CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This Chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

INTRODUCTION

Chapter 3 describes the environment (including its human elements) in and around the project area and discusses the environmental consequences by resource that may result from implementation of each of the alternatives. It provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. Maps referred to in the analysis are located at the end of this document.

The Council on Environmental Quality Regulations (CEQ) recognizes three types of effects:

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

PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

Analysis of cumulative effects presented in this chapter considered past, present, proposed, and reasonably foreseeable activities that could affect the issues pertinent to this analysis. Activities on public and private lands have been considered.

Reasonably foreseeable actions include those management activities that are on going or scheduled to occur within the next five years and for which a proposed action has been developed. These activities may occur regardless of which alternative is selected for implementation.

The environmental analysis required under NEPA is forward-looking, in that it focuses on the potential impacts of the proposed action. Past and present activities and natural events have contributed to creating the existing condition and trends across the Kootenai National Forest. In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies to a large extent on an examination of the current environmental conditions in order to highlight the impacts of past actions. This method is useful because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. Additionally, some of these activities, as well as reasonably foreseeable activities, may continue to produce environmental effects that overlap in time and space with issues or resources relevant to the proposal. Therefore, past, present, and reasonably foreseeable activities have been considered in the cumulative effects analysis for each resource area relative to potential future effects of the proposal.

The cumulative effects analysis in this DEIS is consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008) in accordance with the CEQ Memorandum, *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis*, which state, in part:

> "The analysis of cumulative effects begins with consideration of direct and indirect effects…agencies then look for present effects of past actions that are, in the judgment of the agency, relevant and useful because they have a significant cause-and-effect relationship with the direct and indirect effects of the proposal for agency action and its alternatives. CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decisionmaking. (40 CFR 1508.7)"

During the scoping process and subsequent analysis of this project, the Forest Service determined that the following activities, decisions, information and environmental documents are applicable to all or portions of the NFS lands included in the analysis area for this DEIS. As appropriate, they were considered during the cumulative effects analyses discussed in this chapter. This section also lists known past activities identified by resource specialists as being pertinent to an analysis of cumulative effects for the Miller West Fisher project. There are marked differences between past and current land management practices and policies. The evolution that has occurred in land management practices is the result of science, our ongoing monitoring actions, and changing public values.

A cumulative effects map showing considered activities is included in the project file. A listing of all past timber sales by names and the year those sales were sold is included in Table 3-3 below. Table 3-3 does not contain every timber harvest activity in the subunit because some harvesting took place that did not have a timber sale name. Table 3-3 simply provides all sale names in the subunit, their total acres and the year sold.

The following discussion identifies those past, present, and foreseeable actions that have occurred within the Silverfish Planning Subunit. Data on private lands within the subunit has a moderate level of accuracy, and is the best available information obtained from those landowners and field verified information.

Land Ownership: Total acres of the Silverfish Subunit by landowner are displayed in Table 3-1 below.

Table 3-1
Total Acres by Land Owner and Percent of Total within Riverview Subunit

LAND OWNER	TOTAL ACRES	% OF TOTAL
USDA Forest Service	60,519	87
Plum Creek Timber Company	6,196	9
Montana Department of State Lands	640	<1
Other Private	2,064	3
Silverfish Subunit Total Acres	**69,419**	

Past and Proposed Future Harvest: Table 3-2 below displays harvest history in the Silverfish Planning Subunit by landowner, by harvest type, by decade. Proposed future treatments by decade are also included. Note that some of the PCTC proposed harvest in the 2000 to 2009 period have already been completed.

Table 3-2
Harvest History by Decade by Land Owner in the Silverfish Planning Subunit

LAND OWNER	DECADE	INTERMEDIATE HARVEST (ACRES)	LIBERATION HARVEST (ACRES)	REGERATION HARVEST (ACRES)	TOTAL ACRES
USFS	1920-1929				
	1940-1949				
	1950-1959				
	1960-1969	50	1,661	51	**1,762**
	1970-1979	0	668	91	**759**
	1980-1989	277	225	1,034	**1,536**
	1990-1999	502	25	347	**874**
	2000-2009	0	0	5	**5**
	2010-2019				
Plum Creek Timber Company	1880-1889				
	1900-1909				
	1930-1939				
	1940-1949				
	1960-1969				
	1970-1979				
	1980-1989	275	759	1,686	**2,720**
	1990-1999	308	0	256	**564**
	2000-2009	505	0	55	**560**

LAND OWNER	DECADE	INTERMEDIATE HARVEST (ACRES)	LIBERATION HARVEST (ACRES)	REGERATION HARVEST (ACRES)	TOTAL ACRES
	2010-2019				
Private	1900-1909				
	1910-1919				
	1920-1929	0	0	28	**29**
	1950-1959	41	0	0	**41**
	1960-1969				
	1970-1979				
	1980-1989	0	102	78	**180**
	1990-1999	26	164	147	**337**
	2000-2009				
Montana Dept. State Lands	1940-1949				
	1960-1969				
	1970-1979				
	1980-1989				
	1990-1999				
	2000-2009				
Total Acres					

Table 3-3
Past Timber Sales on USFS Lands within the Silverfish Planning Subunit

TIMBER SALE NAME	YEAR SOLD	TOTAL ACRES
Howard West Fisher	1977	145
West Fisher	1978	593
Teeters Bugs	1985	83
Red Batton PC	1985	100
Trail Creek	1986	287
Miller Stud PC	1986	33
Horse Cable	1987	571
Trail Creek Blowdown	1987	9
Miller Post and Pole	1987	16
West Fisher Seed	1988	117
Swamp Schrieber	1989	16
Midas Trespass	1993	116
Miller Fire Salvage	1993	23
Corral Salvage	1997	221
Total		2,330

PC = Pest Control

Reasonably Foreseeable Future Projects

Forest Wide Fuels EA Units: There are 12 burn units within the Silverfish Planning Subunit that have been analyzed in the 2001 Forest Wide Fuels Reduction and Wildlife Habitat Enhancement EA. Burns planned for the Porcupine Creek area were implemented in May of 2002. The remaining units are expected to be implemented over the next four years. All of these units are shown on the cumulative effects map in the project file and described in the Tables below. Approximately 1,859 acres of spring burning was analyzed in the Forest Wide Fuels EA. Of those acres, 820 acres have been implemented and the remaining acres are scheduled to be completed. No timber harvest treatment is included in these treatment units.

Table 3- 4
Forestwide Fuels Ea Burn Units Completed Within Silverfish Planning Subunit

FORESTWIDE FUELS EA UNIT #	TREATMENT ACRES (ARCGIS)	TREATEMENT	DATE COMPLETED
5077	287	Spring burn	5/13/02
5078	142	Spring burn	5/13/02
5079	118	Spring burn	5/13/02
5080	273	Spring burn	5/13/02
Total	**820**		

Table 3- 5
Forestwide Fuels Ea Burn Units Planned Within Silverfish Planning Subunit

FORESTWIDE FUELS EA UNIT #	TREATMENT ACRES (ARCGIS)	TREATEMENT	ESTIMATED TREATMENT YEAR
5069	201	Spring burn	2009
5070	80	Spring burn	2009
5071	47	Spring burn	2009
5073	47	Spring burn	2009
5082	77	Spring burn	2010
5083	19	Spring burn	2010
5090	283	Spring burn	2007
5095	302	Spring burn	2007
Total	**1,056**		

Burns 5069 and 5070 overlap with harvest Units 102, 104, 105 and 109 in the current proposed action. Burning would not take place in these units until harvest treatments were completed if these units were part of a selected action.

Treatment years for prescribed burns are estimates and are dependant on funding, weather, and agency priority setting.

Miller Creek Wildlife Habitat Improvement Burn – In 1998, a decision memo was signed authorizing a 1,300 acre wildlife habitat improvement burn in the Miller Creek drainage. The burn was accomplished in the spring of 1998.

Management objectives and the purpose and need of the burn were to:

1. Improve big game foraging habitat by rejuvenating decadent brush, reducing shade from standing dead stems, stimulating resprouting in shrubs and grasses, and reducing competition from encroaching conifers (5"dbh and less).
2. Restore the natural fire cycle in areas which historically had low intensity fires every 25 to 50 years prior to effective fire suppression.

Specific design criteria and mitigation included:

1. No ignition would occur within 150 feet of a riparian area. Experience shows spring fires are unlikely to burn into riparian areas since burning conditions are such that fire generally spreads only on open, sunny slopes.
2. Burning would occur only under conditions with good smoke dispersal. The burn plan calls for dry fine fuels, fairly low relative humidity and other conditions that would result in a hotter, cleaner fire that would contribute a minimal amount of particulate matter to the air.
3. Fuels surrounding archaeological and cultural resources would be reduced or pre-burned in order to avoid damage.
4. The likelihood of tree mortality is low; however, should any trees fall across trails in the project area they will be cleared.

Montanore – This project includes permitting a silver/copper mine in the Cabinet Mountains. The project affects BMU's 5 and 6. Mine facilities are generally located north and outside the Silverfish PSU with the exception of a proposed power line that traverses the subunit. This mine was analyzed and permitted originally in 1993 but was closed up and stored in 1996. In January of 2005, Mines Management Incorporated submitted a permit to the Forest for an operating permit and a plan of operations. The proposed action includes impacts to 3,000 acres of National Forest System (NFS) lands and 200 acres of private lands. A 230 kilovolt power line is also proposed. The mine would produce 20,000 tons of ore per day during peak operation. The Montanore Mine would be in operation for approximately 20 years.

