Consultation with FWS completed and concurrence received.

Northern Rockies Lynx Management Direction
The project is in compliance with NRLMD. This statement is based on: 1) the analysis above, 2) concurrence received from USFWS.

Forest Plan
The proposed action meets Forest Plan (FP) guidelines and standards as they apply to Canada lynx:
Forest-wide Management Direction – FP II-1 #7, II-22
a. #7 - Maintain diverse age classes of vegetation for viable populations of all existing, native vertebrate, wildlife species: Moving toward the desired vegetative condition based on historic range of variation with the stands for this area.
b. 22 – Identify and protect important habitat: Habitat parameters are met, suitable foraging and denning habitat available.
c. National Forest Management Act: The project would comply with NFMA direction to provide for diverse populations of plant and animal communities by applying Forest Plan standards and guides (Johnson 2004).

Statement of Findings
The proposed action May Effect – Not Likely to Adversely Affect Canada lynx. This determination is based on: 1) project area is not identified as critical Canada lynx habitat, 2) all applicable Standards and Guidelines are met, 3) Stands in lynx habitat do not meet the cover standard for winter snowshoe hare habitat, Standard VEG S6 does not apply, 4) all applicable Objectives are met.

In addition, the proposed action is will not result in the destruction or adverse modification of proposed critical habitat.

MIGRATORY BIRDS

Executive Order #13186 (January 10, 2001): “Responsibilities of Federal Agencies to Protect Migratory Birds” was issued by President Bill Clinton in furtherance of the purposes of the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Acts, the Fish and Wildlife Coordination Act, the Endangered Species Act, and the National Environmental Policy Act. This order requires including effects of federal actions on migratory birds as part of the environmental analysis process.
A Memorandum of Understanding between the USFS and USFWS was signed in late 2008 (USDA and USFWS 2008) (FS Agreement #08-MU-1113-2400-264). The MOU outlines the responsibilities for both parties regarding migratory birds, including the USFS’s responsibilities regarding consideration of migratory birds in NEPA projects. The MOU was used to help guide the development of this effects analysis.

The National Forest Management Act (NFMA) requires that Forest plans "preserve and enhance the diversity of plant and animal communities...so that it is at least as great as that which can be expected in the natural forest" (36 CFR 219.27). Additional direction
states that "management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which could be expected in a natural forest". Furthermore, implementation regulations for the NFMA specify that, "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area".

**Affected Environment**

Neotropical migratory birds are those bird species that migrate to more northerly latitudes to breed on the Kootenai National Forest each summer. Come fall, these species migrate south to spend the winter months. Of the approximately 205 bird species known to occur on the Forest as breeders, migrants, winter visitors, or transients, about 70 species could be classified as neotropical migratory land birds (Al Bratkovich, Libby District Wildlife Biologist and Forest Landbird Monitoring Program Coordinator, pers. comm. with Steve Johnsen 1999). The USDA Forest Service is a partner with other government agencies, and private organizations in several bird conservation efforts, including the North American Bird Conservation Initiative (NABCI) and Partners in Flight (PIF). In 1998, NABCI introduced Bird Conservation Regions (BCR), a method to identify large areas that contained similar bird habitat. The Kootenai National Forest is in BCR 10, Northern Rockies. Within BCR 10, bird habitat is delineated into grassland, shrubland, forest, riparian, wetlands, and unique habitat. Each of these general categories is further subdivided into more specific habitat associations, such as cedar-hemlock, dry forest, and aspen. NABCI states that the USFS administers 42% of western forests and that 34% of the birds that use USFS land are found in western forest (2011 NABCI).

The Spring Gulch PSU lies within the Forest Habitat component. Montana PIF priority species for that type of habitat are found in Table 3-45.

**Table 3-45. Partners in Flight priority habitats/species for BCR10 (PIF 2000a)**

<table>
<thead>
<tr>
<th>Partners in Flight Priority Habitats and Species</th>
<th>Species</th>
<th>Priority Level</th>
<th>Is the Forest w/in the range of species?*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Forest</td>
<td>Flammulated owl</td>
<td>I</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Lewis’s woodpecker</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blue grouse</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Chipping sparrow</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Cassin’s finch</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Red crossbill</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td>Cedar Hemlock</td>
<td>Brown creeper</td>
<td>I</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Vaux’s swift</td>
<td>II</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Winter wren</td>
<td>II</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Chestnut-backed chickadee</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td>Wildland Resources/Oldgrowth</td>
<td>Golden-crowned kinglet</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>------------------------</td>
<td>-----</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Varied thrush</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td>Burned Forest</td>
<td>Black-backed woodpecker</td>
<td>I</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Olive-sided flycatcher</td>
<td>I</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Three-toed woodpecker</td>
<td>II</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Townsend's solitaire</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td>Moist Douglas-fir / Grand fir</td>
<td>Northern goshawk</td>
<td>II</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Williamson's sapsucker</td>
<td>II</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Sharp-shinned hawk</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Pileated woodpecker</td>
<td>II</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Plumbeous/Cassin's vireos</td>
<td>III</td>
<td>N/Y</td>
</tr>
<tr>
<td></td>
<td>Townsend's warbler</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td>Whitebark pine</td>
<td>Clark's nutcracker</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Red-naped sapsucker</td>
<td>II</td>
<td>Y</td>
</tr>
<tr>
<td>Wet Subalpine fir (spruce/fir)</td>
<td>Great gray owl</td>
<td>III</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Boreal owl</td>
<td>III</td>
<td>Y</td>
</tr>
</tbody>
</table>

Several of these species are analyzed elsewhere in the document: flammulated owl, black-backed woodpecker and pileated woodpecker. Most of the habitats found on the Forest host one or more species of migratory birds. Generally speaking the birds arrive in the spring to set up territories for breeding purposes. Young are raised and fledged by mid-summer. Most species leave the Forest by late summer.

The following table displays the dominant vegetation types in the project area. There is some overlap in categories, and therefore some double-counting. For example, some acres counted as “riparian” would also be counted under the other forested types. Additionally, specific tree species may be found in more than one category, although for the purpose of display they were placed in only one category. Tree species may also be found in several other forest types. For example, aspen is displayed as a separate category, although aspen can be found in smaller quantities scattered throughout the other forested types.
Table 3-46. Dominant vegetation type for the project area organized to approximate the PIF priority habitats. Percentages and acreages do not tally to 100% due to rounding and overlap between some of the categories leading to double-counting.

<table>
<thead>
<tr>
<th>Dominant Veg Type</th>
<th>Estimated % of analysis area</th>
<th>Estimated Acres of the analysis area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry forest (ponderosa pine / Douglas-fir)</td>
<td>22</td>
<td>6,604</td>
</tr>
<tr>
<td>Douglas-fir/grand fir</td>
<td>22</td>
<td>6,655</td>
</tr>
<tr>
<td>Cedar / western hemlock</td>
<td>43</td>
<td>12,901</td>
</tr>
<tr>
<td>Subalpine fir (spruce/fir)</td>
<td>5</td>
<td>1,489</td>
</tr>
<tr>
<td>Misc. forest (alpine larch, mountain hemlock, western larch, white pine, intolerant mix)</td>
<td>5</td>
<td>1,430</td>
</tr>
<tr>
<td>Riparian, Aspen, Cottonwood</td>
<td>29</td>
<td>879,089</td>
</tr>
<tr>
<td>Waterbodies (lakes, ponds, reservoirs, marsh, swamp, river)</td>
<td>&lt;1</td>
<td>57</td>
</tr>
<tr>
<td>Burned forest*</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Non veg</td>
<td>&lt;1</td>
<td>231</td>
</tr>
</tbody>
</table>

*Recently burned, unharvested acres based on 2003-2009 fires and 2003-2010 harvest. For species such as the black-backed woodpecker, recently burned forests are the most suitable habitat.

The habitat requirements of the species listed above, as well as range information, can be found online at NatureServe Explorer's database: [http://www.natureserve.org/explorer/index.htm](http://www.natureserve.org/explorer/index.htm). Population estimates can be found on the Partners in Flight online database: [http://rmbo.org/pif_db/lapecd/](http://rmbo.org/pif_db/lapecd/).

**Environmental Consequences**

Responses of migrant birds to timber harvest and burning (prescribed or wildfire) depends upon their individual habitat preferences and needs. Regeneration harvest removes forest cover used by some species (e.g. brown creeper, chestnut-backed chickadee, varied thrush) and at the same time creates grass, forbs, and shrub habitat used by other bird species (e.g. sharp-shinned hawk, Hammond’s flycatcher, chipping sparrow). This activity also produces “edge” habitat that still other bird species use (e.g. great gray owl, olive-sided flycatcher, Townsend’s solitaire). Edge habitat often is similar to forest stands created with partial cutting (e.g. commercial thinning). Species using edge are often found in partial cut stands, so this management practice may provide additional habitat for these species (Hutto and Young 1999).

**Effects common to all alternatives**

Management indicator species have been designated for the Kootenai National Forest (See the discussion of MIS above). These MIS species represent the habitat needs for migratory birds. As habitat for MIS species is being maintained, it is assumed that sufficient habitat for neotropical migratory land birds is also being maintained.
Alternative 1 (No Action)
The No Action alternative maintains the existing condition in the PSU. Conifer encroachment will continue on south and west aspects and forest stands on those aspects will continue to become more crowded. Understory seedlings and saplings will continue to grow into the canopy and put the overstory at risk, when a fire begins. Insect and disease issues will remain unaddressed and fuel levels in the PSU will increase. Bird populations within the PSU will continue to respond to these changes as they have in the past, subtle changes will occur as birds return to their summer habitat and find that it no longer is suitable for them. The result will be a redistribution of birds throughout the PSU.

Action Alternatives (2)
Each of the action alternatives includes some level of vegetation management (thinning, shelterwood harvest, burning). These activities may change the suitability of the stand for the birds currently using the stand. For the lighter treatments, the change may not make the stand unsuitable for those species with broader habitat requirements. Those species with narrow habitat requirement or in the stands where a more drastic change in the vegetation is made, birds may not find the habitat components they require. However, there are bird species that use open forest or burned forest stands and they will find suitable habitat in the treated stands. The result will be a redistribution of birds throughout the PSU.

Cumulative Effects
The area analyzed for cumulative effects includes the Spring Gulch Planning Subunit on the KNF as well as the surrounding other ownerships. The time period examined included the entire life of project activities, as well as into the past to cover such activities as previous fire suppression and timber harvest.

The effects of past firewood removal can be seen in the loss of snags along the open roads in the project area. Snag losses would be expected to continue into the future under the current management strategies. Roaded access would continue to allow the removal of snags and down wood. Snags created by underburning in the treatment stands would also be subject to loss from firewood gathering, especially in those areas proximate to open roads.

As discussed previously, past timber harvest has largely been accomplished using even-aged management systems, such as shelterwoods and clearcuts. This has reduced the amount of large trees (highest levels of the canopy) and has been focused on stands containing mature, or old growth characteristics. These activities have removed or altered cover and habitat that could have been used for nesting by various neotropical migrant species.

Timber harvest, fire suppression, fuels reduction, and other activities would likely continue on adjacent ownerships as well. These activities would have similar effects as those discussed above on NFS lands.

Regulatory Framework and Consistency
There are no specific goals or standards for migratory land birds in the Kootenai Forest plan. It does contain the goal to: “Maintain diverse age classes of vegetation for viable populations of all existing native, vertebrate, wildlife species (FP, Vol. 1, II-1, goal #7).
All alternatives are consistent with the Kootenai Forest plan, as a wide range of successional habitats would be available (See Vegetation and MIS sections). The alternatives are in compliance with the “Executive Order titled “Responsibilities of Federal Agencies to Protect Migratory Birds”. In addition, as habitat for MIS species is being maintained in the Spring Gulch PSU, and across the Kootenai National Forest, their habitat contributes to the maintenance of habitat and populations of neotropical migratory bird species.

WATER RESOURCES

Introduction
This section discloses the results of analysis for the water resource in the Spring Gulch project area.

Regulatory Framework
Alternative 1 and Alternative 2 would meet forest plan standards and would protect beneficial uses; including all state and federal water quality regulations would be met. This determination is based on the lack of direct or indirect impacts from proposed Forest Service activities on Water Resources.

The Clean Water Act (CWA) establishes federal water quality policies. Both the Environmental Protection Agency and individual states have responsibility for implementing the CWA. States are required to designate the beneficial uses of each stream and determine the criteria sufficient to protect these uses. Beneficial uses include human uses such as drinking water, irrigation and recreation, as well as protection of fisheries and aquatic life.

Section 101 of the Clean Water Act (CWA) states that its objective is to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” To accomplish this, the US Environmental Protection Agency encourages a holistic, watershed-based approach that places equal emphasis on protecting healthy streams and restoring impaired ones.

The CWA also requires states to identify waterbodies they believe are not meeting water quality standards and are at risk of not supporting their designated beneficial uses. These waterbodies are called Water Quality Limited Segments (WQLS). There are no WQLS waterbodies within the Spring Gulch analysis area.

Analysis Area
Direct and indirect effects of the timber harvest activities proposed on water resources were analyzed by one 7th code HUC boundary (Spring Gulch) (Figure 3-17). Effects to Deep Creek from proposed timber harvest activities were not analyzed due to the lack of proposed harvest in that basin.
Direct and indirect effects of the road reconstruction and maintenance activities proposed on water resources were analyzed by two 7th code HUC boundaries (Spring Gulch and Deep Creek) (Figure 3-17). Haul routes are proposed on existing roads that exist within the Spring Gulch and Deep Creek basins.

The response reaches, or reaches with the highest potential for change, for evaluating the effects of the activities proposed on the water resource is Reach 2 of Spring Gulch and Reach 2 of Deep Creek (Figure 3-17). Reach 2 of Spring Gulch was chosen due the public water source improvements present and more defined channel characteristics. Reach 2 of Deep Creek was chosen due the adjacent access road that will be utilized during project implementation. These response reaches and analysis boundaries encompass all upstream effects from proposed activities.

Figure 3-17:

Affected Environment

Reference Conditions
Desirable hydrologic and aquatic conditions within the Spring Gulch planning area include channel characteristics that relate to what is currently present. Natural stream channel stability is achieved by allowing the river to develop a stable dimension, pattern and profile such that, over time, channel features are maintained and the stream system
neither aggrades nor degrades (Rosgen, 1996). When a stream laterally migrates, but maintains its bankfull width and width/depth ratio, stability is achieved even though the river is considered to be an “active” and “dynamic” system (Rosgen, 1996). The stream segments in and around the Spring Gulch project area currently display these characteristics.

Past Actions

Historically, the most prevalent large-scale disturbance in the analysis area was wildfire. Stand replacing fires varied in frequency from 150 – 300 years, depending on the VRU, with the last large scale high intensity fire being in 1910. Once fire passed through an area, sediment delivery and water yield increased until forest floor and canopy vegetation had sufficiently recovered. During the fire disturbance cycle, large woody debris usually remained within channels and riparian zones which greatly aided the recovery of these areas. It is very likely that increased erosion followed these fires, especially on steep slopes where most vegetation would have been removed. More frequent, low-intensity underburns likely had little effect on these watersheds due to the lower levels of overstory mortality associated with these fires.

Floods and debris slides also occurred. Floods occurred in response to rain-on-snow events, heavy snow years, or heavy prolonged rain events. The magnitude of these types of floods can be increased following severe fire for a number of years. Channel stability and aquatic habitat can be affected by floods. Steep reaches tend to scour and the material may be deposited in lower gradient reaches. In the case of Spring Gulch, this phenomena has led to a discontinuous channel that is indistinguishable in places and can be characterized as a dry draw.

Human influence has had an influence on the landscape of the Spring Gulch planning area. Through timber harvest, road building, cattle grazing, rangeland conversion, and human induced fire, the consequential ramifications influenced the local drainage networks flow, quality and timing.

Most timber harvest in the 1950s through the 1980s has vegetatively recovered. Effects of projects implemented in the area more than 50 years ago have revegetated and would not contribute to sedimentation or cause changes in channel morphology. Many of the older road systems are stable and well vegetated.

Timber harvest in the 1950s through the 1980s occurred on 435 acres with minor amounts of other harvest types that have minimal impact on water yields. Areas regenerated during this time period are considered recovered or nearly so from a hydrological standpoint, and most roads from this period that are no longer in use are well vegetated and affecting water and sediment routing similar to roads discussed above.

Hydrologic

Spring Gulch is located in the northwest corner of the lower Clark Fork River basin. The project area consists of one 7th code hydrologic unit code (HUC) watershed (Figure 3-17). This watershed is 1165 acres in size, including private ownership, (Table 3-49) and is composed of 1st and 2nd order drainages. There is one dominant perennial channel to this system, the mainstem of Spring Gulch. Aspects throughout the basin are predominantly high energy, low elevation, generally south, southwest, and northwest). Average upland slopes exceed 60% in headwater cirques and diminish to less than 1%
in valley bottoms. Elevations in the area vary from 5,500’ to 2,350’ at the mouth of Spring Gulch.

Although some small seeps and springs have been identified on Federal land within the project area, there are no lakes, marshes or ponds on Federal land within the project area.

Deep Creek is located in the northwest corner of the lower Clark Fork River basin. The project area consists of one 7th code hydrologic unit code (HUC) watershed (Figure 3-17). This watershed is 8,819 acres in size (Table 3-50) and is composed of 1st, 2nd and 3rd order drainages. There is one dominant perennial channel to this system.

**Climatic**

Like most of the Kootenai National Forest, the contemporary climatic condition for the project area is a combination of continental and maritime influences. The maritime patterns originate primarily from the flow of warm, moist air masses from the west and the Pacific Ocean. One result is the gentle, steady, "soaking" rains in the fall and winter which are typically accompanied by cloudy skies with small diurnal temperature changes. The summers are typically warm and dry, with significant cooling at night. The predictable summer drought, usually occurring sometime in July and August, is a defining characteristic of the local, temperate climate. Continental effects are reflected in occasional cold periods in the winter, typically associated with northerly or arctic weather systems, and the hot, dry summer periods associated with high-pressure systems. These overlapping climatic provinces often create "rain-on-snow" events in the late fall and winter, when two to three days of continuous rain falls on a snowpack causing flooding. The precipitation for the Spring Gulch project area ranges from 27 to 60 inches annually. At the upper elevations, the majority of this precipitation comes in the form of snow between late October and late March.

**Analysis Methods**

The analysis methods used to evaluate the existing condition of the water resource relate to the criteria for measuring effects. These methods include; WATSED based water yield modeling, Rosgen based stream channel survey, and WEPP based sediment modeling.

**Water Yield**

Peak Flow Increases (PFIs), or water yield increases, are changes in a runoff hydrograph caused by forest management activities and natural events such as wildfire, usually causing higher and longer high-flow periods. These changes in water yield relate to the removal of vegetation (whether by timber harvest or fire) modifying the deposition and melt functions, and building of roads which can intercept and divert flows. These types of activities can increase the amount of available water in a snowpack and change the timing in which the runoff from this snow is released. Depending on the location in the drainage, and how much of these activities has and will take place, determines the magnitude of change of water yield. When the magnitude and duration of higher flow events are increased within a drainage, more opportunity arises for adverse channel conditions such as bank cutting and aggradational/degradational processes.

The effects of prior land management on the amount, duration, and timing of water yields in the analysis area were estimated using past R-1 WATSED model runs within
surrounding basins. Previous model runs in basins such as Whitepine Creek, Beaver Creek, Elk Creek, Trout Creek and Orr Creek yielded similar relationships between the effects of land management on basin hydrology in the form of Peak Flow Increases (PFI’s). A linear regression relationship (Figure 3-18) was then established from these past WATSED model runs. Figure 3-18 displays the relationship between the amount of Equivalent Clearcut Acres (ECA’s) needed to increase PFI’s by one percent based for a given basin size. ECA’s are the percent of an area in a clearcut (100% canopy removal) condition. This includes not only clearcuts but partial harvests, burned areas, and roads. Two relationships were made, one for basins 0 to 7,000 acres in size, and one for basins greater than 7,000 acres. For example, a sub basin that is approximately 4,000 acres needs approximately 60 ECA’s to increase the Peak flow by 1% at its mouth (see Figure 3-18 below). The values generated by this model were used along with other information, including field surveys of channel condition and professional judgment, to interpret existing and potential impacts resulting from past and proposed land management activities. These values are not to be considered an absolute measure against other verifiable standards, nor will they, by themselves, provide exact answers of the effects land management activities have on peak flows.

![ECAs for 1% PFI by Drainage Size](image)

*Figure 3-18: 0 to 7000 acre Past WATSED ECA/%PFI linear relationship.*

**Rationale for Recommended Peak Flow Increases (RPFI’s)**

Recommended Peak Flow Increases (RPFI’s) were determined after existing channel conditions were compared to modeled PFIs associated with past levels of disturbance. The intent of an RPFI is to limit the amount of additional ECAs and thereby limit water yield increases to levels that protect channel conditions and beneficial uses. RPFI’s were set in response to the existing channel type, stability, basin size, riparian integrity, and presence of sensitive soils within the planning area.
RPFIs are also based on monitoring information, stream inventory data collected in 2009, and research conducted on the Kootenai and adjacent Flathead National Forests (MacDonald et. al. 1997). RPFI’s were set in the Spring Gulch analysis area using the following considerations:

- Existing channel stability and other geomorphic conditions such as dry draw characteristics (data collected in 2009);
- Stream types present and their sensitivity to disturbance;
- Effects to adjacent private water sources

**Stream Channel Processes**

The various surveys and data collection procedures used to gather information supporting this analysis included:

- Rosgen stream channel surveys;
- System and non-system road survey

The Rosgen Stream Classification System (Rosgen 1996) was used to describe the processes, functions, and patterns of channels and to help predict channel responses. The Rosgen Level II classification requires field measurements of stream attributes including entrenchment, width-depth ratio (W/D), slope, and sinuosity. These attributes depend on topography, geology, and precipitation patterns on the channel. Dominant instream particle size is added to describe the Rosgen Stream Type.

The Rosgen classification can be used to:

- Predict a stream’s behavior;
- Develop specific hydraulic and sediment relations for each given channel type and stability condition;
- Allow comparisons between sites with similar characteristics; and
- Provide a consistent and reproducible frame of reference for streams.

Channel types are related to the shape of the valley where they occur. Some streams are steep and entrenched in narrow-bottomed valleys, while some meander through wide gentle valleys. The channel types found in the Spring Gulch Project Area are listed in Table 3-47 (from Rosgen 1996, Table 4-1, p. 4-5).
Table 3-47. Rosgen Channel Types Identified in the Spring Gulch Analysis Area

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Description</th>
<th>W/D</th>
<th>Sinuosity</th>
<th>Slope</th>
<th>Landform / Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Steep, entrenched, cascading, step-pool, high energy debris transport. Very stable if bedrock or boulder dominated.</td>
<td>&lt; 12</td>
<td>1.0 – 1.2</td>
<td>.04 - .10</td>
<td>High relief. Frequently spaced deep pools in step-pool sequence. May be used for rearing by juvenile fish, if fish are present.</td>
</tr>
<tr>
<td>B</td>
<td>Moderately entrenched, moderate gradient, riffle dominated channel with infrequent pools. Stable banks, stable plan and profile.</td>
<td>&gt; 12</td>
<td>&gt; 1.2</td>
<td>.02 - .039</td>
<td>Moderate relief. Moderate entrenchment and W/D. Predominantly rapids with scour pools. Important spawning habitat.</td>
</tr>
<tr>
<td>E</td>
<td>Meandering channel with low W/D and very high sinuosity. Very stable with high sediment transport efficiency.</td>
<td>&lt;12</td>
<td>&gt; 1.5</td>
<td>&lt; 0.02</td>
<td>Broad alluvial valleys with well developed floodplains. Low W/D and high meander width ratios. Streambanks composed of materials finer than that of the dominant channel bed material</td>
</tr>
</tbody>
</table>

Different channel types operate under different energy conditions (slopes) and input conditions (type of material delivered to the channel, for example, boulders vs. fine material from eroded banks), they also have different capacities for stability, some of which are noted. The combination of these factors also results in different channel structures that range from waterfalls (Aa+) to step-pools (A) to riffles (B) to riffle-pool (C, and F) to braided (D)(Rosgen, 1996).

A numerical classification is added to the basic Rosgen channel type to characterize the size of the material that makes up the channel bed. Bed material size is important to channel stability and response. Larger materials are usually more difficult to make mobile under average flows and thus more stable from the velocities of flow. These size categories are described in Table 3-48.

Table 3-48. Rosgen Bed Material Size Categories (from Rosgen 1996)

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Particle sizes (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bedrock</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Boulder</td>
<td>&gt; 256</td>
</tr>
<tr>
<td>3</td>
<td>Cobble</td>
<td>64 - 256</td>
</tr>
<tr>
<td>4</td>
<td>Gravel</td>
<td>2 - 64</td>
</tr>
<tr>
<td>5</td>
<td>Sand</td>
<td>.062 - 2</td>
</tr>
<tr>
<td>6</td>
<td>Silt or Clay</td>
<td>&lt; .062</td>
</tr>
</tbody>
</table>

Stream channel types and channel stability were inventoried by a trained Hydrology crew during the summer of 2009 in the Spring Gulch Project Area and are presented in Tables 3-49, 3-50 and Figures 3-19 and 3-20 in this report. The Rosgen Stream Classification system was used to gather and interpret current channel conditions and departure from natural. The information obtained was then analyzed by the District Hydrologist. Reaches are numbered starting with ‘1’ at the mouth and proceeding upstream. Stream reaches were broken out by channel type or obvious changes in stability. The channel stability ratings in tables 3-49 and 3-50 are based on the Pfankuch
rating (USDA 1975) and take channel type into account (Rosgen 1996, p.6-29 – 6-30). This rating system provides general information about a stream’s capacity to accommodate, adjust and recover from potential changes in flow or sediment yields.

Upland Sediment Survey (Road derived sediment)
Road logs have been generated within the project area to address the need of BMP’s (Best Management Practices) on all established haul routes. These logs in addition to WEPP based survey information consisted of a quantitative sample that allowed for the estimate of long-term road stability, the potential for mass failure and road related sediment contributions from roads.

The Water Erosion Prediction Project (WEPP) soil erosion model has been developed by an interagency group of scientists including the USDA’s Forest Service, Agricultural Research Service, and Natural Resources Conservation Service, and the Department of Interior’s Bureau of Land Management and Geological Survey. Scientists from these agencies throughout the United States have been working since 1985 to develop WEPP to replace the Universal Soil Loss Equation (USLE)(FSWEPP, 1999).

The WEPP model is a complex computer program that describes the processes that lead to erosion. These processes include infiltration and runoff; soil detachment, transport, and deposition; and plant growth, senescence, and residue decomposition. For each day of simulation, WEPP calculates the soil water content in multiple layers and plant growth/decomposition. The effects of tillage processes and soil consolidation are also modeled)(FSWEPP, 1999).

Existing Channel Conditions – Spring Gulch
Spring Gulch is a second order tributary. The existing condition of the streams in this watershed range from those that display active perennial channel conditions to those that exhibit true “dry draw” characteristics. Existing channel conditions in Spring Gulch are discussed in detail below including a map and table of stream types and channel stability by reach (see table 3-48 and Figure 3-19).
Reach 1
Reach 1 of Spring Gulch exists solely on private land and displays perennial E5 type channel characteristics. The entire reach exists on private property and has been influenced by anthropogenic activities since the early 1940’s. Conversion of riparian forest to hay ground, channelization, cattle pasture, and a small reservoir impoundment typifies the activities that are still occurring today. Generally these actions have not led to adverse channel conditions such as bank instability, sedimentation, and increased water temperatures. Towards the bottom of reach 1 the gradient declines (<.5%) and stream characteristics become non-existent. These conditions persist until the confluence with the Noxon Reservoir.

Reach 2
The lower portion of this reach remains on private land and displays higher gradients (>3%) with larger substrate (B4 Rosgen channel type). This portion of reach 2 is relatively stable with a few areas displaying overwidened conditions. A shallow surface water collection tank and adjoining water line exists at the FS/private boundary. Riparian harvest has occurred in a few small areas of this reach and has not greatly influenced channel stability.
Reach 3
Reference conditions dominate the majority of this fairly entrenched A4 type system. The second order headwater stream in this area is a fairly steep (>5%), gravel bed stream (A4) with some very steep cobble dominated channel inclusions (A3a+). The majority of this reach is influenced mostly by groundwater and is not as susceptible to rain-on-snow events.

Reach 4
The fairly dry and rocky landtypes surrounding this reach explain some of the intermittent nature of this reach. Although there are active channel characteristics such as defined channel banks and active scour, the depth to groundwater is fairly deep (roughly >10 feet) throughout the majority of the year (>6 months).

Reach 5
This area of Spring Gulch displays minimal channel characteristics in terms of active surface water runoff. Very few areas within this reach display overland flow characteristics (such as defined banks and water transported gravel deposits), and relate only to above average snowmelt conditions (roughly <2 months/year). Surface water connectivity to the lower perennial section of reach 3 is virtually non-existent due to these natural conditions.


<table>
<thead>
<tr>
<th>Watershed Name</th>
<th>Reach Num</th>
<th>Rosgen Type</th>
<th>Wtrsh Acres</th>
<th>Sensitivity Potential</th>
<th>Recovery Potential</th>
<th>Bank Erosion Potential</th>
<th>Existing Channel Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Gulch</td>
<td>1</td>
<td>E5</td>
<td>1167</td>
<td>Very high</td>
<td>Excellent</td>
<td>Low</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>B4</td>
<td></td>
<td>Mod</td>
<td>Excellent</td>
<td>Low</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>A4</td>
<td></td>
<td>Extreme</td>
<td>Very Poor</td>
<td>Very High</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>A4</td>
<td></td>
<td>Extreme</td>
<td>Very Poor</td>
<td>Very High</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>A4</td>
<td></td>
<td>Extreme</td>
<td>Very Poor</td>
<td>Very High</td>
<td>Good</td>
</tr>
</tbody>
</table>

- Bold entries represent response reaches where effects from management were assessed.

Existing Channel Conditions – Deep Creek
Deep Creek is a third order tributary. The existing conditions of the streams analyzed in Deep Creek are from those that display active perennial channel conditions. Reach 3 was not analyzed due to the lack of effects anticipated in this area. Existing channel conditions in these areas of Deep Creek are discussed in detail below including a map and table of stream types and channel stability by reach (see table 3-50 and Figure 3-20).
Reach 1
Reach 1 of Deep Creek exists solely on private land and displays perennial B4a type channel characteristics. Channel slopes generally exceed 3% and currently transport sediment efficiently.

Reach 2
The lower portion of this reach remains on private land and displays a lower sinuosity with larger substrate (B4/3 Rosgen channel type). Existing channel stability in this area is good with adequate bank strength related to the adequate riparian vegetation along the channel banks.

<table>
<thead>
<tr>
<th>Watershed Name</th>
<th>Reach Num</th>
<th>Rosgen Type</th>
<th>Wtrsh Acres</th>
<th>Sensitivity Potential</th>
<th>Recovery Potential</th>
<th>Bank Erosion Potential</th>
<th>Existing Channel Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Creek</td>
<td>1</td>
<td>B4a</td>
<td>8819</td>
<td>Mod</td>
<td>Excellent</td>
<td>Low</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>B4/3</td>
<td></td>
<td>Mod</td>
<td>Excellent</td>
<td>Low</td>
<td>Good</td>
</tr>
</tbody>
</table>

- **Bold** entries represent response reaches where effects from management were assessed.

Existing Upland Sediment Contributions

Historic road networks are established within the project area. These corridors have been used over the years for forest management as well as recreational access. Some of these networks are open year round while others have gated closure devices to limit use. Both types of routes have the potential to transport fine sediment to stream channels.

The road sediment contributed from these current networks has been calculated using the USFS WEPP model. Model outputs give an idea of the fine sediment being contributed from specific road segments. The road segments of interest include routes that are going to be utilized during the proposed activities. These segments are then analyzed by each 7th code HUC boundary in the planning area (Spring Gulch and Deep Creek).

Table 3-51. Existing sediment inputs from proposed haul routes.

<table>
<thead>
<tr>
<th>Road ID</th>
<th>HUC 7 Watershed</th>
<th>Road Prism Erosion (tons/yr.)</th>
<th>Sediment Leaving Buffer (tons/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2241</td>
<td>Deep Creek</td>
<td>0.89</td>
<td>0.10</td>
</tr>
<tr>
<td>2241</td>
<td>Spring Gulch</td>
<td>2.38</td>
<td>0.67</td>
</tr>
<tr>
<td>2771</td>
<td>Spring Gulch</td>
<td>2.87</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Table 3-52. Total sediment inputs from proposed haul routes by HUC 7 watershed.

<table>
<thead>
<tr>
<th>HUC 7 Watershed</th>
<th>Road Prism Erosion (tons/yr.)</th>
<th>Sediment Leaving Buffer (tons/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Gulch</td>
<td>5.25</td>
<td>1.12</td>
</tr>
<tr>
<td>Deep Creek</td>
<td>0.89</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Environmental Consequences

Specific criteria were used to evaluate the environmental consequences of the proposed activities on the water resources in the Spring Gulch planning area. These methods include; WATSED based water yield modeling, Rosgen based stream channel survey, and WEPP based sediment modeling.
Direct and indirect Effects
Each of the following will be considered as criteria for measuring effects and be discussed in the context of protection of beneficial uses:

1) Water yield (Peak Flow Increases)
2) Stream channel processes (descriptive)
3) Water quality (sediment reduction potential (tons) as measured by % reduction related to road drainage improvements).

These discussions will be followed by a summary of how the alternatives comply with the CWA and support beneficial uses.

Water Yield Discussion
Water yield will be discussed in terms of flow quantity. Increases in water yield can affect both peak flows and base flows. Peak flow increases resulting from forest management activities are important because peak flows provide the maximum energy for erosion, transport, and deposition of sediment in stream channels. These transport relationships ultimately affect channel function, process and long-term stability.

In northwest Montana, increases in peak flows are primarily due to modifications in snow accumulation, road network water routing, snowmelt runoff, and to changes in evapotranspiration rates. Research has shown that similar changes can result from regeneration harvest treatments (Forest Hydrology Part II, 1973).

Spring peak flows in the analysis area normally occur in April and May, and sometimes into June. High flows can occur throughout the year in response to precipitation events. The timing, magnitude, and duration of runoff events may be changed when vegetation is manipulated by management activities or altered by natural disturbance processes.

Stream Channel Processes Discussion
Channel processes will be discussed in terms of the response to increases in water yield and related issues of channel instability. Increases in water yield can affect both channel shape, function and bank stability. Peak flow increases and their relationship with channel processes are important because peak flows provide the maximum energy for erosion, transport, and deposition of substrate in stream channels. These transport relationships ultimately affect channel function, process and long-term stability.

Water Quality Discussion
As specified in the Clean Water Act of 1972 and subsequent amendments, water quality includes all attributes that affect existing and designated uses of a water body. In the Spring Gulch Analysis Area, non-point sources of pollution are what would be responsible for degraded water quality. A non-point source of pollution is water pollution from a diffuse source. These can best be controlled through proper soil, water, and land management practices (see USFS SWCP’s, which meet intent of including Montana State Best Management Practices, or BMPs). Of the types of non-point source pollution in this basin, it has been concluded that fine sediment has been found to be the most important. Field surveys by Forest Service personnel support these results.
Timber harvest activities have the potential to create soil disturbance and increase overland flow, resulting in soil erosion and sediment delivery to streams. Research has shown that the level of sediment production resulting from timber harvest is dependent on the level of implementation planning and attention to site-specific conditions (Chamberlin et al., 1991). Each harvest unit in each alternative has been individually planned and would have site-specific BMPs applied in order to minimize sediment production.

Haul routes are planned to extend out of the Spring Gulch watershed and use existing road NFSR 2241. Portions of NFSR 2241 exist within the Deep Creek drainage to the south. Under all action alternatives, road drainage improvements would be completed on all haul routes within the planning area. All road ditches would be disconnected from all perennial and intermittent channels limiting the potential for point source discharges of fine sediment. The percent sediment reduction has been modeled through the use of the USDA WEPP erosion model.

**Effects Of The No Action Alternative**

**Water Yield**
Alternative 1 (No Action) would not increase water yield or PFI’s as no harvest would result from this alternative. Existing peak flows would moderate as previously harvested units recover from past disturbances. There would be no new road construction and existing roads would continue to collect and route surface flow in the project area.