The proposed action for the Montanore project includes mine facilities to be constructed including a surface mill in the upper Ramsey Creek drainage, which is outside the Silverfish PSU. Two mine adits adjacent to the mill site will provide access to the ore body. Ventilation portals will be constructed on private property in the upper Libby Creek drainage and upper Rock Creek drainage near Rock Lake. These are also outside the Silverfish PSU but all are within BMU 6. A 990 acre tailings impoundment would be constructed and used in the Little Cherry Creek drainage, also outside Silverfish PSU but within BMU 6.

In the proposed action, the 230 kilovolt power line would be constructed from Sedlak Park in the Pleasant Valley along U. S. Highway 2, and then routed up Miller Creek and Ramsey Creek drainages to the project site. A portion of this power line would be constructed within the Silverfish PSU. Approximately 9.9 miles of new road would be constructed to construct and access this power line. Please refer to the cumulative effects map in the DEIS. This power line route is analyzed in cumulative effects with Miller West Fisher Alternatives 1, 2, and 4, and is referred to as CUM1 in the wildlife section of this document.

The clearing width for the proposed power line is 150 feet over 16.4 miles and would result in about 300 clearing acres. These figures cover the entire power line as described in the Montanore Preliminary DEIS, and extend outside of the Miller West Fisher project area and on both private and federal lands. Alternate power line route locations are considered in the Montanore analysis. Because selection of a power line route *other than* the propose action route through the North Fork of Miller Creek is likely, an

alternative was developed in this project (Miller West Fisher Alternative 6) to analyze the cumulative effects of that alternate route (Montanore Modified West Fisher 2 – referred to as CUM2 in the wildlife section) and take advantage of opportunities for vegetation management and creation of grizzly bear core habitat not available in the other alternatives. The Modified West Fisher 2 power line route would have a 200 foot clearing width over 14.9 miles and would result in approximately 361 clearing acres. Approximately 3.5 miles of new road would be constructed to build and maintain this power line route. The ID team and decision maker decided to analyze Alternative 6 with this Modified West Fisher 2 power line due to the fact that it was very different from the propose power line route and would have very different effects on the project area.

Ore would be crushed underground and conveyed to the surface mill. Ore would then be processed using a flotation process at the mill. Tailings would be transported to the tailings impoundment in Little Cherry Creek using a pipeline. Silver/copper concentrate would be transported by truck to Libby via the Bear Creek road and then shipped by rail to an out-of-state smelting facility.

Design features and mitigation measures are still being determined for this project.

Libby Adit – a proposal for exploration of the Libby Adit for the Montanore Mine is currently being considered. This proposal, called the Libby Adit Plan of Operations (POO), has been combined into the same analysis with the Montanore Mine. The activities proposed in the Libby Adit POO are reasonably foreseeable and include:

- Year-round temporary use of the Libby Creek road #231 and road #2316 to Montanore Minerals Corporation (MMC) to haul building material, explosives, supplies, personnel and equipment to the exploration adit located on private land in the Libby Creek drainage. Road maintenance and snow plowing activities would be permitted under the Plan of Operations. Best Management Practices (BMP's) would be implemented along the road corridor.
- MMC will resume underground evaluation activities utilizing the Libby Adit. These activities would include:
    - Installation of an office, shop, generators, water treatment plant and other ancillary facilities to support the Libby adit exploration activities. These will all be located on private land.
    - Dewatering of existing underground workings originally excavated by Noranda Minerals Corporation;
    - Extension of the existing adit, which is now approximately 14,000 feet long, for approximately an additional 3,000 feet to reach the main ore body (Montanore Deposit). Drill stations, requiring additional tunneling (drifting) will be constructed throughout a portion of the deposit for approximately 10,000 feet. Extension of this adit would occur on National Forest System (NFS) lands and under the Cabinet Mountains Wilderness.
    - Diamond core drilling for approximately 45,000 feet.
    - Storage of waste rock on private lands on a lined waste rock storage facility.

Design features and mitigation measures include closure and storage of a number of roads. Of these roads, only the Standard Creek road is located within the Silverfish PSU. Details of this closure are included on the table below. This closure is also included in the proposed action (Alternative 2) of the Miller West Fisher project.

Table 3-6: Libby Adit Access Changes in Silverfish PSU

LOCATION			ROAD MANAGEMENT MITIGATION	
Road #	Legal Description	Road Name (Length in miles)	Existing Status:	Proposed Action:
#6745	Near the northeast corner of Sec. 31, T27N, R30W	Standard Creek (4.4)	Gated and closed yearlong to motorized vehicles including over snow vehicles	Install earthen barrier. Close yearlong to motorized vehicles including over snow vehicles. Store. Maintain as a trail.

Roads to be closed with an earthen barrier will also be placed into long-term storage. These roads will be closed to create grizzly bear core habitat, which cannot receive motorized use during the active bear year. Therefore road maintenance activities using motorized equipment cannot be performed in these areas. Roads placed into core habitat must be made hydrologically neutral so that improvements in grizzly bear habitat do not result in negative impacts to fisheries habitat.

Green Mountain – The Green Mountain Fuel Reduction project is located on the Cabinet District of the Kootenai National Forest. The project is outside of the Silverfish Planning Subunit, but within BMU 6. Therefore, this project must be included in analysis of effects on grizzly bear within BMU 6. A Decision Notice (DN) was signed for this project on November 20, 2006. This decision authorizes fuels treatments on 1,058 acres including 352 acres of commercial thinning and 706 acres of prescribed fire. Approximately 0.9 miles of temporary road construction are included. Temporary roads will be re-contoured or ripped and seeded at the end of the project.

Rock Creek Mine – This project permits a Plan of Operations for a hard rock mine. A Record of Decision (ROD) was signed for this project on June 27, 2003. The company now seeking the permit is Revett. Permitted activities include:

- Construction of an evaluation adit above the West Fork of Rock Creek off of Forest Development Road (FDR) #2741 near the Cabinet Mountains Wilderness;
- Operation of an underground copper/silver mine and a flotation mill;
- Construction of a tailings impoundment with pipelines to transport tailings slurry to the impoundment. These pipelines would be double-walled with leak detection sensors.
- Construction of a 230 kilovolt power line, a tailings paste plant and storage facility, a wastewater treatment facility and an enclosed rail load-out facility.
- Relocation of FDR #150.

A total of 482 acres of land would be disturbed, with 140 of those acres occurring on NFS lands.

The U. S. Fish and Wildlife Service has consulted on the Rock Creek mine and produced a Biological Opinion (BO) that specifies terms, conditions and mitigation measures that must be implemented to both operate the mine and conserve threatened and endangered species. The BO specifically describes terms and conditions and reasonable and prudent measures for threatened bull trout and grizzly bear. While measures prescribed to protect bull trout will not influence bull trout in the Miller West Fisher project area, measures prescribed to protect grizzly bears will since some of these measures will take place within BMU 6. Specifically, USFWS has prescribed the following measures for protection of grizzly bear in the Rock Creek Biological Opinion:

- Forest actions must not result in a net decrease of core area, nor a net increase open or total motorized route densities within BMU's 4, 5, and 6 during the life of the proposed mine (approximately 35 years).

- The Forest shall ensure that reductions in open and/or total motorized route densities or increases in core areas made possible by acquisition of or obtaining conservation easements on mitigation habitat shall be completed within three years of acquisition or easement. Improvements shall constitute the baseline from which the term and condition above is then measured during the life of the mine. At a minimum, upon acquisition or easement, the Forest and Service shall determine whether, where legally possible, the Forest shall temporarily immediately close access routes to reduce open motorized route densities. Final planning processes would then be conducted.
- Within one year of issuing the permit for the evaluation adit the Forest shall berm or barrier Bear Creek road 4784 to increase core area in BMU 5 for the life of the mine.
- Currently, a portion of Midas Howard Creek Road 4778 is restricted yearlong; the South Fork Miller Creek Road 4724 is partially open year-long and has a spring closure on about six miles of the route. These closures shall remain in place for the life of the mine to increase grizzly bear security in spring habitat. Additional closures may occur through separate planning processes and may occur due to information gained through the monitoring and research effort.
- The Forest shall ensure that land exchanges related to mitigation properties would not result in a loss of management situation 1 grizzly bear habitat in the Cabinet Yaak Ecosystem, unless such loss results in significant habitat benefits for grizzly bears, as agreed to by the USFWS.
- The Forest shall ensure that administrative use levels on restricted roads in BMU's 2, 4, 5, 6, 7 and 8 shall be limited to no more than 57 round trips per year divided by spring, summer, and fall seasons.
- Access management changes shall be monitored and included in the annual Kootenai National Forest monitoring reports.
- Prior to the construction of the evaluation adit, the Forest shall ensure that Revett shall provide funding for the grizzly bear specialist and law enforcement officer for a period of no less than five years. The mitigation plan requires funding for these positions throughout the life of the mine. This up-front funding would ensure the necessary funding to comply with the mitigation plan in the event of a temporary lapse of activity at the mine between the evaluation adit and construction phases. The mitigation plan requires the positions remain active in the event of temporary shutdowns. If after the evaluation adit phase, Revett withdraws its plan of operation or rescinds permits with the intention of not moving forward with development of the mine, this term and condition would not be required.
- Prior to the construction of the mine, the Forest, Montana Fish, Wildlife and Parks (MFWP) bear specialists and USFWS grizzly bear personnel, shall assess the 16 county garbage transfer stations other than the site near the mine entrance. The group shall work with the counties to prioritize the sites and set a schedule for upgrading the sites to grizzly bear-resistant, at those sites deemed in need of such action.
- Prior to construction of the mine, the Forest shall ensure that Revett provide funding for five years of salary and expenses for the additional grizzly bear specialist position, to be funded for the life of the mine.
- The Forest shall seed approval to give the State law enforcement officer authority to enforce the food storage order on the Forest within two years of issuing the permit to proceed with the evaluation adit.
- Any grizzly bear mortality within the action area shall be investigated by the USFWS, Forest and MFWP. If deemed attributable to the effects of the mine, additional measures as needed and as approved by the USFWS shall be taken to prevent additional grizzly bear mortality.
- The Forest shall monitor grizzly bear and black bear sanitation incidents in BMU's 2, 4, 5, 6, 7

and 8 and take corrective action through Forest enforcement of the food storage order and/or other adequate remedy, or through activities coordinated or conducted by the grizzly bear management specialist and/or Oversight Committee. Incidences involving black bears will be reviewed by the grizzly bear management specialists and the USFWS to assess whether the conditions leading to the incident may also be a risk to grizzly bears in the area.

- The Forest shall work with the grizzly bear specialist on public outreach programs that will advance awareness of grizzly bear conservation issues among the public in and surrounding the Cabinet Mountains.
- By April of each year, the Forest shall prepare an annual report of grizzly bear and black bear sanitation incidents and corrective measures taken during the previous year.
- By April of each year, the Forest shall prepare an annual report that summarizes actions taken to comply with the above terms and conditions implementing reasonable and prudent measures 1, 2 and 3 during the previous year.

Bear Lakes Estates – This decision, signed July 21, 2006, permits the owners of the Bear Lakes Ranch, which is a private in-holding directly adjacent to the Cabinet Mountains Wilderness, to access their private property with livestock using either the Bear Lakes Trail #178 or the Divide Cut-off Trail #63 via the Iron Meadows Trail #113. A non-system trail will be constructed off of Trail #63 to the private in-holding. This trail, located in designated wilderness on NFS land, will be approximately 1,300 feet long, and will not be open for use by the general public. A limited amount of blasting will be necessary to construct this trail. This blasting is expected to take place during the summer months in 2009, and would occur within designated wilderness. Livestock use is currently prohibited within the Big Bear Lake basin to protect water quality. The private land parcel is located in Section 30 of T26N, R31W PMM. This project is within the Silverfish Planning Subunit and grizzly bear management unit (BMU) 6.

Wayup/Fourth of July Mines: This project authorized private access to two mining claims near the Cabinet Mountains Wilderness within the Silverfish Planning Subunit. Included in this decision was construction of 2.68 miles of new road off of the end of road 6748 in Lake Creek. In addition, this ROD, signed on January 30, 2000, authorizes the following:

- Reconstruction and motorized use on the 1.3 miles of Rd. 6746 beyond the gate (yearlong closure to motorized use) and to the mine adit, and maintenance and spot reconstruction on approximately 2.8 miles of Rd. 6746 that are currently open to motorized use.
- Access changes:
    - Spring closure (April 1 to June 15) on South Fork Miller Creek road 4724 (not currently in place);
    - Yearlong closure on 6746C, Twin Peaks C spur (already completed – road placed in intermittent stored service);
    - Opening 6746 from it's start at 2332 to the already open portion of 6746 (already completed);
    - Restricting motorized use on 6746 from its junction with 6746C. This portion of the road would be gated and restricted to the permittee and Forest Service administrative use only. Number of trips would be limited by season as described below. 6746 would be open to over the snow use from December 1 to March 31 (not currently in place).
    - Placing an earthen barrier to create grizzly bear core habitat on the end of 4724 South Fork Miller at its junction with road 4780 (already completed);
    - Placing an earthen barrier to create grizzly bear core habitat on road 6743 Teeters Mountain (already completed);

  - Placing earthen barriers on the 2315 (Trail Creek) and 2315A where they enter NFS lands in T26N, R30W, Section 20 (boundary with Section 17) to create grizzly bear core habitat (already completed);
  - Restricting numbers of trips into the Wayup and Fourth of July claims behind gates to those specified in the interim grizzly bear rule set. These specify 38 vehicle round trips from April 1 to June 15, 46 round trips from June 16 to September 15, and 38 round trips from September 16 to November 30. No trip limitations are defined for the period from December 1 to March 31.
- The following terms and conditions from the USFWS BO:
  - The special use permits authorizing road development would restrict work to the period of June 16 to October 15. Road development will be completed in a two to three year time frame.
  - Following road development, easements would be issued. The easements would be managed as "restricted" roads as defined in the Interim-Access Management Rule Set (now the Grizzly Bear Access Amendment to the forest Plan). Access would be allowed consistent with the amendment. The easements for road use would reflect the access conditions in this amendment. The access easement will include the most up to date standards at the time of issuance. Under the access amendment, trips would be kept to the administrative use definition, which allows 57 round trips per year divided by season. No trip limitations are defined for the period of November 16 to March 31.
  - Under the terms of the easement, both permitees would be responsible for providing a record or log of the total number of motorized round trips per week behind gates on access roads. This information will be available on request by the Forest Service at the end of the spring (June 15), summer (September 15), and fall (November 15) periods.
  - Earthen barriers will be placed on roads 2315A and 2315 at the Plum Creek/USFS boundary.
  - The gate on road 4724 would be replaced with an earthen barrier.
  - All food, garbage, livestock and pet foods and other attractants would be made unavailable to bears. During daylight and nighttime hours, all food, garbage and other attractants would be stored in a bear resistant manner, as specified by USFWS. These requirements would be placed in the special use permits and road easements for all activities on NFS lands.
  - Winter access would be compatible with the Lynx Conservation Assessment and Strategy (LCAS).
  - Motorized access on the South Fork of Miller Creek road 4724 would be restricted from April 1 to June 15 to protect spring grizzly bear habitat in BMU 6.

Outfitter and Guide Activities: Four outfitters hold permits for hunting and trail rides within the Silverfish Planning Subunit. A hunting camp is permitted near but outside the Cabinet Mountains Wilderness. This camp is accessed by a trail using foot or saddle and pack stock.

Small Sales: Blowdown or windthrown timber salvage sales that meet the criteria of the Forestwide Blowdown Salvage Decision Notice may be identified and sold in the future. If a sale of this nature were identified, then the criteria outlined in the Blowdown Decision Notice would be followed. Also, small fuels reduction projects may be authorized in the project area through separate decisions.

Data Gathering Activities: Field surveys to gather resource data are likely to occur within the project area within 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.

Road Activities: Routine road maintenance is likely to occur as needed on existing roads in the project area. The roads most likely to receive maintenance are those open to vehicle traffic.

Fire Suppression Activities: If conditions are such that there are fire starts within the project area, efforts will be made to suppress any and all fires.

Weed Control: Spraying to control weeds is ongoing within the project area under the Kootenai National Forest Invasive Plant Management Final Environmental Impact Statement and Record of Decision (April 2007). Noxious weed management activities may also occur on Plum Creek lands and private property.

Other Minerals Activities: There are three gravel pits and numerous mining claims within the Silverfish Planning Subunit. The gravel pits are all on NFS lands and provide mineral material for Forest Service road projects. Two pits, accessed by road 6754, are considered depleted and are in reclamation status. These are D5-45 in T26N R29W Section 16, and D6-47, which is just south of D5-45.

Pit D5-30, located in T27N, R30W, NE ¼ of Section 26, is designated as active and is accessed by road 4724A. Road 4724A is proposed for yearlong closure in the proposed action. Closure would be accomplished using a gate, thus maintaining access to the pit.

Among the mining claims currently listed as active by the BLM are lode claims at the Gloria and Blacktail (also known as Jumbo, Tip Top and New Deal) in the West Fisher and Bramlet drainages, and at the Viking workings in the Silver Butte drainage. The Blacktail is the site of a current Plan of Operations to explore existing workings. Lode Mining claims which have been patented and are therefore in private ownership include the American Kootenai, and Wayup in the Upper West Fisher, the Branagan in Bramlet, Irish Boy and Fourth of July in the Lake Creek drainage, and the King Mine in the Silver Butte drainage. Mines which were developed at these locations recorded from moderate production historically and are all inactive as is the abandoned Golden West mine in the Upper West Fisher drainage.

Prospecting and mining in the Standard Creek drainage included the Mustang Mine (reclaimed in 2002) in upper Standard Creek and numerous prospects on Great Northern Mountain. The Midas Mine, T27N, R30W, Sections 19 and 30, a patented lode claim located on a tributary to Standard Creek approximately two miles north of the Montezuma prospect and three miles northwest of the Miller Placer (both currently inactive prospects on placer claims on the West Fisher) recorded significant production intermittently through the 1950s. The Waylett group approximately one and half miles southeast of the Midas is currently inactive though some prospecting and reclamation was conducted in this area in the SW 1/4 of Section 28 on the South Fork of Miler Creek as recently as 1998. A few active lode claims are located near Standard Lake and approximately one half mile to the southeast of Standard Lake but there are currently no proposals to conduct mineral exploration in this area.