**Stream Channel Processes**
Alternative 1 would not implement any of the proposed activities, including timber harvest, and road drainage improvements. Thus no effect on stream channel processes is anticipated under this alternative.

**Water Quality**
The No Action Alternative would result in no new impacts to water quality. There would be no increases in PFI’s and no risk of increased bank erosion. Because there would be no harvest activity, there would be no risk of additional erosion on harvested areas. Road improvements would not occur, but road maintenance would continue and current sediment contributions from roads would remain about the same as today. ECAs would continue to moderate as previously harvested units recover vegetatively.

**Effects Of The Action Alternative**

**Timber Harvest**

**Common Effects**
Numerous studies have shown timber harvest, and related road construction, can alter streamflows (Jones and Grant 1996; King 1989). Harvested areas accumulate more snow, and that snow melts more quickly than in forested areas (Cheng 1989). Roads and skid roads intercept subsurface and surface water, and redirect runoff more rapidly to stream channels (Megahan 1972; Burroughs and others 1972). These alterations in the watershed’s hydrologic processes can change the duration, magnitude, and timing of streamflows as compared to natural flow regimes. Increases in magnitude or duration of
peak streamflows can change stream channel conditions. Typical adjustments to increased peak flows are increased channel scour in the steeper reaches, and increased deposition of the resulting sediment in the flatter reaches.

Stream channel conditions are a function of the upland watershed's natural characteristics, changes related to land management activities, the inherent stream channel sensitivity, and the recent stream channel disturbance history. The ability of increased streamflow to cause channel erosion depends on the stream channel type and condition. The relative sensitivity of a channel to disturbance depends on a number of factors including stream gradient, size and shape of substrate, bank stability, and access to floodplain and overflow channels. Sensitivity to erosion varies naturally among stream reaches. Stable channel segments can withstand sizable flood events without a major change in overall condition whereas channels that are in an unstable condition may be measurably degraded by relatively small runoff events.

The potential effect of fire or harvest on water yield can be predicted by calculating the equivalent clearcut area (ECA) of a watershed. ECA is the total area within a drainage that exists in an equivalent clearcut condition in a given year (USDA Forest Hydrology Part II, 1973). As ECA increases, water yield increases, which can cause changes in duration, frequency, timing, and magnitudes of streamflows (King 1989). ECA is used by itself as an indicator for changes in water yield, and also as input data for water yield models that predict changes in streamflows based on watershed characteristics.

As regeneration occurs after timber harvest or wildfire, ECA and water yield decline. The rate of this decline, or recovery, depends on habitat type. Full recovery periods take 80 to 140 years depending on habitat type. However, the bulk of the recovery occurs in the early part of this period. Eighty percent recovery is achieved in 30 to 60 years depending on habitat type. One hundred percent recovery would be achieved in 40 to 75 years and is also habitat dependent. Most of the habitat types in the Spring Gulch project area are in the low recovery group, thus will have a longer recovery period.

Thinning results in substantially less ECA than regeneration cuts. For example, a typical thinning with a 40 percent crown removal would only result in a 25 percent increase in ECA. Furthermore, recovery in thinned stands occurs much more rapidly than clearcuts because the remaining trees usually respond to the lack of competition with accelerated growth. A commercial thinning can recover in as little as ten years (Galbraith, 1973).

The ECA of a watershed indicates potential for change in streamflow, but actual effects vary by watershed. Streams in watersheds of the same size, and similar ECA, can have different levels of response. Natural factors such as soils, topography, and geology affect the proportion of surface flow to subsurface flow. Watersheds with a relatively high natural subsurface flow have fewer and less developed scour channels. Since subsurface water takes longer than surface water to reach stream channels, it dampens the effect precipitation events have on streamflow; such is the case in Spring Gulch.

Timber management has had the effect in many watersheds of increasing the proportion of surface flow to subsurface flow. The elevated ECA due to harvest, combined with the increased efficiency of water routing on skid trails and roads, can cause a more continuous condition of increased peak streamflows in a managed watershed. This is in
contrast to the historic pulse nature of wildfire-induced increases in ECA that may have been quite dramatic, but then followed by periods of complete recovery.

Roads related to harvest activities may fail when unstable fill slopes become saturated. Typical causes are ponded water in the ditch or on the roadbed, water running off the road over the fill slope, or water saturating the fill over an undersized or plugged culvert. Failures may result in debris flows that add substantial quantities of sediment to the stream. Failures can occur on maintained or unmaintained roads, including those that are heavily revegetated.

**Water Yield**

The action alternative would increase PFIs above existing levels. None of the alternatives would raise peak flows to the point of creating a newly scoured channel that would allow connectivity to the Clark Fork River.

The mouth of Spring Gulch is essentially a dry draw that exhibits no active channel characteristics or connectivity to perennial or intermittent streams. The predicted stability of this dry draw has been evaluated by the District Hydrologist and is based on other field monitored basins within the Lower Clark Fork valley that display similar dry draw characteristics.

Although the projected peak flows would not scour channels and cause sedimentation, some slight effects related to the quantity and timing of runoff may be realized in the perennial sections. A portion of the proposed units exist on aspects that usually hold snowpack later in the spring. Harvest in these areas may increase thermal inputs and allow for a slightly earlier runoff. Should this scenario play out, it could potentially lead to more available water in the spring and less available water later in the summer months. This scenario happens more often when analyzing regeneration or clear-cut type harvests. This is not expected because the majority of the proposed harvest in these areas will be a commercial thinning, which would not respond as drastic as a regeneration type cut (Galbraith, 1973).

Under the proposed action, PFIs would increase at the mouth of Spring Gulch by 10%. This is within the recommended PFIs and would not affect channel stability, or beneficial uses. The lack of a defined channel in and around the mouth area and the adequate stability within the perennial sections can handle this type and magnitude of increase without undue effects. Due to the lack of direct or indirect effects from alternative 2 the activities proposed in Spring Gulch would maintain beneficial uses at existing levels. Table H-6 displays the RPFIs and the modeled PFIs associated with each alternative in the Spring Gulch Analysis Area.
Table 3-53. Predicted changes in peak flows by alternative in the Spring Gulch watershed

<table>
<thead>
<tr>
<th>Drainage</th>
<th>Acres</th>
<th>Existing PFI(%)</th>
<th>Existing PFI(%)</th>
<th>Recom Max PFI(%)</th>
<th>% of basin in Clearcut Condition</th>
<th>Proposed Action (Alt 2) PFI(%)</th>
<th>% of basin in Clearcut Condition</th>
<th>Alt 1 (No Action) PFI(%)</th>
<th>% of basin in Clearcut Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Gulch - Mouth</td>
<td>1165</td>
<td>4</td>
<td>6</td>
<td>14</td>
<td>23</td>
<td>14</td>
<td>23</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

- Although one perennial section exists within the basin, the mouth of Spring Gulch is a dry draw that displays no active ephemeral, intermittent or perennial channel characteristics that connect to downstream live water.
- The numbers presented in Table H-6 assume that all proposed harvest would occur in 2013. In reality, harvest would likely be implemented over a six-year period.

Stream Channel Processes
Under all action alternatives buffer strips where no harvest is allowed would be set in place around all stream channels and wet areas within the Spring Gulch planning area (see table 3-54) below. These areas will also protect the thermal integrity of the wet areas and their surrounding riparian vegetation (Brooks et. al., 1997). The exclusion of heavy equipment and lack of vegetation removal in these areas will maintain channel integrity. Thus stream channel processes within the Spring Gulch planning area will not be affected by the proposed timber harvest as a result of implementation of any alternative.

Table 3-54. Timber Harvest Guidelines within Streamside Management Zones on the KNF.

<table>
<thead>
<tr>
<th>Flow Regime</th>
<th>Description</th>
<th>INFS Stream Class</th>
<th>INFS RHCA Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial (flows at least 9.5 months/year)</td>
<td>Large Perennial Fish Bearing Stream (BF width &gt;10')</td>
<td>1</td>
<td>300 feet on each side unless extended by ERV or slope</td>
</tr>
<tr>
<td>Perennial (flows at least 9.5 months/year)</td>
<td>Small Perennial Fish Bearing Stream (BF width &lt;10')</td>
<td>1</td>
<td>300 feet on each side unless extended by ERV or slope</td>
</tr>
<tr>
<td>Perennial (flows at least 9.5 months/year)</td>
<td>Small Perennial Non-Fish Bearing Stream (BF width &lt;10')</td>
<td>2</td>
<td>150 feet on each side unless extended by ERV or slope</td>
</tr>
<tr>
<td>Intermittent/Ephemeral (flows at least 9.5 months/year)</td>
<td>Large Inter/Ephemeral Non-Fish Bearing Stream (BF width &gt;3')</td>
<td>4</td>
<td>50 feet on each side unless extended by ERV or slope</td>
</tr>
<tr>
<td>Intermittent/Ephemeral (flows between 6 and 9 months/year)</td>
<td>Small Inter/Ephemeral Non-Fish Bearing Stream (BF width &lt;3')</td>
<td>4</td>
<td>50 feet on each side unless extended by ERV or slope</td>
</tr>
<tr>
<td>Intermittent/Ephemeral (flows less than 6 months/year)</td>
<td>Small Inter/Ephemeral Non-Fish Bearing Stream that does not flow into lower order channel</td>
<td>4</td>
<td>50 feet on each side unless extended by ERV or slope</td>
</tr>
</tbody>
</table>
Water Quality

When a forested area is harvested, a number of changes occur on a watershed that can change the concentrations of dissolved chemical constituents in streamflow. More logging residue (slash) is left in the harvest units contributing to the amount of decaying litter on the forest floor. Increased short-term nitrogen losses occur when this organic material is oxidized and not utilized by the forest vegetation that harvesting has removed. These nitrates either filter out downslope or leach into the adjacent stream channels or wet draws. Movement of these nitrates has been found to be directly related to the increases in water yield created by timber harvest. In areas that are not harvested, nitrate movement at this rate is not seen.

Buffer strips where timber harvest will not be allowed (RHCAs) would be incorporated into the prescriptions of all action alternatives and will maintain water quality and stream bank stability. These buffers would vary in size based on stream channel and wetland characteristics and totally surround these areas of concern (see Table 3-54).

All harvest, fuels treatments and road construction activities would be conducted with strict adherence to all applicable BMPs. These measures, combined with specified Design Criteria and adherence to INFS Standards and Guidelines within Riparian Habitat Conservation Areas (RHCAs) (USDA Forest Service, 1995), are fully expected to prevent any negative impacts on water quality or beneficial uses.

Studies of erosion and sediment transport in harvest units have shown that the application of BMPs, including the installation of skid trail drainage and riparian buffers, results in sediment retention within the harvest unit and riparian buffer (Croke et al., 1999; Wallbrink and Croke, 2002) and adequately protect streams from sediment introduction. District and Forest reviews of BMP implementation and effectiveness support these findings (District BMP review records on file and USDA Forest Service, 2002).

Prescribed Burning

Water Yield

All prescribed burning activities proposed will be conducted within predetermined limits on fuel moisture, wind and other variables to prevent high intensity wildfire and limit incidental mortality to less than 10%. These activities will occur in springtime or late fall when naturally high fuel moistures will preclude high intensity fire occurrence. Mortality rates of 10% or less will be dispersed throughout each burn unit and would not add to the water yield projections related to the harvesting and road building activities. No direct or indirect effects are anticipated from prescribed burning that will influence water yield within the Spring Gulch planning area.

Stream Channel Processes

Prescribed burning may increase the risk of slope failures because of changes in soil properties, increased or concentrated runoff, and the lack of root strength. Slide material that reaches streams can scour channels, completely fill in pools, and reduce channel capacity causing bank erosion or overland flow. Fine sediment delivered by slides can adversely affect streams by increasing turbidity, accumulating in pools, and clogging interstitial spaces in gravel/cobble areas.
All prescribed burning activities proposed will avoid direct ignition in RHCA buffers and occur in springtime or late fall when naturally high fuel moistures will preclude high intensity fire occurrence. No direct or indirect effects are anticipated from prescribed burning that will influence the channel processes of streams within the Spring Gulch planning area.

**Water Quality**
Several chemical constituents are likely to result from forest and rangeland burning and could affect surface waters. The primary ones of concern are nitrate (NO₃⁻) and nitrite (NO₂⁻). Sulfate, pH, total dissolved solids, chloride, iron, turbidity and several other constituents can also be affected, as can color, taste and smell by surface erosion. The potential for increased nitrate in streamflow occurs mainly because of accelerated mineralization and nitrification in soils after burning, as well as reduced plant demand. This effect is short-lived, usually lasting only a year or so (Landsburg, 2000).

Wildfires usually are more severe than prescribed fires, and as a result, they are more likely to produce significant effects on water quantity and quality. Prescribed fires are designed to be less severe and would be expected to have lesser effects. Use of prescribed fire allows the manager the opportunity to control the severity of the fire and to avoid creating large areas burned at high intensity (increased ECA’s). The degree of fire severity is also related to the vegetation type. In forested environments, the magnitude of the effects of fire on water quantity and quality will probably be much lower after a prescribed fire than after a wildfire because less fuel is consumed in a prescribed fire.

Firelines, particularly those that are created by bulldozers and excavators, are important potential sources of sediment and turbidity in streams. Improperly placed firelines may provide direct channels for sediment into streams. Firelines may be difficult to stabilize with vegetation because much of the nutrient-rich surface soil is cast aside. Hence, they are likely to be slow to revegetate with perennial vegetation. The proposed burning activities within the planning area will incorporate firelines into the burn plan for safety purposes within each harvested unit adjacent to private property (see fire report). All of the lines made within the planning area will mostly be excavator dug line with some minimal line dug by hand. All of these lines will adhere to the RHCA guidelines mentioned above and incorporate Best Management Practices. Past studies have demonstrated that seeding firelines with several species of introduced and native grasses have produced up to 85 percent foliar cover within 2 years (Landsburg, 2000). With the incorporation of BMP’s, RHCA’s and the spring burning periods, no direct or indirect effects are anticipated from prescribed burning that will influence the water quality of streams within the Spring Gulch planning area.

**Road Construction and Best Management Practices (BMP’s)**

**Water Yield**
Skid trails and roads prevent infiltration and intercept subsurface flow, converting it to surface flow. Skid trails and roads can become new “tributaries”, and as such, route runoff more efficiently to the natural stream channels. Roads cause “interruption of hill slope drainage patterns (which) alter the timing and magnitude of peak flows and
changes base stream discharge; and subsurface flows"... Factors that increase the
effects of roads on peak flows include road density, stream density, number of
road/stream crossings, location of the roads within the drainage area, road grades, road
design, and road conditions (Wemple 1994).

Since no new permanent road construction is planned in the Spring Gulch planning area,
the reconstruction of permanent road systems will not add to the current ECA’s within
each basin. There are no effects anticipated to water yield from the planned road
reconstruction and installation of BMP’s.

**Stream Channel Processes**

No temporary roads or skid trails would cross or border any live water channels, wet
areas, seeps or springs within the Spring Gulch planning area. Channel processes and
sediment delivery would not change due to avoidance of these areas. Known wet areas
in the planning area have been mitigated for or avoided and routes within treatment
areas would be designed to avoid areas discovered during operations. By implementing
proper design features, no direct or indirect effects from the reconstruction of roads will
influence the stream channel processes within the Spring Gulch planning area.

**Water Quality**

Effects relate to the reconstruction of permanent roads and their associated water
routing characteristics. When located directly adjacent to a stream or stream crossing,
fine sediment from the new road surface can affect the water quality of an area. These
effects will be ameliorated by a series of BMP’s that will provide adequate road surface
drainage away from any active channels of water. No temporary roads or skid trails will
cross or border any live water channels, wet areas, seeps or springs within the Spring
Gulch planning area. Channel processes and sediment delivery will not change due to
avoidance of these areas. These measures, combined with specified Design Criteria and
adherence to INFS Standards and Guidelines within Riparian Habitat Conservation
Areas (RHCAs) (USDA Forest Service, 1995), are fully expected to prevent any negative
impacts on water quality or beneficial uses.

Haul routes are planned to slightly extend out of the Spring Gulch watershed and use
existing road prism NFSR 2241. Portions of NFSR 2241 exist within the Deep Creek
drainage to the south. Under all action alternatives, road drainage improvements (such
as disconnecting road ditches to waterways) would be completed on all haul routes
within the planning area. The percent sediment reduction has been modeled through the
use of the USDA WEPP erosion model.

The proposed road related activities could potentially benefit water quality. The units of
measure for the effects of road actions on water quality are as follows:

1. **Sediment reductions from proposed BMP’s on haul routes**
   Road drainage BMPs would focus on preventing water and sediment delivery
   from the road network into streams. The primary methods for accomplishing this
   would be improvements to road surface and ditch drainage (Furniss et al., 1991).
   The drainage improvements would be implemented in conjunction with the sale.
   The proposed work would decrease sediment delivery and water routing through
   the installation of rolling surface dips and ditch relief culverts on 8.84 miles of
road. Only localized short-term increases in fine sediment in dry draws are anticipated from construction of these structures, and would not affect water quality.

**Table 3-55. Total sediment inputs from proposed haul routes by alternative.**

<table>
<thead>
<tr>
<th>Road ID</th>
<th>HUC 7 Watershed</th>
<th>Alternative 1 (No Action) Road Prism Erosion (tons/yr.)</th>
<th>Alternative 1 (No Action) Sediment Leaving Buffer (tons/yr.)</th>
<th>Alternative 2 Road Prism Erosion (tons/yr.)</th>
<th>Alternative 2 Sediment Leaving Buffer (tons/yr.)</th>
<th>% Reduction Sediment Leaving Buffer (tons/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1023</td>
<td>Deep Creek</td>
<td>0.59</td>
<td>0.19</td>
<td>0.49</td>
<td>0.12</td>
<td>20</td>
</tr>
<tr>
<td>2241</td>
<td>Deep Creek</td>
<td>0.89</td>
<td>0.10</td>
<td>0.71</td>
<td>0.09</td>
<td>10</td>
</tr>
<tr>
<td>2241</td>
<td>Spring Gulch</td>
<td>2.38</td>
<td>0.67</td>
<td>1.62</td>
<td>0.58</td>
<td>13</td>
</tr>
<tr>
<td>2771</td>
<td>Spring Gulch</td>
<td>2.87</td>
<td>0.45</td>
<td>2.10</td>
<td>0.39</td>
<td>11</td>
</tr>
</tbody>
</table>

**Table 3-56. Total sediment inputs by HUC 7 by alternative from proposed haul routes.**

<table>
<thead>
<tr>
<th>HUC 7 Watershed</th>
<th>Alternative 1 (No Action) Road Prism Erosion (tons/yr.)</th>
<th>Alternative 1 (No Action) Sediment Leaving Buffer (tons/yr.)</th>
<th>Alternative 2 Road Prism Erosion (tons/yr.)</th>
<th>Alternative 2 Sediment Leaving Buffer (tons/yr.)</th>
<th>% Reduction Sediment Leaving Buffer (tons/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Gulch</td>
<td>5.25</td>
<td>1.12</td>
<td>3.72</td>
<td>0.97</td>
<td>13</td>
</tr>
<tr>
<td>Deep Creek</td>
<td>0.89</td>
<td>0.10</td>
<td>0.71</td>
<td>0.09</td>
<td>10</td>
</tr>
</tbody>
</table>

Based on the results shown in Tables 3-55 and 3-56, the action alternative would improve water quality throughout the analysis area. Application of BMPs for all vegetation management would protect streams from non-channelized sediment inputs.

The road surface drainage improvements that would occur under alternative 2 would reduce the risk of road erosion during extreme events in these locations. Even in areas that are not currently eroding, major runoff events could cause enough concentration of flow to initiate road surface gully, ditch scour, or culvert failure. The BMP improvements in road surface and ditch relief drainage are designed to reduce these risks, reduce current levels of water surface routing and decrease sediment while maintaining and improving channel function.

**Past Actions and Their Effects on Current Conditions**

Harvest activities in the 1950s thru the 1980s included approximately 435 acres of harvest, and are responsible for most of the water yield increases noticed today. Peak flows in Spring Gulch are currently estimated to be 4% over natural conditions. These types of peak flows are not generally considered excessive, especially in watersheds that lack any active channel characteristics. Roads built and used for sale activities in
this period were constructed and maintained with a lesser understanding of the
importance of surface water management, and are still producing sediment and routing
surface flow to channels in some places. Specific treated acres from this period by
decade include:

- 1950s – Approximately 117 acres of thinning and selection harvest
- 1960s – Approximately 114 acres of regeneration and liberation harvest
- 1970s – Approximately 46 acres of liberation harvest
- 1980s – Approximately 158 acres of intermediate harvest

Analysis of water yield increases for the past work done on the State and Stimpson
lands in the Spring Gulch drainage predicted an additional 1% increase over natural as a
result of past work. The absence of a defined channel and/or any evidence of overland
flow in this portion of Spring Gulch appears to have adjusted to past water yield
increases related to these activities without undue channel effects.

Riparian conversion of forests to rangeland in some areas have not played a role on
channel stability within the dry draw areas of Spring Gulch that reside on private. Private
land clearing and pasture creation have not had an effect on siltation and stream stability
due to the lack of a distinguishable channel and downstream connectivity to the Clark
Fork River.

**Cumulative Effects**

Cumulative effects are analyzed, displayed and based on the cumulative effects of
proposed activities. The cumulative effects were analyzed at one downstream analysis
point within the Spring Gulch planning area, the mouth of Spring Gulch. The mouth of
Deep Creek was not analyzed for cumulative effects. The water yield analysis concluded
that no increases in peak flow would occur at the mouth of Deep Creek. This analysis
also led to the conclusion that no direct or indirect effects would be noticed from the
action alternative at the mouth of Deep Creek. Due to this lack of measurable effects, in
terms of water yield, only the mouth of Spring Gulch will be talked to in detail below.

This cumulative effects analysis area encompasses Spring Gulch, an area of 1,165
acres. Downstream effects were analyzed within Spring Gulch just above the confluence
with the Clark Fork River.

**Cumulative Effects of the No Action Alternative**

**Water Yield**

With no harvest and/or prescribed burning occurring, overstocked stands would continue
to be a fire hazard, and under extreme drought, could pose severe threats to the
watersheds within the planning area by way of large stand replacing fires. Should fires of
this intensity occur, PFI’s would rise over existing and compromise the already poor
channel stability of many of the streams in the project area for years to follow. FSR Road
networks would still be used and maintained and thus would still provide the same
amount of increase to water yield and sediment delivery. The past harvest in the basin
would eventually moderate and PFI’s associated with past harvest would ultimately
decrease to pre-management conditions. Effects to water yield from timber harvest on
private land is minimal due to the lack of a defined channel in these areas. Should
adjacent private land burning spill over onto national forest lands the potential for stand
replacing wildfire is realistic. This scenario could result in added ECAs and further increase water yield in the drainage.

**Stream Channel Processes**

By not increasing peak flows from existing in these drainages, natural recovery will be allowed to occur throughout the system and should not result in project related increase in instabilities. Channel conditions would remain similar to the existing condition throughout the project area.

**Water Quality**

Should no activities occur within the project area, channel stability would still be affected by existing PFI’s and remain as is. Channels and ECA’s would slowly recover through natural revegetation. PFI’s would reduce as much they could through this natural revegetation while still having ongoing water quality effects from permanent road systems within the planning area.

**Cumulative Effects of the Proposed Action (Alternative 2)**

**Water Yield**

Downstream effects in Spring Gulch would not exceed threshold limits of channel stability in any alternative. Alternative 2 would result in a cumulative peak flow increase of approximately 14% respectively over natural at the mouth of Spring Gulch (Table 3-57). These increases will be protective of beneficial uses in this area.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Proposed ECA</th>
<th>Existing ECA</th>
<th>Cumulative ECA</th>
<th>Existing PFI %</th>
<th>Cumulative PFI %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1 (No Action)</td>
<td>0</td>
<td>76</td>
<td>76</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Alternative 2 (Proposed Action)</td>
<td>190</td>
<td>76</td>
<td>266</td>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

**Stream Channel Processes**

Harvest of dry draws in combination with a large percentage of the basin left in clearcut condition can sometimes lead to downcutting and the formation of new channels. These types of events are not expected to happen within Alternative 2. The amount and type of harvest proposed coupled with landtypes and slope is not conducive for gully formation in the Spring Gulch project area. The integrity of the dry draw areas as well as the perennial sections of Spring Gulch will maintain a positive trend through Alternative 2.

**Water Quality**

Much of the sediment in the Spring Gulch and Deep Creek drainages are derived from upland sediment sources (roads). BMP’s would minimize short-term adverse impacts from harvest and roading activities. These proposed road activities and the application of additional road drainage structures would provide for long-term sediment reduction. The
cumulative effects of road actions on water quality are displayed within tables 3-55 and 3-56 above.

Overall trends would remain the same for channel and bank stability due to the lack of connectivity to areas of activity.

**Reasonably Foreseeable Activities**

Reasonably foreseeable activities on private lands in the Spring Gulch drainage include timber harvest, road building, home site development, road maintenance, recreation, and continued use of domestic water lines, herbicide application and burning. Approximately 1200 feet of new road is proposed to be built on the state land. Effects that relate to these types of private land practices include increases in stream temperatures, water yield from timber harvest and roading. Although all of these activities could occur, due to the lack of active surface channel characteristics on this relatively flat ground, the amount and intensity predicted on private land would not change the scope or magnitude of effects anticipated from this proposal.

No active mining claims currently exist within the cumulative effects area of the Spring Gulch project area.

Foreseeable road maintenance activities on County, Forest Service and private roads including sanding and plowing of roads in the winter, cleaning of ditches and culverts, riprapping of stream channels where eroding banks threaten roads or bridges, blading gravel roads, and application of dust abatement chemicals. Maintenance on Forest Service roads would be consistent with the existing programmatic road maintenance BA.

**Consistency with the Forest Plan and Regulatory Framework**

Alternative 1 and Alternative 2 would meet forest plan standards and would protect beneficial uses; including all state and federal water quality regulations would be met. This determination is based on the lack of direct or indirect impacts from proposed Forest Service activities on Water Resources.

The 2011 data summary for BMP reviews from 1991 to 2011 shows that 96% of activities evaluated had appropriate BMPs implemented, and 94% of those activities were effective (see project file). BMPs that apply to timber sales are listed in Appendix D. These BMPs would be translated into required activities through the timber sale contract. BMP implementation would be monitored by a certified sale administrator and certified engineering representative who would insure that they are being implemented. Project specific BMPs are listed in Chapter 2 - Design Features. The results of BMP monitoring would be evaluated by the ID Team and other forest specialists. The monitoring plan for this project is outlined in Appendix F. The results of BMP monitoring for this project will be used to design future projects.

This project has been designed to avoid **point source discharges** through implementation of BMPs at road stream crossings. This required BMP work on the proposed timber haul roads would be implemented to disconnect ditch water from the stream network and was designed to avoid the discharge of storm water into waters of the United States from the roads used for haul on this timber sale.
At this time it is uncertain whether this project will require a National Pollution Discharge Elimination System (NPDES) permit, due to several factors.

In Northwest Environmental Defense Center v. Brown, 640 F.3d 1063 (9th Cir. 2011) ("NEDC"), the Ninth Circuit Court of Appeals held that stormwater runoff associated with two logging roads that flows into systems of ditches, culverts, and channels before being discharged into forest streams and rivers is a point source discharge for which a National Pollutant Discharge Elimination System (NPDES) permit is required. The Court of Appeals then remanded to the district court for further proceedings consistent with its opinion. The State of Oregon and other parties filed petitions for certiorari with the U.S. Supreme Court to review the Ninth Circuit’s decision. The United States was not a party to litigation. NEDC v. Brown involved a citizen suit; thus any available relief on remand would be limited to addressing the violation in question and is only binding on the involved parties. Because the USDA Forest Service was not a party, the Ninth Circuit’s decision did not impose any affirmative duties on it. However the case has implications for federal land management agencies.

In response to NEDC v. Brown, EPA issued a formal notice on March 23, 2012 in the Federal Register (77 FR 30473) indicating its intent to expeditiously propose revisions to its Phase I stormwater regulations (40 C.F.R. §122.26) to specify that stormwater discharges from logging roads are not stormwater discharges “associated with industrial activity.” The notice also states that EPA intends to further study and seek public comment on alternative approaches for addressing stormwater discharges from forest roads.

Additionally, following the Ninth Circuit's decision, Congress took legislative action suspending any potential permitting requirement imposed by the decision:

From the date of enactment of this Act until September 30, 2012, the Administrator of the Environmental Protection Agency shall not require a permit under section 402 of the Federal Water Pollution Control Act (33 U.S.C. 1342), nor shall the Administrator directly or indirectly require any State to require a permit, for discharges of stormwater runoff from roads, the construction, use, or maintenance of which are associated with silvicultural activities.


Permanent legislation is also pending in both the U.S. Senate and the House of Representatives that would amend Section 402 of Clean Water Act to exempt stormwater discharges resulting from silvicultural activities from NPDES permit requirements.

Due to these factors, it is uncertain at this time whether any NPDES permitting requirements apply, or will apply in the future to stormwater discharges from logging roads. Should it be determined that an NPDES permit is required for this project, the Forest Service will comply with any applicable NPDES permitting requirements.
FISH POPULATIONS AND HABITAT

Introduction

This section discloses the results of the analysis for Fish populations and habitat in the Spring Gulch project area.

Regulatory Framework

Endangered Species Act

The Endangered Species Act (ESA) of 1973 declares that "...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." Under the Act, Federal agencies must consult with the Secretary of the Interior whenever an action authorized by such agency is likely to affect a species listed as threatened or endangered. Bull trout and white sturgeon are currently listed as threatened and endangered, respectively, under the ESA. Effective January 13, 2010 the U.S. Fish and Wildlife Service proposed a revision of bull trout critical habitat (USFWS 2010). Under the ESA, critical habitat identifies geographic areas that contain features essential for the conservation of a listed species. Critical habitat designations provide extra regulatory protection that may require special management considerations and the habitats are then prioritized for recovery actions. In addition, agencies are required to provide an analysis of effects of proposed actions to primary constituent elements (PCEs) for bull trout critical habitat. There is no critical habitat or proposed critical habitat within the project area.

National Forest Management Act

Sensitive species are managed under the authority of the National Forest Management Act (NFMA) and are administratively designated by the Regional Forester (FSM 2670.5). FSM 2670.22 requires the maintenance of viable populations of native and desired non-native species and to avoid actions that may cause a species to become threatened or endangered. The NFMA directs the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” [16 U.S.C. 1604(g)(3)(B)]. Providing ecological conditions to support diversity of native plant and animal species in the planning area satisfies the statutory requirements. The Forest Service’s focus for meeting the requirements of NFMA and its implementing regulations is on assessing habitat to provide for diversity of species.

FSM 2672.42 directs the Forest Service to conduct a biological evaluation (BE) to analyze impacts on Sensitive species. If any unmitigated, significant effects are identified in the BE, the Forest Supervisor must make a decision to allow or disallow the impact. If the significant effects would result in a trend toward federal listing, the Forest Supervisor cannot allow the project to proceed. The sensitive species analysis in this document meets the requirements for a BE as outlined in FSM 2672.42. The westslope cutthroat trout (Oncorhynchus clarki lewisi) is the only sensitive fish species identified within the
analysis area. The western pearlshell mussel (*Margaritifera falcata*) was added to the USFS R1 sensitive species list in May 2011.

The Kootenai Forest Plan establishes forest-wide objectives, standards, guidelines, and monitoring requirements for Kootenai National Forest (KNF) sensitive species. Forest Plan direction for sensitive species includes determining the status of sensitive species and providing for their environmental needs as necessary to prevent a trend toward federal listing.

**Executive Order 12962** mandates disclosure of effects to recreational fishing.

**Kootenai Forest Plan**

The 1987 Forest Plan established management areas within the forest with different goals and objectives based on the capabilities of lands within this area (USDA Forest Service 1987). The Inland Native Fish Strategy (INFS) amended the Forest Plan in 1995 (USDA Forest Service 1995). INFS established standards and guidelines to protect riparian and aquatic resources on National Forest System lands. As part of this strategy, the Regional Forester designated a network of priority watersheds which includes Lake Creek and all of its tributaries with surface water connections.

INFS established stream, wetland, and landslide-prone-area protection zones called Riparian Habitat Conservation Areas (RHCAs) on National Forest System lands. RHCAs are broken into four categories (Table 3-58).

**Table 3-58. RHCA Categories and Standard Widths.**

<table>
<thead>
<tr>
<th>Stream or Waterbody Category</th>
<th>Standard Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish-bearing streams</td>
<td>Minimum 300 feet each side of the stream</td>
</tr>
<tr>
<td>Perennial, non-fish bearing streams</td>
<td>Minimum 150 feet each side of stream</td>
</tr>
<tr>
<td>Ponds, lakes, and wetlands greater than 1 acre</td>
<td>Minimum 150 feet from maximum pool elevation</td>
</tr>
<tr>
<td>Intermittent and seasonally flowing streams, wetlands less than 1 acre, landslides and landslide prone areas</td>
<td>Minimum 50 feet from edge (except in priority watersheds where the minimum is 100 feet)</td>
</tr>
</tbody>
</table>

Source: USDA Forest Service 1995

INFS also identifies riparian management objectives (RMOs) for forested systems that include pool frequency, large woody debris (LWD) frequency, width/mean depth ratio, and water temperature (Table 3-59). Bank Stability is also addressed but is not a required RMO for forested systems. Actions that retard attainment of these RMOs, whether existing conditions are better or worse than objective values, are considered to be inconsistent with the Forest Plan.
### Table 3-59. Interim Riparian Management Objective standards by stream width.

<table>
<thead>
<tr>
<th>Wetted Width</th>
<th>Pools/mile</th>
<th>LWD/mile</th>
<th>Bank Stability %</th>
<th>Width/Mean Depth Ratio (Pools)</th>
<th>Water Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10 feet</td>
<td>96</td>
<td>20 pieces &gt; 12” diameter and 35’ length.</td>
<td>&gt; 80</td>
<td>&lt; 10</td>
<td>No increase, &lt; 59 ° F</td>
</tr>
<tr>
<td>10-20 feet</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-25 feet</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26-50 feet</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: USDA Forest Service 1995.

### Bounds of Analysis

The fishery Analysis Area for this project includes the Spring Gulch and Deep Creek drainages. Species potentially affected by the proposed action utilize habitat within this boundary and effects from the proposed action would be potentially measurable at this scale. Figure 3-17 shows the two drainages affected by the proposed actions.

Existing conditions were determined through surveys and review of existing data sources to develop effects analysis for fisheries/aquatic resources in each of the two watersheds. Effects to fish populations were assessed based on effects to habitat. Cumulative effects were analyzed to the lowest downstream point of effect; the confluence of Deep Creek with Noxon Reservoir. Spring Creek flow becomes subsurface on private land and does not connect with Noxon Reservoir. Effects to fish or fish habitat in the reservoir are not expected to be detectable from any proposed, ongoing, or reasonably foreseeable activities. The temporal bounds of analysis extend ten years from present.

### Data Sources, Methods, and Assumptions

The Lower Clark Fork River Drainage Habitat Problem Assessment (MFWP 2005) and Fisheries Survey of Graves Creek, Deep Creek, and East Fork Bull River (Avista 2003) were reviewed to identify current known fish distribution in the two project area drainages. Because data were lacking in Spring Gulch, a fish distribution survey using a backpack electrofisher was conducted during the 2009 field season. The survey focused on distribution and connectivity of fish species in the project area.

Interim RMOs as established by INFS standards for forested systems include pool frequency, large woody debris, temperature, and pool width/mean depth ratio. Actions which retard attainment of these RMOs, whether existing conditions are better or worse than objective values, are inconsistent with INFS. A fish habitat Survey using the KNF Fish Habitat Inventory Protocol (2002) was conducted during 2009 to evaluate habitat conditions in Spring Creek relative to INFS RMOs (Table 3-61). Fish habitat conditions in
Deep Creek were evaluated using existing R1R4 (Overton et al. 1997) data collected during 1995 by the Lolo National Forest.

Project area baseline conditions were determined to evaluate the effects of proposed actions. This baseline includes current fish distribution, equivalent clearcut area (ECA), road density, number of stream crossings, amount of road derived sediment, and existing channel conditions. Existing channel conditions were evaluated during the 2009 field season and obtained from existing stream survey data (see Water Resources section).