A Plan of Operations has been received from the owner of a placer claim on Silver Butte Creek, T25N, R30W, NE ¼ Section 4, proposing in-stream suction dredging and exploratory digging. The exploration site is accessed via road 5009, the Viking mine road. The claim is called the A Far Placer.

Gravel pit and mine locations are shown on the cumulative effects map in the project file.

Midas Mine Subdivision: This former mine property has now been purchased by real estate interests and has been subdivided and offered for sale. It is accessed by road 231, the Libby Creek Fisher River road, which is open to motorized traffic yearlong.

Plum Creek Native Fish Habitat Conservation Plan: PCTC, the US Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS) have collaborated on the Native Fish Habitat Conservation Plan (NFHCP). A habitat conservation plan is part of a process outlined by Section 10 of the Endangered Species Act (ESA) that involves cooperation between the federal government and a private landowner (NFHCP 2000). The plan is designed to address "taking" of species listed under ESA. Taking a species can take the form of directly killing an individual animal, plant or other species, or it can result from loss of habitat. The HCP allows the services to issue an incidental take permit for the species of concern while getting a signed commitment by the private land owner to implement beneficial conservation practices on their lands. The HCP offers the private land owner confidence and certainty for long term business planning and investments in areas that would otherwise be risky in habitat for listed species.

The NFHCP covers 1.6 million acres of PCTC lands in Montana, Idaho and Washington as well as access roads leading to those lands that PCTC is cost shared into. The NFHCP covers all native salmonids, including bull trout, westslope cutthroat trout, and redband trout. PCTC committed to a number of conservation practices, including compliance with State Best Management Practices (BMP's) on existing roads and enhanced BMP's on construction of all new logging roads and many others. These practices are designed to protect watershed health and fisheries populations, and are included in the project file in the cumulative effects section.

Public Activities Likely to Occur: Firewood cutting is likely to continue to occur along open roads. Recreational use of the area will also continue and includes driving open roads, snowmobiling, hunting, hiking, berry picking, and other activities.

Actions on Private Lands: Continued development of private lands within the analysis area is expected. Development is expected to include commercial timber harvest, land clearing, home construction, road construction, septic field installation, water well drilling, livestock grazing, and stabilization of migrating stream banks. All proposed harvest and road building activities is described in the table above or in the cumulative effects map in the project file.

FOREST VEGETATION

INTRODUCTION

This section describes the existing condition and effects to vegetation and ecological processes in the Miller West Fisher Area. This report is tiered to the Fisher Landscape Assessment completed September 30th, 2003.

Tiering to Fisher Landscape Assessment

An ecosystem management approach was used to analyze the Fisher Physiographic Area. Please refer to the Fisher Landscape Assessment (USDA 2003). This analysis identified resource management opportunities by analyzing biophysical landscape characteristics in association with historic disturbance regimes. These landscape characteristics and disturbance regimes were used to identify the composition of tree species that historically occurred in the Fisher drainages. The existing conditions were compared to historic conditions. We believe (as reinforced by the latest scientific understanding) that maintaining the landscape within the range of conditions that could happen within the natural disturbance regimes would also maintain those species that evolved and adapted to those conditions. The desired conditions for vegetation types in the physiographic areas we assessed are based on the Kootenai National Forest's Vegetation Response Unit (VRU) Characterizations and Target Landscape Prescriptions (1999). Based on that analysis, opportunities were identified to utilize management activities to restore, maintain, or enhance the basic ecosystem functions that evolved and/or adapted to and within those disturbance regimes. These opportunities were prioritized for treatment. The potential treatments are designed to sustain ecosystems and to provide commodities and amenities.

The analysis within this report is tiered to reference and current conditions described in the Fisher Landscape Assessment (USDA 2003).

Purpose and Need

The identified purpose and need related to vegetation and ecology for the Miller West Fisher Project are to:

- Maintain the vigor and long-term productivity of forest stands;
- Reduce hazardous fuels and restore natural fire regimes;
- Provide forest products

ANALYSIS AREA

Analysis bounds for most effects indicators are the "Analysis Boundary" as described below. In order to fully understand and address some of these indicators it is necessary to look at a variety of scales. Therefore, some indicators will have more than one bounded area.

Fire Regimes	Northwest Montana, VRU, and Potential Natural Vegetation (PNV) Project Area Boundary (Silverfish Planning Subunit)
Fire History	Northwest Montana, VRU, PNV, Project Area Boundary
Past Management Activities	Project Area Boundary
Stand Structure (Seral Stage)	Project Area Boundary
Forest Type	Project Area Boundary

Insect and Diseases	Project Area Boundary
Conifer Regeneration	Stand and Habitat Type Group

The Analysis Boundary for vegetation effects includes the Silver Butte, West Fisher and Miller Creek drainages on the west side of the Fisher River and US Highway 2. The analysis area is 69,419 acres of which 87% or 60,519 are National Forest System (NFS) lands, 640 acres are Montana Department of Natural Resource lands, 6196 are Plum Creek Timber Company (PCTC) lands, and 2,064 are in small private ownership.

General historic or reference conditions, and the desired and existing condition information is described in the Fisher Landscape Assessment Vegetation Response Units (VRU's) and pertain to the project area addressed in this document. To describe some of the reference and desired conditions it is more effective to describe conditions across larger landscapes such as Northwestern Montana or similar biophysical units such as the Vegetation Response Unit or Potential Natural Vegetation Group as described in the Fire Regime Condition Class Analysis.

ANALYSIS METHODS

Based on the findings in the Fisher Landscape Assessment (2003), opportunities were identified that address discrepancies between historic or reference conditions - and current conditions. During this environmental assessment, those opportunities were developed into site-specific treatments that trend the landscape toward a desired condition and meet the purpose and need of maintaining vigor and long term productivity; and restoring natural fire regimes.

Ecological characterization and analysis for this report is based on the Vegetation Response Unit (VRU), and Fire Regime Condition Class (FRCC) analysis as described in the Fire Regime Condition Class Guidebook, 2005, page 1-2-2.

The VRU is an aggregation of land having similar developmental and response to disturbance capabilities and similar potential for management. As mapped polygons, these units have similar patterns in potential natural communities, soils, hydrologic function, landform, topography, lithology, climate, air quality and natural disturbance processes. These VRUs are the suggested basic environmental stratification for relating repeatable landscape patterns to predictable ecological processes (including disturbance and succession) (USDA 1999). VRU's are a biophysical unit that is commonly used to compare reference and current conditions and to look at processes and disturbance regimes that have been altered. A VRU or groups of VRU's equate to the Potential Natural Vegetation Group that is utilized in the Fire Regime Condition Class Analysis.

The FRCC analysis will characterize the reference biophysical conditions and fire regime characteristics against the current conditions. This provides a comparative analysis tool for our proposed actions. The FRCC utilizes ecological information on vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern) along with fuel composition, fire frequency, severity, and pattern, and other associated disturbance processes such as insect and disease, grazing, or harvesting. Reference conditions are standardized by using the best science available to develop the Potential Natural Vegetation Group and natural fire regime, which is a classification of the role fire would play across a landscape in the absence of modern human intervention (including the influence of aboriginal burning). This is a course scale analysis comparing current characteristics to natural reference conditions.

The Miller West Fisher Analysis Boundary is spread across three drainages within the Silverfish Planning Subunit (including Silver Butte, West Fisher and Miller Creek drainages). Vegetation treatments are proposed in all three drainages. The Kootenai National Forest is the primary land owner

within these drainages, and Plum Creek Timber Company (PCTC) is the secondary landowner. The State owns a section in the West Fisher drainage. There are also small, privately-owned parcels within each drainage that vary from residences in the lower drainages to mining claims in the head end of the drainages.

Because the analysis area is large enough to look at ecological processes, the majority of the land base is National Forest System (NFS) Lands, and the area has been identified through the

Interior Columbia River Basin Ecosystem Management Project (ICRBEMP) as having moderate ecological integrity; there is value in utilizing a course filter ecological tool such as the FRCC analysis to look at existing conditions and trends. This will in turn help guide management direction, and help determine if we are meeting or trending toward the identified purpose and need objective of maintaining vigor and long-term productivity, and restoring natural fire regimes.

While it is important to look at reference conditions to help guide management, it is also important to look at potentially changing climate, and to address the potential impacts on vegetation, species productivity, phenology, distribution shifts, disturbance regimes, and the carbon cycle. The Fire Regime Condition Class is a course scale analysis that will be utilized to compare current characteristics to the natural reference conditions. The departure from reference conditions, in conjunction with potential impacts of climatic change will be utilized to help guide management direction.

Landres et al, 1999, conclude that natural variability concepts provide a framework for improved understanding of ecological systems and changes occurring within these systems. They also suggested that specific goals, site-specific data, inferences, simulation models and value judgments must drive selection of the relevant time period and spatial extent used in defining natural variability. The relevant time period for this analysis is the current climatic period measured with pollen analysis for the past 2,500 years (Chatters and Leavell 1994), combined with an analysis filter that looks at climatic trends the past 100 years.

The desired condition described in this report and the summary VRU tables from the Fisher Landscape Assessment, along with the FRCC Analysis will describe the range of natural variability for the Miller West Fisher project. However, management will be tailored to local conditions. The FRCC analysis may be found in the project file.