Four variables were used to quantify effects of proposed activities on fish habitat quality. These variables include ECA, road density, number of stream crossings, and tons of road-derived sediment. Increased ECAs caused by the proposed action were analyzed to determine the potential effects to instream flow (see Water Resources section for ECA methodology). Changes in road density, stream crossing numbers, and estimated tons of road derived sediment on haul routes caused by the action alternatives were used as a measure to evaluate changes in sediment production. These four best address the pertinent disturbance and sediment related habitat indicators determined to be appropriate for evaluating effects to fish species and habitat by the Western Montana Level 1 Team. Road derived sediment was evaluated using the Water Erosion Prediction Project (WEPP) model to estimate sediment generated from representative road segments on proposed haul routes (see Water Resources section). Potential effects to remaining habitat indicators are ameliorated by the default RHCAs.

The cumulative effects analysis was based on habitat changes from the baseline condition as a result of the proposed activities, ongoing projects, and other foreseeable Federal, State and private activities. Effects to resiliency and consequently the probability of a species persistence within the planning area were based on this cumulative analysis.

Affected Environment

Fish Population Status

Deep Creek is the only fish-bearing stream within the project area. Fish species present during the 2002 Deep Creek electrofishing survey included native westslope cutthroat trout, bull trout, and mountain whitefish and nonnative brown and brook trout (Avista 2003). No streams within the project area provide white sturgeon habitat. The nearest occupied habitat is in the Kootenai River. Westslope cutthroat trout, which were the only species captured upstream of the Blue Slide Road crossing, occurred at relatively high densities (1,358 per mile). Subsequent genetic testing of tissue collected from 30 fish, indicated that westslope cutthroat trout upstream of the Blue Slide Road are genetically pure (Personal Communication, John Hanson MFWP). All other fish species were limited in distribution to the 0.6 mile reach between Blue Slide Road and the Clark Fork River where they occurred at very low densities (Table 3-60). A perched fish barrier culvert and seasonal intermittency downstream of the Blue Slide Road account for this discrepancy in fish species and abundance above and below the road. Due to these limitations, lower Deep Creek is not a viable spawning location for fall spawning salmonids such as bull trout and only provides seasonal habitat for transient fish (Avista 2003). Therefore, it is likely that fish present in lower reaches, besides cutthroat trout,
entered Deep Creek from the Clark Fork River seeking rearing habitat or cold water refugia. No fish were observed or captured during 2009 electrofishing in a 394-foot reach of Spring Creek. However, five tailed frog larvae were captured at a density of 1.3 per 100 feet.

Table 3-60. Population estimates, associated 95% confidence intervals, and capture probabilities for Deep Creek (Avista 2003).

<table>
<thead>
<tr>
<th>Section / Location / Length</th>
<th>Spp.</th>
<th>Estimate</th>
<th>95% C.I.</th>
<th>Fish/mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1 / Below Blue Slide Road-lower / unknown</td>
<td>Bull Trout</td>
<td>2</td>
<td>n/a</td>
<td>na</td>
</tr>
<tr>
<td></td>
<td>Cutthroat Trout</td>
<td>31</td>
<td>26-60</td>
<td>na</td>
</tr>
<tr>
<td></td>
<td>Brown Trout</td>
<td>2</td>
<td>2</td>
<td>na</td>
</tr>
<tr>
<td></td>
<td>Brook Trout</td>
<td>1</td>
<td>n/a</td>
<td>na</td>
</tr>
<tr>
<td></td>
<td>Mountain Whitefish</td>
<td>5</td>
<td>5</td>
<td>na</td>
</tr>
<tr>
<td>Section 2 / Below Blue Slide Road-upper / 344 feet</td>
<td>Cutthroat Trout</td>
<td>44</td>
<td>36-64</td>
<td>419</td>
</tr>
<tr>
<td></td>
<td>Brown Trout</td>
<td>1</td>
<td>na</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Mountain Whitefish</td>
<td>2</td>
<td>na</td>
<td>19</td>
</tr>
<tr>
<td>Section 3 / Above Blue Slide Road / 253 feet</td>
<td>Cutthroat Trout</td>
<td>65</td>
<td>65-68</td>
<td>844</td>
</tr>
</tbody>
</table>

THREATENED, ENDANGERED, AND PROPOSED SPECIES

Bull Trout

Description of General Population and Habitat Status

Bull trout are native to the upper Columbia River basin in northwest Montana. Bull trout require clean, cold, complex and connected habitat. Bull trout have declined by perhaps more than 50 percent because of land management practices, expansion of introduced fish populations, overharvest by recreational fishing, and loss of habitat connectivity, (Lee et al. 1997; MBTSG 1998). Forest management, mining and dam operations have adversely affected spawning and rearing habitat conditions for bull trout in the lower Clark Fork River area. Current bull trout habitat is also inhabited by non-native brook trout that threaten the persistence of bull trout by hybridization. Competition with other fish species is also a factor in their decline.

The majority of migratory bull trout spawning in Montana occurs in a small percentage of the total available stream habitat. Spawning takes place between late August and early November, principally in third and fourth order streams. Spawning adults use low gradient areas (< 2%) of gravel/cobble substrate with water depths between 0.1 and 0.6 m and velocities from 0.1 to 0.6 m/s. Proximity of cover for the adult fish before and during spawning is an important habitat component. Spawning tends to be concentrated in reaches influenced by groundwater where temperature and flow conditions may be more stable.
Successful incubation of bull trout embryos requires water temperatures below 8°C (46°F), less than 35-40% of sediments smaller than 0.25 inch in diameter, and high gravel permeability. Eggs are deposited as deep as 10 inches below the streambed surface and the incubation period varies depending on water temperature. Spawning adults alter streambed characteristics during redd construction to improve survival of embryos, but conditions in redds often degrade during the incubation period. Mortality of eggs or fry can be caused by scouring during high flows, freezing during low flows, superimposition of redds, or deposition of fine sediments or organic materials over redds. A significant inverse relationship exists between the percentage of fine sediment in the incubation environment and bull trout survival to emergence. Entombment, or burial of redds by fines, appears to be the largest mortality factor in incubation (Weaver and Fraley 1991). Groundwater influence plays a large role in embryo development and survival by mitigating mortality factors.

Rearing habitat requirements for juvenile bull trout include cold summer water temperatures (< 59°F) provided by sufficient surface and groundwater flows. Warmer temperatures are associated with lower bull trout densities and can increase the risk of invasion by other species that could displace, compete with, or prey on juvenile bull trout. Juvenile bull trout generally forage along the stream bottom, rarely stray from cover, and prefer complex forms of cover. High sediment levels and embeddedness can result in decreased rearing densities. Unembedded cobble/rubble substrate is preferred for cover and feeding and promotes invertebrate production. Highly variable stream flow, reduction in large woody debris, bedload movement, and other forms of channel instability can limit the distribution and abundance of juvenile bull trout. Habitat characteristics that are important for juvenile bull trout of migratory populations are also important for stream resident subadults and adults. However, stream resident adults are more strongly associated with deep pool habitats than are migratory juveniles.

Both migratory and stream-resident bull trout move in response to developmental and seasonal habitat requirements. Migratory individuals can move great distances (up to 155 miles) among lakes, rivers, and tributary streams in response to spawning, rearing, and adult habitat needs. Stream-resident bull trout migrate within tributary stream networks for spawning purposes, as well as in response to changes in seasonal habitat requirements and conditions. Open migratory corridors, both within and among tributary streams, larger rivers, and lake systems are critical for maintaining bull trout populations.

**Description of the Population within the Analysis Area**

Historical use of Deep Creek by bull trout is unknown (Pratt and Huston 1993). However, intermittency in lower reaches probably limited its use (Avista 2005). Currently, due to intermittency and lack of connectivity, there is not a viable bull trout population within the project area. Instead, only the lower reaches of Deep Creek are occupied seasonally by a few subadult bull trout during periods of sufficient flow. Only one 7 inch and one 10 inch fish were captured during the 2002 electrofishing survey of the lower reach downstream of the Blueslide Road crossing (Avista 2003).

Recent work under Avista Corporation’s Settlement Agreement for relicensing of their two hydroelectric facilities has included bull trout passage activities that have increased connectivity between natal streams and rearing habitat in Lake Pend Oreille. Even so, limited habitat in lower Deep Creek and lack of connectivity to habitat above the Blue...
Slide Road will preclude a viable migratory bull trout population from becoming established in the project area.

**SENSITIVE SPECIES**

**Westslope Cutthroat Trout**

**Description of General Population and Habitat Status**
The distribution and abundance of westslope cutthroat trout has declined from historic levels (<59% of historically occupied stream habitat) across its range, which included western Montana, central and northern Idaho, a small portion of Wyoming, and portions of three Canadian provinces (Liknes and Graham 1988; Shepard et al. 2005). Westslope cutthroat trout persist in only 27% of their historic range in Montana. Due to hybridization, genetically pure populations are present in only 2.5% of that range (Rieman and Apperson 1989).

Introduced species have hybridized or displaced westslope cutthroat trout populations across their range. Repeated backcrossing of hybrid fish (introgression) can result in a substantial loss of genetic purity and fitness in westslope cutthroat trout populations (Muhlfeld et al. 2009).

Brook trout are believed to have displaced many westslope cutthroat trout populations (Behnke 1992). Where the two species co-exist, westslope cutthroat trout typically predominate in higher gradient reaches and brook trout generally prevail in lower gradient reaches (Griffith 1988). This isolates westslope cutthroat trout populations, further increasing the risk of local extinction from genetic and stochastic factors (McIntyre and Rieman 1995).

Habitat fragmentation and the subsequent isolation of conspecific populations is a concern for westslope cutthroat trout due to the increased risk of local and general extinctions. The probability that one population in any locality will persist depends, in part on, habitat quality and proximity to other connected populations (Rieman and McIntyre 1993).

Habitat degradation also threatens the persistence of westslope cutthroat trout throughout their range. Sediment delivered to stream channels from roads is one of the primary causes of habitat degradation. Sediment can decrease quality and quantity of suitable spawning substrate and reduce overwintering habitat for juveniles which reduces spawning success and increases overwinter mortality. Roads can also alter the drainage network of a watershed and thereby increase peak flows. The end result of increased peak flows is decreased channel stability and accelerated rates of erosion. Across their range the strongest populations of westslope cutthroat trout exist most frequently in the wilderness, Glacier National Park, and areas of low road densities or roadless areas (Liknes and Graham 1988; Marnell 1988; Rieman and Apperson 1989; Lee et al. 1997).
Description of the Population within the Analysis Area
Within the project area, a genetically pure population of westslope cutthroat trout is present in Deep Creek (Personal Communication, John Hanson MFWP). Densities of westslope cutthroat trout, compare favorably to other small stream allopatric (single species) populations in local drainages (Avista 2003). Moreover, condition (weight-length relation) of fish was relatively high.

The culvert at the Blue Slide road crossing has been an effective barrier preventing nonnative fish invasion and related competition, predation, and hybridization. However, limited habitat, lack of life history diversity, and no connectivity to other populations may limit the long-term viability of this population (Fausch et al. 2006). Case studies reviewed by Fausch et al. (2006) indicate that at least 6.2 miles of suitable stream habitat must be present for a population to maintain genetic diversity and persist for 25 to 50 years. To adequately evaluate population viability in Deep Creek, additional work is needed to determine the extent of suitable occupied habitat and effective population size.

Western Pearlshell Mussel

Description of General Population and Habitat Status
The following description of species requirements and habitat status was adapted from Stagliano (2010). The western pearlshell mussel is found in stable, cool-coldwater, streams and rivers of low to moderate gradient (1-2%) and > 2m in width with stable gravel and pebble substrate characteristic of the Rosgen Class C4 stream channel type. However, the species can occur in sand or gravel in moderate to higher gradient larger rivers especially if cobble or boulders are present to shelter mussel beds from scour during flood events. Stream velocities affect habitat selection with stream gradients of 1.4% containing mussels and those averaging 2.4% typically absent of mussels. Mussels are not found in streams where substrate is disturbed by torrents (Toy 1998). Unlike *M. margaritifera*, *M. falcata* [western pearlshell mussel] is found in hard as well as soft water (Clarke 1981). The larval life stage (glochidium) must briefly parasitize a vertebrate host (usually a fish) in order to complete its development. Glochidia of *M. falcata* are highly host specific (Bauer 1987) and are generally restricted to the salmonid family of fishes.

Although, the western pearlshell are widespread in western Montana, viability of individual populations is questionable. Stagliano (2010) documented only 14 western pearlshell populations from 8 streams statewide that are ranked A-viability (excellent) using Nature Serve criteria. In a viability analysis, only 15 sites had young mussels present out of 32 living populations evaluated with quadrat sampling. With relatively few viable populations present in Montana, the western pearlshell mussel will be added to the Forest Service R1 sensitive species list in May 2011 and has been ranked as a Montana Species of Concern (S2), since 2008.

Specific threats to *M. falcata* populations, include damming and diversion of rivers for irrigation, hydroelectric, and water supply projects. Nutrient enhancement (eutrophication), siltation, unstable substrate, or similar impacts can extirpate populations. Any anthropogenic activites which generate fine sediment or cause channel instability can degrade *M. falcate* habitat and may compromise viability of individual populations.
Description of the Population within the Analysis Area

Neither the western pearlshell mussel nor suitable pearlshell mussel habitat are known to occur within the analysis area.

Watershed Existing Condition

Westslope cutthroat and bull trout are the only potentially affected endangered, threatened or sensitive fish species within the project area. This analysis will center on their habitat needs. This section complements the existing condition narrative in the Water Resources section of this document. In an effort to minimize repetition, only select watershed condition information is summarized as it relates directly to the local TES fish populations. For a thorough review of the existing hydrologic condition, the reader is referred to the Water Resources section.

To address effects of project activities on sediment and water yield, road related sediment and water yield data were juxtaposed to develop a departure from baseline condition for Spring Gulch and Deep Creek (See Water Resources section).

To quantify existing condition in project area streams, stream habitat survey data were collected during 2009 on Spring Creek and existing data collected by the Lolo National Forest were referenced on Deep Creek. The data for each stream (Table 3-61) were compared to the INFS Interim RMOs (Table 3-59).

Table 3-61. Existing habitat conditions in Spring and Deep Creek. Asterisks depict values meeting INFS RMO standards.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Pool s / mile</th>
<th>LWD / mile</th>
<th>LWD / mile RMO</th>
<th>Bank Stability %</th>
<th>Width / Mean Depth Ratio (Pools)</th>
<th>Water Temp</th>
<th>Percent Fines (Surface/Wolman)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Cr</td>
<td>307*</td>
<td>798</td>
<td>31*</td>
<td>82*</td>
<td>12.21</td>
<td>NA</td>
<td>67 / 33</td>
</tr>
<tr>
<td>Deep Cr</td>
<td>39.7</td>
<td>417.3</td>
<td>NA</td>
<td>NA</td>
<td>18.9</td>
<td>NA</td>
<td>NA / 5</td>
</tr>
</tbody>
</table>

Existing Stream Habitat Conditions-Spring Gulch

Spring Gulch is a second order stream with less than one mile of perennial flow. Habitat data were collected only in reach 2, which is the lowermost reach on Forest Service System lands. This lower “response” reach was selected because effects of past management actions on aquatic habitat would be more readily apparent than in reaches higher in the drainage.

Although fish are not present in Spring Gulch, habitat is generally good with pool frequency, LWD frequency, and bank stability exceeding INFS RMO standards and abundant spawning sized gravel (59% of all substrate). However, pools tended to be shallow relative to their width (width/mean depth ratio below the INFS standard) and generally had large accumulations of surface fines (67% on average). This can be
attributed to Spring Gulch being a stable groundwater-dominated stream with insufficient flow to mobilize and transport fine sediment and scour deep pools. Data were not available to evaluate stream temperature relative to the INFS RMO. Because Spring Gulch is groundwater fed and riparian vegetation is intact, stream temperature should be good regardless of habitat quality, the limited extent of available habitat (< one stream mile) would preclude long term fish population viability.

Existing Stream Habitat Conditions-Deep Creek
Deep Creek is a third order stream approximately 6.8 miles in length. About 0.75 miles of its length downstream from the Blue Slide Road crossing (reach 1) on private land are subject to dewatering at base flow and provide only limited habitat for transient fish (Avista 2003). As discussed previously, a perched fish barrier culvert exists at the Blue Slide Road crossing eliminating connectivity to habitat with perennial flow in the upper drainage. Reach 2 is located upstream from the Blue Slide Road crossing where flow is perennial and only westslope cutthroat trout occur. This reach is paralleled by a riparian road that will not be used for this project. Existing habitat data collected from reach 2 by the Lolo National Forest indicate that pools per mile and with/depth ratio do not meet INFS standards. This could be related to bank erosion and evidence of historic riparian timber harvest observed during a qualitative examination of channel and habitat condition in February 2010. Despite these limitations, the percent substrate composed of fine sediment is relatively low (5%) and LWD is abundant (attainment of INFS LWD RMO could not be evaluated due to data limitations). Existing habitat conditions in reach 3 were not evaluated because it is located upstream from any anticipated effects of this project. Data were not available to evaluate stream temperature.

Desired Condition
Despite some historic riparian timber harvest and road networks, Spring Gulch does not deviate markedly from reference conditions on National Forest System land. As riparian timber continues to recover from harvest and BMP’s are instituted on project roads, Spring Gulch will continue to trend toward the desired condition.

Although, there is evidence of extensive riparian harvest in Deep Creek, much of the reach is composed of mature cedar and hemlock stands. As these riparian stands continue to recover, LWD frequency, channel stability, and stream shading will be improved.

ENVIRONMENTAL CONSEQUENCES

Recreational Fishing
Spring Creek does not support fish populations or recreational fishing. Deep Creek does support a robust population of small westslope cutthroat trout, but its small size and limited access preclude a high degree of recreational fishing.

The lack of direct and indirect effects to fish bearing waters as a result of this project would result in a corresponding lack of effects to recreational fishing.
Climate Change

Generally speaking, climate change presents a threat to aquatic habitat with projected effects on water temperature and quantity. Recent warming has already driven significant changes in the hydroclimate, with a shift towards more rainfall and less snow in the western U.S. (Knowles et al. 2006). Likewise, the peak of spring snowmelt is two weeks earlier in recent years, and this trend is anticipated to continue (Stewart et al. 2004). Probable effects of climate change in the western U.S. will be increased water shortages and warmer water temperatures. These conditions may further restrict distribution of cold water dependent species such as bull trout (Rieman et al. 2007) and cutthroat trout (Williams et al. 2009) while increasing distribution of species more tolerant of warmer temperatures such as brook trout and brown trout (Rahel et al. 2008). In addition, changes in timing of spring runoff and temperature may alter spawning cues that have maintained temporal segregation of native and nonnative species. However, in highly dissected mountainous areas, such as those within the project area, local responses are highly variable (based on flow regimes, topography, and geology), and current global climate models cannot reasonably predict responses at a practical scale. The past and present effects of climate change on project area fish habitat and populations are reflected in the existing condition. Within the 10-year temporal bounds of this analysis, ongoing effects of climate change are not expected to significantly alter baseline habitat conditions.

Ongoing and Reasonably Foreseeable Actions

Road Activities

Road maintenance activities would continue as outlined in the Programmatic Road Maintenance Biological Assessment (USDA Forest Service 1999). Activities such as blading, ditch maintenance, resurfacing, snowplowing, and graveling done under the auspices of this BA would have a discountable effect to fisheries resources. This could occur at stream crossings and where roads are adjacent to streams with site specific mitigations to reduce effects.

Fire Suppression

Fire suppression activities would continue within the project area. These activities can affect fish. Mortality can occur if toxic fire retardants and fuels are applied to streams or lakes. However, INFS has clear guidelines regarding retardant and fuel storage and handling. Similar guidelines cover fire suppression activities within RHCAs.

Weed Control

Spraying to control weeds may take place within the area under the Kootenai National Forest Herbicide Kootenai National Forest Invasive Plant Management Final Environmental Impact Statement (4/2007).

Data Gathering Activities

Field surveys to gather resource data are likely to occur within the project area over the next five years. Types of data collection may include vegetation surveys, fire history sampling, cultural resource surveys, ecodata plots, wildlife habitat surveys, noxious weeds surveys, stream surveys, road maintenance surveys, and fuels surveys.
Public Actions on Forest Service Lands
Recreation use will continue; this includes driving open roads, snowmobiling, hunting, hiking, berry picking, and other activities.

Actions on Private Lands
Within the project area continued development of private land is almost certain. Development is expected to include commercial timber harvest, subdivision, land clearing, home construction, septic field installation, road construction, water well drilling, livestock grazing, and riprap of migrating streambanks.

COMPARISON OF ALTERNATIVES

NO ACTION ALTERNATIVE

Direct, Indirect, & Cumulative Effects

Alternative A is the no action alternative and would not implement any of the Spring Gulch proposed activities including timber harvest, fuels reduction, and prescribed burning, or associated BMP work.

Under this alternative, vegetation in previously harvested units would mature over time resulting in gradually decreasing water yield. If wildfires are successfully suppressed and no prescribed burning occurs, fuel loadings would increase resulting in increasing risk of high intensity fires which could affect watershed conditions. Existing roads would continue to channel surface flow and sediment. Undersized and aging culverts could periodically plug and wash out, potentially resulting in pulsed delivery of sediment to stream channels and aquatic habitat degradation.

Activities on private property would continue with change in watershed condition consistent with past activity. These activities include private development for homes. Small scale agricultural activities would continue as would timber harvest on private lands.

Cumulative effects in the Project area include past and current effects of increased peak flows and input of fine sediments to the watershed from past timber harvest, road-building activities, and natural events. All presently authorized activities would continue. These activities would incrementally affect fisheries habitat and fish populations.

Statement of Findings/Forest Plan Consistency

The no action alternative is consistent with INFS because natural processes would continue to occur and there are no reasonably foreseeable activities that would adversely impact channel conditions in Spring Gulch or Deep Creek.
ACTION ALTERNATIVE

Direct & Indirect Effects
Timber Harvest and Associated Activities
Peak Flows
Timber harvest activities can impact fish and their respective habitat by increasing peak flow. Excessive peak flows can destabilize the stream channel causing degradation of fish habitat by decreasing habitat diversity (loss of pools, cover, stable substrates) and increasing in-channel sediment production / erosion.

Timber harvest activities would be limited to the Spring Gulch drainage and would include 88 acres of regeneration cut and 160 acres of thinning. Because fish are not present in Spring Gulch and Spring Gulch is not connected to occupied fish habitat, proposed timber harvest activities would have no potential to affect fish populations or fish habitat. As discussed in the Water Resources section this activity is expected to result in a 10% increase in peak flow at the mouth of Spring Gulch. This would not result in an increase in channel erosion or sedimentation and would therefore not affect aquatic habitat.

Sediment
In addition to increases in peak flows, ground based harvest systems, and associated activity on haul roads may also increase sediment production. Sediment decreases habitat diversity, degrades spawning and rearing habitat and consequently fish reproduction and survival. It also reduces aquatic insect production. The density of salmonids in rearing habitat has been shown to be inversely proportional to the level of fine sediment (Bjornn and Reiser 1991). Fine sediment can greatly reduce the capability of winter and summer rearing habitats and when levels reach 30 percent or more, survival to emergence is significantly reduced (Shepard et al. 1984). Fine sediment may have the greatest impact on winter rearing habitat for juvenile salmonids. Fine sediments can cap or fill interstitial spaces of streambed cobbles. When interstitial rearing space is unavailable, juvenile salmonids migrate until suitable wintering habitat can be found (Hillman et al. 1987). Fine sediment has also been shown to cause alterations in macroinvertebrate abundance and diversity.

Default RHCAs would protect streams from non-channelized sediment inputs. This is because non-channelized sediment rarely travels more than 300 feet and 200-300 foot riparian buffers are generally effective at protecting streams from sediment from non-channelized flow (Belt et al. 1992; USDA Forest Service 1995).

Overall potential for sediment contribution from haul roads to Spring Gulch is extremely low. This is because very few areas within the watershed display characteristics indicative of surface runoff (See Water Resources discussion). As a result, only 1.12 tons of sediment per year are estimated to leave road buffers in Spring Gulch (See Water Resources Discussion). BMPs will reduce this amount by 13% to only 0.97 tons per year.

Nutrients
Typically, there is a 3 to 4 year increase in nitrogen and phosphorus in streams draining a newly harvested area. The brief increase in the two nutrients critical to stream productivity results from the breakdown of logging slash; the flushing of some soil
nutrients normally taken up by trees; and in some cases due to slash burning. These short-term indirect and cumulative water quality effects do not generally extend very far downstream because of mitigation by instream sediments and uptake by plants and animals (Murphy and Meehan 1991). The relatively low amount of surface runoff in the Spring Gulch watershed should minimize potential for increased nutrient delivery to the stream channel. Moreover, these nutrients are likely in short supply in the affected area and the potentially affected water downstream would increase aquatic productivity for a short time. Therefore, there would be no negative effect of timber harvest on water quality.

**Riparian Values**

Riparian values such as temperature maintenance, filtration of sediment, nutrients, and contaminants, large woody debris recruitment, and stream bank stability would not be compromised by timber harvest due to the implementation of default INFS RHCAs. As such, this project would not retard the attainment of INFS RMOs.

**Road Reconstruction, and BMPs**

Forest roads can cause serious degradation of salmonid habitats in streams (Furniss et al. 1991). Roads directly affect natural sediment and hydrologic regimes by altering streamflow, sediment loading/routing, sediment transport and deposition, channel morphology, channel stability, substrate composition and water quality within a watershed (Lee et al. 1997). Roads can interrupt hill-slope drainage patterns and alter the timing and magnitude of peak flows and change base stream discharge and sub-surface flows.

Poor road location or concentration of surface and sub-surface water by cross slope roads can lead to road-related mass soil movements. Damaging direct effects to fish habitat occur if roads are located in RHCAs and especially if they cross streams where they can intercept water and sediment and directly route it to streams.

Under the action alternative, an existing road would be reconstructed on an existing prism to access lower elevation units in the Spring Gulch watershed. Following completion of harvest-related activities the road would be seeded, and waterbarred as necessary to prevent surface erosion and water routing. Slopes in the area are gentle and it is not expected to deliver much, if any, sediment to Spring Gulch in the short term. Following completion of activities the prism is expected to stabilize rapidly and not be a sediment source.

BMP and reconstruction work on existing roads in the project area would improve surface drainage and sediment that is channeled to streams by roads would be reduced. Roadwork may include replacement and installation of drain dips and culverts, constructing or cleaning catch basins, blading, dust abatement, buttressing cut slopes and fill slopes and resurfacing. This would accelerate hydrologic recovery of the affected watersheds and reduce the potential for further habitat degradation. The drainage network would be improved and the likelihood of sediment introduction from failed culverts would also be reduced. Road work occurring on road segments in Spring Gulch and outside of RHCAs would not require timing restrictions. All disturbed areas would be seeded. Nonetheless, short-term increases in sediment from disturbed areas are possible because of the risk of rain events occurring before the vegetation is established. A portion of the haul route lies within the Deep Creek watershed but there is
Fish Populations and Habitat

no surface water connectivity and road work on the haul route is not expected to have any potential for effect to Deep Creek.

Fuel Reduction
RHCAs would be implemented on all perennial and intermittent stream channels and wetlands within and adjacent to the proposed units. No fires would be ignited in riparian areas. Incidental inclusion of RHCAs in burns would likely be of low intensity due to moist conditions during periods of burning and vegetation characteristics. The proposed burning would not result in an increase in water yield (see Water Resources section); therefore there would be no effect to aquatic habitat.

Fuels treatments are expected to have minimal offsite effects, protecting soils and retaining a duff layer component due to the high soil moisture present. As a result sediment production from the burned areas would be negligible. Standard erosion control practices would be applied to minimize sediment production from fireline construction. Rare instances of storm-event erosion, channeling of water down soil depressions, or minor road surface erosion from equipment use may result in minor additional fine sediment loads in channels proximate to operations. Since the magnitude of the expected sediment change is so small, the minor additional load that may result from the proposed activities is anticipated to have an insignificant effect.

Prescribed Burning
Potential effects to fish habitat would be avoided by igniting all fires outside of RHCAs. Incidental inclusion of RHCAs in most burns would likely be of low intensity due to moist conditions and vegetation characteristics. The proposed burning would not result in an increase in peak flows or sediment (See Water Resources section), therefore its effect to aquatic habitat would be negligible.

Prescribed burning would have some short-term indirect effects on site nutrient levels. The effects of any increased nutrient levels due to the prescribed burning would be minor and similar to natural environmental fluctuations.

Low fire intensities within riparian areas, and minimal changes in forest openings in upland areas, would mean no additional cumulative stream temperature effects.

Cumulative Effects

Past Actions and their Effects on Current Conditions: As described in Chapter 3, Water Resources section, past timber harvest and road construction impacted the watersheds and stream channels within the project area mainly through increased sedimentation and water yield. Timber harvest has elevated water yields by reducing the canopy and allowing more water to reach the stream, which may have caused Spring Gulch to widen through increased channel erosion. This widening may be reflected in the high existing RMO width/depth ratio (12.2) recorded in Spring Gulch. Roads have acted much the same way as timber harvest by intercepting ground water and routing water down ditches to stream channels.

Contrasting Effects of Proposed Actions with Past Actions: There has been a marked shift in the last ten years to more intermediate harvest and greater crown retention.
Since the INFS amendment (1995) to the Forest Plan, riparian buffers are left intact, thus limiting the effects to riparian habitat and stream channels.

These changes in management practices are reflected in RMOs generated from Project area fish habitat data collected in Spring Gulch in 2009 (Table 3-59, and Fisheries Project File). First, the total amount of large woody debris per mile is relatively high, exceeding the INFS standard, and as a result of RHCAs, LWD levels and recruitment sources will continue to increase within the project area. Finally, streambank stability was generally good with an average stability of 82% in Spring Gulch.

Because proposed actions have been designed to minimize effects to fish habitat, Project area streams would continue to trend toward attainment of INFS RMOs.

**Effects of Ongoing and Reasonably Foreseeable Actions:**

Ongoing timber management, road maintenance, fire suppression, and weed control activities would be conducted in accordance with INFS guidelines and designed to minimize or prevent effects to fish habitat.

Reasonably foreseeable activities on private lands within the project area include timber harvest, road building, home site and septic system development, road construction and maintenance, riparian disturbance, streambank armoring, and water withdrawals. Effects to fish and aquatic habitat resulting from these practices include reduced channel stability, decreased habitat complexity, increased nutrient inputs, increased sedimentation, increased stream temperature, and reduced base flows. Although all of these activities are likely to occur, the amount and intensity on private land would not change the scope or magnitude of effects anticipated from this proposal.

**Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions:**

Implementation of this project in conjunction with the past, proposed, and ongoing activities in the project area would not measurably affect fisheries populations or habitat. Although some fish habitat conditions in project area streams do not meet INFS standards, ongoing proposed activities would not retard attainment of RMOs.

**Statement of Findings/Forest Plan Consistency**

Alternative A (no action) is consistent with INFS, as it would not retard the attainment of RMOs. However, problems that would likely develop associated with culvert failure and sediment delivery to streams would need to be addressed in the future to promote long-term recovery of the watersheds.

Activities proposed in the action alternative implement INFS RHCAs to protect riparian resources and function. No harvest or burning is proposed in RHCAs. Additionally, any RHCAs identified during implementation would be delineated accordingly. Although peak flows may potentially increase in Spring Gulch, they would not retard the attainment of RMOs that in many cases are being met or exceeded. Based on these factors it is determined that the action alternatives are consistent with INFS and the Forest Plan.
STATEMENT OF FINDINGS FOR ALL ALTERNATIVES

Threatened, Endangered Species

Based on the analysis above, the action alternative would not affect bull trout. This determination is based on the lack of potential for take (harm or harassment of individual fish) and lack of effect to occupied habitat. More specifically, the project area supports only a few transient juvenile bull trout in lower Deep Creek and due to seasonal dewatering and limited habitat connectivity does not support a viable population. This assessment constitutes the biological assessment for bull trout.

Sensitive Species

The action alternative will result in **No Impact** for the western pearlshell mussel. This determination is based on the absence of pearlshell mussel and suitable habitat within the analysis area.

The action alternative will result in **No Impact** for the westslope cutthroat trout. This determination is based on the lack of potential effects to individual fish, populations, and habitat. Because westslope cutthroat trout are not present in Spring Gulch and there is no potential for direct or indirect effects to cutthroat or their habitat in Deep Creek there will be no effects to this species. This assessment constitutes the biological evaluation for westslope cutthroat trout.
SOIL RESOURCES

Introduction

This section discloses the results of the analysis for the soils resource in the Spring Gulch project area on soil productivity. Field surveys for soils for this project were conducted in 2010 using the R1 Soils Quality Monitoring Protocol (USDA FS 2011).

Regulatory Framework

The regulatory framework pertaining to soils is summarized below. For additional information, please refer to the Soil and Water Regulatory Framework in the Soil and Water Project File.

STATE AND FEDERAL LAWS REGULATIONS

Regulatory Framework

The regulatory framework pertaining to soils is summarized below providing direction for protecting a site's inherent capacity to grow vegetation comes from the following principle sources:

- The Multiple Use-Sustained Yield Act of 1960
- The National Forest Management Act of 1976 (NFMA)
- The Forest Plan and Regional Soil Quality standards (2554.03-R1 Suppl. 2500-99-1)

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.

Section 6 of 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.

The National Forest Management Act of 1976 (NFMA) – Section 6(g)(3) states that harvest cuts shall be “carried out in a manner that is consistent with the protection of soil resources” and that “soil, slope, and other watershed conditions will not be irreversibly damaged”. 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 and guidelines are built into Forest Plans.

The Regional Soil Quality Standards (R-1 Supplement 2500-99-1) 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. This recommendation is based on research indicating that a decline in productivity would have to be at least 15% to be detectable (Powers, 1990). In areas where more than 15 percent detrimental soil conditions exists from prior activities, the cumulative detrimental effects from project
Soil Resources

implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality. These standards do not apply to intensively developed sites such as permanent roads/landings, mines, developed recreation and administrative sites.

FOREST PLAN AND DIRECTION
The Kootenai National Forest Plan was developed in 1987. The following standards and guidelines apply to soils and form the basis for this analysis.

Objectives
Ground-disturbing activities such as road construction, road reconstruction, and timber harvest will be accompanied by mitigation measures to prevent or reduce increases in sedimentation and stream channel erosion. The amount of harvest allowed will depend on the rate of hydrologic recovery after timber has been removed (Volume 1 p 11-7).

Each project plan for which the use of heavy equipment is required shall evaluate the effect of operating that equipment on soil productivity. When it is determined that equipment operation is a hazard to soil productivity the project shall:

- Establish a standard for how much of the project area will be allocated to skid trails, landings, temporary roads, or similar areas of concentrated equipment travel. The standard shall minimize the area allocated to those uses to the extent practical.

- Consider the potential hazard to soil productivity before planning the practices requiring the operation of equipment off established roads and trails. Practices such as dozer piling of brush or mechanical site preparation shall not be planned without considering the feasibility of limiting the soil conditions under which these practices are applied or alternative practices that do not require the use of equipment. (Volume 1 p II-7)

Standards
The Forest Plan states that soil and water conservation practices (SWCPs) as outlined in Water Conservation Practices Handbook R-1/R-4 Amendment No. 1 (FSH 2509.22) will be incorporated into all land use and project plans as a principle mechanism for controlling non-point pollution sources and meeting soil and water goals, and to protect beneficial uses. Activities found not in compliance with soil and water conservation practices or State standards will be brought into compliance, modified, or stopped. (Volume 1 p II-23) Best Management Practices consist of state-of-the-art practices that fulfill Forest Plan objectives and are designed to minimize soil disturbance during harvest and road construction activities.

The KNF Forest Plan states that effects on soil productivity will be evaluated for all projects involving the use of heavy equipment and that the total area allocated to concentrated equipment travel should be minimized.

ANALYSIS AREA AND METHODS
SOILS ANALYSIS AREA
The direct and indirect effects of the alternatives will focus on individual activity areas as defined by the Forest Service Manual (R-1 Supplement No. 2500-99-1):

“Activity Area: A land area impacted by a management activity to which soil quality standards are applied. Activity areas include harvest units within timber sale areas, prescribed burn areas, and grazing areas or pastures within range allotments. Inclusion of system roads within the activity area is dependent on analysis objectives. System roads are often evaluated separately; however, temporary roads, landings, and skid trails are included within an activity area. Riparian and other environmentally sensitive areas may be monitored and evaluated as individual activity areas within larger management areas.”

For this analysis, the soil activity areas are the proposed harvest, fuel treatment, and ecosystem burning units. Skid trails, landings, and fire lines are included in the delineation of project areas.

**ANALYSIS METHODS**

**Existing Condition**

Existing condition for the soils resource were determined using timber stand records, air photo interpretation, GIS data analysis, and on-the-ground visits. Landtypes and hazard ratings were gathered from landtype descriptions and characteristics found in the Soil Survey of the Kootenai National Forest Area, Montana and Idaho (Kuennen and Gerhardt 1995).

All units containing evidence of existing soil disturbance related to past management activities that were proposed to have future ground based equipment activities received a full qualitative field survey using R1 Soil Survey Procedures. Field surveys consisted of random stratified transect/sample point methods with confidence intervals confidence intervals at or above 80% ± 5% with the majority of surveys being 95% ± 5%.

Completed soil surveys can be found in the Soil Project File and/or District Files. Existing detrimental soil disturbance values are a result of all currently measureable effects of past actions in each activity area, including but not limited to: timber harvest (trails and landings), temporary road construction, management related burns, grazing, off highway vehicles, natural disturbance, firewood gathering, etc. These methods provide data that is used in the analysis to determine if the Forest Plan and Regional Soil Quality Standards would be met.

**Field Sampling Procedure**

In order to determine the severity and the aerial extent of existing soil disturbances from previous forest management activities, randomly selected soil transects were conducted across representative portions of the proposed activity areas (harvest polygons, temporary roads and landings). Sample locations were chosen to be representative of areas with either high amounts of previous soil disturbance (i.e. major skid trails or log landings) or that of relatively undisturbed areas (i.e. areas of one or two pass skidding or cable yarding). Physical resistance to penetration was found to correlate quite well with altered soil conditions related with past management activity. In areas displaying the strongest properties of past management activity the shovel blade is only capable of penetrating a short distance into the soil with great effort.
Field sampled transect points were placed in one of three categories: 1) no disturbance; 2) disturbance present but not detrimental; and 3) detrimental soil disturbance (DSD). The detrimental disturbance category is considered detrimental as defined in FSM 2550 and Region 1 Supplement 2500-99-1. As a result, DSD is defined as the proportion of an activity area that may be subjected to displacement, compaction, rutting, erosion, or severe burning due to past management activity (such as harvest or fuels treatment), exclusive of dedicated resources (such as system roads).

**Walkthrough Assessment Procedure**

Proposed units with no past timber management activities were field reviewed by a professional soil scientist, hydrologist, or non-technical FS employee during a walkthrough. The walkthrough consists of quickly reviewing a proposed unit to determine if any past management activity has occurred. Soil disturbances, irregular surface conditions, evidence of mass wasting and other possible soil productivity concerns were noted. The walkthrough assessment data is summarized in the project files.

**Detrimental Soil Disturbance**

**Detrimental Soil Disturbance (DSD)**

The potential soil disturbance (DSD) values were calculated based on a summation of past monitoring of soil productivity within the Kootenai National Forest (Table 3-62). The percentages were developed as an average soil disturbance level and equated to harvest type, fuel treatment methods, and season of operation. The soils in an activity area are considered detrimentally disturbed at a given sample point when one or a combination of any of the following soil conditions is present as a result of Forest Management activities:

a. **Displacement:** Removal of one inch or more surface soil continuous area greater than 100 sq. feet which often consists of the O and A soil horizons. Displacement removes the most productive part of the soil resource. Temporary roads, skid trails, ground-based yarding, dozer piling and cable corridors are the major contributors to displacement.

b. **Compaction:** A 15% or more increase in bulk density. Soil compaction reduces the supply of air, water, and nutrients to plants. Roading, ground based yarding, dozer and grapple piling activities are the major contributors to compaction.

c. **Surface erosion:** Indicated by rills, gullies, pedestals, and localized soil deposition. Generally less than 1 to 2 tons per acre soil loss per year.

d. **Soil ruts:** Machine-generated soil displacement having smeared the soil surface in a rut. Wheel ruts at least 2 inches deep in wet soils.

e. **Severely burned soils:** Physical and biological changes of soil resulting from high-intensity burns of long duration as described in the Burned-Area Emergency Rehabilitation Handbook (FSH 2509.13).

f. **Soil mass movement:** Any soil mass movement caused by management activity.
New temporary roads are considered 100% detrimentally disturbed through the removal of organic matter, displacement, and/or compaction. New temporary roads yield 2 acres of DSD per mile of road.

**Direct and Indirect Effects**

The potential detrimental soil disturbance (DSD) values were calculated based on a summation of past monitoring of soil productivity (KNF 1988-present date) within the Kootenai National Forest (Table 3-62). The percentage were developed as an average soil disturbance level and equated to harvest type, fuel treatment methods, and season of operation. Timber removal had always occurred prior to the “post-harvest field surveys” and includes mechanical fuel abatement activities such as excavator piling activity if present. The end DSD figure is a composition of all disturbances and did not separate each category of disturbance values where present within each unit. Thus, the value of 8% DSD for summer tractor is a “statistical summary” which takes into account not only the skid trails but temporary roads, mechanized piling, and fire lines if present within the units being surveyed at that time and date. Refer to Table 3-62.

Table 3-62. Monitoring results of DSD from Management Activities on the KNF Years 1988 – 2005 (Kuennen 2007a; Kuennen 2003)

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>SEASON OF OPERATION</th>
<th>DETRIMENTAL DISTURBANCE COEFFICIENTS (%)&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skyline</td>
<td>NA</td>
<td>1</td>
</tr>
<tr>
<td>Tractor&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Summer</td>
<td>8</td>
</tr>
<tr>
<td>Tractor&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Winter</td>
<td>4</td>
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<tr>
<td>Forwarder</td>
<td>Summer</td>
<td>4</td>
</tr>
<tr>
<td>Forwarder</td>
<td>Winter</td>
<td>2</td>
</tr>
<tr>
<td>Excavator Piling&lt;sup&gt;2&lt;/sup&gt;</td>
<td>NA</td>
<td>2</td>
</tr>
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<td>2</td>
</tr>
<tr>
<td>Fireline Construction&lt;sup&gt;2&lt;/sup&gt;,&lt;sup&gt;4&lt;/sup&gt;</td>
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<td>1</td>
</tr>
</tbody>
</table>

<sup>1</sup> The numbers for this document were based on percentages from the last five years. Previous documents have used 18 year averages. Typically the larger data set is more accurate, but because the eighteen year data set includes practices that are not used anymore (i.e. dozer piling) it was deemed more appropriate to use the more accurate information pertaining to modern harvest and slash disposal methods.

<sup>2</sup> DSD percent is listed but is not necessarily additive to other activities. This is because the percentages listed for each management activity included some units with excavator piling, or fireline construction. In addition, disturbance from these activities within harvest units usually overlaps at least a portion of the skidding disturbance.

<sup>3</sup> Feller Buncher must be operated straight up and down the fall line on slopes not exceeding 45%. Where such harvest activities occur on skyline units an additional 2% DSD is expected to occur.

<sup>4</sup> Fireline construction prior to 1995 included a dozer fireline construction while data collected following 1995 generally included hand line construction or excavator bucket-width activity. As a result there has been a significant reduction of fireline disturbance in a given unit.
Generally, detrimental effects on soils are not permanent and depend primarily on soil texture, parent material, aspect, and level of disturbance, i.e. compaction. Recovery begins once activities cease on the site. However, vegetative recovery time may take approximately 30 to 70 years as the second growth timber becomes established in and around the disturbed areas (Dykstra and Curran 2002; Froehlich and McNabb 1983; Froehlich and others 1983 and 1985; Louis Kuennen pers. comm. 2009). In areas where soil displacement mixes or moves the volcanic ash surface layer and reduces moisture holding capacity, soil productivity may continue to be impacted far beyond the 70 year timeframe.

**Indirect Effects**
Indirect effects may include the reduction of site productivity due to the removal of vegetation and nutrients. Large woody debris (woody residue >3” diameter) and finer organic material are essential for maintenance of sufficient microorganism populations and long-term site productivity. Design features (see Design Criteria) 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). Where feasible, smaller woody material such as tree tops, foliage, and branches would be left to over-winter before fuels treatment, which allows nutrients to leach out of these materials and into the soil.

**Cumulative Effects**
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. Existing system roads and designated landings on the National Forest transportation system are considered dedicated lands and are not part of the soils cumulative effects.

**ASSUMPTIONS AND LIMITATIONS**
The potential detrimental disturbance numbers for each proposed harvest unit are based on empirically derived coefficients that were obtained and averaged from numerous monitored sites throughout the Kootenai National Forests (Kuennen 2003; Kuennen 2007b). The assumptions are limited to the harvest and slash disposal methods for which coefficients have been determined, and its coefficients assume that Best Management Practices (BMPs) will be implemented. The predicted values do not account for changes in soil type, the recovery of soils over time, or existing conditions.

Evaluation of cumulative effects to soil productivity does not require an integrated “watershed scale” assessment since that is not considered an appropriate geographic area. Soil conditions are site-specific. Loss of soil productivity in one treatment unit will not lead to a loss in soil productivity in an adjacent stand. Soil productivity can vary from one square foot to the next with each area functioning independently. Thus, the highly variable and independent nature of soil productivity requires site-specific analyses to maintain the proper context. Assessments of cumulative effects on soil productivity is retained at the site specific boundary scale since analysis at the watershed scale for soils misrepresent management activity effects by masking and/or diluting the site-specific effects across a larger area. In contrast, soil processes such as erosion regime and hydrologic functions occur at a watershed scale and have been analyzed as such in the Watershed Resource Report.
SCIENTIFIC UNCERTAINTY AND CONTROVERSY
Soil productivity relies on complex chemical, physical, and climatic factors that interact within a biological framework. For any given site and soil, a change in a key soil variable (i.e. bulk density, soil loss, nutrient availability, etc.) can lead to changes in potential soil productivity. The intent is to prevent extensive detrimental soil disturbance that would result in a measureable decline in timber productivity for a site. The Region 1 supplement requires that detrimental soil disturbance should be limited to 15% of an activity area. The value of 15% is based on the assumption that soil quality and productivity will be maintained if less than 15% of an activity area is detrimentally impacted after disturbance (Page-Dumroese et al. 2000).

Currently the Soil Quality Standards are being studied across North America by a cooperative research project called the North American Long Term Soil Productivity Study (LTSP). The study began in 1990 and is currently ongoing in order to provide the best available science for forest managers. Results over the past ten years indicate that there is little evidence of adverse effects of adverse effects of soil organic removal or soil compaction on productivity as measured by total biomass production, and the growth and vigor of planted trees (Powers et al. 2004).

Additional controversy surrounds the use of the term ‘irreversible’ in NFMA. NFMA has guidelines that “insure that timber will be harvested from NFS lands only where soil, slope, or other watershed conditions will not be irreversibly damaged.” The detrimental soil disturbance described in this analysis does not necessarily result in permanent or irreversible damage. Detrimental soil damage is reversible if the processes (organic matter, moisture, top soil retention, soil organisms) are in place and time is allowed for recovery.

AFFECTED ENVIRONMENT

SOIL REFERENCE CONDITIONS
The bedrock underlying the project area is composed mostly of metamorphosed sediments of ancient sea beds from the Precambrian era (0.8-1.4 billion years before present), referred to as the Belt Supergroup. The major structural feature is the Hope Fault, which parallels the Clark Fork valley, and several large northwest-trending faults that are perpendicular to the drainage.

The project area is composed of an erosional landscape modified by some alpine glaciation (approximately the upper 1/4 of the drainage). The landform is very steep, except for the valley floor adjacent to the Clark Fork River. Elevations of the Spring Gulch range between approximately 2,840 to 5,640 feet. The lower elevations were impacted by episodic Glacial Lake Missoula ice damming activities which came down the Purcell Trench from the north, and extended eastward up the Clark Fork valley. This large glacial lake reached an average water line level of 4,200 feet.

Most soils in Spring Gulch are residual which means that they were not affected by glaciation and developed “in place” rather than by glacial activities. The amount of rock present in residual soils is much higher than that associated with glacial till or Cordilleran Ice Sheet soils and rock shape is strongly angular.
Approximately 7,700 years ago (Zdanowicz and others 1999) Mt. Mazama erupted in southwest Oregon and deposited a layer of volcanic ash-influenced loess over northwestern Montana forming a topsoil horizon in many local areas. This layer is present on all northerly and easterly aspects and the higher elevations of the southerly and westerly aspects and is important since it increases soil productivity and provides the best rooting environment within the soil profile. The ash cap is light and feathery and has a yellowish to reddish brown color and ranges from four to 14 inches thick. The uppermost ash is usually enriched with organic matter and has been incorporated into the local soil system. Such soils have a high water-nutrient holding capacity and are important for soil productivity. Generally speaking the sub-soil horizons are not nearly as fertile as the surface horizons.

Between the eruption of Mt. Mazama to the early 1900s, the soils were relatively undisturbed. Naturally occurring surface erosion and small-scale landslides probably occurred on occasion, but the overall magnitude would have been insignificant in terms of long-term soil productivity. Soil recovery in such areas was attained when the slope reached a stable angle and/or the area was revegetated. Soil productivity was maintained over the long-term as vegetative matter slowly decomposed or burned in low intensity natural wildfires.

Historically, the most prevalent large-scale disturbance in the project area was wildfire. Stand replacing fires varied in frequency from 50-350 years, depending on vegetation type and location. Once fire passed through an area, erosion increased, especially on steep slopes and in headwater swales where most vegetation was removed, until sufficient forest floor and canopy vegetation had recovered. More frequent, low-intensity underburns likely had little effect on soils due to the short contact time and lower temperatures associated with these fires.

**EXISTING CONDITIONS**

Existing condition is the result of the past management activities (temporary road construction, timber harvest, prescribed burning, etc.) and natural events (wildfire, floods, landslides, etc.) that occurred in the Analysis Area. These activities and events provide baseline conditions for the affected environment in the Analysis Area.

Soils are the basic support system of forest ecosystems, providing nutrients, water, oxygen, heat, and mechanical support to vegetation. Any environmental stressor that alters the natural function of the soil has the potential to influence the productivity, species composition, and hydrology of forest systems. Maintenance of soil quality is dependent upon the protection of surface layers from erosion, displacement, and compaction, as well as the continual cycling of nutrients and organic material. Soil quality refers to the capacity of a soil to function within ecosystem and land use boundaries, to sustain biological productivity, maintain environmental quality, and promote plant and animal health. Various factors influence soil quality. Although management activities do not affect factors such as climate and soil parent material, they can affect physical, chemical, biologic, and hydrologic soil properties.

Three criteria were used to assess existing condition for soil resources:

1.) Kootenai National Forest Landtypes;
2.) Identification of Sensitive Soils;
3.) Coarse Woody Debris

LANDTYPES

There are 50 recognized landtypes on the Kootenai National Forest. This classification of landtypes is based on five criteria including: landforms, geology, soils, vegetation, climate, and drainage type. They describe inherent conditions and do not change as a result of management. The landtypes were compiled in Kuennen and Nielson-Gerhardt (1984), and published in Soil Survey of the Kootenai National Forest Area, Montana and Idaho (Kuennen and Nielson-Gerhardt 1995). Landtype classification helps determine suitability, equipment operating limitations, and the production potential of the landscape. It is an important tool for protecting soils during resource management activities. Refer to Figure 3-21: Landtypes in the Spring Gulch Analysis Area. The landtype map is generally quite accurate; however, field verification may indicate some site variability. The landtypes were broken down into five generalized groupings or series which include the following:

- **Water influenced Landtypes (100 Series):** Present in very low relief topography which is highly water influenced locations.

- **Steep topography Landtypes (200 Series):** Exist in very steep topographic lands (60% plus). Such landform areas are usually rocky slopes and may be convex or linear in shape.

- **Glaciated Landtypes (300 Series):** Exists in areas of past glacial deposits and shaped through time by glacial advances that occurred throughout the Kootenai National Forest. The most recent, the Cordilleran Ice Sheet retreated from the area several thousand years before present. These landtypes included glaciated slopes, drumlins, and moraines.

- **Alpine till Landtypes (400 Series):** Such landtypes exist in very steep alpine or subalpine locations and consist of glacial cirque headwalls or trough walls.

- **Mid-elevation Landtypes (500 series):** Such landtypes are residual in nature and developed on site and are typically mid-slope in elevation.

Of the 50 recognized landtypes on the KNF three of these landtypes are found in the Spring Gulch project area (Figure 3-21, Table 3-63). The landtype map is in general quite accurate; however, field verification may indicate some site variability.
Figure 3-21. Landtypes of the Spring Gulch Project area
Table 3-63. Landtypes in the Analysis Area (Kuennen and Gerhardt 1995)

<table>
<thead>
<tr>
<th>LANDTYPE</th>
<th>ACRES</th>
<th>TIMBER MANAGEMENT</th>
<th>ROAD CONSTRUCTION/MAINTENANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TRACTOR OPERATIONS</td>
<td>SEDIMENT HAZARD</td>
</tr>
<tr>
<td>251</td>
<td>242</td>
<td>Slope, Rock</td>
<td>Severe</td>
</tr>
<tr>
<td>502</td>
<td>147</td>
<td>Slope</td>
<td>Slight</td>
</tr>
<tr>
<td>555&lt;sup&gt;1&lt;/sup&gt;</td>
<td>413</td>
<td>Complex slope, Soil Damage, Rock</td>
<td>Moderate</td>
</tr>
<tr>
<td>Total</td>
<td>802</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup> Not applicable because landtype has only scattered stands of trees.

The landtypes in the analysis area and their implications are displayed in Soils Table 3-63. Management activities on each landtype are designed to be comparable to the risk associated with that landtype.

**SENSITIVE SOILS**

*Sensitive Soils* are identified based on one of three characteristics: 1) landtypes of concern, 2) riparian/wetland areas; and 3) low productivity soils. Sensitive soils are best addressed through avoidance, Best Management Practices (BMPs), buffers, and/or through design criteria.

**Landtypes of Concern**

There are seven designated “landtypes of concern” on the KNF that should be given additional consideration prior to the introduction of management activities. These are landtypes 102, 112, 325, 351, 365, 370, and 520 (Kuennen 2006a). When viewed at the Project Area level none of these landtypes of concern are present and thus this is not a concern to be considered with any of the proposed harvest acres.

**Riparian and Wetland Areas**

There are scattered riparian corridors and small patches of wetland areas in the project area. Riparian and wetland soils are considered sensitive because their moisture levels are high all or most of the year, and moist soils are more prone to compaction, displacement, rutting, and puddling. Harvest and road construction activities will avoid timber activity in wetland areas and as a result this factor will not be carried forward in the Soils Report.

**Low Productivity Soils**

Soil productivity as defined by Brady and Weil (2002) is “the capacity of a soil for producing a specific plant or sequence of plants under a specified system of management.” The most productive part of the soil occurs near the surface, at the
contact between the forest litter and the mineral soil. Here the litter has been
decomposed into an organic rich layer containing most of the soil nitrogen, potassium,
and mycorrhizae that must be present for a site to be productive. However, this is also
the part of the soil that is easiest to disturb by management activities.

Soil productivity levels for each landtype on the Kootenai National Forest are classified
as low, moderate, or high in Kuennen and Gerhardt (1984). It is important to look at soil
productivity to properly assess the effects of potential actions on a specific area. For
instance, if timber harvest is proposed on a given area of land that was considered as
having low soil productivity, additional actions may need to be taken to insure a fully
stocked stand after harvest. The majority of the project area has moderate to high soil
productivity. Refer to Table 3-64 for characterization of soil productivity by landtype for
the entire project area.

Table 3-64. Soil Productivity in the Spring Gulch
Project Area (Kuennen and Gerhardt, 1984)

<table>
<thead>
<tr>
<th>LANDTYPE</th>
<th>ACRES</th>
<th>FOREST VEGETATION GROUP</th>
<th>RELATIVE PRODUCTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>251</td>
<td>242</td>
<td>Moist, Mixed Forest</td>
<td>Moderate</td>
</tr>
<tr>
<td>502</td>
<td>147</td>
<td>Sub-alpine Forest</td>
<td>Moderate</td>
</tr>
<tr>
<td>555</td>
<td>413</td>
<td>N/A</td>
<td>High</td>
</tr>
</tbody>
</table>

1 Not applicable due to landtype having only scattered stands of trees

Application of appropriate management precautions (BMP’s) such as avoiding timber
harvest in wet seasons, maintaining buffer zones below open slopes, and skidding over
snow or frozen ground can decrease the negative impacts to soil productivity.

SITE CONDITIONS IN THE ACTIVITY AREAS

Site conditions are considered for each activity area in the effects analysis portion of this
assessment. Past activities in the Spring Gulch project area have resulted in impacts
that persist today and will be characterized and quantified in a cumulative effects
analysis. Past activities affecting soils include, but are not limited to, road construction,
timber harvest (including skid trails and landings), prescribed or natural wildfire, public
vehicular activity such as firewood gathering and off-road vehicle use.

The three factors which have created the most impacts to soil conditions associated with
the Spring Gulch project area are:
1.) Road Construction
2.) Timber Harvest
3.) Severely Burned Soil

Road Construction

Common impacts to soils from road construction are displacement, compaction, and
erosion (road-related runoff). Road construction affects soils by displacing topsoil layers
from the road prism and compacting the road surface and shoulders. The road surface
will not support trees and other forest vegetation as long as the road is used and
maintained. Trees and shrubs will grow along the road bank, but site productivity is less
than in unaffected soils in similar productivity zones.
Roads also disrupt hydrologic processes that occur within the soil profile. The cut slope intercepts subsurface flow and the compacted road surface reduces precipitation infiltration. As long as roads remain on the landscape, the impacts to soils persist. When road use ceases, soils gradually begin to recover. Implementation of BMPs reduces erosion and the rerouting of water associated with roads.

Roads are categorized as “National Forest System Roads” (dedicated under the area transportation plan) or “Undetermined” (non-dedicated roads, which are not considered to be a current part of the Access Travel Management Plan). This is due to the road system not being considered part of the suitable timber land base. However, the proposed temporary roads, excavated skid trails, and landings do contribute toward the 15% standard. Implementation of BMPs reduces erosion associated with such roads. Presently there are approximately 12.4 miles of Authorized Forest Road and 1.1 miles of Undetermined Road within the Spring Gulch project area of which all are located on FS land.

Removal of forest canopy cover associated with harvest activities and road construction may increase snowpack depths and related snow melt rates, resulting in increased surface runoff and the potential for increased erosion from compacted soils. These same activities cause varying degrees of course woody debris (CWD) reductions, soil exposure, soil compaction, and surface runoff routing which lowers soil productivity. Slumps can also occur as a result of intercepted subsurface flow and soil saturation. The degree that erosion occurs is due in large part to the landtypes present in the area.

Timber Harvest
Early harvest on Forest Service lands included hand fall and Holt tractor operations while later in time harvest activities was altered to skyline and rubber tire skidders and handfall/clipper cutting in land areas farther up the drainage systems. Two of the more important impacts to soils are detrimental soil disturbance (compaction, displacement, rutting, etc.) and the removal of organic matter which can affect physical and biological soil conditions. Soil disturbance as a result of timber harvest and fuels reduction is usually associated with mechanized activity. Timber harvest activities can physically alter soils and reduce soil organic matter, which can lead to reduced site quality and soil productivity.

Soil compaction impacts recover over time due to freeze/thaw activity, burrowing by animals, plant root growth, wetting/drying, and the action of soil microbes. Soil erosion and displacement are impacts that require a longer timeframe to recover since the rate of soil formation is very slow. Long-term soil processes are influenced by fire, mass wasting, wind deposition, and weathering of parent material at the rate of one inch of topsoil formed every 300-1,000 years (Thurow 1991). To date 435 acres of harvest or approximately 55 percent of the Spring Gulch project area being in second growth stand age.

A number of the unit acres located upslope and in the eastern portion of the project area were harvested in the past using skyline activities based on the steep topography. Those areas located in the more western locations of the project area consist of more gentle topography and were tractor harvested. Slash treatments used included limbing and lopping to reduce slash depth to 18”, windthrow piling and burning, landing clean-up, and natural abatement.
Severely Burned Soils
Wildfire is a natural component in forest watersheds and has influenced forest soils for thousands of years (Ice 2003). Records of historic wildfires enforce that the potential for future wildfire remains, especially if a fire ignites in untreated areas under dry weather conditions. The largest fire on record occurred in 1910 and impacted the entire Spring Gulch project area. Beginning 1971 fire records began in the Cabinet Ranger District and have recorded several smaller spot fires in 1977, 1994, and 2009. These spot fires are believed to have only impacted very small areas of land upon occurrence. Similar activities most likely occurred between 1910 and 1971 but the extent and severity is unknown (refer to Fire/Fuels report for more detail).

Many fire effects on soil are not observable with the naked eye. Severe deteriorating effects that wildfires have on soils usually include loss of organics and nutrients and a reduction of water infiltration (Wells et al 1979). Burns that create very high soil surface temperatures, particularly when soil moisture content is low, may result in an almost complete loss of soil microbial populations, woody debris, and the protective duff and litter layer over mineral soil. Soil erosion increases following fire activity are often directly proportional to fire intensity (Megahan 1990). Similarly, the removal of ash-capped surface soils as related to soil disturbance could reduce soil productivity. 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; Amaranthus 1989).

The scenario of a wildfire occurring on sites with accumulated fuels could result in areas of high burn severity and hydrophobicity (water repellant soils). This impact is greatly amplified by increased burn severity (Huffman et al. 2001). 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; Dyrness 1976) and other studies have documented a much more rapid recovery of one to three years (Huffman et al 2001). However, before water infiltration rates improve, increased overland runoff and sediment movement may occur. The primary risks for erosion and mass failure during this timeframe is related to roads, especially where stream crossings are located.

Depending on fire severity and activity 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 is greatly affected by the presence of invasive plants and weeds (Goodwin and Sheley 2001). Burned areas can contain high initial nutrient levels, exposed ground surfaces, and low shade with high light conditions which all directly favor colonization of invasive plant species. Invasive plant survival coupled with fire disturbance can cause rapid expansion of invasive plant growth. As a result, values such as wildlife habitat, watershed stability, and water quality often deteriorate.
ENVIRONMENTAL CONSEQUENCES

Direct And Indirect Effects
Direct and indirect effects on the soils resource are described below for proposed activities identified in Chapter 2.

The Soils report will analyze in full content the impacts of the action Alternative as compared to the No Action Alternative.

Measurement Indicators
No significant issues were identified for Soil Resources during the scoping process. Therefore, law regulation, and policy drive the effects analysis, specifically:
- Compliance with NFMA; and
- Compliance with Forest Plan Standards

Effects of the Alternatives on soil resources will be analyzed in terms of:
1. Activities on Sensitive Soils;
2. Detrimental Soil Disturbance and the 15% Standard;
3. Prescribed Fuels Treatments; and

Sensitive Soils

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

Alternative 1 does not proposed any new management activities on sensitive soils. Therefore, no direct, indirect, or cumulative effects to sensitive soils would result from Alternative 1.

ALTERNATIVE 2 (Action Alternative)
Direct, Indirect and Cumulative Effects of the Action Alternative

None of the landtypes located within the Spring Gulch project area are classified as being sensitive soils. Therefore, no direct, indirect, or cumulative effects to sensitive landtypes would result from harvest activities in the proposed Alternative.

No harvest activities are proposed in riparian areas and wetlands with Alternative 2. Therefore, there would be no direct effects to riparian areas or wetlands. All RHCAs would be maintained to at least the required SMZ boundary widths by law. As a result one indirect effect to riparian areas and wetlands could be an increase in blow down trees or additional large woody debris from opening the stands in and around wet areas.

None of the landtypes located within the Spring Gulch project area are considered as being low productivity soils. The proposed harvest activities within the Spring Gulch project area are expected to leave a fully stocked stand. This would allow for a
continuous input of nutrients through needle-cast and coarse woody debris and would maintain soil productivity. For this reasons, soil productivity with regards to landtype will not be discussed further in this analysis.

**Detrimental Soil Disturbance (DSD)**

Management activities including, but not limited to, road building, off-highway vehicle use, timber harvest (trails and landings), and mechanical fuel treatment are considered to be potential sources of detrimental soil disturbance. Refer to the Soils Project File for spatial representation of past harvest activities.

Compaction occurs when heavy equipment used in site preparation, clipping, and skidding breaks down soil structure, reducing the pore spaces within the soil. This is most common where heavy equipment makes repeated passes over the same ground, particularly during times of high soil moisture. Soil compaction is usually greatest within the first 1-3 passes within an area (Kuennen 2003). Soil compaction can change slope hydrology and lead to overland flow of water during precipitation or snowmelt events. Compacted soils can also reduce soil productivity. These are some general direct effects that can occur with all timber harvest activities.

The percent DSD is the measurement indicator of soil compaction. **Table 3-65** displays existing, proposed and cumulative percent DSD for each activity area. Predicted detrimental and foreseeable activity disturbance is based on information from Kuennen 2003 and 2007a, which includes a summary of the Kootenai Forest Soils Monitoring to date with recommendations for analysis based on survey results. The cumulative percentage is derived by adding the percentage of disturbance expected from proposed activities and reasonably foreseeable activities to the existing disturbance percentage. All harvest activities, prescribed burning, skid trails, landings, fire lines, excavator piling, and temporary roads are included in this analysis.

In general, the degree of detrimental soil disturbance in all proposed activity areas is relatively low. Impacts are concentrated on existing skid trails that converge and intersect throughout the units or portions of units. Best Management Practices (BMPs) would be followed where applicable, and additional design criteria have been specified in order to minimize disturbance. Complete soils survey data can be found in the Soil project file at the Cabinet Ranger District.
<table>
<thead>
<tr>
<th>Unit #</th>
<th>Activity Area (acres)</th>
<th>Proposed Vegetation Actions</th>
<th>Proposed Logging Systems</th>
<th>Proposed Fuels Treatment</th>
<th>Existing Detrimental Soil Disturbance DSD (%)(^1)</th>
<th>Action Alternative 2</th>
<th>Alt 2 Project Design Features</th>
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<tr>
<td></td>
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<td></td>
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<td>Predicted Temp Road DSD%</td>
<td>Predicted Harvest DSD%(^2)</td>
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<td>66</td>
<td>PCT THIN HP</td>
<td>HP</td>
<td>Not Reviewed</td>
<td>0 0 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>122</td>
<td>NFuels S/UB</td>
<td>HS</td>
<td>0</td>
<td>0 0 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>301</td>
<td>94</td>
<td>NFuels S/UB</td>
<td>HS</td>
<td>0</td>
<td>0 0 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>13</td>
<td>NFuels S/UB</td>
<td>HS</td>
<td>0</td>
<td>0 0 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>303</td>
<td>2</td>
<td>NFuels HP</td>
<td>HS</td>
<td>0</td>
<td>0 0 0 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>553</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) The Spring Gulch soil survey was conducted using the new Region 1 Soil Sampling Protocol which meets the R1 definition of detrimental soil disturbance, and therefore the Spring Gulch pre-activity conditions meet the R1 definitions.

\(^2\) Predicted DSD has been calculated based on historical soil monitoring data collected in the field in post-harvest timber sale units. (Kuenen, 2007a). In units with combined tractor/skyline harvest activity the anticipated DSD was calculated as related to the overall acreage of potential disturbance by harvest activity.

Note: An existing condition of 0% DSD can mean either: 1) No disturbance present or 2) there is some disturbance present but does not amount to 1%.
ALTERNATIVE 1 (No-Action)

Direct, Indirect and Cumulative Effects
Under Alternative 1 timber harvest and other operations proposed associated with this project would not occur. However, natural changes in climate and vegetation would continue to occur. Vegetation regeneration and stand growth activities would continue to slowly recover over time on existing harvest units resulting in lower compaction values due to tree root growth, freeze-thaw activities, and increased soil nutrients from the decomposition of forest litter and coarse woody debris (CWD). Therefore, no direct, indirect, or cumulative DSD would result from Alternative 1.

ALTERNATIVE 2 (Action Alternative)

Direct and Indirect Effects of the Action Alternative – DSD
The percent detrimental soil disturbance (DSD) is the measurement indicator of soil compaction for this analysis. Direct impacts on soils from management activities could include compaction, rutting, and displacement. Typically these impacts take place as a result of vehicle/equipment traversing areas within proposed units such as skid trails, landings, and temporary roads. Table 3-65 identifies the extent of these impacts for each unit in Alternative 2.

Alternative 2 includes hand slashing post-harvest pile burning activities as well as slashing and underburning of natural fuels activities as discussed in the next section. Burning activity may require construction of firelines around the unit; the effects of disturbance are included in the Table 3-65.

The construction of fire line directly impacts soils by removing (displacing) the organic layer down to the mineral soil for 2-3 feet wide around the perimeter of units. The effects of soil compaction associated with fire lines only applies to those units where machinery may be involved in such lines. The bulk of units will have fire lines constructed by hand.

Fuels treatments may also include mechanical piling. The effects of mechanical piling are included in figures identified in Table 3-65. The direct effects of mechanical piling with heavy equipment are discussed above. Because mechanical piling is reducing the amount of woody material within a unit, it can also affect nutrient cycling. Nutrient cycling is discussed in depth below.

Regeneration harvest activities conducted thru skyline operations would not result in multiple entries to reach the desired silvicultural objectives over time. Related post-harvest unit entry would be for thinning and scheduled to occur several decades later. Regeneration harvest activities would require one entry to reach the desired objective. This being said, units proposed with intermediate harvest prescriptions are anticipated to yield more detrimental soil disturbance than that of a regeneration prescription. More potential large woody debris material will be left in place for regeneration units as compared to commercial thinning units.

Indirect effects from the action alternative could include erosion from surface water runoff channeled into ruts, fire lines, and/or along temporary roads within units. With less vegetation a conversion from a drier soil environment to a slightly moister sight would occur. Less vegetation would mean a thinner canopy and more soil interception from rainfall above. Again, these impacts would be minimized by implementing BMPs (Appendix 2 of the EA) and the following specific management requirements and design criteria.
Cumulative Effects
Based on this analysis, while some increase in DSD is expected with proposed management activities, all activity areas are expected to remain at/or below the 15% soil quality standard with the proposed Action Alternative for Alternative 2. Recall, soil productivity effects are spatially static and productivity in one location does not affect productivity in another location.

PERMANENT ROADS

ALTERNATIVE 1 (NO-Action)

Direct, Indirect, and Cumulative Effects
Regarding soil disturbance it should be noted that Authorized Forest Roads as defined in 36 CFR 212.1 are not considered part of the productive land base. As a result these features do not count toward the 15% soil quality standards (FSM 2500-99-1). Under Alternative 1, there would be no implementation of proposed 7.5 miles of road re-construction and, 1.1 mile segment of undetermined road being converted to system road construction (FS Road 38123). Therefore, road management related to permanent road systems would have no direct, indirect, or cumulative effects on soils in the activity area. Recall that soil productivity effects are spatially static and productivity in one location does not affect productivity in another location. Similarly, under Alternative 1, no length of road is scheduled to be placed in Intermediate Storage.
Routine road maintenance of the existing roads within the Spring Gulch project area would occur as funds become available.

ALTERNATIVE 2 (Action Alternative)

Direct and Indirect Effects of the Action Alternative
Under Alternative 2 approximately 1.0 miles of undetermined road 38123 would be used to access units 1A, 1, and 2A while approximately (0.1) miles of currently undetermined road would be used to accesses proposed Unit 8 (skyline harvest). Under Alternative 2 both roads will be converted to authorized or permanent road system and numbered FS Road 38123 and FS Road 2771A and placed on the Authorized Forest Roads database. Following harvest activities these 2 road sections will be bermed and placed into long term storage at mile post 0.00 by using an earth berm. Although authorized or permanent National Forest System Roads do not fall under the 15% disturbance, enhancing the drainage system through road reclamation can benefit soils. In the short-term, reclamation would improve water infiltration rates, though they may still be lower than undisturbed infiltration rates. Long-term, infiltration rates would continue to improve as soils freeze and thaw, and plant root growth improves soil porosity.

Cumulative Effects of the Action Alternative
Under Alternative 2 an estimated 1.1 miles of combined FS Roads 2771A and 38123 are to be placed into storage (Maintenance Level 1) following harvest activity in the permanent roads database. Proposed road re-construction and maintenance under Alternative 2 may increase short-term sediment movement from road surface run-off but should be minimal, especially at road locations higher on the slope that are relatively low gradient and provide sufficient buffer zones. Road re-construction includes new culvert installation, blading, and brushing, and typically improves drainages and decreases erosion from water channeling down the road surface in the long run. Road management and construction is outside the activity area identified for soils analysis because the permanent road system and administrative sites do not count towards the 15% soil quality standards. As a result, the road management activities are
anticipated to have no cumulative effects on soils in the analysis area because soil productivity effects are spatially static and productivity in one location does not affect productivity in another location.