Stand treatments are assessed at the stand level (within adjacent stands) at the VRU and drainage scale within the Analysis Boundary.

Information from field surveys conducted in the mid 1980's through the mid 1990's combined with walk through surveys in 2005 through 2007, are the basis for evaluation of the stands. These surveys are located in the project file. The Libby Ranger District stand files contain the survey information for individual stands in the form of field forms and summary tables extracted from R1Edit System. The Timber Stand Management Record System (TSMRS) - a computerized database also stores general site and stand characteristics and information on historic activities for each stand in the project area. Data was extracted from the old TSMRS data rather than the National FACTS Database since it was still in the developmental stages.

The diagnostic prescription process for the analysis area and stands proposed for treatment are summarized within this report on page 34-35 and included in full in the project file.

REGULATORY FRAMEWORK

Federal

National Forest Management Act (NFMA) documented in FSH 1909.12 discusses specific findings for vegetation manipulation; this is covered in Section IX of this document. This includes timely conifer regeneration.

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).

The objectives of National Forest Management Act (NFMA), as well as the principals of ecosystem management, include maintaining the diversity of plants and animals existing in forest ecosystems. Implementing regulations for the NFMA state:

> "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 would be expected in a natural forest and the diversity of tree species similar to that existing in the planning area. Reductions in diversity of plant and animal communities and tree species from that which would be expected in a natural forest, or from that similar to the existing diversity in the planning area, may be prescribed only where needed to meet overall multiple-use objectives." [36 CFR 219.27(g)]

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.

USFS

Management of the vegetation resource is regulated by the Kootenai National Forest Plan standards and guidelines and specifically Appendix 2 (Vegetation Management Practices) and Appendix 3 (Timber Productivity Classification).

Silvicultural Practices Handbook (FSH 2409.17) gives direction on vegetation management practices.

Northern Regional Guide provides regulations and direction for vegetation manipulation. Section VI covers consistency with regulatory requirements guiding vegetative manipulation. Guidance for exceeding the 40-acre opening size for even-aged harvest is stated in R1 Supplement 2400-92-8, (12/15/92) 2470.1-2474.53.

Fuel treatment is covered in the Forest Service Manual 5151.1 with additional guidance outlined in the Region One "Fuel Management and Treatment Guide".

USDA Forest Service, Inland Native Fish Strategy, Environmental Assessment, Decision Notice and Finding of No Significant Impact, 1995: INFISH, Interim Strategies for Managing Fish Producing Waters in Eastern Oregon and Washington, Idaho, Western Montana and portions of Nevada; INFISH, or INFS, provides guidance for land management within streamside habitat while protecting water

quality and fisheries habitat. INFS amends the Kootenai Forest Plan and thus, is considered part of the plan.

Northern Region Overview

The Northern Region Overview is to be used to implement the Natural Resource Agenda by setting priorities for ecosystem restoration and to gain a common view of Region 1. Specifically related to vegetation, the Overview explores the situation with regard to Ecosystem Health.

The Overview identified the following areas of concern that are applicable to the Miller West Fisher project area:

Ponderosa Pine - there appears to be a moderate departure from natural conditions due to fire exclusion and past harvest. Ponderosa pine dominated stands = 4% of the analysis area, with an estimated 40-45% suitable for ponderosa pine. One of the main objectives of the Miller West Fisher project is to move species composition more towards seral species such as ponderosa pine and western larch and to regenerate these species when possible.

Western Larch -There appears to be a moderate departure from historic conditions due to the high severity stand replacing fire in1910 that left few western larch relics on the steeper slopes and regenerated heavily to lodgepole pine. Western larch only dominates 14% of the analysis area with an estimated 80+ % of the area suitable and desirable to have western larch. Proposed treatments would generally retain large overstory western larch. Planting western larch after harvest would shift the species composition from lodgepole pine and other more tolerant species to higher levels of larch.

Western White Pine - Significant losses in the western white pine component occurred through the large stand replacing fire in the project area in 1910 with additional losses due to white pine blister rust. Less than one % of the area is dominated with western white pine, with an estimated 50-60% of the analysis area suitable for western white pine. There is a moderate to high departure from natural conditions and a need to restore western white pine to the landscape. There are opportunities to harvest other cover types to create openings and add white pine to the species composition.

Aspen – Conifers have been encroaching into aspen groves due to fire exclusion, and lack of other types of disturbance. A review of current and historic acres of aspen indicates there has been a 64% decline in acres of aspen in Montana. While historically, this area was not dominated by contiguous aspen clones, it was a common component on the dryer and warm moist VRU's and in the riparian areas. This is evidenced by remnant clones in moister areas throughout the dryer VRU's and riparian areas and by aspen occurrence within recent regenerated stands in the warm moist VRU's. Proposed prescribed fire has the potential to rejuvenate aspen on many sites. With potential global climate change towards a warmer condition, aspen strongholds are expected to move north. Western Montana may be a future aspen stronghold as a result (Rehfeldt 2006). A Forest Type Summary Table and Forest Type Map are included in the project file.

National Fire Plan

Hazardous Fuel Reduction – A key point of the National Fire Plan is hazardous fuel reduction. The Fire Plan directs our Agency to focus on fuel management activities that change condition classes from higher risk to lower risk in areas where fire exclusion has resulted in overly dense forest vegetation and/or heavy fuel loadings.

Natural Resource Agenda

Forest Ecosystem Health - The Natural Resource Agenda addresses forest ecosystem health in several areas of concerns relevant to the Miller West Fisher project area:

Fuel buildups - Due to the mortality within lodgepole pine stands from mountain pine beetle infestations in the late 1980's and early 1990's, fuel loads are generally high within the moister VRU's. In some cases the mountain pine beetle affected the younger ponderosa pine component on drier sites. Down fuel loading on the drier aspects are generally not extreme at this time, but the loading will continue to build. Ladder fuels are higher than natural conditions within the dry and moderately dry VRU's due to fire exclusion since the stand replacing fires in 1910.

Exotic Pests - White pine blister rust has been introduced into the project area and has substantially reduced the component of western white pine in the project area.

Disturbance Patterns - Natural disturbance regimes in the project area are largely related to natural wildfire cycles. Our wildfire suppression efforts over 100 years have disrupted these patterns in the project area, which burned extensively in 1910.

Biodiversity loss – Within the project area, losses to biodiversity occur in ponderosa pine, western larch, aspen, and western white pine forest types. These result from disruption of natural fire regimes and introduction of exotic diseases in the project area.

Interior Columbia River Basin Ecosystem Management Project (ICRBEMP)

Findings:

Tree species mix and age classes have changed. Historically, there was a wider, more diverse range of age classes of tree species. Generally, the landscape consisted of a higher percentage of younger, and mixed-age classes, of and older stands. Now, uniform stands of middle-aged trees predominate. As a result of the 1910 fire, approximately 80% of the analysis area is in a single age class. Please refer to the vegetation project file for more specific information.

Most of the timber volume consists of smaller diameter trees. Our project is consistent with this finding due to the following:

1. Stand replacing fire in 1910,
2. The overstocked nature of the Douglas-fir encroachment on the dryer sites
3. Lodgepole pine and lodgepole pine/western larch mix stands that followed on the moist sites.

Large diameter ponderosa pine, western larch, and Douglas-fir are less abundant than reference conditions.

Objectives and Standards: These are not required but are identified as features common to many of the alternatives in the ICRBEMP:

Coarse Woody Debris: ICRBEMP provides guidelines for quantities of coarse woody debris by VRU.

Restoring Fire as Natural Disturbance Process: ICRBEMP recommends restoring fire to the landscape as a natural disturbance process where appropriate.

Restore ecosystem processes: ICRBEMP recommends managing vegetation structure, stand density, species composition, patch size, patch distribution, fuel loading and distribution so the ecosystem is resilient to fire, climatic change, and insects and disease: In moist forests, management activities shall

be conducted to maintain viability of and/or an increase of western white pine in areas where it is adapted.

Snags: ICRBEMP notes that there has been a reduction of snag habitat. This is consistent with findings within the project area.

Manage production activities and their levels on available and suitable lands to produce commodities in areas that are within the ICRBEMP Desired Range of Future Conditions. At the same time, maintain ecosystem processes, including disturbance intensities and frequencies, within the desired range of variability.

Derive social and economic benefits, promote commercial activity, and foster demand for labor and capitol formation through producing a mix of goods and services. Minimize large annual shifts in commercial activity that cause rapid changes in demand for labor (gain or loss) and capital, including the offering of timber and forage. Contribute to economic diversity consistent with local economic development goads. Economic diversity is recognized as a factor important to community resiliency: This is primarily due to the need to provide timber to the national and local economies. The community of Libby is especially vulnerable to wide swings in the offering of timber. This community has been and continues to be dependant on timber.

AFFECTED ENVIRONMENT

This section of the report will describe the affected environment by describing reference or historical conditions, potential climate change, current or existing conditions, and our desired conditions.

Reference Conditions

Reference conditions refer to past or historic conditions of an ecosystem. The purpose of describing reference conditions is to explain how conditions have changed over time as a result of human and natural disturbance. This reference condition is used for comparing existing or current conditions, describing desired conditions, and identifying needs for restoration in the context of historic conditions. Historic Range of Variability (HRV) and Natural Range of Variability (NRV) are terms found in the literature and describe historic (reference) conditions. 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). For the Fisher Landscape Assessment project this information was gathered from a variety of sources: site-specific investigation, old timber type data, old photos, fen analysis, fire scar analysis, historical and research references and inferred from VRU information designed for the Kootenai Forest. In addition, the Fire Regime Condition Class analysis was used to describe general historic characteristics of the landscape, and the historic fire regimes, and reference values. More specific information may be found in the project file.

The landscape is composed of different habitats created by vegetation response to climate, disturbance, and the environment. A long-term, global change in climate, such as in an ice age, results in a shift in vegetation response and resulting habitats, assuming this change occurs over a long enough period of time. The overall climatic condition on the Kootenai National Forest has remained relatively uniform for approximately the past 2,500 years (Chatters and Leavell 1994 DRAFT). Relatively minor, short-term climatic variations have occurred during this time period such as the warmer and drier Little Climatic Optimum (900-1300 AD) and the more moist and cool Little Ice Age (1300-1860 AD) (Chatters and Leavell 1995 DRAFT). Within this time frame, disturbance processes together with landform and other environmental elements are the major factors influencing the patterns of habitats

across the landscape. In turn, species abundance, diversity, and distribution are a result of this dynamic pattern. Native plants and animals today have adapted to these climatic and disturbance regimes throughout the past 2,500 years.

Climate Change

The combination of a predicted long-term, warmer climate with increased levels of carbon dioxide that could aid fertilization could cause another shift in vegetation response and resulting habitats as a result of more frequent and more severe fires in the western United States. In ecosystems whose fire regimes have recently been altered by fire exclusion, long-term climatic change may accelerate the restoration of these historic fire regimes, or could create new regimes. While it is difficult to predict the effects of climatic change on natural resources, the effects of climatic variability on fire occurrence provides some predictability to the potential for large and severe fires. This could pose a serious threat to rare taxa that are associated with specialized and fragmented habitat such as late-seral forest and riparian habitat (McKenzie 2004, Page 897-899).

Predicted warmer climate, precipitation pattern change, increase in frost free days, earlier spring snowmelt, less snow pack, earlier green up, and carbon dioxide fertilization would have ecological impacts that may include; increase in invasive weed biomass, changes in potential vegetation distribution from conifer forest to shrub/woodland, distributional vegetation, mammal, and insect shifts towards the poles or upper elevation in species ranges, increase insect and disease infestations and increased site conversions. Adding climate change to ecosystems that are already altered from historic conditions presents another layer of complexity for management. If occurred over a long enough period of time, it is likely that climate change could further stress, reduce, or alter the range of plant species that we are trying restore such as ponderosa pine on the driest sites. Because western larch, western white pine, and aspen are in the middle of their ecologic amplitude, a predicted shift may not affect those species within this analysis area, but might enhance productivity for these species. The upper elevation range of some conifers such as subalpine fir could move higher up in the sub-alpine fir habitat within the Cabinet Mountain Wilderness with the predicted warmer and dryer climate. Based on the realized climate niche estimates for predicted effects of global warming, Rehfeldt (2006) indicates a stable environment within northwest Montana for ponderosa pine and western larch through 2060 with declines but still present through 2090 - and Douglas-fir steadily increasing through 2090 (Rehfeldt 2006, pg 1145, 1146).

Management Approach

Although our management approach is not an attempt to restore historic conditions, there is strong support for managing ecosystems within the range of variability that has occurred during the past 2,000 years to sustain native species and maintain ecosystem integrity (Swanson et. al. 1993), or the past 2,500-3,000 years as described from local pollen analysis (Chatters and Leavell 1994 DRAFT). "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" (Morgan et al 1993).

Proposed management activities are designed to fit within the broad historic ranges we've identified, and to foster the processes and patterns that make up the ecosystem, while acknowledging the human footprint, and the potential for climate change. Knowledge of historic conditions and natural disturbance processes can help clarify the types, extent, and causes of ecosystem changes, and can help

identify management objectives and restoration priorities (Brown 2004, page 904). We are not attempting to precisely recreate past conditions, and do acknowledge that the modern human imprint cannot be eliminated. In addition, no one can precisely predict the future climate and associated disturbance processes. Pierce suggests that restoration of processes typical of pre-settlement times may be difficult in a warmer future that promotes severe fires, and that these efforts to return to fire regimes typical of a generally colder pre-settlement era will need to adapt to changing vegetation and fire activity in a warmer and drought-prone future (Pierce 2004). Our attempt to restore ecosystems within a historical range, while utilizing an adaptive management approach to address potential climate change, is an attempt to keep all the parts, and to theoretically maintain a sustainable and resilient system. There is likely a risk to doing this and no attempt is made to correct all the problems created by human intervention in the past within this project area, nor would it be reasonable to target a landscape solely aligned with predicted climate change conditions.

In conjunction with management within the historic range, we need to create and increase resilience to change, with a possibility of wildfire, exotic species, insect and disease and site conversions increasing with global climatic warming. Management strategies to create this resilience include aggressive control of invasive species, thinning conifer stands to decrease competition and stress, type conversions to intolerant species, developing mixed species plantations with intolerant species, creating age class diversity, reducing hazardous fuels, creating fuel breaks, increasing buffers, and generally increasing heterogeneity through patches, gaps, variable stand compositions, ages and structures. In addition we need to use knowledge from climate projections to plan vegetation options, and anticipate and plan for associated risks including forest dieback, alterations in vegetative species ecologic amplitude, increase in fire size, severity, duration, and location. Landscape resistance and resilience necessary to meet the purpose and need of maintaining vigor and long-term productivity and restoring natural fire regimes, will require utilization of adaptive management and realignment to current and predicted stand dynamics.

In some areas within the Miller West Fisher Landscape, the interdisciplinary team acknowledged that this may not be the time to do vegetation management but to focus on passive restoration (the cessation of activities that are causing degradation or preventing recovery), road and stream restoration, and noxious weed management. In the Miller West Fisher Area, the ID Team recommended road restoration and vegetation management as timely and appropriate activities for some portions of the landscape.

Frissell and Bayles (1996) present some good arguments against using the historic range of variability in analyzing effects to aquatic ecosystems. One of the major points they make is that Ecosystem Management should be framed as a conscious experiment with a largely uncertain outcome. This may well be the case but doing nothing is not the answer either. The “restoration” identified for this area is an honest effort in a new management style that is designed to “keep all the parts,” protect the “keystone species,” and to return or maintain the forested landscape to a sustainable and resilient condition. It also is designed to provide some commodity products and recreational values.

Landscape function refers to the flow of mineral nutrients, water, energy and/or species across the landscape and how the compositional and structural elements of a landscape interact and operate. Because landscapes are heterogeneous, they differ in the flows of species, energy, and materials among the structural landscape elements (Forman and Godron 1986); therefore it is difficult to measure landscape function. It is widely hypothesized that where community composition and structure occur within a historic range of conditions, the function of the landscape community will also be maintained within a manageable range of the historic range of variability. However we can not maintain function by restoring the vegetation structure, composition and patch size without restoring fire on the landscape. No mechanical means can duplicate the unique ecological effects of wildland fire, such as soil heating,

nutrient recycling, and the resulting effects to the community composition and structure (Kauffman 2004, page 880).

Miller West Fisher Project Area

This section describes the reference conditions, existing conditions, and trends for the affected environment in the analysis area.

The vegetation in the Miller West Fisher Project Area is dominated by coniferous forest and woodland. Dominant forest types include Douglas-fir mixed with ponderosa pine on the drier slopes and lodgepole pine mixed with true firs, Douglas-fir, and western larch on the more moist sites. Lodgepole pine and lodgepole pine/western larch mixed types are common as a result of the large-scale stand replacing fire in 1910. This forest type dominates the mid elevation and much of the upper elevation moist sites within this analysis area. Natural grass/shrub lands intermixed with rock outcrops make up a moderate portion of the landscape. Natural meadows, riparian zones, wetlands, and aspen groves, also make up a minor but important portion of the landscape. Please refer to the project file for more detailed forest type information.

Historically, the major disturbance factor that created vegetation patterns on the landscape was fire; both lightning-caused and human-caused. Native American burning was practiced in the lower elevation dry types to promote travel, provide visibility and provide big game habitat, as well as the mid and upper elevations to sustain huckleberry fields. Over time and for a long enough period of time for species to adapt, each vegetation community had a particular fire regime that gave a unique structure to the community. These fire regimes ranged from frequent, low severity fires in ponderosa pine types to infrequent higher severity fires associated with the lodgepole pine and mixed conifer types. Wind, insect, disease and snow caused minor gaps in the forest. Major insect or disease infestations predisposed or set up the landscape for large scale fire. Invasive plants and their effects on the native flora and fauna were essentially non-existent until the late 1800's.

Forest management and associated road building over the last 50 years has introduced changes in forest structure (vegetation composition, age class, patch size and location, and connectivity) on the Miller West Fisher landscape. Stand replacing fire in 1910, combined with white pine blister rust (an introduced, exotic pathogen) caused significant mortality in the western white pine component. Road building associated with timber harvest and mining increased human access into this area and influenced forest management. This resulted in some impacts to riparian areas and contributed to the introduction and spread of invasive plants.

Almost one hundred years of fire suppression has also contributed to changes in forest structure and composition. Forest stands are more crowded than they would have been with periodic fire, leading to overpopulation and stress, increased insect and disease levels, increases in natural fuel loads, and the development of ladder fuels. All of these factors can contribute to increased fire severity during a fire event. While individual areas may have more acreage burned in a given event or year, on a forest-wide level, less area is burned annually than what had historically occurred.