TEMPORARY ROADS

ALTERNATIVE 1 (NO-Action)

Direct, Indirect, and Cumulative Effects
Alternative 1 has no temporary road construction and closure occurring. Therefore, temporary road management would have no direct, indirect, or cumulative effects on soils.

ALTERNATIVE 2 (Action Alternative)

Direct and Indirect Effects
Alternative 2 has no temporary road construction and closure occurring. Therefore, temporary road management would have no direct, indirect, or cumulative effects on soils.

All newly constructed landings used for harvest activities are considered contributing factors towards DSD sums and considered 100% detrimentally disturbed through removal of organic matter and compaction. Indirect effects from this action include the temporary soil erosion related to the soil exposure of more mineral soil. Without a protective mat of vegetation and stable soil profile, these areas are more susceptible to the erosive force of wind, water and dynamic temperature changes resulting in frost heaves. These localized effects are short-term (5-10 years) due to warmer wet climate found on the KNF.

Recall that all new skid trails will be agreed upon and designated on the ground by the Purchaser and the Forest Service before felling begins. Skid trail spacing will range between 75 and 125 feet dictated by the local topographic features. Section IV A. 5 says to limit the grade of constructed skid trails on unstable, saturated, highly erosive or easily compacted soils to a maximum of 30%. Such activities entail bladed skid trails and not surface skidding activity. Rehabilitation and reseeding of such areas upon project completion should limit the long-term erosion related to these activities. Post-harvest activity will include covering utilized skid trails with slash and randomly placed logs (on contour) to increase the microtopography necessary to reduce runoff and stabilize with waterbars.

Cumulative Effects of the Action Alternative
Similar to Alternative 1, Alternative 2 proposes no temporary road construction and closure. Therefore, temporary road management would have no cumulative effects on soils.

Fuels Treatments
Due to the suppression of wildfires over the last century, fuels have accumulated in many areas throughout the KNF. The intent of fuels treatments is to reduce fuel levels and meet prescribed vegetation management objectives. High-intensity or long-duration burning has the potential to cause soil heating and associated soil impacts such as loss of soil organic matter, impacts to soil organisms, and creation of water repellency (hydrophobicity). Table 3-66 displays the fuels treatments proposed with this project.
Table 3-66. Types and Amounts of Fuels Treatments by Alternative

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>ALTERNATIVE 1</th>
<th>ALTERNATIVE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underburn to Remove Fuels</td>
<td>0</td>
<td>155 acres</td>
</tr>
<tr>
<td>Slashing and Underburning of Natural Fuels</td>
<td>0</td>
<td>229 acres</td>
</tr>
<tr>
<td>Machine Piling Fuels</td>
<td>0</td>
<td>101 acres</td>
</tr>
<tr>
<td>Hand Piling Fuels</td>
<td>0</td>
<td>68 acres</td>
</tr>
<tr>
<td>Total Fuels Acres Removal</td>
<td>0</td>
<td>553 acres</td>
</tr>
</tbody>
</table>

**ALTERNATIVE 1 (NO-Action)**

**Direct, Indirect, and Cumulative Effects**
Alternative 1 does not propose any fuels treatments. Therefore, no direct, indirect, or cumulative effects to soils would result from Alternative 1. Should Alternative 1 be selected, there would be no reduction in fuel loads within the project area through management activities. As a result, there would be a greater risk of indirect effects caused by high intensity wildfire and greater potential for damaging soil heating (Keane et al 2002). The potential effects include alteration of soil structure, impacts to soil invertebrates, reduced nitrogen, and loss of soluble nutrients (Kuennen 2000). However, past experience with wildfires on the KNF indicate that there is a very low risk of these effects even with high intensity fire.

**ALTERNATIVE 2 (Action Alternative)**

**Direct and Indirect Effects**
Alternative 2 includes: 1) 155 acres proposed underburn to remove fuels; 229 acres slashing and underburn of natural fuels; 3) 101 acres machine piling of fuel materials; and 4) 68 acres fuel material hand piling for a total of 553 acres of fuel reduction. Of these activities it is expected that equipment will only be involved in the 101 acres of proposed fuel reduction activities while the remaining 452 acres will not involve machinery activities and therefore be less consequential on soil impacts. Large wood would be retained on site to levels specified to each unit in the design features (refer to Table 3-67).

The burning prescriptions under Alternative 2 were designed to provide only the fire intensity needed to achieve the vegetative management objectives. Direct effects from underburning can result in soil heating and associated soil impacts such as loss of organic matter, impacts to soil organisms, and creation of water repellency. The potential for these impacts are minimized because the burning prescriptions for this project were designed for low to moderate fire intensity and would be implemented when soil moisture levels were high. Typically, burning is scheduled when the soil moisture in the lower duff layers is high enough so that the fire does not consume those layers, which insulate the soil from surface heating (DeBano 2000). Burn intensity would not reach the levels associated with nutrient loss through volatilization. Nutrients would be released from burned materials and made available for new vegetation.
Under proposed Alternative 2 a considerable amount of the limb material will be taken to landings in proposed tractor logging units. Such material will be left up to a year in slash piles prior to slash pile burning should the opportunity arise to do this work. During that period the needles from the limbs will have time to release a considerable amount of nutrients into the soils. Slash piles will result in a nutrient flush from slashing/prescribed fire activities. For those units which are to be skyline harvested a larger amount of limb material will remain in place within the harvested units. The benefits of this are both related to nutrients and coarse woody debris retention. If harvest occurs by tractor remaining materials will dominantly consist of excavator piled and jackpot burned activity. If post-harvest burning does not occur until approximately 6 months following harvest activities a large portion of the nutrients contained in the needles will have had time to release nutrients back into the soil.

Although a small portion of the nutrients would be indirectly lost through leaching, most of the nutrients would cumulatively remain attached to or between soil particles on site. The reintroduction of fire to the Activity Area is consistent with the ecological understanding of these forest types (Arno 1996). Positive impacts may result in the short-term (1 to 2 years) increase in plant-available nutrients (Choromanska and Deluca 2001; Hart et al 2005; Certini 2005). Additionally, light to moderate fire effects may maintain higher nutrient availability in the long-term with the positive influences from charcoal. Overall the proposed fuels treatments are not expected to detrimentally affect soil productivity in the Analysis Area. This is supported by past Forest Soil Productivity Monitoring results (refer to the Soil Project File).

**Cumulative Effects of the Action Alternative**

Under proposed Alternative 2 there is an anticipated cumulative reduction in the fuels volume within the planning area. This reduction is anticipated to benefit soil productivity by opening up the stand for replacement of the dead or dying trees and reducing fuel concentration in the stands. By reducing fuel concentration the potential of stand removal by fires is decreased not only within the planning area but in adjacent timber stands to which fires could spread.

**Nutrient Cycling**

Forest ecosystems have evolved with a continual flux of coarse woody debris (CWD). 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 et al. 1994; Brown et al. 2003). CWD performs many physical, chemical, and biological functions in the forest ecosystems. Physically it protects the forest floor and mineral soil from erosion and mechanical disturbances. CWD disrupts airflow and provides shade, which insulates and protects new forest growth and also has significant water holding capacity, making it an important source of moisture for vegetation during dry periods. This decaying woody debris provides nutrients, especially sulfur, phosphorus, and nitrogen, necessary for new plant growth. CWD also hosts ectomycorrhize, micro-organisms that play an important role in the uptake of nutrients and water by woody plants (Graham et al. 1994).

The importance of soil organic matter (duff layer) is indispensable to productivity and the ecological function of soils (Brady and Weil 2002). This organic component contains a large reserve of nutrients and carbon, and typically includes the majority of microbial activity within the soil column. Forest soil organic matter influences many critical ecosystem processes such as the formation of soil structure, which in turn influences soil water infiltration rates and soil water holding capacity. Soil organic matter is also the primary location of nutrient recycling and humus formation, which enhances soil cation exchange and overall fertility.
The removal of trees from a site can cause temporary nutrient deficits that negatively affect physical and biological soil conditions. To avoid this, it is important to maintain both fine and coarse woody debris (CWD) at all managed sites. Allowing the accumulation and decomposition of a range of sizes of woody debris maintains both short-term and long-term soil productivity (Graham et al. 1994; Brown et al. 2003). The different decomposition rates provide for the slow, continual release of nutrients.

**ALTERNATIVE 1 (NO-Action)**

**Direct, Indirect, and Cumulative Effects**

Alternative 1 does not propose any new management activities. Therefore, no direct, indirect, or cumulative effects to nutrient cycling would result from Alternative 1. Nutrient cycling would continue at present rates until a natural disturbance occurs.

**ALTERNATIVE 2 (Action Alternative)**

**Direct and Indirect Effects**

A direct impact from management activities in Alternative 2 would be the removal of woody material from proposed timber harvest units. The removal of all or most of the organic material (both duff layers and CWD) from a site can cause temporary nutrient deficits that may affect physical and biological soil conditions (Brady and Weil 2002; Graham et al. 1994; Brown et al. 2003). To avoid this, it is important to maintain both fine and CWD on managed sites, especially regeneration harvest units where most of the organic matter is removed (Graham et al. 1994; Brown et al. 2003). Allowing the accumulation and decomposition of a range of sizes of woody debris maintains both short-term and long-term soil productivity. The different decomposition rates provide for the slow, continual release of nutrients.

This project was designed to provide for a continuous supply of woody material based on recommendations from Graham et al (1994) and Brown et al (2003). In harvest stands, where more of the overstory is being removed, each activity area has been assigned a habitat-specific retention level for CWD (Table 3-67). In underburn with mechanical treatment and pre-commercial thin harvest units, post-harvest stands would remain fully stocked, which would provide for yearly nutrient inputs through litter fall (Brady and Weil 2002) and long-term CWD as a result of future blow-down and decadence. Therefore, these units need less CWD left on the ground post-activity (Table 3-67). It should be noted that currently under the KNF Forest Plan the required CWD tons per acre to be retained only applies to regeneration harvest activities. In stand improvement units such as commercial thins future CWD is expected to result from natural events such as blow-over, root rot, and beetle kill.

Table 3-67. Recommended Levels of CWD (> 3' diameter) for Proposed Timber Treatment Units

<table>
<thead>
<tr>
<th>BIOPHYSICAL SETTING</th>
<th>TONS ACRE</th>
<th>UNIT(S)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm Dry</td>
<td>7-13</td>
<td>1, 2, 9, and portions of 12A</td>
</tr>
<tr>
<td>Warm Moist/Cool Moist</td>
<td>15-32</td>
<td>Portions of 12A</td>
</tr>
</tbody>
</table>
*Some units may be listed under more than one Forest Type based on multiple habitat types being present in the unit.

^It should be noted that VRU CWD values should be looked at as a local estimation and are dependent on local precipitation levels and vary across the KNF from north to south.

Coarse wood provides micro-sites for microbial activity, retains carbon on-site, and moderates soil moisture (Graham et al 1994; Brown et al 2003). Alternative 2 proposes the removal of vegetation through timber harvest and burning. Soil productivity would be maintained through retention of CWD at levels recommended in Graham et al (1994) and Brown et al (2003). Maintaining CWD at the levels identified in these guidelines would ensure that both short-term and long-term soil productivity is maintained. Therefore, implementation of the action alternative is not expected to adversely impact nutrient cycling in the Analysis Area.

**Cumulative Effects**

Cumulative effects are the result of all the impacts that past, current, and reasonably foreseeable activities have on a resource. Direct, indirect, and cumulative effects on soils are measured within each activity area although adjacent land outside the activity areas is considered as well, primarily in regards to slope stability. A summary of activities are listed in Chapter 1 of the EA. The results of past activities have resulted in the “Existing Condition” described above. The anticipated effects from proposed activities were then added to the existing condition and described in the section titled “Direct and Indirect Effects.” The sum of the existing condition (including past actions) and the direct and indirect effects of proposed actions combined with current and reasonably foreseeable actions result in the cumulative effects described in this section.

The spatial scale or geographic bounds for consideration of cumulative effects consists of the same activity areas analyzed used in existing condition, direct, and indirect effects. This is appropriate because soil productivity is spatially static and productivity in one location does not affect productivity in another location. The activity areas are delineated as directed by Forest Service Manual R-1 Supplement No. 2500-99-1.

The temporal scale of cumulative effects is dependent on the 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, and even decades. This is complicated by data constraints that require constant monitoring to detect change – though data is 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 actions and the observed effect. This is particularly true for Soils. 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 abilities.

**Current Verses Historic Management Practices**

There are marked differences between past and current land management practices and policies. The evolution that has taken place with regard to land management practices is the result of science, technology, ongoing monitoring actions, and changing public values. The earliest harvest methods involved harvesting the biggest, most valuable trees and leaving the other trees on-site. Harvest methods in the 1960s, 1970s and 1980s focused primarily on providing low-cost wood products. Logging systems were selected primarily by the least expensive method to transport trees from the forests to the mill. Tractor skidding was typically used and trails and landings were not minimized. Harvest on slopes, at times, involved stair-
step excavated trails (i.e. jammer roads). In addition to harvest activities, fuels reduction and site preparation for natural regeneration or planting on earlier dates involved dozer piling. Many of these practices led to excess soil disturbance and involved the risk of erosion.

Over the last twenty years, impacts to soil and water resources from logging activities have been reduced because of Best Management Practices (BMPs), the Inland Native Fish Strategy (INFS), and changes in science, technology, etc. Based on research studies, current BMPs and INFS riparian habitat conservation areas (RHCAs) can reduce sediment delivery to streams compared with historical practices (USDA Forest Service 1995). Harvest methods and removal of timber products from the national forest changed substantially over time. Modern timber harvest prescriptions and design emphasize desired conditions of the forest after timber harvest. This often results in the retention of various amounts of trees in a post-harvest stand to address objectives that may include seed production, shelter for the site, watershed objectives, soil productivity, wildlife, and others. Elements of modern harvest prescriptions that address specific resource concerns include retention of snags and down wood for soil nutrition, minimizing the number of skid trails, and maintaining sediment filtering vegetation in riparian areas near lakes and streams. Jammer roads and dozer piling rarely occur. Forest BMPs currently incorporated into timber harvest activities include (refer to the BMP document in the Soil and Water Project File):

- Reduce impacts to sensitive soils based on season of operations or equipment use
- Use excavator for mechanized slash piling and fire line construction
- Operate equipment over slash mat where feasible
- Limit logging to dry conditions (less than 18% soil moisture) or during winter when the ground is frozen
- Use existing skid trails and landings where feasible
- Avoid skidding on unstable slopes and slopes that exceed 40% unless not causing excessive erosion (State of Montana BMPs Section IV.B)
- Rehabilitate, scarify, re-seed, and waterbar project areas deemed necessary upon completion
- Space skid trails 75 to 125 feet apart
- Ensure that enough coarse woody debris is left to sustain long term soil productivity while still meeting fuel reduction objectives
- Removal of slash to landing using whole tree yarding
- Use excavators instead of dozers for slash piling
- Reduce erosion and sedimentation through timber harvest unit design
- Exclude RHCAs from harvest and equipment entry
- Limit operation during high soil moisture conditions
- Determining the proper log retrieval system for the timber harvest unit slope to protect from degradation of water quality or soil productivity
- Light intensity burns following harvest operations

In 1995, the forest plan was amended to include INFS management direction (USDA Forest Service 1995). The implementation of INFS gave greater protection to soil and water resources in riparian areas adjacent to streams, lakes, and wetlands. INFS gives riparian dependent resources priority over other resources in RHCAs. RHCAs are not “lock out” zones, activities that occur in them either benefit the riparian area and associated aquatic features or, at a minimum, not slow the rate of recovery within the riparian area.
Ongoing And Reasonably Foreseeable Actions
In the following discussion, the effects of past, current, and/or reasonably foreseeable activities are considered cumulatively with activities proposed with this project. The effects were either described as not contributing effects, contributing indiscernible effects, or having a measurable effect on soil resources.

Vegetation Management
There is the potential for approximately 94 acres of regeneration harvest and approximately 162 acres of intermediate harvest with the proposed action. If harvest authorized by the Forest occurs, soil disturbance would be limited to existing trails, roads, and fire lines. Following harvest activities mitigations would occur where necessary and implemented in order to meet BMPs and INFS guidelines as a procedure to minimize effects on soil resources and meet the R1 guidelines regarding soil compaction. Therefore, only minor additional detrimental soil disturbance is expected within the activity areas.

Fuel Reduction Activities
Approximately 231 acres of natural fuels burning is expected to be implemented in association with the Spring Gulch Activity Area. Light, short-duration burning that does not consume the entire duff layer does not strongly affect soils. Duff acts as an insulator, protecting the soil from excessive heating (Hartford and Frandsen 1992). Effects of this type of burning are generally short-lived (Neary et al 1999). Therefore, burning activities are expected to contribute indiscernible effects to soil and water resources.

DNRC Harvest Activities
Scheduled harvest of State DNRC acres located on the Lolo National Forest will be accessed via Forest Service Road 2241 on the KNF. This Forest Service Road will be accessed by the DNRC through a State-owned gravel pit. This road is currently planned for construction. The use of joint cost share roads within the Spring Gulch Planning Area is related to Northern Region Road Right of Way Construction and Use Agreement of January 13, 2003 (refer to Water Resource Report for a more in-depth discussion).

Blowdown Salvage
It is expected that there would be salvage of blown-down trees within the Analysis Area. Treatment acres are not expected to exceed individual tree selection per year over the next 10 years and activities would follow the 1998 Forest-wide Blowdown Salvage DN/FONSI direction. As a result, soil disturbance would be limited to existing trails, roads, and fire lines. Therefore, no additional detrimental soil disturbance is expected within the activity areas. Some of the salvage is likely to occur outside of the units treated under the selected alternative; therefore, any such impacts would not be additive activity areas analyzed in this decision.

Pre-commercial Thinning
Pre-commercial thinning is an ongoing and reasonably foreseeable activity. It is expected that 68 acres would be thinned within the Analysis Area over the next five years. Ongoing and reasonably foreseeable pre-commercial thinning activities within the Analysis Area would contribute indiscernible effects to soils within the Analysis Area. This is because pre-commercial thinning is done by hand and there is no additional ground disturbance. In addition, trees removed during thinning projects are left on-site.
Christmas Tree Boughs
Christmas trees/boughs can be harvested for individual use or commercially on National Forest land. Each of these activities requires a permit. These activities are both current and reasonably foreseeable within the Analysis Area over the next ten years. This activity does not create additional ground disturbance or remove enough vegetation to affect soil productivity and therefore would not contribute additional effects to soil resources.

No heavy equipment is associated with any post-harvest tree planting. Tree planting does not create detrimental soil disturbance or increase sedimentation rates. Therefore, tree planting would not contribute additional effects to soil resources.

Personal Firewood Collection
It is expected that personal firewood collection will occur throughout the Project Area. This activity is not expected to create additional ground disturbance or remove enough vegetation to affect soil productivity and therefore would not contribute additional effects to soil resources.

Road Management
Routine road reconstruction work would occur on the main haul routes and consist of reconditioning ditches, drainage structures, shoulders, roadbeds, and aggregate surfaces. Under Alternative 2, approximately 8.8 miles of road reconstruction of permanent roads is scheduled to occur on FS Roads 2241, 38123, and 2771 on the Kootenai NF. A special use permit will be required to haul on State-owned lands which involve FS Road 2241. The use of joint cost share roads within the Spring Gulch Planning Area is related to Northern Region Road Right of Way Construction and Use Agreement of January 13, 2003 (refer to Water Resource Report for a more in-depth discussion).

Proposed road re-construction and maintenance may increase short-term sediment movement from road surface runoff initially but should be minimal, especially at road locations higher on the slope that are relatively low gradient and provide for sufficient buffer zones. Road maintenance includes culvert installation, blading, and brushing, and typically improves drainages and decreases erosion from water channeling down the road surface in the long run. The proposed soil restoration within specific units involves the ripping and seeding of landings used by the purchaser of the Spring Gulch timber sale following harvest activity. These types of practices would help offset the harvest activities to soil productivity by allowing previously disturbed soils to re-establish as a productive area capable of producing future natural vegetative cover which in turn may one day be harvested again.

Fire Suppression
Fire suppression activities would occur as needed. Effects from wildfire suppression would vary with location and size of the fire; however suppression activities are expected to follow Forest Plan direction. Suppression of wildfires could have measurable effects to soils within the Analysis Area. These effects could include soil compaction, displacement, and erosion. Due to the unpredictable nature of wildfires, cumulative effects from future wildfire suppression activities could not be meaningfully quantified in this document.

Noxious Weed Treatments
The control of noxious weeds on National Forest land is an ongoing activity that normally occurs within the summer months. The 2007 Kootenai National Forest Invasive Plant Management ROD provides direction for noxious weed control on the District. Noxious weed control is expected to continue over the next ten years.
Soil Resources

Effects of noxious weed control were incorporated into the cumulative effects analysis through consideration of the effects disclosed in the Herbicide Weed Control EA, a review of the project database, and professional judgment and personal knowledge of noxious weed control. The findings of this assessment conclude that ongoing and reasonably foreseeable noxious weed control within the Analysis Area would cumulatively contribute indiscernible effects to the soils resource. The level of noxious weed control within the Analysis Area is not expected to increase much over the next ten years. All activities will follow approved application methods as analyzed in the Kootenai National Forest Invasive Plant Management ROD (2007); therefore no adverse cumulative effects would occur.

Recreation Maintenance
Routine maintenance will occur within the Spring Gulch project area. Maintenance may include brushing; removing blowdown, debris, and hazard trees; repairing or adding waterbars; repairing treads; repairing or replacing signs; and improving vistas. Routine trail maintenance would have no effect on soils in the activity areas identified. Administrative sites and trails do not count toward the 15% standard.

Consistency with Regulatory Framework

STATE AND FEDERAL LAWS AND REGULATIONS
The National Forest Management Act (NFMA) requires that all lands be managed to ensure maintenance of long-term soil productivity, hydrologic function, and ecosystem health. All activities proposed are consistent with this direction. Having a fully stocked stand left on-site to contribute needle-cast and/or trending toward the CWD guidelines contained in Graham et al (1994) and Brown et al (2003) would assure long-term soil productivity. All activity areas would remain below 15 percent detrimentally disturbed soils, RHCAs would be delineated where appropriate, design criteria would be followed, and all applicable BMPs would be implemented.

FOREST PLAN DIRECTION
The Forest Plan states that project plans for activities requiring the use of ground-based equipment will establish standards for the area allocated to skid trails, landings, temporary roads, or similar areas of concentrated equipment use (USDA Forest Service 1987). Forest Service Manual 2500-99-1 establishes guidelines that limit detrimental soil disturbance to no more than 15 percent of an activity area. Forest Plan soil productivity monitoring results were reviewed throughout this project (Kuennen 2007; Kuennen 2003; USDA Forest Service 2003; and USDA Forest Service 1998). The five-year results from 1992-1997 found less than one percent of the acres surveyed following harvest activities exceeded the 15 percent threshold, with 77 percent of the surveyed areas having less than 10 percent disturbance. From 1998-2005, none of the areas surveyed were above the threshold. Such information was used as the basis for soils analysis and specifying design criteria for this project. All proposed activities are expected to remain below the 15 percent threshold. All management activities would follow the BMPs outlined in Soil and Water Project File and would be consistent with Forest Plan Standards. The 2011 KNF Monitoring Summary (USDA Forest Service 2011a) states that monitoring between 1991 and 2011 shows that 95 percent of the BMPs implemented during that time were effective. A study on the KNF was completed in 2012 involving re-sampling of timber units which had previously been monitored between 1992-2006. This data is currently being reviewed to determine if there is a trend in soil recovery curves and what may be some of the key relationships.
The proposed project is consistent with the goals, objectives, and standards for soil and water resources set forth in the Kootenai Forest Plan because project design criteria and BMPs have been included to protect soil and water resources. The BMPs include Soil and Water Conservation Practices at a minimum to control non-point source pollution and protect soil and water resources from permanent damage. None of the proposed harvest units would exceed the Regional Soil Quality Standards for detrimentally disturbed soils.

SCENIC RESOURCES

Regulatory Framework

The Kootenai Forest Plan lists as Goal 14: “Maintain a natural appearing landscape adjacent to major travel corridors, around local communities, and around popular destinations such as campgrounds” (USDA Forest Service, 1987a, II-2). It also sets objectives for Visual Resources: “The visual resource will be inventoried, evaluated, and managed throughout all management activities. Consideration for the visual resource will guide all activities seen from major travel corridors and local communities. Other activities will consider landscape management to a degree dependent on the visual sensitivity of the area and its compatibility with the primary goals of the individual Management Areas” (USDA Forest Service, 1987a, II-5). Standards for each Management Area (MA) list the Visual Quality Objective (VQO) allowed or desired for each MA. Projects are then analyzed to determine the effect on the scenic resource for each MA.

Analysis Area

The area analyzed for potential effects of the activities on Scenic Resources is all National Forest land within the Spring Gulch Project Area which encompasses 796 acres.

Description of Measurement Indicators

The Kootenai National Forest (KNF) visual resources management method was updated in 1995 from the Visual Management System (VMS)(USDA Forest Service, 1974) to the Scenery Management System (SMS). This new system is presented in Landscape Aesthetics, A Handbook for Scenery Management. This system is a tool for “integrating the benefits, values, desires, and preferences regarding aesthetics and scenery for all levels of land management planning” (USDA Forest Service, 1995c). This tool was utilized in the analysis but the ultimate measurement indicators were expressed using the VMS guidelines as defined in the KNF Forest Plan. Desired levels of scenic quality in the KNF Forest Plan are expressed in VMS terminology as Visual Quality Objectives (VQOs). The Forest Plan (USDA Forest Service, 1987a, VI-23) definitions for VQOs described in table 3-68.
Table 3-68. VQO Descriptions.

<table>
<thead>
<tr>
<th>VQO’s-Scenic Integrity objectives</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention (R) – High</td>
<td>Refers to landscapes where the valued landscape character “appears” natural. Changes may be present but must repeat form, line, color, texture and pattern common to the character so completely that they are not evident.</td>
</tr>
<tr>
<td>Partial Retention (PR) - Moderate</td>
<td>Refers to landscapes where the valued landscape character, “appears slightly altered.” Noticeable changes must remain visually subordinate to the landscape character being viewed.</td>
</tr>
<tr>
<td>Modification (M)- Low</td>
<td>Refers to landscapes which “appear moderately altered”. Changes begin to dominate the viewed area, but they borrow attributes such as size, shape, edge effect and the pattern of natural openings. They should be compatible or compliment the landscape character.</td>
</tr>
<tr>
<td>Maximum Modification (MM)</td>
<td>Refers to landscapes which “appear altered”. Changes dominate the viewed area. When viewed as background they must borrow attributes such as size, shape, edge effect and the pattern of natural openings. When viewed as foreground or middleground they may not appear to completely borrow from naturally established form, line, color or texture.</td>
</tr>
</tbody>
</table>

The analysis looks at the existing scenic condition for the portions of the project area with proposed management activities to determine whether or not the existing condition meets Visual Quality Objectives (VQO’s) for the affected Management area (MA). It then addresses how the action would modify the scenic condition and whether or not the resulting landscape would meet the VQO for the same area. The criteria used to evaluate each alternative were the Forest Plan VQO definitions.

Each alternative was evaluated using Visual Nature Studio (v2.53, 3D Nature, LLC) to create photorealistic images of the landscape with the proposed harvest treatments as well as an existing condition with which to compare. Viewpoints chosen for this evaluation were along Highway 200 at: WGS84, 47 46.943, -115 31.283 and 47 44.913, -115 29.229. The project area is in the middleground and background when viewed from these viewpoints.

The Forest Plan direction for Scenic Resources in MAs 10, 11, and 18 provides a range of VQO standards. This leaves the determination of the appropriate VQO as a choice dependent upon the visual significance of the specific area being affected. In MA 5 the VQO is retention. Management should attempt to achieve park like stands of large trees in the immediate foreground and visual diversity characteristic of the vegetation type in the midground; *The Forest Plan (USDA Forest Service, 1987a, VI, pg. III-13).*

**AFFECTED ENVIRONMENT**

**Existing condition**

The major defining ecological event for the vegetation we see today in the project area was the 1910 fire which burned 100% of the project area, resulting in areas of even aged, homogenous appearing stands of Douglas Fir, Western Larch and Lodgepole Pine. Also evident on the
landscape are areas of Ponderosa Pine that survived the 1910 fire event. Fire and the exclusion of fire since the 1940’s have created the vegetation pattern we see in today’s landscape. Due to fire suppression, however, insect and disease outbreaks have become the most common natural disturbance processes modifying the vegetation in today’s landscapes.

The existing natural landscape character of the Spring Gulch study area is in a slightly fragmented state, with 100% of the landscape defined as Moderate or Slightly Altered. Previous management activities, which includes 275 acres of intermediate harvest and 116 acres of regeneration harvest on National Forest lands as well as 150-200 acres of regeneration harvest on adjacent private property, which have contributed to the altered character in the Spring Gulch landscape.

Previous road building from the management activities is evident on the hillside. The results of the management activities have left a mottled appearance with openings that have grown in with small trees and brush. Other natural openings have larger scattered trees.

**Environmental Consequences**

Direct and indirect effects on scenic resources are described below for proposed activities identified in Chapter 2. Cumulative effects were considered for all past, proposed, current, and reasonably foreseeable activities, which are described at the end of this section.

Table 3-69 shows the breakdown of proposed harvest treatment acres by MA.

<table>
<thead>
<tr>
<th>Prescription</th>
<th>MA 5</th>
<th>MA 10</th>
<th>MA 11</th>
<th>MA 18</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regeneration</td>
<td>57</td>
<td>0</td>
<td>37</td>
<td>0</td>
<td>94</td>
</tr>
<tr>
<td>Commercial Thin</td>
<td>41</td>
<td>21</td>
<td>6</td>
<td>76</td>
<td>162</td>
</tr>
<tr>
<td>Natural Fuels</td>
<td>12</td>
<td>111</td>
<td>13</td>
<td>95</td>
<td>231</td>
</tr>
<tr>
<td>Pre Commercial Thin</td>
<td>66</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>66</td>
</tr>
<tr>
<td>Total Acres</td>
<td>182</td>
<td>132</td>
<td>56</td>
<td>171</td>
<td>553</td>
</tr>
</tbody>
</table>

**EFFECTS BY ALTERNATIVE**

**DIRECT AND INDIRECT EFFECTS**

Alternative 1 – No Action

The visual conditions of the area would generally remain as it is. Natural processes such as insects and disease mortality, and wildfire would contribute to the visual landscape. Alternative 1 with no harvest or natural fuels treatment, the fuel loading in the analysis area would, at the least, remain the same and most likely increase. An increase in fuel loading equates to an increase in potential wildfire severity, which could result in a greater visual change than the
proposed units themselves. Root disease and Mountain Pine Beetles would also begin to make a bigger impact on the landscape due to the density of susceptible species like Douglas-fir and lodgepole pine as well as Ponderosa Pine.

**Alternative 2 – Proposed Action**

The Proposed action includes harvest activities using regeneration and commercial thinning prescriptions, as well as one unit of pre-commercial thinning and natural fuels units. The acres of each of the different treatments in the proposed action are listed below in table 3-70.

Table 3-70 shows the number of acres of treatment types by alternative.

**Table 3-70. Acres of treatment by Alternative**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Regeneration</th>
<th>Pre-Commercial Thin</th>
<th>Burn</th>
<th>Commercial Thin</th>
<th>Total Acres Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>94</td>
<td>66</td>
<td>231</td>
<td>162</td>
<td>553</td>
</tr>
</tbody>
</table>

Proposed units that are in areas of moderate to high visual significance will have a variable leave component of Larch, Ponderosa Pine, and Douglas- Fir trees dependent on the unit prescription. Implementation in regeneration units includes irregular edges; burning fuels from harvest activities; and planting to facilitate re-establishment of trees that are more favorable for the site. Short term effects to scenic resources would be a more open appearing landscape and some evidence of harvest and burning activates. Over time these units would blend in with the existing natural and previously created openings and trend towards a more park like setting.

In commercial thinning units, unit design and prescriptions will create irregular edges as well as denser leave pockets within the units. Implementation would also include leaving the larger healthy trees and treating fuels from harvest activities. In the short term the units may appear more open than untreated areas and some harvest related activities, such as skid trails, may be noticeable. In the long term as vegetation regrows, these effects would be unnoticed in the landscape.

Pre-commercial thinning would occur in one unit to reduce the stocking level and promote growth in desired species. In the short term, it is unlikely there would be any change to the scenic resource. Long term, the tree growth would blend into the surround area sooner than if left untreated.

Natural fuels treatments may leave some scorched trees in the short term, but overall these treatments would not have an effect on the scenic resource.

In general, variable leave tree densities and irregular boundaries would be utilized to lessen visual impacts by blending the treatment activities with the molten appearing landscape. Short term impacts may be visible from the viewpoints, but over the long term, the harvest units would blend in to the surrounding landscape. Natural fuels and activity fuels treatments could potentially cause short-term visual effects from scorched or killed trees which would be within the range of acceptability for the VQO’s of the area.
Cumulative Effects Common To All Alternatives

The Montana State Department of Natural Resources and Conservation has on-going harvest activities adjacent to the project area but these are in areas of low visual significance. Privately owned lands have been harvested in the past and there is some expectation there would be activity in the future. These impacts, and the impacts from the proposed activities, would have a cumulative effect on the scenic resource in the short term until vegetation becomes reestablished.

The proposed activities are anticipated to have a short term negative effect but would eventually blend in with existing openings while striving to meet and protect the Forest Plan VQO’s for the long term.

Consistency With Regulatory Framework

The action alternative would be consistent with the Forest Plan for Scenic Resources by maintaining or improving the Scenic Resources in the long term.
See Visual Simulations in project file.
INVENTORIED ROADLESS AREAS

Inventoried Roadless Areas (IRAs) are those areas identified in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000. These are held at the National headquarters of the Forest Service, with any updates, corrections, or revisions.

There are no IRAs within the project analysis area. In the general vicinity there are two IRAs; Cataract IRA#665, and Cube Iron IRA #784. Cataract IRA is 25,440 acres and adjacent to the north boundary of the project area and extents to the Lower Vermilion River drainage. The Cube Iron IRA on the Kootenai National Forest is 600 acres and approximately 4.5 miles southwest from the project area. This portion of the Cube Iron IRA is contiguous with the Cube Iron IRA located on the Lolo National Forest (see Figure 3-22). Neither of the IRAs were recommended for wilderness designation in the 1987 Kootenai National Forest Plan.

Regulatory Framework

The Forest Service has reinstated an interim directive (ID) 1920-2001-1 (issued Dec. 14, 2001, and expired June 14, 2003) for the management of inventoried roadless areas. The reinstated interim directive, now numbered ID 1920-2004-1, is intended to provide guidance for addressing road and timber management activities in inventoried roadless areas until land and resource management plans are amended or revised. The interim directive has been reinstated to the Forest Service Manual (FSM) Chapter 1920, Land Management Planning.

This action reinstates the administrative policy that, until a land management plan is revised or an amendment is adopted that considers their protection and management, inventoried roadless areas shall, as a general rule, be managed to preserve their roadless characteristics. This interim directive also reinstates the reservation of authority to the Chief to make decisions affecting inventoried roadless areas, except in specific circumstances that generally are consistent with the exceptions in the set aside Roadless Area Conservation Rule (Roadless Rule) (36 CFR part 294).

Forest Plan - Current Forest Plan guidance for Management allocations in the Cataract, and Iron Cube IRAs call for offering roadless recreation opportunities.
Figure 3-22. Spring Gulch Project area and Adjacent IRAs

Bounds of Analysis

The lands in the general vicinity of the Spring Gulch project area were included in the analysis discussion in order to address potential effects to the proximity of the project area to IRAs. The
area selected for analysis is of a scale suitable for the recognition of cumulative effects on the resource.

Affected Environment

Cataract and Iron Cube IRAs are located outside of the project boundary therefore, no special features would be affected. There would be no change in boundaries. There are no activities proposed which would affect any future consideration of the IRAs for potential wilderness designation.

Analysis Methods

FSM 1923 directs evaluation of inventoried roadless areas for recommendation as potential wilderness. The inventory criteria are described in FSH 1909.12 (72.1). The capability of a potential wilderness is the degree to which that area contains the basic characteristics that make it suitable for wilderness recommendation.

Activities that could affect or have affected potential wilderness attributes (Table 3-71) of the IRAs are analyzed. Generally, those activities include miles of road, and acres of timber harvest or ecosystem burning. The analysis covers the next 5-10 years for direct, indirect, and cumulative effects.

Table 3-71: Wilderness Attributes and Descriptions

<table>
<thead>
<tr>
<th>Wilderness Attributes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Integrity</td>
<td>The extent to which long-term ecological processes are intact and operating. Impacts to natural integrity are measure by the presence and magnitude of human-induced changes such as physical development (e.g. roads, utility and railroad rights-of-way, fences, lookouts, and cabins), recreation developments, domestic livestock grazing, mineral developments, wildlife/fisheries management activities, vegetative manipulation, and fire-suppression activities. Such developments are scaled as to their presence, effect on natural integrity, size of area impacted, potential separability from the rest of the area, duration of impact if uncorrected, and feasibility of correcting.</td>
</tr>
<tr>
<td>Apparent Naturalness</td>
<td>Degree that the environment looks “natural” to most people using the area. It is a measure of the importance of visitors’ perceptions of human impacts to the area.</td>
</tr>
<tr>
<td>Remoteness</td>
<td>A perceived condition of being secluded, inaccessible, and out of the way. The physical factors, which can contribute to “remote” settings, include topography, vegetative screening, distance from human impacts such as roads and logging operations, and difficulty of travel. A user’s sense of remoteness is also influenced by the presence or absence of roads, their condition, and whether they are open to motorized vehicles.</td>
</tr>
<tr>
<td>Solitude</td>
<td>A subjective value defined as “isolation from the sights, sounds, and presence of others, and the developments of man.”</td>
</tr>
<tr>
<td>Special Features</td>
<td>Unique geological, ecological, cultural, or scenic features which may be located in roadless areas. Unique fish and wildlife species, plants or plant communities, potential Research Natural Areas, outstanding landscape features such as rock formations, and significant cultural resource sites are some of the items that</td>
</tr>
</tbody>
</table>
Environmental Consequences

Direct and Indirect Effects
The Spring Gulch project does not include proposed management activities in either of the IRAs. Direct and indirect effects may include sights and sounds from harvest activities, but these would be short term and likely go un-noticed due the topography and location of the IRAs. Long term there would be no effects to the wilderness attributes or roadless characteristics of these areas.

Special features would not be affected. There would be no change in boundaries. There are no activities proposed which would affect future consideration of the IRAs for potential wilderness designation.

Cumulative Effects
The Past, Current, and Reasonably Foreseeable Actions listed in Table 3-1 were considered for cumulative effects. Past harvest units and roads can be found within the Cataract IRA, but no activities are proposed in the IRAs under either of the alternatives. Harvest activities and future development on State and private lands will continue. Cumulatively, the past, current, and reasonably foreseeable actions would not have an effect on the existing IRAs.

Regulatory Consistency
Forest Plan
All Alternatives are consistent with the Forest Plan standard that calls for providing semi-primitive or roadless recreation opportunities. All alternatives are consistent with current national interim direction on managing roadless areas.
UNROADED AREAS

Introduction
During scoping concerns were raised about unroaded areas located outside of Inventoried Roadless Areas (IRAs). Two separate areas outside of IRA’s were identified within the Spring Gulch project area which do not contain National Forest System roads. The two areas combined are 456 acres and are divided by an open forest system road and adjacent to the Cataract IRA. No road construction proposed. Vegetation management (including prescribed fire) and ecosystem burning is proposed in both areas under Alternatives 2.

Regulatory Framework

Forest Plan
Complete management direction for these two areas is located in Management Area prescriptions (MA) found in the Kootenai National Forest Plan (Project file). Current MA prescriptions for these areas, where vegetation management is proposed, would occur in MAs 10 and 18. These MAs are unsuitable for timber production, but timber harvest may take place for other benefits such as preventing the spread of insects or disease to adjacent MAs and/or for wildlife habitat maintenance or enhancement. Prescribed fire and ecosystem burning in these areas is proposed in MAs 10, 11, and 18, and is allowed to treat fuels and enhance wildlife forage.

There are no Forest Service regulations or laws that prohibit development of National Forest System lands in areas where the Forest Plan allows such use. These areas are not located within or adjacent to a wilderness area, wilderness study area, National Recreation Area, or research natural area. They are adjacent to the Cataract IRA.

Bounds of Analysis
The lands in the general vicinity of Spring Gulch project area were included in the analysis discussion in order to address potential effects to the contiguous unroaded area and proximity of the project area to the Cataract IRA. Spring Gulch project area is located on the east side of the Clark Fork valley, and includes Spring Creek which drains into the Noxon Reservoir. It is bounded on the west by private and state lands, the south by the Lolo National Forest, and the north by Kootenai National Forest. The entire project area is located on the Cabinet Ranger District.

Although the areas are not designated as wilderness or located within an Inventoried Roadless Area, in response to public comments, the effects of the Spring Gulch Project on these two areas will be assessed using the wilderness attributes identified in FSH 1909.12 and the 1964 Wilderness Act. In addition, Forest Service Manual 1923 directs evaluation of inventoried roadless areas for recommendation as potential wilderness. The capability of a potential wilderness is the degree to which that area contains the basic characteristics that make it suitable for wilderness recommendation.
Analysis Methods

To provide clarity for this analysis, Table 3-72 provides a crosswalk between the wilderness attributes identified in Forest Service Handbook 1909.12, the 1964 Wilderness Act; and the roadless area characteristics defined in the 2001 Roadless Area Conservation Rule (36 CFR Subpart B 294.11).

The Wilderness Act of 1964 defines wilderness as “as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geographical, or other features of scientific, educational, scenic, or historical value.”

Table 3-72. Crosswalk between Wilderness Attributes\(^1\) and Roadless Area Characteristics\(^2\)

<table>
<thead>
<tr>
<th>Wilderness Attributes</th>
<th>Roadless Area Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural</strong></td>
<td>• High quality or undisturbed soil, water, and air;</td>
</tr>
<tr>
<td>(ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature)</td>
<td>• Sources of public drinking water:</td>
</tr>
<tr>
<td></td>
<td>• Diversity of plant and animal communities;</td>
</tr>
<tr>
<td></td>
<td>• Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land;</td>
</tr>
<tr>
<td></td>
<td>• Reference landscapes</td>
</tr>
<tr>
<td><strong>Undeveloped</strong></td>
<td>Natural appearing landscapes with high scenic quality</td>
</tr>
<tr>
<td>(degree to which the area is without permanent improvements or human habitation)</td>
<td></td>
</tr>
<tr>
<td><strong>Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation</strong></td>
<td>Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation</td>
</tr>
<tr>
<td>• <strong>Solitude</strong>: opportunity to experience isolation from the sights, sounds, and presence of others from the developments and evidence of humans</td>
<td></td>
</tr>
<tr>
<td>• <strong>Primitive and unconfined recreation</strong>: opportunity to experience isolation from the evidence of humans, to feel a part of nature, to have a vastness of scale, and a degree of challenge and risk while</td>
<td></td>
</tr>
</tbody>
</table>
Unroaded Areas

<table>
<thead>
<tr>
<th>Wilderness Attributes</th>
<th>Roadless Area Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>using outdoor skills.</td>
<td></td>
</tr>
</tbody>
</table>

**Special Features and Values**
(capability of the area to provide other values such as those with geologic, scientific, educational, scenic, historical, or cultural significance)

- Traditional cultural properties and sacred sites; and
- Other locally identified unique characteristics.

**Manageability**
(the ability of the Forest Service to manage an area to meet size criteria and the elements of wilderness)

No criteria

---

1 Wilderness attributes identified in Forest Service Handbook 1909.12, Chapter 70 that describe the basic characteristics that make an area suitable for wilderness recommendation. These principal wilderness characteristics originate from the definition of wilderness in the 1964 Wilderness Act.

2 Roadless area characteristics defined in the 2001 Roadless Area Conservation Rule (36 CFR Subpart B 294.11)

**Affected Environment**

**Background**

The major defining ecological event for the vegetative landscape we see today in the project area was the 1910 fire which burned 100% of the project area, resulting in large areas of even aged, homogenous appearing stands of Douglas Fir, Western Larch and Lodgepole Pine. Fire and the exclusion of fire since the 1940’s have created the vegetation pattern we see in today’s landscape. Due to fire suppression, however, insect and disease outbreaks have become the most common natural disturbance processes modifying today’s vegetation. The existing natural landscape character of the Spring Gulch study area is in a fragmented state, with 100% of the landscape defined as Moderate or Slightly Altered. Previous management activities such as historical mine sites, timber harvest, and associated roads on National Forest lands as well as on adjacent private and State property, have contributed to the altered character in the Spring Gulch landscape.

**Unroaded areas**

The unroaded areas are located on the north side of the Spring Gulch project area and divided by an open NF system road (FSR #2241). Together they encompass approximately 456 acres. The northeast area is approximately 208 acres and nearly surrounded by roads. Except for the open road dividing the two areas, these roads are closed by a gate or berm. The southwest area is approximately 248 acres and has open roads on three sides. The north edge of this area is contiguous to the Cataract IRA along the ridge line.

In general, the unroaded areas are bound south, east, and west by extensive road systems that were previously used for timber harvest with some open main arterials providing access to the IRA boundary and other areas for forest administration and public recreation. Private and State
lands border the west side of the project area and contain several year round residences. The east side of the project area is bordered by the Kootenai and Lolo NFs.

Forest Plan MA prescriptions for the Spring Gulch project area.

The current Forest Plan MA prescriptions summarized below provide land management direction within the unroaded area in the Spring Gulch project area. Treatments proposed in Alt. 2 for the unroaded areas are commercial thin prescriptions. Unit 6 is 12 acres in MA 10 and 1 acre in MA 18. Unit 14 is 9 acres in MA 10. Forest Plan direction allows for treatments to enhance wildlife forage. Natural Fuels units 300 (122 acres) and 301 (94 acres) are in MAs 10, 11, and 18, and is allowed to treat fuels and enhance wildlife forage.

- **MA 10** designation is nonwilderness (some development) and is managed for big game winter habitat. Planned ignitions are acceptable. This MA standard for recreation includes limited motorized access; ROS class predominantly roaded-natural and semi-primitive motorized and some semi-non-motorized recreation; and VQO is maximum modification in areas of low viewing significance to partial retention in areas of high viewing significance.

- **MA 11** designation is non-wilderness (developed) and is characterized by suitable timber producing sites and the goal is to maintain or enhance winter big-game habitat and produce a programmed yield of timber. Planned ignitions are acceptable. Recreation standards for this MA include some restrictions for OHV use when in conflict with winter big-game habitat. The ROS class varies throughout the MA from semi-primitive non-motorized to roaded-natural. The Visual Quality Objective (VQO) is maximum modification in areas of low viewing significance to partial retention in areas of high viewing significance.

- **MA 18** designation is non-wilderness (some development) and is characterized by unsuitable timber producing sites and the goal is to maintain native wildlife. Planned ignitions are acceptable. Recreation standards for this MA include some restriction for motorized use. The ROS class varies from semi-non-motorized to roaded-natural recreation. The Visual Quality Objective (VQO) is maximum modification in areas of low viewing significance to partial retention in areas of high viewing significance.

Environmental Consequences

Direct and Indirect Effects of Alternative 1 – No Action

Alternative 1 does not propose management activities in the Spring Gulch project area and therefore there is no direct effect that would change the potential of the unroaded areas for designation as IRA. Indirect effects would include an increased potential for wildfire in the unroaded areas as fuels would continue to accumulate. Severe wildfires could cause changes to soil and water, diversity of habitat for plant and animal communities, as well as impacts to scenic quality and recreation. Loss or degradation of these qualities does not preclude designation for IRA as wildfire is a natural event. Other indirect effects could include increased development of State and private lands adjacent to the project area that would farther decrease the value of wilderness attributes such as solitude and remoteness.
Considering the current conditions of these unroaded areas, and the attributes and characteristics described in the Wilderness Act and RAC FEIS and summarized in the above table, the potential for designation as an addition to the Cataract IRA would be low.

**Direct and Indirect Effects of Alternative 2**

No new road or temporary road would be constructed within the unroaded areas. Timber harvest and related fuels work would occur on approximately 21 acres and 215 acres of natural fuels burning would occur within the current unroaded areas. Prescription for timber harvest is to thin the harvest units to reduce tree density and create a more park like setting. In the short term, evidence of harvest activities would be evident until the vegetation recovers. Long term effects from Harvest activity would be the reduced tree density, enhanced wildlife forage and a trend of the scenic resource towards desired conditions of a park like setting.

Effects of natural fuels treatment may be the short term scorching of some trees and shrubs, and smoke during burning. Long term, the fuels would be reduced and new vegetation regrowth would enhance the wildlife forage.

The overall unroaded acreage of these areas would not change. Indirect effects to the unroaded areas would be the addition of effects from other treatment units in Alt 2. Other activity units in the project would be seen from the unroaded areas, but in the long term these units would blend in with the surrounded landscape and be unnoticed to any measurable degree.

The potential for designation as an addition to the Cataract IRA would continue to be low. Treatments scheduled in Alt. 2 would have little effect on the low rating for potential consideration as an area for addition to the Cataract IRA.

**Cumulative Effects**

The Past, Current and Reasonably Foreseeable Actions listed in Chapter 3, Table 3-1 were considered for cumulative effects.

Cumulatively, past road building and timber harvest on federal lands has reduced the unroaded areas to their current size and shape. Old timber harvest units have also modified the scenic quality and natural integrity of the unroaded areas, but these past activities do not preclude consideration of designation. Soil, water, and air in the unroaded areas may have been disturbed with historic mining, but mining is not currently occurring and is unlikely in the foreseeable future.

Road building and timber harvest on State and private land is ongoing and will likely continue into the future in the vicinity on Spring Gulch. The Forest Service has ongoing road maintenance, tree improvement projects, monitoring, and other management activities occurring in the Spring Gulch Area.

The unroaded areas provide for a semi-primitive non-motorized class of dispersed recreation with some semi-primitive motorized and rural opportunities adjacent to the unroaded areas. These recreational opportunities are on-going and there are no foreseeable changes.
Regulatory Consistency

Forest Plan
Forest Plan management allocations for this unroaded area are MA 5, 10, 11, and MA 18. As summarized above, these MA allocations are classified as non-wilderness and focus on visual resources, big game habitat, and timber production. The alternatives are consistent with this direction for the unroaded area.

This report analyzed the effects on the potential future designation of the unroaded areas in the Spring Gulch Project area as an IRA. Implementing Alt 2 would not pose a significant change on the consideration for future designation, but the direct, indirect, and cumulative effects, size, and location make this unroaded area unlikely for future designation.

OTHER RESOURCES

Introduction
This section looks at other resource areas including recreation, minerals, range, and special uses.

Regulatory Framework

Guidance for these resources can be found in the Kootenai Forest Plan. In general, the Plan calls for providing for recreational opportunities while minimizing impacts to wildlife, allowing responsible development of mineral resources, meeting domestic livestock grazing needs where feasible, and providing for legitimate special needs on National Forest land.

Bounds of Analysis

The Spring Gulch project area was chosen for the bounds of analysis discussion. The area selected for analysis is of a scale suitable for the recognition of cumulative effects on the resource.

Affected Environment

Recreation
Recreational use in the Spring Gulch project area includes but is not limited to hunting, camping, hiking, some snowmobiling, sightseeing, and huckleberry picking. There are no developed recreation sites in the Spring Gulch project area, but camping occurs at a limited number of dispersed sites. There are no designated recreational trails in the Spring Gulch Project area.

Roads that are currently open to motorized travel facilitate the majority of the recreational use. Huckleberry picking, firewood gathering, driving for pleasure, and most camping activities are directly tied to roads with motorized access. Hiking and hunting are not as dependent on motorized access; however open roads are important for providing initial access for these pursuits.
Dispersed recreation use is generally light except during the general hunting season. Most dispersed camping areas are in use during the general hunting season. Hunting outfitter use is moderate, but no outfitter camps are authorized in the project area. Use during the first two weeks of the general hunting season could be categorized as moderate to heavy. Big game hunting is important economically to the local community and the State. It is also important socially as a family tradition, for providing meat, and as a form of recreation.

**Range**
No livestock grazing is currently authorized in the project area, primarily because of the lack of suitable range and available forage.

**Minerals**
Mineral exploration historical took place at several locations in the Spring Creek and Bear Creek areas. There are several historic mining locations in the project area, which have been identified and recorded. As of February 2010, there were no known active unpatented mineral claims in the project area. There are no patented claims within the project area. There is an existing rock quarry near the boundary with State lands on the Lolo NF, but there is has been little or no use of this pit.

**Special Uses**
There are no special uses permits in the project area. There is one water transmission system near the project boundary, which is administered by the Lolo NF.

**ANALYSIS METHODS**
The Recreational Opportunity Spectrum (ROS) is used to describe settings and recreational opportunities associated with each setting (Table 3-73). The setting and opportunities often overlap and intermix. The ROS is used as a guideline to help managers and users describe these recreational activities. ROS classes for the project area includes Roaded Natural (RN) and Roaded Modified (RM) settings. RN and RM areas are generally within ½ mile of a road. ROS provides a framework of settings and experiences in each class (ROS Book - 1986).

Measurement indicators of effects to recreation include changes in how lands are categorized within the Recreational Opportunity Spectrum, changes in miles of road available for motorized access, and miles of trail affected by harvesting, road building, or prescribed fire. Effects to special uses are measured by the number and type of use that could be affected. Effects to the range resource are measured by qualitative change in forage values, and minerals effects are measured by the number of mineral claims that would be affected by activities. The analysis covers the next 5-10 years for direct and indirect effects, and in addition, known past activities for cumulative effects (Table 3-1).
Table 3-73  Recreation Opportunity Spectrum

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>SEMI-PRIMITIVE NON-MOTORIZED RECREATION</th>
<th>SEMI-PRIMITIVE MOTORIZED RECREATION</th>
<th>ROADED NATURAL</th>
<th>ROADED MODIFIED</th>
<th>RURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction between Users</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Little evidence or interaction of camp sites</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>Evidence of Other Users</td>
<td>Some</td>
<td>Predominately natural appearing environment</td>
<td>Mostly natural appearing</td>
<td>Substantially modified environment</td>
<td>Agricultural</td>
</tr>
<tr>
<td>Access and Travel</td>
<td>Non-motorized trails &amp; primitive roads</td>
<td>Motorized, involves challenge and risk</td>
<td>Little challenge and risk. Conventiona l motorized access.</td>
<td>Roads may be evident but generally have restricted access.</td>
<td>Well roaded</td>
</tr>
<tr>
<td>Vegetation Alterations</td>
<td>Widely dispersed, not evident</td>
<td>Small &amp; widely dispersed.</td>
<td>Maintain desired visual &amp; recreational characteristics</td>
<td>Slash &amp; debris may be evident.</td>
<td>Agricultural in nature</td>
</tr>
<tr>
<td>Interpretation Guides</td>
<td>Self-discovery, maps, brochures &amp; guidebooks</td>
<td>Very limited on-site facilities, maps, guidebooks &amp; brochures</td>
<td>Simple wayside exhibits</td>
<td>Simple wayside signs.</td>
<td>Directional signs</td>
</tr>
</tbody>
</table>

Environmental Consequences

Direct and Indirect Effects of Alternative 1 – No Action
Natural processes would continue in the Spring Gulch Creek project area. Recreational use and recreational settings in this area are not expected to change with primary use occurring on the roads, and dispersed sites. Recreational use is expected to slowly increase and continue to be
dispersed and varied. Special uses and minerals would not be affected. Forage availability for livestock would slowly continue to decline as vegetation becomes thicker in the absence of timber harvest or ecosystem burning.

**Direct and Indirect Effects of Alternative 2**

The recreational setting, as described in the ROS, would not change to any measurable degree. Road reconstruction and timber harvest would occur in areas that are in roaded natural or roaded modified settings. No new road construction is planned and 8.84 miles of road reconstruction is proposed to meet maintenance and BMP needs.

Opportunities for dispersed recreation would still be available. Road management would not materially change hunting opportunities from the current situation. Over the short term, foot access would be improved in some areas by reconstruction of roads and clearing from timber harvest. Over the long term, foot access on closed or decommissioned roads would decrease as roads or existing road prisms revegetated. General ROS designations would remain unchanged over the short term. Over the long term, road decommissioning in the Spring Gulch Creek drainage could change the area to one of the semi-primitive ROS designations.

Sights and sounds of harvest activities would be apparent to forest visitors over the short term. Recreational users may be temporarily displaced in areas where activities are occurring but these would be short-term effects. There is a potential for recreational drivers to conflict with harvest-related traffic. Upon completion of the harvest activities, recreational use would continue to be varied and dispersed. Burning activities would not affect the recreation opportunities in the area over the long term. Over the short term, dispersed recreation users might avoid areas that have been treated with fire, while some users such as hunters might seek out these areas.

There would be no effects to special uses since there are no special use permits in the project area. There would be no effects to mineral resources as there are no active unpatented or patented mining claims within the project area. Livestock forage values are expected to increase because of prescribed burning and timber harvest, but not to the point where stocking of allotments could be expected.

**Cumulative Effects of Alternative 1**

Past actions in the project area have included timber harvest and associated activities, road building and maintenance (Table 3-1). There would continue to be recreational use of this area. There are no cumulative effects to range, special uses, or minerals.

**Cumulative Effects of Alternatives 2**

There are no reasonably foreseeable actions or activities planned or other ongoing activities that would add to the effects from the action alternatives to recreation, mining, grazing or special uses. No mineral, range, or special uses activities are reasonably foreseeable. Past actions in this area have included timber harvest and associated activities, road construction and maintenance (Table 3-1). There would continue to be recreational use of this area. Recreational use of the area is expected to increase at levels projected in the Forest Plan.
Regulatory Consistency

Forest Plan
All Alternatives are consistent with the Forest Plan standard that states, “All recreation activities and management will be based on the Recreation Opportunity Spectrum (ROS) inventory” (USDA Forest Service, 1987a, II-21). The environmental consequences from the alternatives on the other resources (special uses, range, and minerals) would be consistent with goals, objectives and standards of the Forest Plan.

NOXIOUS WEEDS

Introduction
Invasive noxious weeds are a serious threat on the Kootenai National Forest and they are increasing and expanding their range. (USDA, Forest Service, 2007). Noxious weeds and invasive species are threats to wildlife habitat quality, impact soil and water resources, have substantial economic impacts, and impact species diversity and native plant habitat (Duncan, 1997). The threat of weeds is real; invasive species have been recognized as being second only to land development in the loss of biodiversity (Mantas, 2003). Invasive and noxious weeds are usually associated with disturbance factors, but the reality is that all plant communities are at risk to invasion (Larson et. al.1997).

Regulatory framework
Legally, a noxious weed is any plant designated by a government entity that is injurious to public health, agriculture, recreation, wildlife, or any public or private property. The Forest Service defines noxious weeds as "Those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official". Forest Service Manual (section 2080.5) defines noxious weeds as species that “generally possess one or more of the following characteristics: aggressive and difficult to manage; poisonous; toxic; parasitic; a carrier or host of serious insects or disease; and generally non-native or new to or not common to the United States or parts thereof” (USDA 1995).
Most of the weeds invading U.S. rangelands originated in Europe and Asia and were introduced in the nineteenth century. However, new weed species are introduced continually and they can become successful invaders because they do not have the control agents found in their ecosystem of origin. Thus, they can out-compete the native plant communities (Shely and Petroff, 1999).

The Forest Service Manual directs the National Forests to conform to the Federal Noxious Weed Act of 1974, as amended. Accordingly, Forest Service policy has been enacted for the development and coordination of a noxious weed program for the management and control of noxious weeds. The basic goals for noxious weed management on the Kootenai NF are to comply with Forest Service policy and manage weeds in order to protect forests, rangelands, wildlands, and adjacent farmlands, and to cooperate with private individuals and county and state agencies concerned with managing noxious weeds (USDA Forest Service, 2007).
Noxious Weed Control

The Kootenai NF works under the 2007 Final Environmental Impact Statement, Kootenai National Forest Invasive Plant Management and Record of Decision. In 2001, a weed control program was started on the Cabinet Ranger District when the district obtained a spray truck. The goal of the program is to slow the spread of established weeds along roads (vectors for weed spread/invasion) and to eradicate new invader or 1b category species. Main roads on the Cabinet Ranger District are prioritized and put on a four to five year spray rotation schedule. The main road, FS Rd. #2241 has been treated. This document addresses the environmental consequences of weed infestations and chemical control. The KNF Invasive Plant Mgt. EIS addresses the environmental effects of invasive plant treatments and authorizes control including chemical and biological control.

Bounds of Analysis

The Spring Gulch project area will serve as the geographic area for noxious weeds/invasive species analysis discussion. The entire project area, 796 acres, was selected for discussion of direct, indirect and cumulative effects. The area exhibits invasive species populations and trends common on the Cabinet Ranger District. Areas of potential effects are the harvest treatments, road building, fuel treatments, hauling, and other project activities in the proposed action that would create ground disturbance. The time span for looking at effects of the action alternative is over the next 5 to 10 years.

Analysis Methods and Measurement Indicators

Detrimental disturbance soil acres, calculated from the soils report, were chosen for the measurement indicator. Soil disturbance is one of, if not the most, significant factor contributing to the invasion of noxious weeds and invasive species. Detrimental soil disturbance was chosen as a measurement indicator of the proposed units because it provides an ideal potential habitat for noxious weeds. Detrimental disturbance includes the effects of compaction, displacement, rutting, severe burning, surface erosion, loss of organic matter, and mass soil movement (see Soils analysis disclosure). The “cumulative percentage” was used to calculate detrimental soil disturbance acres for the action alternatives. These acres then were summed up for each action alternative to give a total of detrimentally disturbed soil acres. The cumulative percentage number includes all harvest activities, piling activities, prescribed burning, skid trails, landings, fire lines, and temporary roads.

Existing Condition

Spotted knapweed (*Centaurea maculosa*) and St. Johns-wort (*Hypericum perforatum*) are the most widespread weeds within the project area. These two noxious weed species found on the roads and in the open, drier habitats within the analysis area. Oxeye daisy (*Chrysanthemum leucanthemum*), sulfur cinquefoil (*Potentilla recta*), hawkweeds (*Hieracium spp.*), toadflax (*Linaria spp.*) are also scattered within the analysis area.

Spotted knapweed (*Centaurea maculosa*) is the most widespread weed species in the Spring Gulch project area as well as the Cabinet RD. This perennial forb reproduces almost entirely by seed and forms a soil seedbank. Knapweed seeds are known for their longevity and durability and have the potential to germinate shortly after maturity. Spring and fall seedlings are common. In western Montana, knapweed success increases with site disturbance and soil moisture stress. This species readily occupies disturbed sites but also invades pristine areas.
grassland and open-canopy forest sites (Rice et. al. 1997). Once established, spotted knapweed is able to form monotypic stands because its age class hierarchy allows it to occupy all available niches.

St. John’s-wort, or goatweed (*Hypericum perforatum*) is a perennial herbaceous plant with many flowers. Seed production averages between 15,000-34,000 seeds per plant and the seeds can persist in the seedbank for many years. The species also reproduces asexually. Commonly, it is found in pastures, open grasslands, and disturbed places; populations can be found on all slopes and aspects. In the project area, this species is found on roads and on the open, drier slopes but was also noted scattered about in most inventoried harvest units.

Other known noxious weed or invasive species scattered throughout the project area include Speedwells (*Veronica spp.*), common tansy (*Tanacetum vulgare*), Canada thistle (*Cirsium arvense*), chicory, blueweed (*Echium vulgare*), cheatgrass (*Bromus tectorum*), mullein (*Verbascum thapus*) and common burdock (*Arctium minus*).

**Environmental Consequences**

Direct and indirect effects on noxious weeds are described below for proposed activities identified in Chapter 2. Cumulative effects were considered for all past, proposed, current and reasonably foreseeable activities listed and described in Chapter 3.

**Direct and Indirect Effects of Alternative 1 – No Action**

There would be no ground-disturbing activities, no harvest units, no temporary road construction and no road reconstruction. Weed populations would remain more or less stable and fluctuate annually. Further invasion into relatively pristine areas would continue. Weed populations adjacent to roads would persist, but could be managed with periodic herbicide treatments. The area is a popular destination for hunters, wood cutters, huckleberry pickers, and other visitors. Summer and fall are the primary months of visitor activity. It is likely a new invader noxious weed species or a new invasive species will eventually invade the analysis area. A majority of the project area is not accessible by wheeled vehicles in the winter and spring months because roads are snowed in.

An indirect effect of the No Action or no management alternative is increased fuel accumulation and the concomitant increase or likelihood of wildfires; in particular, intense wildfires. A few generalizations about weed response to wildfires can be made (October 2012, Monthly Weed Post, MSU Extension, Bozeman MT)

- Weeds may increase following fire, but in many cases do not result in long-term persistence.
- As fire severity and frequency increase, so does the risk of invasion.
- Risk of invasion varies by plant community type.
- Weed invasion can be more pronounced in areas that were highly disturbed prior to fire.
- Activities related to fire management can create disturbance and introduce seeds of new weeds.
- Annual grasses (e.g. cheatgrass or *Bromus tectorum*), forbs capable of long-distance dispersal, and resprouting perennial forbs are most likely to increase following wildfire.
As fire severity and pre-fire cover of weeds increases, the need for revegetation after fire increases. This list illustrates that wildfires and especially intense wildﬁres magniﬁes the negative impacts of weeds.

**Cumulative Effects of Alternative 1**

The No Action alternative would perpetuate the spread of noxious weeds and other invasive species in the project area. In particular, the potential of a new, serious invader species is always a threat to impact the project area. Ideally, roadside herbicide treatment may continue but this practice is largely budget driven and annual budgets to allow herbicide treatment are impossible to predict.

**Direct and Indirect Effects—Action Alternative 2**

Table NW-1 lists actions and their associated estimated acres of detrimental soil disturbance for the four proposed action alternatives. Disturbed soil is a direct effect of timber harvest activities and the potential for noxious weed/invasive species invasion into these habitats is an indirect effect.

**Table 3-74. Disturbance Levels – Existing vs. Action Alternative**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detrimental Soil Disturbance acres per alternative (harvest)</td>
<td>1.23</td>
<td>10.86</td>
</tr>
<tr>
<td>Road reconstruction/BMP's (miles X 4 rounded to nearest acre)</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td><strong>TOTAL DISTURBANCE ACRES</strong></td>
<td>1.23</td>
<td>45.86</td>
</tr>
</tbody>
</table>

Timber harvest and new or temporary road construction activities provide potential habitat for noxious weeds and invasive species. Soil disturbance coupled with canopy removal provide the greatest potential for weed establishment. This is particularly true for spotted knapweed. Overall, spotted knapweed success was correlated with degree of disturbance and moisture-stressed environments (Mooers and Willard 1989). There are several factors that contribute to the success of noxious weeds invading a new area. These factors can be species specific, but soil disturbance coupled with canopy removal combine to create a “niche” for the weed to occupy. Soil disturbance provides a foothold or space for the weed to establish whereas canopy removal results in increased sunlight and increased soil surface temperatures. In light of this, the proposed project activities, from highest to lowest potential to create potential weed habitat are road construction, followed by regeneration timber harvest and intermediate timber harvest. In terms of actual acres disturbed, timber harvest activities would create the most potential for weed invasion.
Different timber harvest methods create different levels of disturbance. A regeneration harvest removes 90-95% of the canopy cover whereas an intermediate harvest removes about 50% of the canopy. Likewise, logging systems create different levels of disturbance. The project proposes tractor and skyline logging systems. Of these two systems, tractor logging has the higher potential for soil disturbance. Tractor logging utilizes more machinery such as skidders, grapplers, forwarders, etc., each a potential vector to bring in noxious weed and invasive species seed into the harvest unit. Table 3-75 displays the number of acres by harvest system and logging system of the Action alternative.

Table 3-75. Acres of Tree Harvest by Harvest Type and Logging Systems

<table>
<thead>
<tr>
<th>Alternative</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regeneration Harvest acres (90-95% canopy removal)</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Intermediate Harvest acres (ca. 50% canopy removal)</td>
<td>0</td>
<td>166</td>
</tr>
<tr>
<td>Total timber harvest</td>
<td>0</td>
<td>256</td>
</tr>
<tr>
<td>Tractor Logging system - acres</td>
<td>0</td>
<td>101</td>
</tr>
<tr>
<td>Skyline Logging system - acres</td>
<td>0</td>
<td>155</td>
</tr>
</tbody>
</table>

In general, ecosystem burning is an activity that would not promote the spread of noxious weeds. The Action alternative proposes natural fuels treatment on 231 acres. Ecosystem burning would normally occur in the spring before most plants come out of winter dormancy or they are just breaking dormancy. These are normally low duration/low intensity surface fires. Sometimes, native understory vegetation may suffer some mortality, but usually burning only consumes the surface fuels. Besides reducing fuel loading, ecosystem burning rejuvenates much of the native vegetation and hence, increases vigor and promotes desirable vegetation. Rice (2005) had found that low severity spring burning did not affect weed abundances. If anything, prescribed fire would favor Bromus tectorum, where present, and this species would “replace” a noxious weed species. Keley’s study showed that once cheatgrass had become established in open ponderosa pine forests, low-intensity prescribed burning favored its continued persistence. In Rice’s study, their spring burns did not affect cheatgrass abundance in ponderosa pine forests/drier Douglas-fir communities. Cheatgrass has invaded the Cabinet RD, but is uncommon in the project area and appears restricted to road sides. As previously mentioned, cheatgrass is not recognized as a noxious weed but as a “regulated weed”; this species has very limited and insignificant populations within the activity areas. If botanical surveys reveal the species has significant infestations in any of the areas scheduled for fuel treatments, the burn plans may have to be modified. However, for noxious weed species, ecosystem burning will not be considered an action that would have any significant adverse effect on the spread on noxious weeds.

To summarize, different methods and logging systems create different levels of soil disturbance. Of course, the Action alternative has more detrimental soil disturbed acres and overall disturbance due to logging activities than the No Action alternative. Detrimental soil disturbance acres would have a higher risk of noxious weed invasion but all disturbed areas with reduced
canopy cover offer potential habitat for noxious weeds. Existing weed populations would expand under the Action alternative but the potential for a new noxious weed species, as well as any new invasive species is a more serious threat. Post-harvest succession would reduce weed populations over time.

The action alternative would contribute to the spread and abundance of noxious weeds/invasive species. Roads are an obvious vector for spreading these species but roads are also easy to treat and monitor. Some of the design criteria employed to reduce or minimize the spread of noxious weeds will include washing vehicles and equipment, treating existing access roads, as needed prior to activities, spraying new roads/landings and seeding landings post-harvest. Also, gravel pits should be checked and/or treated before any road material is transported into the project area. Weeds are a perpetual problem but monitoring and treatment would minimize the threat of noxious weeds, in particular new invader species and other invasive species.

**Cumulative Effects-Action Alternatives 2**

The Cumulative Effects catalog lists past, current, and reasonably foreseeable activities. Past activities, as well as current activities in the Spring Gulch project area affect the spread and impact of weeds.

**Past Actions and their Effects on Current Conditions:**

Past activities throughout the Spring Gulch analysis area have affected the spread of weeds. The following table gives the miles of road construction, by decade in the Spring Gulch analysis area.

<table>
<thead>
<tr>
<th>Decade</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940s</td>
<td>1.3 miles</td>
</tr>
<tr>
<td>1950s</td>
<td>0 miles</td>
</tr>
<tr>
<td>1960s</td>
<td>7.3 miles</td>
</tr>
<tr>
<td>1970s</td>
<td>4.9 miles</td>
</tr>
<tr>
<td>1980s</td>
<td>Maintenance/BMP’S</td>
</tr>
</tbody>
</table>

The net result was increased vehicle travel into the analysis area. The adjacent Montana state land is managed for timber production and has several roads, most blocked off, accessing different areas of their section. Adjacent private lands have been and still are largely agriculture. An early water system (1940s), Dickson Ditch, channeled water from Deep Creek to pastures that border NFSL. Higher population density has resulted in increased the potential for noxious weed infestations from sources as vehicles, equipment, livestock forage and planting of non-native species. Roads also increase recreational use. All these activities directly contributed to weed spread by providing a source of weed seeds/weed propagules, or by increasing the number of vectoring agents, i.e. vehicles, people and animals into the Spring Gulch analysis area.