Historically, noxious weeds were essentially non-existent until the late 1800's. Several noxious weeds are currently established or are potential threats within the analysis area. Spotted knapweed, common St-John's-wort, orange and meadow hawkweeds, and Bird's Foot Trefoil are well established along road and trail travel vectors. Sulfur cinquefoil and common tansy are known to be present in the analysis area. There are identified sites of Dalmatian toadflax, and rush skeletonweed within the analysis area. The sites are currently being monitored and treated, but these species will continue to be a threat.

Disturbance Agents

A natural disturbance regime is a general classification of repeatable disturbances and recovery processes across a landscape in the absence of modern human intervention. A disturbance is an event that causes a change from the normal successional pattern in an ecological system such as an ecosystem or landscape. Over time, disturbances mold and shape a landscape; they include natural events such as fires and pest outbreaks as well as human disturbances such as land clearing and timber harvest. Each ecosystem type has a distinctive disturbance regime, with a range of intensities, frequencies and types that occur in it. Natural agents of disturbance such as windstorms, fire and insect and disease outbreaks are usually viewed as unpredictable. But, when long periods pass with little disturbance, an outbreak of insects, a fire, or a windstorm is likely to damage a large portion of the stand or landscape (Waring and Schlesinger 1985). Of the three, fire is the best documented as the surviving trees are often scarred and these can be used to date the event. Timber harvest, fire and insect activity are the most evident disturbance regimes in the Miller West Fisher landscape.

Long-term health and sustainability of ecosystems are linked to disturbance. Recurrence of disturbance and recovery within ecosystems is an important mechanism for energy flow, nutrient cycling, maintaining age, species, genetic and structural diversity and all attributes of ecosystem health (Averill et al 1994).

Natural succession processes and natural disturbances such as fire, wind, insects and diseases have historically formed vegetation patterns across this landscape. Human disturbances, including timber harvest, road building, and fire suppression have altered these vegetation patterns in the Miller West Fisher landscape. An ecologically-based landscape assessment characterizes and describes the landscape in terms of disturbance regimes and the resulting patterns, composition, and structure. The first section describes overall landscape patterns across the entire area. To help describe how the current landscape was shaped, the following disturbances and associated landscape patterns have been described:

1. Vegetation Succession, Structure, and Function
2. Insect and Disease
3. Fire
4. Human Disturbance
5. Vegetation, and Natural Disturbance Processes as described by Vegetation Response Unit Groups

Vegetation Succession, Structure, and Function

In the absence of or between disturbance processes, succession is the basic process of change in the composition, structure, and function of plant communities over time. A simplified illustration of succession can be described as a forest progresses through stages, each stage generally named after the size class of the trees, or after the dominant life form (i.e.: grass, forbs or shrubs). The successional process following a disturbance is described below.

A disturbance such as wildfire, kills all or a portion of the existing plant community and will affect the structure and composition of the landscape. Following a major disturbance, the first plant communities to become established are usually pioneering grasses, forbs and shrubs. This stage is followed by seral tree species that require sunlight and are intolerant of shade. As these trees mature, shade-tolerant species (may include shrubs and forbs as well as trees) develop under the forest canopy. The understory plants change as the trees begin to shade the site. Species that require sunlight disappear or become restricted to openings in the canopy. Shade-tolerant species become more abundant, but overall the

understory plants become smaller and less dominant. In the absence of disturbance, the seral species are replaced by climax species (those species that can regenerate under themselves). This condition is rarely achieved in the Northern Rocky Mountain forests due primarily to insect and disease outbreaks such as mountain pine beetle and periodic fire.

Change is fundamental to all ecosystems, and disturbances are inevitable. Change is the only constant in our ecosystems. The pattern of plant vegetation communities over northwestern Montana reflects the combined influence of these disturbances along with the effects of settlement, timber management and fire suppression. The resulting plant communities vary considerably with site characteristics such as: topography; solar radiation; precipitation; elevation and soils, and plant species distribution and development patterns. These plant communities will continue to change via natural processes, such as fire, insect and disease activity, and succession. 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.

Insects and Pathogens

Most insects and pathogens (diseases) are natural and critical and within parts of forests have integral functions in the forest ecosystem. It is necessary to maintain forest components supporting tree diseases and insect infestations primarily to support first-tier food web sources, such as insects for predator populations. These components indirectly support cavity nesters by playing a decomposition role in nutrient recycling and providing snags. They also play a role in the fire ecology of northwestern Montana by creating areas of dead conifers that fuel large, catastrophic stand-replacing fires. In general, where fire is removed from the natural processes, stand density will increase, composition moves towards shade tolerant trees, and the probability of insect and disease outbreaks increases as population increase and stress increase (Waring and Schlensinger 1985). Fire exclusion without management will likely result in an increase of pathogen and insect activity within the dry and transitional forests (Harvey et al 1994). These increases will likely not be within historic ranges. Since modern society began managing forests for raw materials for wood products as well as recreation and wildlife habitat, fires have been suppressed, increasing the proportion and preponderance of insects and diseases.

Historically, the most conspicuous insects and pathogens in the forest were bark beetles, defoliators, stem decays, and root disease. Mountain pine beetle was a large mortality factor in the lodgepole pine forest, with periodic infestations on ponderosa and white pines. Douglas-fir beetle periodically caused significant mortality in late seral stands with a large diameter Douglas-fir component. Defoliators such as the western spruce budworm played a significant role in regulating stand composition and structure in stands with susceptible hosts (Douglas-fir, Engelmann spruce, and true firs). Stem decays were common in white pine, Douglas-fir, grand fir, and alpine fir. Root disease commonly thinned the Douglas-fir and grand fir from white pine and western larch dominated stands.

Listed below are some of the major insects and pathogens in the Miller West Fisher project area.

Mountain Pine Beetle

The Mountain Pine Beetle (*Dendroctonus ponderosae*) is a bark beetle that generally attacks mature and over mature stands of lodgepole pine and ponderosa pine. All species of pine are susceptible. Outbreaks usually develop in mature to over mature forests, especially in lodgepole pine and severe outbreaks occur where large areas of these stand types exist. Characteristics usually found where mountain pine beetle epidemics occur are: climatic suitability of stand location, average tree diameter > 8", average age 80 years or more and over-stocked stands. During major outbreaks, like those

experienced on the Kootenai National Forest from about 1978 to 1995, the majority of the trees over 7" are generally killed.

The number of acres of mountain pine beetle (MPB) infestation has been decreasing on the KNF and Libby District since 1985. Infestations are not expected to continue to cause significant mortality in the short term; however it is likely that another mountain pine beetle cycle could occur within the next 10-20 years. MPB has reduced the stocking in some stands to unacceptable levels. Stands with a high percent of lodgepole pine were affected the most. The majority of the high-risk stands have already sustained appreciable mortality and there is only minor indication of recent infestations.

The relationship between lodgepole pine and mountain pine beetle has been extensively researched and is fairly well understood. Endemic populations of mountain pine beetle 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 mountain pine beetle infestations occurred in these lodgepole pine areas, heavy fuel accumulations occurred. 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).

Mountain Pine Beetle infestations are expected to increase with the predicted climate change.

Douglas-Fir Beetle

The Douglas-fir Beetle (*Dendroctonus pseudotsugae*) is a bark beetle that generally attacks large diameter, mature, and over mature Douglas-fir in dense stands. Characteristics usually found where Douglas-fir beetle epidemics occur are: stands with a component of Douglas-fir greater than 14" dbh; over 100 years old; and overstocked (greater than 140-150 basal area). During a major outbreak, less susceptible Douglas-fir may be killed, particularly in infestation pockets. Due to the relatively non-aggressive nature of the Douglas-fir beetle, it is rare that an entire landscape would be impacted by Douglas-fir induced mortality. 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).

The number of acres of Douglas-fir beetle infestation has increased on the Kootenai Forest and Libby District since about 1994. This increase is most likely a result of the 1994 fires and windthrow and breakage during the winter of 1996 and 1997. The infestation appears to have peaked in 1999, but hot spots are still occurring primarily due to the extended drought we have had since 2000. Surveys indicate the peak years for Douglas-fir outbreak on the Fisher River District was 1998 with a slight decline in 1999 (Higgins and Odor 2000). Evidence of Douglas-fir beetle was observed during stand reconnaissance in all three drainages of the analysis area during the summer and fall of 2005.

Douglas-fir Beetle infestations are expected to increase with the predicted climate change.

Western Spruce Budworm

Western spruce budworm (*Choristoneura occidentals*) is the most widely distributed and destructive defoliator in the western United States and plays a critical role in forest nutrient recycling and regulating stand composition and structure (Bulaon and Sturdevant 2006). Budworm is a native insect that co-evolved with Douglas-fir, spruce, and true fir forests. Larvae mine buds and needles and consume new foliage as buds flush. After several years of defoliation, branch dieback, top kill and tree mortality can occur (FHP 2004). Budworm populations are cyclic on the Kootenai National Forest, but outbreaks may have become more frequent and severe with higher density and increased, dominant Douglas-fir stand composition.

Western spruce budworm is present in dense Douglas-fir and Douglas-fir mix stands across the analysis area. Management options include silviculture practices that mimic stand replacement fires in areas that historically had stand replacing fires, and reducing stand density, and favoring non-host species in areas that historically experienced higher frequency, lower intensity fires. Please refer to the Insect and Disease Map located in the project file.