Commercial timber harvesting on NFSL has been documented from the 1950s thru the 1980s. Undoubtedly there was some timber harvest after the 1910 fire and after on National Forest lands. Commercial logging occurred on private lands occurred upon settlement and continues to
the present Past timber harvest methods were largely ground-based systems that resulted in large areas of ground disturbance. It is unknown which invasive species were present but probably the wide spread invasion of spotted knapweed resulted from these timber harvest methods.

Other past activities that facilitated weed spread include sheep grazing after the 1910 fire, incidental grazing over the years, firewood cutting, minerals exploration and the general increase of recreational use of National Forest System Lands (NFSL).

Contrasting Effects of Proposed Action with Past Actions:

Before the mid-1990s, there were few, if any noxious weed prevention mitigations in place. The Kootenai National Forest adopted preventive measures to avoid weed spread and introduction of new invasive species with the 1997 Kootenai NF Herbicide Weed Control Plan. This authorized integrated pest management strategies including the use of certain herbicides. Contractual provisions included washing of equipment to remove weed seeds/propagules prior to entry onto NFSL, contractor herbicide spraying of haul routes and use of weed-free seed grass to re-vegetate disturbed ground. These weed control measures have been included with timber harvest, road building and fire suppression activities to reduce the risk of invasive species. Soon after this project was proposed, weed populations were inventoried and the main road treated. The first major timber sale that required equipment washing and seeding of skid trails by the contractor was the White Pine EIS (June 2002). The Marten Creek Project (2008) also required off-road equipment washed and inspected prior to entering the project area and all haul roads of the Marten Devil timber sale were treated with herbicides (8-10-2011) after harvest. These measures have been standard practices for all major timber harvest activities and have been successful. The FY 2004 KNF Monitoring and Evaluation Report states “The KNF has used herbicides to control noxious weeds with success. Spraying of roadsides, administrative sites, and gravel pits has visibly reduced weed populations in many areas and prevented weeds from spreading to un-infested areas.” The Spring Gulch project would require these provisions plus additional measures to protect *Clarkia rhomboidea* populations adjacent to the main access routes.

Effects of Ongoing and Reasonably Foreseeable Actions:

Some future activities that have the potential to contribute to the spread of weeds are routine road maintenance, increased recreational use with ATVs and UTVs, etc., continued recreational activities by forest visitors, private land development and large scale canopy gaps as result of disease (pine beetle, root diseases, etc.).

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions:

The combined effects resulting from the Spring Gulch project would increase the risk of weed invasions because of soil disturbance, along with other factors (increased soil temperature, light, etc.); however design features are included in Chapter 2 and monitoring post project would help minimize this risk.

Regulatory Consistency

As mentioned, Forest Service policy directs the National Forests to conform to the Federal Noxious Weed Act of 1974. Accordingly, the Kootenai NF established weed management
Heritage Resources

direction with the 1987 Forest Plan. The Forest Plan addresses noxious weed species under the Forest-wide management direction and states in its goals that we will attempt to stop the spread and suppress the existing levels of noxious weeds through land management and weed suppression activities (USDA Forest Service, 1987a).

The Spring Gulch project is consistent with Forest Plan direction because of design criteria, contract provisions, as well as Forest and District weed control policy.

This project is consistent with the Final Environmental Impact Statement, Kootenai National Forest Invasive Plant Management and Record of Decision (2007). These documents authorize specific herbicides to control noxious weeds along with treatment methods and application rates at various treatment sites.

HERITAGE RESOURCES

Introduction

Cultural and heritage resources include both archaeological sites and historic structures that reflect past human interactions as well as human use of the landscape and its resources. These historic properties have value for their association with important events or people in our history, their distinctive historical style, or their potential to provide information about our past. Cultural resources that are determined to be eligible to the National Register of Historic Places (NRHP) are considered historic properties that are managed to avoid or mitigate impacts to their integrity.

Regulatory Framework

The Forest Service and other Federal Agencies are required to manage historic properties in the United States under several statutes, most notably the National Historic Preservation Act of 1966 (NHPA). These requirements are regulated through 36CFR800 and are carried forward in the Forest Plan standards (Forest Plan, Volume 2, Appendix 19).

Historic properties are identified by a cultural resource inventory and are determined as eligible to the National Register of Historic Places based on their ability to yield information about the past or their relation to important events, persons or historical styles. Cultural resource inventories must be completed prior to road construction, timber harvest, or any other ground-disturbing activities that may have the potential to impact historic properties. Historic properties are managed to either protect them in-place or to mitigate adverse project effects. The State Historic Preservation Office (SHPO) reviews eligibility and management provisions and provides comments about project effects on cultural resources. The process of consultation with SHPO must take place prior to impacts on the ground unless the inventory results fall within a scope of a memorandum of understanding between the KNF and SHPO that streamlines consultation. The location of cultural resource sites is exempt from public disclosure as described in FSH 6209.13 11.2 & 11.22. The exemption protects sites from harm and retains confidentiality of sites culturally significant to American Indian Tribes.
Analysis Area

The Spring Gulch project area encompasses approximately 796 acres of National Forest System Lands on the Cabinet Ranger District. Areas of potential effects are the harvest units, other treatment areas, and roads from the action proposal. The project activity area is within the Spring Gulch watershed. One road that is on the Lolo National Forest, road #2241, will be used for access to the activity area. In addition, the state of Montana is proposing to construct/improve a road route through T23N R30W Section 16 that would bypass road #1023 and provide direct access across state land to road #2241 into Spring Gulch. This project would follow an existing road through state land and into an existing gravel pit, then a new road route would be constructed for the remainder of the distance. This proposal, while not on KNF lands, has been included in the analysis area in order to fulfill the district’s cultural resource responsibilities.

Methodology Used to Collect Data and Make Scientific Findings

Analysis of cultural resources within the Spring Gulch project area began with a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the project and surrounding areas. This information is both from background historic information and prehistoric research as well as from many years of Forest Service heritage resource inventories within and adjacent to the project area. Our information on previously documented sites also allowed some idea of the type, frequency and location of sites likely to be found within the analysis area.

This synthesis of past data was then used during field inventories of the proposed areas of potential effect and adjacent areas of high probability for sites. These inventories included both pedestrian surveys and subsurface testing, with the method of survey adjusted according to the probability of historic or prehistoric materials being recovered in the area. Information from past KNF inventories was used to cover a current area of potential effect if upon review it met current inventory standards. Additional inventory was then conducted of the APE in areas where no previous inventory was conducted, where previous inventory was not adequate or around known sites to relocate and verify their location.

Areas of low, medium and high probability for the occurrence of cultural resources within proposed areas of activity were identified on a map prior to the undertaking of inventories. High probability areas for both historic and prehistoric properties, such as ridges and terraces adjacent to stream bottoms, were chosen for more intensive inventory and were selectively shovel tested for subsurface artifacts, as well. Harvest units and areas planned for “ecosystem burning,” on the other hand, are generally steep and will have a low probability for prehistoric sites. These areas are most likely to contain historic mining or logging properties, which can often be previously identified in historic records. Therefore such areas were generally not subsurface tested, but covered with pedestrian transects.

Once inventory is complete, identified cultural resources within the project’s area of potential effect are analyzed to determine their eligibility to the National Register of Historic Places. For those considered eligible, the potential effects of the project on that historic property is analyzed. Where adverse effects may occur to a historic property, measures are designed to mitigate these effects. The State Historic Preservation Office is consulted for concurrence on
each of these three steps. The consultation on all three steps is usually conducted simultaneously.

Measurement Indicators

Indicators for heritage resources are measured in terms of beneficial or adverse effects to historic properties eligible to the National Register of Historic Places.

Beneficial effects could include stabilizing a historic property by controlling erosion of an archaeological site, restoring and maintaining a historic building, or reducing fuel concentrations around a historic property. Beneficial effects are designed and agreed upon through consultation conducted under Section 106 of the NHPA with the SHPO. In some cases where a beneficial action is possible, a no action determination that does not implement the beneficial action could be adverse if it allows greater degradation or deterioration of the historic property.

Adverse effects are impacts to the integrity of the property which destroy a portion or all of the property and the information it could yield. A direct adverse impact occurs during an activity itself, such as when a road is built through a historic property and the construction process destroys or damages the site. Indirect adverse impacts are a side effect of the activity or occur after the activity is complete, like when runoff from a road eventually erodes a historic property adjacent to it. In some cases where a beneficial action is possible, a no action determination that does not implement the beneficial action could be adverse if it allows greater degradation or deterioration of the historic property.

This planning process allows adverse impacts to be avoided altogether through project design or mitigated through scientific investigation so that there are no adverse impacts to eligible historic properties. These avoidance or mitigation measures are agreed to in consultation conducted under Section 106 of the NHPA with the Montana SHPO and allow the project to proceed in compliance with the National Historic Preservation Act.

Affected Environment

The Clark Fork River Valley was part of a prehistoric thoroughfare between the Great Plains, on the east, and the Columbia River Plateau on the west, providing a river-level gateway through much of the Northern Rocky Mountains. There were also considerable movements over the mountain passes throughout this region, with prehistoric peoples making use of high elevation areas as well as valley bottoms (Malouf 1982).

The lower Clark Fork Valley was not inhabited until around 8000 BP, after Glacial Lake Missoula had drained. These early native inhabitants were foraging peoples, whose hunting and gathering lifestyle meant that they were highly mobile and lived most of the year in small groups. They moved camps to take seasonal advantage of fish runs, animal migrations, and seasonal plants. In 1811, David Thompson noted all tributaries of the lower Clark Fork had Indian weirs or fish traps on them, which is a striking illustration of the importance of fish in native life during the later periods of prehistory. Base camps, where groups would remain for longer periods of time, were often located on river or stream terraces, where plants, animals and fish were both harvested and processed for storage. Native peoples also used special purpose camps, which are smaller sites that were exploited for a specific purpose and a shorter period of time. From
these camps they hunted, collected particular plants and gathered raw tool materials such as argillite and quartzite. The archaeological remnants of these prehistoric native peoples are found in campsites, in rock art, in trees peeled for their bark, in stone hunting blinds, and any number of other types of sites. These early inhabitants of the lower Clark Fork were ancestral to the Salish and Kootenai tribes. Other tribes also used the area, including the Upper Pend Oreille, Coeur d’Alene and Kalispell people.

In the early 1800s early fur trappers entered northwest Montana, including the lower Clark Fork River Valley. The Northwest Fur Company was responsible for early, scattered settlements of Europeans in the area, and in the 1860s the trappers began to give way to miners. Much of the activity associated with the lower Clark Fork through this time was miners passing through the area on their way to other strikes. Completion of the Northern Pacific Railway in 1883 forever changed the lower Clark Fork Valley by ending its geographic isolation and opening it up for settlement. The railroad also provided opportunities for agricultural development as well as transportation for the region’s natural resources (Historic Overview of the Kootenai National Forest, 1994). Among these resources were cedar shingles, milled 50,000 a day by the Montana Improvement Co. from 1884-1885. Both this mill and another shingle mill at Smeads shipped their production to other towns on the railroad. Agricultural products were either shipped out on rail or consumed by the towns that sprung up along the railroad, many of which either died out or were inundated by the Noxon and Cabinet Gorge Reservoirs (early 1950s). The 1910 fires had a profound influence on the area as a whole because of their intensity and the immense area they covered. Most of the forest in the project area is a product of this fire.

Spring Gulch is a small second order watershed that has about one quarter of a mile of perennial flow. The stream becomes sub-surface before it drains into the Clark Fork of the Columbia. Most of the project area is steep but there are small benches adjacent to Spring Gulch that have higher probability to contain historic or prehistoric sites. In addition, some of the area affected by the proposed road improvement and new construction is of higher probability because it is more flat and is within the main Clark Fork drainage.

The evidence of these past occupations can be diminished in value by any change in their historical, architectural, archaeological, or cultural character. Adverse impacts to cultural resource sites can result in their damage or complete destruction, the effects of which are irreversible. In cases of partial damage, the undisturbed portion of the site may still yield valuable information. The Forest Plan, in accordance with Section 106 of the NHPA, requires integration of cultural resource management into the overall multiple resource management effort in order to avoid adverse impacts. In addition, the Forest must work closely with the appropriate scientific community and American Indian Tribes concerning this resource.

One historic property was located and recorded in association with this project, a set of historic irrigation ditches known as the “Dickson Ditches” that crosses State and Lolo National Forest Land. It has been determined eligible to the National Register of Historic Places. No other historic properties have been located in the project area on Kootenai National Forest Lands.
Environmental Consequences

Direct and Indirect Effects Alternative 1 – No Action

Under this alternative, no actions are proposed and any previously recorded or as yet undiscovered sites would remain undisturbed. Historic properties would be subject to natural deterioration and decay.

Direct and Indirect Effects Common to all Action Alternatives 2

There would be no adverse or beneficial effects to historic properties under the action alternative. The state of Montana plans to construct/improve a state road system that will bypass road #1023 and link across state lands to road #2241. This project will follow an existing road through state land into an existing gravel pit, then a new road route will be constructed to road #2241. The “Dickson Ditches,” mentioned above, would intersect the planned road improvement at the mouth of the gravel pit, where a road is in existence across the ditch. Design for this road improvement activity shall stipulate that no further impacts would occur to this historic property, and the road improvements must be confined to the existing road prism at the point where it crosses the ditch. These requirements have been approved through consultation with SHPO. No other historic properties were identified in the area of potential effect through inventory for this project.

If additional sites are encountered in the course of project implementation, the same protocol that has been followed throughout this project would be adhered to. Forest Archaeologists or Heritage Specialists would consult with the State Historic Preservation Office, as required by law, to determine the significance of the discovery and the effects of the project upon them. The Confederated Salish and Kootenai Tribes would be included in discussions concerning properties with aboriginal affiliation. Mitigation designed and reviewed by the Montana State Historic Preservation Office may include avoidance of sites, protection or scientific investigation.

Cumulative Effects – All Alternatives

The cumulative effects geographic analysis area for historic properties is the Spring Gulch project area and temporally we are analyzing for the present, meaning that this cumulative effects analysis operates under the condition that prehistoric and historic sites exist in the project area.

Past Actions and Effects on Current Conditions:

Before the National Historic Preservation Act (NHPA) of 1966 was implemented, project planning did not consider impacts to cultural resources. Projects such as timber harvest, road building, fire suppression, or any other ground disturbing activity prior to NHPA had the potential to adversely impact cultural resources, and many of these projects occurred in areas considered high probability for cultural materials and so probably did impact cultural sites. Conversely, the remains of some of these activities that took place longer than 50 years ago may now be considered historic properties, and so have added to the historic record. While past actions may
have affected cultural resources, no ongoing effects are known to be occurring currently from those past actions.

**Contrasting Effects of Proposed Actions with Past Actions:**

Since implementation of NHPA, cultural resource inventories have been conducted to locate cultural resources prior to project implementation. Known sites found during earlier inventories, and the refinement of the inventory process to locate properties during current inventories, allows impacts from projects to be avoided or mitigated. While natural deterioration of the resources is ongoing (processes include weathering, decay, and erosion) the current condition and trend of the historic record is that historic properties are being protected from project impacts. Knowledge of the location and condition of historic properties allows the potential for management action to abate or mitigate those natural processes that can adversely affect the historic record.

As described in the direct and indirect effects section, there will be no significant adverse or beneficial effects to historic properties from the action alternatives. Locating and documenting historic properties allows their protection from proposed undertakings.

**Effects of Ongoing and Reasonably Foreseeable Actions:**

Ongoing and foreseeable activities were considered in this analysis. Fire suppression activities can impact historic properties through the construction of fireline, the movement of equipment and people, etc. Appendix 3 of the Northern Region Programmatic Agreement regarding Cultural Resources Management on National Forests in the State of Montana sets guidelines to limit impacts fire suppression activities may have on historic properties.

**Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions:**

There will be no cumulative effects to historic properties from the Spring Gulch Project. The post-project condition and trend will continue the current condition and trend, which protects historic properties through inventory and project design so no historic properties are impacted by project implementation.

**Regulatory Consistency**

The guidelines of the Forest Plan and that of other jurisdictions were recognized in the development of all alternatives. In addition, the laws and policies that govern cultural resource management on Federal lands are coordinated with the State Historic Preservation Officer (SHPO) of Montana, who serves in an advisory capacity. The policies of the Forest Service and the SHPOs are consistent. All alternatives are consistent with the Forest Plan and applicable regulations and laws regarding historic properties.
THREATENED, ENDANGERED AND SENSITIVE PLANTS

Introduction

Fifty-five Threatened and Sensitive plant species are listed on the KNF plant list. Only two are threatened species under the Endangered Species Act, Howellia aquatilis (Water Howellia) and Silene spaldingii (Spalding’s Catchfly). These two species are suspected to occur on federal lands on the KNF. The remaining 53 species are identified as sensitive species in the latest Region 1 sensitive plant list (Montana & Idaho) and also the latest Montana Natural Heritage Plant Species of Potential Concern list. To date, no threatened species have been confirmed on the Cabinet Ranger District. Of the 53 sensitive species, 11 have been found on the district.

Activities proposed in the Spring Gulch Project have the potential to adversely impact populations or potential habitat of proposed threatened, endangered and sensitive (PTES) plant species. The purpose of this document is to analyze potential effects of this project to PTES plants occurring or potentially occurring with the project area.

Regulatory Framework

The Endangered Species Act (ESA) of 1973 declares that all Federal agencies “utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act”. The ESA requires federal agencies to ensure that any agency actions (any action authorized, funded, or carried out by the agency) are not likely to jeopardize the continued existence of any threatened, endangered, or proposed species. Agencies are further required to develop and carry out conservation programs for these species.

Sensitive species are administratively designated by the Regional Forester (FSM 2670.5) and managed under the authority of the National Forest Management Act. Forest Service Manual (2670.5 Section 19) defines sensitive species as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:

a) Significant current or predicted downward trends in population numbers or density.

b) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution".

The Kootenai’s Forest Plan establishes forest-wide goals, objectives, standards, guidelines, and monitoring requirements. Direction for sensitive species includes determining the status of sensitive species and providing for their environmental needs as necessary to prevent them from becoming endangered (Forest Plan II-1).

Analysis Area

The Spring Gulch project activity areas were chosen for the bounds of analysis discussion related to potential direct and indirect effects. This analysis area includes all treatment units and
roads with activities in the proposed project. These areas were selected for analysis of a scale suitable for the recognition of direct and indirect effects.

Cumulative effects on PTES plant populations will be analyzed at the project level. The Spring Gulch project area is an area broadly similar in forest processes, vegetation type patterns, soil types, elevation, growing season, and other environmental variables that indicate reasonable bounds for analysis. The analysis area for species viability is range-wide of each PTES plant species.

**Existing Condition**

The Spring Gulch project area encompasses approximately 796 acres of National Forest System Lands of the Cabinet Ranger District. The project area is in a small watershed that drains into the Clark Fork of the Columbia. Spring Gulch is a second order stream with about ¼ mile of perennial flow; water ultimately flows subsurface into the Clark Fork. The 1910 fire burned thru the project area and present vegetation is a product of that event.

The project area has four mapped soil units: Andic Dystrochrepts-Rock outcrop complex, breaklands; Andic Dystrochrepts, breaklands; Typic Ustochrepts, mountain slopes, south aspects; and Andic Dystrochrepts, mountain slopes. Vegetation varies from moist, mixed forest to dry mixed forest and includes several habitat types. Dominant slopes switch from northerly aspects to southerly aspects. The major habitat types are western hemlock/queencup beadelily, Douglas-fir/ninebark and subalpine fir/menziesia (KNF Soil Survey, 1995).

There are no unique habitats as fens, moist open meadows, rich marshes, or subalpine ridgetops (>7,000ft).

Past plant surveys located 6 locations of *Clarkia rhomboidea* within the analysis area and project inventories located 2 more. The original 6 populations were located in 1995 and revisited in 1997. They have been checked several times since field work on this project started. The analysis area contains habitat considered suitable for several R1 Sensitive plant species.

**Methodology Used to Collect Data and Make Scientific Findings**

Suitable habitats for each Sensitive species known or suspected of occurring on the Forest were identified by consultation with Sensitive plant field guides (Montana Natural Heritage Program), various conservation strategies, published and unpublished literature on Sensitive plants as well as through extensive field experience. Suitable habitat for specific plants was reevaluated in 2012 with the updated KNF sensitive plant list.

Probability of occurrence of Sensitive species was estimated, including both historic and existing conditions. The species included in this assessment are those with a moderate to high probability of occurrence in the analysis area. The probability analyses took into consideration numerous factors, including:

- past disturbance
- locations of known populations
- results of past field surveys
ecological requirements of the individual species (e.g., elevation, potential vegetation, land type, lithology, shade and moisture regimes)

The Spring Gulch project area covers many acres and many diverse habitats. All 53 sensitive species were assigned a potential, based on their habitat, of occurring within the analysis (attachment). Only sensitive plant species known to occur in the project area or with a medium to high probability of occurrence within or near the activity areas were focused on.

*Clarkia rhomboidea* (common clarkia) has several populations throughout the project area and *Cypripedium fasciculatum* (clustered ladyslipper), *Heterocodon rariflorum* (western pearl flower) and *Psilocarphus brevissimus* (dwarf woolyheads) have at least a moderate probability of occurring.

Four new Sensitive plant species were added to the Kootenai Sensitive plant list in the late summer of 2011. These species were added after most of the field work had been completed. These species are *Allium acuminatum* (tapertip onion), *Mimulus ampliatus* (Washington monkey-flower), *M. clivicoa* (bank monkey-flower) and *Pinus albicaulis* (whitebark pine). The onion and bank monkey-flower have been identified on other KNF districts and on the adjacent Plains/Thompson Falls Ranger district, Lolo NF.

Varying degrees of potential habitat does exist on the Cabinet RD and these species were searched for in the 2012 field season. Seasonal timing is critical for identifying these species. Tapertip onion and bank monkey-flower were each assigned a moderate probability to occur in the Spring Gulch project area. The Washington monkey-flower has been identified on the KNF. This species requires vernal moisture and is found in moist openings but other habitat requirements are not understood. This species was given a low probability to occur in the analysis area. No whitebark pine populations are known in any of the activity areas. Potential habitat does exist at the higher elevations above the project area and hence, whitebark pine was assigned a very low probability.

TABLE 3-77 – Known and Suspected Sensitive Plant Species in Spring Gulch Project Area

<table>
<thead>
<tr>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
<th>STATUS</th>
<th>POTENTIAL/FOOTNOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapertip onion</td>
<td><em>Allium acuminatum</em></td>
<td>Suspected</td>
<td>Moderate</td>
</tr>
<tr>
<td>Common Clarkia</td>
<td><em>Clarkia rhomboidea</em></td>
<td>Known</td>
<td>High</td>
</tr>
<tr>
<td>Clustered Lady’s slipper</td>
<td><em>Cypripedium fasciculatum</em></td>
<td>Suspected</td>
<td>Moderate</td>
</tr>
<tr>
<td>Western pearl-flower</td>
<td><em>Heterocodon rariflorum</em></td>
<td>Known</td>
<td>Moderate</td>
</tr>
<tr>
<td>Bank monkey-flower</td>
<td><em>Mimulus clivicoa</em></td>
<td>Suspected</td>
<td>Moderate</td>
</tr>
<tr>
<td>Dwarf woolyheads</td>
<td><em>Psilocarphus brevissimus</em></td>
<td>Known</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

**Design Features**

*Clarkia rhomboidea* is the only sensitive species known to occur in the project area. Botanical surveys revealed the areal extent of the known populations and also led to the discovery of
additional populations. Populations in proposed harvest units were clearly identified and will be avoided during harvest activities. If any individual or populations of Sensitive plants are located in areas proposed for management activities, they would be protected under the provisions of the timber sale contract. Timber Sale Contract B(T) 6.24 would be applied to modify the activity so that adverse effects would be avoided (See Design Criteria, Table 2-14) and finding any additional sensitive plant populations will result in mitigation requirements.

PTES PLANT SPECIES BIOLOGICAL ASSESSMENT/EVALUATION

CONSULTATION REQUIREMENTS FOR THREATENED AND ENDANGERED SPECIES

In accordance with the Endangered Species Act, its implementing regulations, and FSM 2671.4, the Kootenai National Forest is not required to initiate formal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding the determination of no effects to the threatened water howellia and Spalding’s catchfly; nor is it required to request written concurrence from the USFWS with respect to the determination of "no effect".

Table 3-78 summarizes the biological assessment/evaluation for the 6 plant species considered in this analysis.

Table 3-78—Summary of Effects to Known and Suspected Sensitive Species

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Conclusion</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapertip onion</td>
<td>Allium acuminatum</td>
<td>May Impact**</td>
<td>MI 2</td>
</tr>
<tr>
<td>Common clarkia</td>
<td>Clarkia rhomboidea</td>
<td>May Impact**</td>
<td>MI 1</td>
</tr>
<tr>
<td>Clustered ladyslipper</td>
<td>Cypripedium fasciculatum</td>
<td>May impact**</td>
<td>MI 2</td>
</tr>
<tr>
<td>Western pearl flower</td>
<td>Heterocodon rariflorum</td>
<td>May Impact**</td>
<td>MI 2</td>
</tr>
<tr>
<td>Bank monkeyflower</td>
<td>Mimulus clivicola</td>
<td>May Impact**</td>
<td>MI 2</td>
</tr>
<tr>
<td>Dwarf woolyheads</td>
<td>Psilocarphus brevissimus</td>
<td>May Impact**</td>
<td>MI 2</td>
</tr>
</tbody>
</table>

*No Impact expected

N1 no activities proposed in potential habitat
N2 low potential for occurrence in project area

**May impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause loss of viability to the population or species.
MI 1 High potential for occurrence: Proposed activities may impact potential habitat or individuals not detected in surveys.

MI 2 Moderate potential for occurrence: Proposed activities may impact potential habitat or individuals not detected in surveys.

Direct and indirect effects on sensitive plant species are described below for proposed activities identified in Chapter 2. Cumulative effects were considered for all past, proposed, current and reasonably foreseeable actions listed and described in the beginning of Chapter 3 (Table 3-1) and are described at the end of this section.

The following effects analysis will focus on 1) measurable effects to sensitive plant habitat and 2) effects on known populations. Habitats with moderate to high probability of occurrence of sensitive plants are considered. For the documented sensitive plants, population trends are used as a measure for this analysis.

Environmental Consequences

Direct and Indirect Effects of Alternative 1 – No Action

This alternative proposes no ground disturbing activity and hence no direct effects would result from this alternative. The response of each of the sensitive plant species to management activity varies by species, and in some cases, is not fully known. We do know that these plants, as well as all native vegetation of the KNF evolved with and are adapted to the climate, soils, and natural processes that took place prior to settlement to this area by Europeans. Any management or lack of management that causes these natural processes to be altered may have a negative or sometimes a positive impact on native vegetation, including sensitive plants.

Cumulative Effects of Alternative 1

The No Action alternative would have no cumulative effects upon known Sensitive Plant populations. Natural plant succession most likely will reduce or eliminate habitat of the western pearl flower and dwarf wooly head populations. These two annual species are usually found in habitats with plenty of sunlight, low surrounding vegetation and areas that have been disturbed. A vast majority of their populations are found adjacent to or along roads (open and closed). As vegetation grows in along roads and canopy closure increases, sunlight will be reduced to the soil surface, which could reduce the available suitable habitat.

The No Action alternative also would increase fuel loads in the project area and increase the risk of a catastrophic fire which may damage populations, reduce suitable habitat and create habitat for noxious weeds and other invasive, non-native species.

Direct and Indirect Effects of the action alternatives 2

No sensitive plant species are known to exist in any of the harvest units or areas of any proposed activity; hence there would be no direct effects to any population. An indirect effect would be the creation of potential or suitable habitat for the two annual species, western pearl flowers and dwarf woolyheads. Habitat for these two species is described as “vernally moist” soils or grasslands.

Western pearl flower occurs almost exclusively on or along roads on the Cabinet Ranger District. Many of these populations were on more or less abandoned roadbeds that receive
ample sunlight. A “natural” population has been located on a well-used game trail. If there are populations on an existing road, they may be directly affected by localized road improvements and maintenance. However, these activities are compatible with those that originally created suitable habitat for this species. Temporary road construction in alternative 2 would create suitable habitat for this species.

Dwarf woolyheads habitat is described as drying mud of ponds and other vernally wet soil in the valleys and on the plains. The few District populations known of this species have been found in low spots (mud holes) on more or less abandoned roads. This species is known in the analysis area but activities associated with timber harvest are compatible with those that originally created suitable habitat for this species. Alternative 2 could also create potential habitat for this species.

The only known population on the Cabinet RD of *Cypripedium fasciculatum* is in the Little Beaver Creek watershed. This orchid is also found on the adjacent Plains/Thompson Falls RD, Lolo NF. The species is globally ranked G4 (appears secure, though it may be quite rare in parts of its range, especially in the periphery) and ranked S2 in Montana (imperiled because of rarity or because other factors make it especially vulnerable to extirpation). The species is easily identified, even in the vegetative state. The Action alternative would create potential suitable habitat with the regeneration harvest.

In the Montana portion of its range, *Cypripedium fasciculatum* is most commonly found in moderately warm and dry mid-seral forest habitat types; a majority of occurrences are in *Pseudotsuga menziesii/Physocarpus malvaceus* habitat type (H.T.), *Abies grandis/ P. malvaceus* H.T. or in transition zone between these types (Clearwater NF, 2002). The alternative actions have the potential to add warm and dry potential habitat. The following information is from *Cypripedium fasciculatum*, Conservation Assessment, USDA Forest Service, Region 1, by Jack Greenlee, December 1997. “The distribution of *Cypripedium fasciculatum* in Douglas fir/ninebark (Pseudotsuga menziesii/Physocarpus malvaceus) habitat types in Region 1 is probably best described as a metapopulation, or a “set of populations…that are interdependent of ecological time” (Harrison et al. 1988) and which are linked by recurrent extinctions and recolonizations. Historically, *Cypripedium fasciculatum* in such habitat types probably “followed” patches of suitable habitat on the landscape as disturbances and successional changes occurred; the landscape was composed of a shifting mosaic of occupied and unoccupied suitable habitats. In order to maintain a viable metapopulation of clustered lady’s-slipper in the drier Douglas fir habitat types, we need to maintain occupied habitats even as some occupied and unoccupied habitats are treated with silvicultural prescriptions that mimic natural processes. While such treatments would probably cause local declines in subpopulations of clustered lady’s-slipper, over the long term they would create patches of suitable habitat”.

As mentioned, *Pinus albicaulis* (whitebark pine) was officially added to the R1 Sensitive Plant list in December, 2011. There are no known populations of this species within the analysis area and potential habitat exists at higher elevations above the project area. There would be no direct or indirect effects to this species in the Spring Gulch analysis area.

Two species with potential habitat in the project area are *Allium acuminatum*, (tapertip onion), and *Mimulus clivicola* (bank monkey-flower). These two species would occupy similar habitat in the analysis area. Tapertip onion is found on dry, open forest slopes, and grasslands in the montane zone. Bank monkey-flower is almost found exclusively on southern aspects in xeric habitat types. However, an important factor appears to be the availability of spring moisture. Plants are typically found growing in pockets of moist, exposed mineral soil caused by natural or
human-caused disturbances. Several associated species are commonly found growing with bank monkey-flower but *Clarkia pulchella* (pink-fairies) and *Collomia linearis* (narrow-leafed collomia) proved to be excellent indicators for identifying potential habitat. *Collomia linearis* is a common species in the Spring Gulch analysis area and *Clarkia pulchella* was located in the project area. The *Clarkia pulchella* populations were well outside of any activity areas and were found at lower elevations. *Mimulus clivicola* was not located in any plant surveys and this project would have no direct effects to this species. Indirectly, ground disturbance could create some potential habitat in the dryer montane zones of the project area.

**Cumulative Effects of the Action Alternatives 2**

**Past Actions and their Effects on Current Conditions:**

Past effects to sensitive plant species in the project area may have occurred due to soils disturbance, overstory removal, fire suppression, mining and the recent introduction of noxious weeds and other invasive species.

No known PTES plant populations have been impacted by any of the past timber sale projects. However, there is the possibility that some populations were never identified and may have been inadvertently impacted.

Past wildfires in the project area may have impacted sensitive plant species. No known sensitive plant populations have been impacted by past wildfires but it is likely that populations were affected by these fires. Fires of 1889 and 1910 burned the entire Spring Gulch drainage (796 acres) and undoubtedly impacted sensitive plants as well as all vegetation in the project area. These fires are responsible for current vegetation in the project area because native plants, including sensitive plants, have evolved with the influence of wildfires.

The introduction of non-native species (eg. Orchard grass, *Dactylis glomerata*) and invasive/noxious weeds through the years may also have impacted sensitive plant species. No known populations have been impacted by these non-native species, but it is generally agreed that noxious weeds and invasive species potentially are the biggest threat to plant communities (Larson et. al. 1997). These species are even invading native, pristine environments.

**Contrasting Effects of Proposed Action with Past Actions:**

The Spring Gulch project activities are designed to avoid impacts to any known or newly discovered populations of sensitive plants. Except for one population, *Clarkia rhomboidea* was located adjacent to FS Rd. 2241. Habitat for this species were road cuts and other disturbed areas associated with this road. The population found within a harvest unit has been recorded and would be avoided in project implementation. Like most annual species, annual populations can fluctuate tremendously. *Heterocodon rariflorum* (western pearl flower) and *Psilocarphus brevissimus* (dwarf woolyheads) are also annual species and project activities are compatible with those that originally created suitable habitat for all three species. Contract clauses are included which allow operational changes if any sensitive plants are found during project implementation.

**Effects of Ongoing and Reasonably Foreseeable Actions:**

Foreseeable activities include road maintenance, herbicide applications, fire suppression, mining and recreation/firewood gathering. These activities may impact plants through toxicity, ground disturbance, and canopy removal. Of these activities, herbicide application would avoid treatment when plants are growing or application could be done in the fall with a non-residual,
contact herbicide. Fall treatment would not harm the species because the plant exists in the soil seed bank. Proposed ground disturbing activities would be evaluated through surveys and biological assessments/evaluations as to their impact on PTES plant species.

**Combined Effects of Past, Proposed, and Foreseeable Actions:**

This project would have no effect on PTES plant species and hence, no cumulative effect.

**Regulatory Consistency**

The Kootenai NF Forest Plan (USDA Forest Service, 1987a) addresses Sensitive species under its Forest-wide management direction. In its goals it states that we will “determine the status of Sensitive species and provide for their environmental needs as necessary to prevent them from becoming Threatened and Endangered” (USDA Forest Service, 1987a, p. II-1). The plan also supports the protection and maintenance of important riparian zone features, marshes and water bodies, where Sensitive plants often occur (USDA Forest Service, 1987, p. II-28, 29). In terms of Sensitive plants, all alternatives are consistent with the Kootenai NF Forest Plan. There is no significant physical or biological connection between the analysis area and known populations or critical habitat of Endangered, Threatened or Proposed plant species. As such, all alternatives comply with the Endangered Species Act.

**Attachment - POTENTIAL SPECIES FOR PROJECT-LEVEL CONSIDERATION**

Two species, water howellia (*Howellia aquatilis*) and Spalding’s catchfly (*Silene spaldingii*) are federally listed as threatened and suspected on the KNF. Spalding’s catchfly has been found on the Tobacco Plains near Eureka and on the Flathead Indian Reservation in Sanders County but not on KNF lands. Water howellia habitat probably does not exist on the KNF and this species may be taken off the Kootenai PTES list in the near future.

**Table 3-79. Findings for Threatened and Endangered plant species.**

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>HABITAT</th>
<th>CONCLUSION</th>
<th>JUSTIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Howellia aquatilis</em> (Water howellia)</td>
<td>Ephemeral glacial ponds and abandoned river oxbows.</td>
<td><strong>No Effect</strong></td>
<td>No habitat in the PA nor the Cabinet Ranger District</td>
</tr>
<tr>
<td><em>Silene spaldingii</em></td>
<td>Open grasslands in valleys and foothills; deep soils</td>
<td><strong>No Effect</strong></td>
<td>No habitat in PA and very unlikely any on the Cabinet RD</td>
</tr>
</tbody>
</table>

**Table 3-80: Sensitive Plant Species of the Kootenai National Forest and Status in the Spring Gulch Project Area**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
<th>Potential/Footnote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapertip onion</td>
<td><em>Allium acuminatum</em></td>
<td>Suspected</td>
<td>Moderate</td>
</tr>
<tr>
<td>Round-leaved orchis</td>
<td><em>Amerorchis rotundifolia</em></td>
<td>Not Suspected</td>
<td>NS5</td>
</tr>
<tr>
<td>Water marigold</td>
<td><em>Bidens beckii</em></td>
<td>Not Suspected</td>
<td>NS1</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Status</td>
<td>Potential/Footnote</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Deer fern</td>
<td>Blechnum spicant</td>
<td>Not Suspected</td>
<td>Very Low</td>
</tr>
<tr>
<td>Upswept moonwort</td>
<td>Botrychium ascendens</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Wavy moonwort</td>
<td>Botrychium crenulatum</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Western moonwort</td>
<td>Botrychium hesperium</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Peculiar moonwort</td>
<td>Botrychium paradoxum</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Stalked moonwort</td>
<td>Botrychium pedunculosum</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Watershield</td>
<td>Brasenia schreberi</td>
<td>Not Suspected</td>
<td>NS1</td>
</tr>
<tr>
<td>Big-leaf sedge</td>
<td>Carex amplifolia</td>
<td>Not Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Creeping sedge</td>
<td>Carex chordorrhiza</td>
<td>Not Suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Prairie sedge</td>
<td>Carex prairea</td>
<td>Not Suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Beaked sedge</td>
<td>Carex rostrata</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Sheathed sedge</td>
<td>Carex vaginata</td>
<td>Not suspected</td>
<td>NS5</td>
</tr>
<tr>
<td>Common clarkia</td>
<td>Clarkia rhomboidea</td>
<td>Suspected</td>
<td>High (in Project area)</td>
</tr>
<tr>
<td>Sand springbeauty</td>
<td>Claytonia arenicola</td>
<td>Suspected</td>
<td>Very Low</td>
</tr>
<tr>
<td>Jelly lichen</td>
<td>Collema curtisporum</td>
<td>Suspected</td>
<td>Very low</td>
</tr>
<tr>
<td>Pink corydalis</td>
<td>Corydalis sempervirens</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Clustered lady’s-slipper</td>
<td>Cypripedium fasciculatum</td>
<td>Suspected</td>
<td>Moderate</td>
</tr>
<tr>
<td>Small yellow lady’s-slipper</td>
<td>Cypripedium parviflorum</td>
<td>Not Suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Sparrow’s egg lady’s-slipper</td>
<td>Cypripedium passerinum</td>
<td>Suspected</td>
<td>Very Low</td>
</tr>
<tr>
<td>English sundew</td>
<td>Drosera anglica</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Linear-leaved sundew</td>
<td>Drosera linearis</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Crested shield fern</td>
<td>Dryopteris cristata</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Giant helleborine</td>
<td>Epipactis gigantea</td>
<td>Not suspected</td>
<td>NS8</td>
</tr>
<tr>
<td>Slender cotton grass</td>
<td>Eriophorum gracile</td>
<td>Not Suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Thinleaf cottonsedge</td>
<td>Eriophorum viridicarinatum</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Western boneset</td>
<td>Eupatorium occidentale</td>
<td>Suspected</td>
<td>Very low</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Status</td>
<td>Potential/Footnote</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------</td>
<td>--------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Hiker's gentian</td>
<td>Gentianopsis simplex</td>
<td>Not Suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Mouse moss</td>
<td>Grimmia brittoniae</td>
<td>Known</td>
<td>Low</td>
</tr>
<tr>
<td>Howell's gumweed</td>
<td>Grindelia howellii</td>
<td>Not suspected</td>
<td>NS8</td>
</tr>
<tr>
<td>Western pearlfower</td>
<td>Heterocodon rariflorum</td>
<td>Known</td>
<td>Moderate</td>
</tr>
<tr>
<td>Latah tule pea</td>
<td>Lathyrus bijugatus</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Geyer's biscuit root</td>
<td>Lomatium geyeri</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Bog club moss</td>
<td>Lycopodiella inundata</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Prickly tree club moss</td>
<td>Lycopodium dendroideum</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Running pine</td>
<td>Lycopodium lagopus</td>
<td>Not suspected</td>
<td>NS7</td>
</tr>
<tr>
<td>Moss</td>
<td>Meesia triquetra</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Stalked leaved monkeyflower</td>
<td>Mimulus ampliatus</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Short-flowered monkeyflower</td>
<td>Mimulus breviflorus</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Bank monkey-flower</td>
<td>Mimulus clivicola</td>
<td>Suspected</td>
<td>Moderate</td>
</tr>
<tr>
<td>Lichen</td>
<td>Nodobryoria subdivergens</td>
<td>Not suspected</td>
<td>NS7</td>
</tr>
<tr>
<td>Northern adder's-tongue</td>
<td>Ophioglossum pusillum</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Northern beechfern</td>
<td>Phegopteris connectilis</td>
<td>suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Whitebark Pine</td>
<td>Pinus albicaulis</td>
<td>Suspected</td>
<td>Low</td>
</tr>
<tr>
<td>Dwarf wooly heads</td>
<td>Psilocarphus brevissimus</td>
<td>Known</td>
<td>Moderate</td>
</tr>
<tr>
<td>Pod grass</td>
<td>Scheuchzeria palustris</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Water bulrush</td>
<td>Schoenoplectus subterminalis</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Moss</td>
<td>Scorpidiurn scorpioides</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Tufted bulrush</td>
<td>Trichophorum cespitosus</td>
<td>Not Suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Flat leaved bladderwort</td>
<td>Utricularia intermedia</td>
<td>Not suspected</td>
<td>NS2</td>
</tr>
<tr>
<td>Great-spurred Violet</td>
<td>Viola selkirkii</td>
<td>Suspected</td>
<td>Low</td>
</tr>
</tbody>
</table>

Footnotes:  
NS1 - Not suspected due to lack of associated riparian habitat  
NS2 - Not suspected due to lack of associated wetland habitat, floating moss mats, fens
NS3 - Not suspected due to lack of calcareous influence
NS4 - Not suspected due to lack of associated open habitat
NS5 - Not suspected due to lack of associated forest type
NS6 - Not suspected due to lack of associated substrate
NS7 - Not suspected due to lack of subalpine or alpine habitat
NS8 - Not suspected / has not been found on the KNF

**High Potential** = Habitat appears to be suitable and plant known from several occurrences on the KNF, or a known site is within one mile of Project area boundary.

**Moderate Potential** = Habitat appears suitable and plant known on the KNF.

**Low Potential** = Habitat appears to be suitable but plant is very rare on the KNF, or known occurrences on the forest are considerably distant or confined to specific geographic area.

**Very Low Potential** = Habitat appears suitable, but plant is not known to occur on the KNF.

Sensitive species not suspected or with low or very low probability of occurrence in the project area will not be considered further in this analysis.

**AIR QUALITY**

**Introduction**

This analysis discloses potential effects to air quality from implementing an alternative, providing the decision maker with a means of comparison. The analysis of alternatives include the effects of wildfire smoke, prescribed fire smoke and fugitive dust.

Wildfires produce smoke that can adversely impact air quality. For a thirty-year period, the area including the Kootenai, Flathead, Idaho Panhandle, and Lolo National Forests averaged approximately 480 lightning caused fires per year (Barrows, Sandberg, and Hart, 1977). The size, intensity, and occurrence of wildfires depend directly on variables such as meteorological conditions, the type of vegetation present, the moisture content of both live and dead fuel, topography and the total weight of consumable material available. Under the extreme condition of heavy fuel, drought, and hot, dry weather nearly all forest fuels are available for consumption. Ward (et al 1976) estimated that smoke emissions created by wildfires are approximately three times greater than that produced by prescribed burning. The impacts to air quality are relative to the amount of smoke produced. Smoke produced varies with burning conditions and duration. During extreme burning conditions large volumes of smoke are produced for an extended duration.

Smoke produced from prescribed burning can have an adverse effect on air quality. The quantity of smoke produced is influenced by the same factors influencing smoke production by wildfires. Increased utilization of forest residue during timber harvest reduces available fuel in turn reducing smoke production. Smoke production is also influenced by the timing of the burn and weather conditions. Other methods of slash treatment and site preparation are available. However, most alternatives require costly equipment, and can cause excessive soil disturbance.
Fugitive dust produced by vehicular traffic on native surface roads affects air quality. Factors that affect dust production include: silt content of the road surface, the distance traveled, the weight and speed of the vehicle, and weather conditions. Mitigation measures including watering or dust suppressants are effective. Utilizing standard timber sale contract mitigation measures fugitive dust is not expected to increase (and may decrease) during implementation of an alternative.

This analysis includes the direct effects (effects resulting from the implementation of an alternative that occur at the same place and time), indirect effects (effects resulting from the implementation of an alternative that occur later in time or are further removed in distance but are reasonably foreseeable), and cumulative effects (effects resulting from the incremental impacts of past, present and reasonably foreseeable future actions regardless of who is responsible).

**Regulatory Framework**

Under the 1977 Clean Air Act amendments (42 U.S.C. 7401 et seq), areas of the country were designated as belonging to Class I, II, or III Airsheds for Prevention of Significant Deterioration purposes. Class I areas are all international parks, national parks greater than 6,000 acres, and national wilderness areas greater than 5,000 acres which were created prior to August 7, 1977. Class I areas provide the most protection to pristine lands by severely limiting the amount of additional, human-induced air pollution, which can be added to these areas. Class II areas are currently all other areas of the country that are not Class I. To date, there are no Class III areas. Glacier National Park and the Cabinet Mountain Wilderness, Class I Areas, and impact zones were considered in the development of this project.

The 1977 amendments to the Clean Air Act contained provisions for the Prevention of Significant Deterioration (PSD) Program to prevent the growth of stationary industrial sources from causing a significant deterioration of air quality in areas that meet present air quality standards of National Ambient Air Quality Standards (NAAQSs) and placement of limits on the “increment” of clean air that can be used by industrial projects. The PSD Program is administered by the State air regulatory agencies with oversight authority retained by EPA.

The Clean Air Act authorizes states with approved PSD Programs to exclude particulate matter emissions caused by temporary activities from consuming increment. EPA expects the states, on an individual basis, to decide the extent to which prescribed fires (and the resulting emission increases) should be considered temporary sources of air pollution when determining increment consumption in specific areas.

The majority of the legal entities in Montana (including the Forest Service), which create particulates as a result of their burning activities, formed the Montana/Idaho State Airshed Group. Through a Memorandum of Understanding with the Montana Air Quality Bureau, this group has established a smoke monitoring system that provides daily air quality predictions and air quality restrictions to its members. The Montana Air Quality Bureau issues an annual burn permit to the Forest Service. Issuance of this permit is based on participation and compliance with burning restrictions set by the Montana/ Idaho State Airshed Group.

Prescribed burning within the analysis area would comply with the current Federal and state management plans. Prescribed burning is reported to the Airshed Coordinator on a daily basis.
If the monitoring unit forecasts ventilation problems, prescribed burning is either restricted by elevation or curtailed until good ventilation exists.

Combustion products of wildfires and prescribed burning smoke include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, nitrogen oxides, and trace minerals. Federal and State ambient air quality standards have been established for particulate matter (PM), which is the pollutant of most concern from smoke. Specifically, PM less than or equal to 10 micrometers in aerodynamic diameter (PM-10) is the size which can penetrate the inner recesses of the lungs, causing health problems. It is also the size that most severely impacts local and regional visibility.

If a community does not meet or “attain” the National Ambient Air Quality Standards, it is designated as a non-attainment area and must demonstrate to the public and the Environmental Protection Agency how it will meet standards in the future. This demonstration is done through the State Implementation Plan.

In July 1997, the EPA issued revised national air quality standards for ozone and particulate matter in the 2.5 micron class (PM-2.5). The EPA proposed the following implementation plan for the new standards, which took effect on January 17, 2007:

- Nationwide fine particulate monitors in place.
- States and EPA collect data from nationwide network.
- States submit to EPA their State Implementation Plans (SIPs) describing how they'll meet and enforce the new standards.
- States implement their Plan to assure they attain the standards.

In December of 2012 the EPA issued a new final rule which changed the national annual arithmetic average from 15 micrograms per cubic meter to 12 micrograms per cubic meter.

The current Federal and State standards are:

**PM 10:** 1) the concentration of PM 10 must not exceed 150 micrograms per cubic meter over a 24-hour period; or 2) the annual arithmetic average must not exceed 50 micrograms per cubic meter.

**PM 2.5:** 1) the concentration of PM 2.5 must not exceed 35 micrograms per cubic meter over a 24-hour period; or 2) the annual arithmetic average must not exceed 12 micrograms per cubic meter.

PM 10 and PM 2.5 monitors are located in Thompson Falls, Libby, Kalispell, Whitefish, Missoula, Helena, and several other sites in Montana.

**Bounds of Analysis**
The state of Montana is divided into 10 Airsheds according to the Montana State Air Quality Bureau. The Spring Gulch project area lies within Airshed 2. The analysis area for air resource impacts would be a 140 kilometer radius from the project area. Sensitive areas, like population centers, impact zones, non-attainment areas, and Class 1 areas are considered (refer to the Airshed information in the project file).
Affected Environment/Existing Condition

Airshed Characteristics
Smoke and dust from the west is the predominant influence on air quality in Airshed 2. Prescribed burning of logging residue by private and other government entities adds smoke to the air mass. Wildfires burning in the localized area, Canada, and from areas as far west as the coastal range of Oregon and Washington also contribute to air quality degradation. Dust, originating from tilled farmland during dry windy weather, can add to local haze and reduce air quality.

The principal impact to air quality in Class 1 areas from prescribed burning and wildfires is the temporary visibility impairment caused by smoke. This may reduce the quality of forest recreation experiences, as vistas beyond the boundaries of the Class 1 areas may be temporarily obscured. The conditions that may reduce visibility also produce visual benefits, such as spectacular sunsets.

The effects of smoke from prescribed burning within the analysis area are affected by the season of burning, the atmospheric stability, topography, and the time of day the burning occurs.

Season - Smoke dispersal is usually best during the spring and early summer because daytime heating and general wind flows help smoke rise above ridge tops and into the free-air winds where it is transported and dispersed.

Stability - Stable high-pressure systems that often occur during late summer and fall hamper the vertical motion of air reducing the smoke dispersion potential.

Topography - The mountainous topography of the analysis area also influences the dispersion of smoke. Smoke produced at high elevations is closer to the free-air winds that occur so dispersion is improved over low elevation units. Burns on slopes exposed to the prevailing wind would have better smoke dispersion than units located on the lee slope.

Time of Day - Smoke dispersal is best between 1:00 and 6:00 PM. This is when daytime heating is greatest. This usually coincides with the period of greatest atmospheric instability for the day.

Historical Conditions
Quantitative air quality data is not available for the period prior to settlement of the analysis area late in the 19th century. However, journals from early day explorers and newspaper articles from the late 1800’s often mention the smokey conditions from summer fires burning in western Montana and northern Idaho (paper by Mark J. White in project file).

The annual amount of smoke generated from forest fires has generally decreased since the early 1900’s. Prior to the advent of effective fire suppression, fires which started on the Cabinet District, generally burned unchecked from the time of ignition until weather changes stopped their spread. Smoke production varied as environmental factors changed. Smoke could have been produced for just a few hours or for as long as several months. During severe fire seasons, especially when stagnant high pressure systems persisted, regional air quality was probably poor. The acreage burned by wildfires within the project area decreased as effective fire suppression evolved resulting in improved air quality. During the last half of the 20th century,
natural fuels resulting from decades of fire suppression have reached a level where larger, more intense fires are possible.

**Existing Conditions**
Studies conducted by the Montana Health and Environmental Sciences Department have demonstrated that prescribed burning of logging slash, when burned in compliance with State regulations, is not a major contributor to reduced air quality in the Thompson Falls and Libby areas. Source apportionment studies taken in Libby, a non-attainment area, have shown that slash burning contributes less than three percent of the total PM-10, with road dust and wood stove smoke being major contributors. PM-10 readings taken in Libby since 1988 have shown a trend toward improvement in air quality from September through November when most fall prescribed burning occurs.

Situations in forest management require treatment of activity created fuels at timber sale completion. Prescribed fire is one common technique used to dispose of these fuels. Because prescribed fire is a forest management adaptation of wildfire, it simulates natural processes better than other fuel treatment alternatives.

According to the Environmental Protection Agency's Report, *AP-42 Compilation of Air Pollution Emission Factors*, air pollution is generated from prescribed burning. The net amount is believed to be a relatively small quantity compared to that produced by wildfires. The Environmental Protection Agency states in this report, "prescribed fire is a cost effective and ecologically sound tool for forest, range, and wetland management. Its use reduces the potential for destructive wildfires and thus maintains long term air quality."

**Analysis Methods**
Burning would be expected within the ten years following the signing of a Finding of No Significant Impact (FONSI) and would occur during spring and fall seasons.

Emissions production was estimated by the computer model *First Order Fire Effects Model (FOFEM)*. Modeling was used to predict the particulate produced by a wildfire pre and post implementation of an action alternative.

Dispersion modeling of smoke is more complex than estimation of emissions, since atmospheric stability conditions and winds transport and mixes the particulate matter downwind. *Wind Roses* produced From Spokane, Washington Radiosonde Data are used to predict annual percent probability of wind direction and speed. This method is analyzed to predict the probability of smoke produced from the project area affecting downwind airsheds of concern.

**Location and Frequency of Burning**
The proposed burning and fuel treatments for each alternative are indicated on the alternative Tables located in Chapter 2.

Burning associated with this project would occur annually, during the spring or fall burning periods, until all burning is completed. The spring burning period usually runs from late March through June. The fall burning period usually occurs in September through November. Historically by October broadcast and underburning are prohibitive due to wet conditions. Pile burning would occur during the late fall burn period which runs from October through November.
The Montana Air Quality Regulations restrict open burning during December, January and February.

The criteria used to select timing of burn projects would include: fuel moistures, risk of escape, general weather patterns, smoke dispersion, live fuel moistures, and resource objectives.

**Indicators and Units of Measure**

Indicators used for measuring effects to the environment will be the amount of particulate matter produced modeled pre and post treatment for the project area. Probability of wind direction will be used to measure the chance that a smoke event will affect a Class 1 area.

1.) Particulate matter 2.5 micrograms/meter$^3$ produced. Measured in total tons produced.
2.) Probability of wind direction that would affect adjacent airsheds.

**Environmental Consequences**

Direct and indirect effects on the air quality are described below for activities proposed in Chapter 2. Cumulative effects were considered for all past, present, and reasonably foreseeable activities listed and described in Chapter 1, Table XX.

Prescribed burning is a land management treatment to accomplish natural resource management objectives. Prescribed fires are conducted within limits of a fire plan that describes the conditions under which the burn can be implemented to accomplish resource objectives. Prescribed fire is a cost-effective and ecologically sound tool for forest, range and wetland management. Its use reduces the potential for high intensity wildfires and thus has the potential to maintain long-term air quality. Prescribed burning removes logging residues and fuel accumulations, controls insect and disease, improves wildlife habitat and forage production, increases water yield, maintains natural succession of plant communities, and reduces the need for pesticides and herbicides. The major air pollutant concern is the smoke produced by prescribed fire (A Desk Reference for NEPA Air Quality Analysis, 3.1.2-1).

The following objectives are taken into consideration when selecting the appropriate fuel management technique.

1. Treat activity fuels and natural fuels to reduce the potential for unwanted wildfires.
2. Prepare harvested sites for tree planting or natural seedlings using the most appropriate method, including prescribed fire and mechanical means.
3. Use prescribed fire to maintain the natural succession of fire dependant plant communities.
4. Use methods that reduce unwanted fuel through improved harvest techniques or through higher utilization standards. Favor utilization when the cost of onsite treatment equals the cost of removal for utilization.

The selection of a fuel management technique depends of several factors including: silvicultural prescription, timber harvest method, timber harvest type, wildlife habitat, soil, water, cultural resource protection, and air quality. The Interdisciplinary Team selected fuel treatment options which balance resource objectives and economic concerns.
Direct and Indirect Effects of Alternative 1 – No Action

Wildfire
The direct effects of wildfire smoke on air quality from implementing the no-action alternative is that fire occurrence, intensity, and size would be similar to fires in the recent past. Historic records show that since 1971 the fire occurrence rate for the project area is 1 fire every 12.7 years. During the period since 1971 there have been 3 fires in the project area. These fires are generally small, burning less than one acre each due to fire suppression. However, there is an increasing probability that a fire would escape initial attack growing large in size and burn for a long duration due to increasing fuel loads. Fires of this scale and duration would impact air quality. A recent example is the Ulm Peak Fire that burned over 800 acres on the Cabinet Ranger District and actively burned for over four weeks.

For analysis purposes, a model comparison is made of burning all acres within the project area pre and post treatment. This modeling gives the deciding official an opportunity to compare the different effects on air quality to expect during a wildfire event under different treatment scenarios. Smoke produced by wildfire is largely unmanageable in terms of the timing and duration of the event.

Be aware the modeling is not an attempt to depict reality, but merely an analysis for comparison purposes.

Table 3-81 Modeled Particulate Production

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Particulate Produced by Wildfire If Project Area Burns Post Implementation (Total Tons Produced)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PM 2.5</td>
</tr>
<tr>
<td>Alternative 1 – No Action</td>
<td>141.70</td>
</tr>
<tr>
<td>Alternative 2 – Proposed Action</td>
<td>104.40</td>
</tr>
</tbody>
</table>

Direct and Indirect Effects of Alternative 2

Prescribed Burning Associated with Harvest and Non-harvest Activities
All alternatives are portrayed in Table AQ-1. Smoke from fuel treatment is related to fuel loading. Current fuel loading information can be found in the project file fire fuels section.

Smoke emitted by prescribed burning is managed because the timing of the burn is selected when air quality and dispersion are favorable. Fire intensities, fuel moisture levels, and utilization of the flaming phase of combustion would all be monitored and used to reduce particulate production and airshed impact. By burning under favorable conditions, particulate amounts would be drastically reduced compared to amounts generated by a wildfire of the same acreage. PM 10 and PM 2.5 levels would rapidly disperse as they are carried by local and general winds. Another management technique is limiting the size of burn units to reduce the amount of particulate released at a time thus giving the particulate an opportunity to disperse before introducing more to the airshed.

Alternative 1 would generate particulate during implementation. The smoke produced during project implementation would be in compliance with the Montana/Idaho State Airshed Group.
thus causing no significant impact to the airshed. Participation and coordination with the Montana/Idaho State Airshed Group is instrumental to successful smoke dispersion and reduced smoke impacts.

**Summary**
The potential amount of unmanaged smoke produced would vary by alternative proportionate to the amount of fuel hazard reduction. The greatest potential reduction of wildfire emissions through fuel hazard reduction would occur from the implementation of Alternative 2, while the least amount would occur with Alternative 1.

Smoke produced by prescribed burning would be managed through the Montana/Idaho State Airshed Group to stay within the EPA Standards. Alternative 2 would produce particulate during implementation however standards would not be exceeded.

**Cumulative Effects**
The Cumulative Effects Worksheet, located in the Air Quality Project File, describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed in Chapter 1. Those activities that cumulatively affect air quality are discussed below.

**Vegetation Management**
The cumulative effects on air quality by smoke produced from implementation of an action alternative could result in an incremental decrease in air quality if unmanaged. Particulates from this source would combine with other particulates from local and regional sources located upwind. Smoke produced by alternative implementation would be managed through the Montana/Idaho State Airshed Group to stay within the EPA Standards mitigating negative cumulative effects.

General wind patterns may cause smoke to drift into Libby, Thompson Falls, Glacier National Park and the Flathead Valley. Visibility may be temporarily reduced until prevailing weather influences mix and disperse smoke. Impacts would be minimized in the spring due to fewer park and forest visitors, higher fuel moistures (less emissions), better smoke dispersion, and reduced impacts from other PM 10 and PM 2.5 producing activities.

**Fire Suppression**
The cumulative effects of wildfire smoke on air quality includes all pollution sources contributing particulates to the air mass in addition to the smoke produced by wildfires within the analysis area. The largest impacts occur when wildfires are burning upwind of the analysis area and within the analysis area concurrently. The cumulative effect of these particulate sources could result in extended periods of poor air quality.

**Potential Impacts to Non-attainment Areas, Class I Airsheds and Local Communities on Air Quality**

The following analysis is based on radiosonde data collected at Spokane, Washington for the period from January of 1991 to December of 2008. The data selected for this analysis is for the 750-millibar level, which corresponds to 8,400 feet above sea level. Winds at this level represent the free-air wind direction and velocity that are likely to occur over the analysis area. *Wind Rose* and tables containing the source data are included in the project file.
The range of wind speeds at 8,400 feet above sea level, for the entire year, ranges from a low of 3 mph to a high of 23 mph. Winds that originate from a westerly direction tend to be stronger than those originating from an easterly direction. Winds with a westerly component, those ranging from SSW to NNW, account for 81% of wind origin directions. Southeasterly winds are the least frequent.

Two data sources were used to estimate the likelihood that air pollutants from the Spring Gulch project area would impact a given area of interest. The percent probability that wind direction would be such that it would carry smoke toward the area of concern from information taken from the Wind Rose data tables, and the distance from the project area to the points of concern.

The premise of the analysis is the likelihood that smoke produced as a result of the implementation of one of the action alternatives would affect an area of concern, is a function of the following factors.

1. The probability a wind direction blowing from the project area to the area of concern would occur.

2. The dilution of the smoke as it traverses the distance from the project area to the area of concern.

The analysis, summarized in the following table, considers the combined factors that would influence the effects that smoke from the project area would have on non-attainment areas, Class I area, and other local communities.

<table>
<thead>
<tr>
<th>Area of concern and reason for concern</th>
<th>Transport wind direction to location of potential impact</th>
<th>Distance to area of concern in kilometers</th>
<th>Percent Probability of wind direction occurrence: May (Spring)</th>
<th>Percent Probability of wind direction occurrence: Oct. (Fall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libby, MT, Non-attainment area</td>
<td>S</td>
<td>69</td>
<td>26.2 %</td>
<td>25.8 %</td>
</tr>
<tr>
<td>Whitefish, MT, Non-attainment area</td>
<td>SW</td>
<td>108</td>
<td>36.3 %</td>
<td>26.4 %</td>
</tr>
<tr>
<td>Kalispell, MT, Non-attainment area</td>
<td>SW</td>
<td>95</td>
<td>36.3 %</td>
<td>26.4 %</td>
</tr>
<tr>
<td>Thompson Falls, MT, Impact Zone</td>
<td>NW</td>
<td>19</td>
<td>10.6 %</td>
<td>10.5 %</td>
</tr>
<tr>
<td>Eureka, MT, Sensitive area</td>
<td>S</td>
<td>126</td>
<td>26.2 %</td>
<td>25.8 %</td>
</tr>
<tr>
<td>Cabinet Mt.</td>
<td>S</td>
<td>21</td>
<td>26.2%</td>
<td>25.8%</td>
</tr>
</tbody>
</table>
### Effects Analysis of Potential Impacts to Class I Area.

Certain wilderness areas and National Parks established before August of 1977 were designated as Class 1 areas. Class 1 designation allows limited increase in air pollution above existing air pollution levels. The Clean Air Act amendments of 1977 included a program for prevention of significant deterioration of air quality, generally referred to as the PSD program. This program is to prevent areas currently having clean air from becoming polluted. The Bob Marshall Wilderness, Glacier National Park and the Cabinet Mountains Wilderness are all Class 1 areas.

Effects resulting from the implementation of the action alternatives would be considered direct effects since the Cabinet Mountains Wilderness is within close proximity of the project area.

The analysis presented in table AQ-2 above indicates that transport winds, from a direction that would carry smoke toward the Cabinet Mountains Wilderness Area, would occur less than 26% of days in the spring or the fall. If burning occurs on one of these days, smoke may impact visual quality and could also deliver airborne pollutants to this Class I area. The effects of visual impairment would be noticed less during spring weather because of low visitor use due to deep snow. The probability of impacting air quality of Cabinet Mountains Wilderness is low.

The data in the table above indicates the probability that transport winds would carry smoke toward Glacier National Park 36% of the days in the spring and 26% of days in the fall. If burning occurs on one of these days, smoke could impact visual quality and could also deliver airborne pollutants to this Class I area. Smoke dilution due to the 137 kilometers distance from the project area would greatly reduce the level of pollutants reaching this airshed. The probability of impacting Glacier National Park is low due to the distance to this area.

### Mitigation Measures Taken to Reduce Prescribed Burning Emissions.

The potential air quality impacts from prescribed burning would be reduced by four general methods: fuel load reduction, fuel consumption reduction, flaming combustion optimization, and impact avoidance.
1. **Fuel Loading Reduction:**
The Kootenai National Forest has encouraged material utilization through contract provisions. Purchasers may be required to pay for top wood smaller than the utilization standard. This encourages utilization of small diameter material. These measures help decrease the amount of available fuel (Standard Contract Provision BT 3.41).

2. **Reduction in the Amount of Fuel Consumed:**
Fuel consumption can be accomplished through spring burning. Harvested areas located on east, southeast, south, southwest and west aspects could be burned during the spring season. Typically the spring season runs from late March through June. During this timeframe larger diameter fuels and the duff layer usually have relatively high moisture contents reducing fuel consumption, which reduces smoke emissions.

3. **Flaming Combustion Optimization:**
When prescribed burning is determined to be the most appropriate fuel treatment, methods which increasing flaming combustion phase would be used. Concentration of logging slash by whole tree yarding or excavator piling increases the amount of material consumed during flaming combustion. Purchasers are required to construct piles so they are compact and free of excess soil.

4. **Impact Avoidance:**
Smoke impact avoidance would be accomplished through daily monitoring of airshed conditions. In Montana, the open burning season runs from March 1 through November 30. All open burning in the state is regulated by the State of Montana Air Quality Bureau. Major prescribed burners, including the Forest Service, have formed the Montana/Idaho State Airshed Group. Through a Memorandum of Understanding with the Montana Air Quality Bureau, this group has established a smoke monitoring system that provides daily air quality predictions and restrictions to its members. To accomplish this, the Airshed Group has a monitoring unit consisting of meteorologists and technicians that use weather forecasts and air quality conditions to determine, on a daily basis, the need for restrictions on prescribed burning. The Forest Service is issued an annual permit to burn by the Montana Air Quality Bureau. Issuance of this permit is based on participation and compliance with burning restrictions issued by the Montana/Idaho State Airshed Group. Proposed prescribed burns on the Cabinet Ranger District are reported to the Airshed Coordinator on a daily basis. If ventilation problems are forecasted by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation conditions return. The Forest Service will cooperate with the state in meeting the requirements of the State Implementation Plan and the Smoke Management Plan (Forest Plan, II-26).

Individual burn bosses are trained in smoke management techniques prior to being qualified as burn bosses. Part of a burn boss responsibility is to evaluate smoke dispersion and halt burning operations in the event the actual smoke dispersion is not as forecasted and will cause significant harmful impacts.

**Regulatory Consistency**

The forest-wide objectives for air quality are:
1) Maintain excellent air quality on the forest and protect local and regional air quality by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and State Implementation Plan (SIP). Requirements of PSD and SIP and the Montana Smoke Management Plan would be met.

2) Prevent long-term deterioration of the air quality, classified as Class I for Cabinet Mountain Wilderness and Class II for the rest of the Forest.

The Montana/Idaho State Airshed Group regulates smoke management for air quality. The Kootenai National Forest coordinates and schedules burning activities to maintain air quality. Prescribed burn plans describing how and under what conditions the burning would take place are prepared by qualified personnel for all burning activities. All activities under the proposed action would be consistent with the Forest Plan.

By participating in the Montana/Idaho State Airshed Group, complying with the Memorandum of Understanding with the Montana Air Quality Bureau and meeting the requirements of the State Implementation Plan and the Smoke Management Plan, the proposed activities would comply with the Forest Plan and the 1977 Clean Air Act.

ECONOMIC EFFICIENCY

Introduction
The Forest Service is to manage the forest in cost efficient manner. This section presents analysis on project feasibility and financial efficiency, which relate to the costs and revenues of implementing the proposed action.

Regulatory Framework
The preparation of NEPA documents is guided by CEQ regulations for implementing NEPA [40 CFR 1500-1508]. 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].

OMB Circular A-94 promotes efficient resource use through well-informed decision-making by the Federal Government. It suggests agencies prepare an efficiency analysis as part of project decision-making. It prescribes present net value as the criterion for an efficiency analysis.

The development of timber sale programs and individual timber sales is guided by agency direction found in Forest Service Manual (FSM) 2430. Forest Service Handbook (FSH) 2409.18 guides the financial and, if applicable, economic efficiency analysis for timber sales.

Analysis Area
The analysis area for the efficiency analysis is the project area. All costs and revenues associated with the project decision were included.
**Affected Environment**

To be implementable, the timber sale must be feasible. The timber sale feasibility analysis predicts saleability of the project. Saleability is based on the demand for stumpage and the costs and revenues associated with the sale.

The collapse of the U.S. housing industry and the related global financial crises has had a large negative impact on the Montana and Idaho forest products industry. With declines in housing and generally weakening demand, lumber prices have dropped about 35 percent from 2005 to 2008 (Morgan and Keegan, 2009). Availability of stumpage is still important to industry to help ride out the current market situation. There is local demand for stumpage from the Forest, as evidenced by the amount of timber sales sold on the Kootenai in recent years. Most sales offered were sold with strong competition. There continues to be demand for stumpage, although at reduced prices.

**Methodology**

*Project feasibility* is used to determine if a project is feasible – will it sell, given current market conditions. It relies on the Region 1 Transaction Evidence Appraisal (TEA) System and delivered log prices. The TEA uses regression analysis of recently sold timber sales to predict bid prices. The most recent appraisal and feasibility model for the area of interest was used to estimate the stumpage value (expected high bid resulting from the timber sale auction) for the timber project. The estimated stumpage value for each alternative was compared to the base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury) for that alternative. The project is considered to be feasible if the estimated stumpage value exceeds the base rates. If the feasibility analysis indicates that the project is not feasible (estimated stumpage value is less than the base rates), the project may need to be modified. The infeasibility indicates an increased risk that the project may not attract bids and may not be implemented.

*Financial efficiency* provides information relevant to the future financial position of the program if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. PNV combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive PNV indicates that the alternative is financially efficient.

Many of the costs and benefits associated with a project are not quantifiable. For example, the benefits to wildlife from habitat improvement, underburning to stimulate browse and reduced fuel loadings, are not quantifiable. These costs and benefits are described qualitatively, in the individual resource sections of this document. Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) indicates “For the 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. Costs for various vegetation, recreation, wildlife, road and burning activities are based on recent experienced costs and professional estimates. Non-harvest related costs are included in the PNV analysis, but they are not included in appraised timber value.
Environmental Consequences

Project Feasibility

The estimation of project feasibility was based on a transaction-evidence and delivered log price appraisal, which took 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 estimated high bid was compared to base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury). The estimated high bid and base rates for the action alternative is displayed in Table 3-82. Given the predicted high bid and the base rate, the action alternative is feasible.

The predicted high bid is the basis for the timber revenue estimate. The actual timber value will depend on the market when the timber is sold, and may be higher or lower than the predicted high bid. The analysis included a relatively low Western Wood Products Association (WWPA) average value per thousand board feet (MBF).

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 for each alternative is the corresponding predicted high bid from the transaction evidence appraisal equation. The present net value (PNV) was calculated using Quicksilver, a program for economic analysis of long-term, on-the-ground resource management projects. A four percent discount rate was used over the 6-year project lifespan (2013-2018). 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 associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. These values are discussed throughout this document, for each resource area.

Planning costs (NEPA) were not included in any of the alternatives since they are sunk costs at the point of alternative selection.

Table 3-82 summarizes the project feasibility and financial efficiency for each alternative. Table 3-82 indicates that the action alternative is financially inefficient, with a PNV of -$26,325. The no action alternative would not harvest, plant trees, enhance wildlife habitat, implement BMP’s on haul routes, return fire to the landscape or take other restorative actions and, therefore, incur no costs. As indicated earlier, many of the values associated with natural resource management are non-market benefits. These benefits should be considered in conjunction with the financial efficiency information presented here. These non-market values are discussed in the various resource sections found in this document.

3-251
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.

### Cumulative Effects

The above economic efficiency is only for this project. There are no cumulative effects to economic efficiency.