Western Spruce Budworm infestations are expected to increase with the predicted climate change.

Dwarf Mistletoe

Dwarf mistletoe (*Archeuthobium Sp*.) is present in the western larch throughout the area. Dwarf mistletoe is a parasite that depends on the conifer for water, carbohydrates and minerals. Effects on the host tree are reduced height and diameter growth, weakened trees, mortality, and decreased cone and seed production. The typical lateral spread is 1-2 feet per year and seed spread is up to 100 feet from an infected tree.

Mistletoe is present in some of the larger diameter western larch, and in some of the stagnant larch stands primarily in mid to lower elevations in Miller Creek and West Fisher drainages on moderately steep to gentle topography where overstory trees were not killed in the 1910 fire. Due to the objectives to retain structure in the larger diameter trees, management options may include removing only the most severely infected overstory trees were western larch regeneration is an objective, or to girdle infested trees within managed stands before the regeneration is three feet tall but may not include removal of the live trees. Mistletoe infestation is light throughout the majority of the project area due to the severe stand replacing fire in 1910 that cleaned the overstory of mistletoe by killing mature larch. However in the Miller Creek Area, mistletoe infestation is common in the stagnant western larch/lodgepole pine stands on the north slopes in the lower half of the drainage and on the mid elevation southerly aspects in West Fisher drainage.

Root Diseases

The most common root disease in the analysis area is Armillaria (*Armillaria obscura*). This fungus is the most common and widely distributed root pathogen in the Northern Region. Most large disease centers occur in grand fir or Douglas-fir habitat types. Primary hosts in this area are grand fir and Douglas-fir.

Armillaria can be found throughout the drainage but appears to be in an endemic state, likely due to the cleansing nature of the stand replacing event in 1910. Management options include silvicultural practices that mimic stand replacement fires in areas that historically had stand replacing fires and reducing stand density and favoring non-host species in areas that historically experienced higher frequency lower intensity fires.

White Pine Blister Rust

This disease (*Cronartium ribicola*) is an introduced stem decay that has had a severe impact on western white pine and whitebark pine throughout its range. The Miller West Fisher Area has minimal western white pine probably due to the lack of seed source after the large, drainage-wide fire in 1910 and with blister rust in the surviving western white pine. Many of the sites within VRU 3, 4, 5, 6, and 7 are suitable for western white pine restoration. Management options include planting rust resistant western white pine and pruning branches off sapling-size western white pine in managed plantations (Burns 2008, pg 12-14).

Disruption of natural fire cycles and the associated reduction of stand density and tolerate conifer species has likely contributed to increased incidence of insects and disease across the landscape. This, combined with the predicted climate change, 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 (Logan 2003). The majority of research on the effect of climate change on forest insect pests indicates that insect attacks will intensify in severity, frequency, and size (acreage) (Logan 2003). This result is logical because stressed trees are more likely to succumb to insect and disease attacks, and climate change will likely result in stress to at least a portion of the current forest. Current research on mountain pine beetle, gypsy moth, spruce beetle, and spruce budworm confirm this prediction (Logan 2003).

Wind

High-intensity windstorms can destroy whole stands. Lower intensity windstorms destroy stands with a high percentage of defective or dead trees or those occupying particularly wind-prone sites. The comparative resistance of trees to blowdown is somewhat similar to fire resistance. Certain species or individuals within some genera are more susceptible than others. When trees are grown under an open canopy, more wood is produced near the base of the tree which strengthens the bole and roots against the forces of wind. Trees that have grown in dense stands are particularly susceptible to wind-throw when surrounding trees are removed either through mortality or harvest (Waring and Schlesinger 1985). Trees growing in areas with shallow rooting zones (such as Engelmann spruce) are more susceptible to windthrow than trees growing in soils with a deeper rooting zone.

Blowdown is a natural consequence after tree mortality occurs. Prevailing wind patterns, topography, soils landtypes, species, size, and elevation are variables that will affect rate of future blowdown. Fallen trees eventually break down into decaying wood which is essential habitat for ectomycorrhizae. Ectomycorrhizae is a fungus that has a symbiotic association with the roots of higher plants, such as trees and shrubs. The fungus acts as small root extensions, by reaching and transporting water and nutrients that are otherwise relatively immobile in the soil into the higher plant roots. Mycorrhizae are a common occurrence in forested ecosystems.

Windthrow susceptibility of standing green trees is related to soils landtypes, species, topography, location, and stand conditions. Factors of landtypes that contribute to windthrow hazard are firm glacial till substratum, calcareous substratum, shallow soils, and high water tables. These factors can cause shallow rooting and increase the chance for windthrow. Landtypes within the Miller West Fisher landscape generally have a low to moderate susceptibility to windthrow, however landtype 101,102, and 352 can be susceptible if not topographically protected. Topographic areas susceptible to windthrow are ridges, saddles, and narrow canyons. Stand condition factors include: stands that are well stocked and primarily even-aged that have been opened up due to mortality or harvest; stands with shallow rooted species such as Engelmann spruce and grand fir; and stands adjacent to openings. The effects of

windthrow are greatest adjacent to large openings and in areas that are topographically unprotected. Stands in landtypes 101, 112, and 352 are susceptible and may experience some wind throw.

Refer to the project file for a project area landtype map. Please refer to the soils section for a description of project area landtypes.

Fire Ecology

Pre-European Settlement, Fire Influence on Forests

Fire has been the major influence on vegetation patterns, composition, structure, age and development of both individual stands and the larger landscape (Habeck and Mutch 1973; Arno 1980; Fischer and Bradley 1987). The mixtures of forest types found in northwestern Montana have developed under a variety of fire regimes. These regimes vary with moisture, temperature, topography, and vegetation composition.

Historically, the influence of fire within the project and surrounding landscape created a mosaic of stands with variable vegetative species, size and age classes, and structures, as well as with variable patch sizes.

Periodic underburns were common in the lower elevation, dryer aspects. These occurred frequently, consuming some of the understory fuels and potentially extending the time between stand replacing fires. With a longer duration between stand replacing events and the resulting larger size of the fire resistant ponderosa pine, western larch, and Douglas-fir in these stands, even a stand replacing fire event generally left enough survivors to reforest these areas back to ponderosa pine, Douglas-fir, and western larch.

Periodic mixed severity underburns with less frequent, high severity stand replacing fire were common on the moderately dry to moist north to northwest aspects and on the mid and upper elevation moist sites. Higher elevation cool and moist sites experienced less periodic underburns, with long intervals between high severity stand replacing fire. The size and severity of the fires and the resulting vegetation patterns are determined by a combination of soils, topography, stand structure, and climatic conditions.

Post-European Settlement, Changes in Forests

The dramatic change in frequency, distribution, and magnitude of fire since European settlement has had major impacts on many forest types in the northwestern Montana forest region. This has upset the biological balance that developed and existed over thousands of years under historical patterns and frequency of disturbance. In the drier forest types, fairly frequent low severity fires have historically served to "clean out" understories, maintaining a substantial number of stands in an open, park-like condition with large overstory trees and patchy, understory vegetation. Fire exclusion occurring over the last one hundred years has allowed shade-tolerant species to become well established in the understory of these stands and has generally allowed downed woody fuel loadings and ladder fuels to increase. This has created multistory stands that are consistently more dense and continuous than could be expected if fire had continued to play its natural role. Such stands are more likely to experience high severity fires with greater mortality due to down woody fuel loadings and ladder fuels. They are also far more susceptible to serious insect and disease infestations such as defoliation by spruce budworm, root disease, and Douglas-fir beetle mortality in these stands newly dominated by Douglas-fir.

Similarly, fires have not cleaned out the understories or replaced the cooler, moister forest types. This has resulted in stands with higher densities and frequently dominated by shade-tolerant tree species. These over-stocked stands are more subject to environmental stress, often having cumulative effects

with one stress predisposing organisms to another and increasing susceptibility to insect and disease problems. Please refer to the Fire Regime Condition Class Analysis in the project file for a characterization of reference conditions and departure from those conditions.

Prior to European settlement, the major element of change in the forests of northwestern Montana was fire. Especially fire as amplified by periodic drought. Insect and disease infestations often interacting with fire, was also a major factor in most forest types. The frequency, distribution, and magnitude of fire changed dramatically over the past 120 years. From 1850's to the present, a reduction in moderate severity underburning has occurred. And from 1920 to the present, a reduction in stand replacing fires has occurred. Several factors have contributed to this reduction:

- Changes in the demographics of northwest Montana from Native American to Euro-American and the resulting decline in planned or ignited fire since the early 1800's;
- Changes in land use (particularly the development, farming, and grazing of the valley bottoms) have dramatically altered the type and distribution of vegetation and historical fire patterns;
- Increased effectiveness of fire suppression efforts since the 1920's.

Fire Disturbance Regimes:

Four different fire regimes occur on this landscape. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention and including the influence of aboriginal burning (FRCC 2005).

Fire Regime I occurs on the warm and dry south and west aspects and consists of frequent, low severity fires on a frequency of 0-35 years (average of 22 years). This is a low severity (non-lethal) to mixed severity fire that burns up accumulated litter and undergrowth but leaves the majority of the overstory intact. At times these non-lethal burns may have created small, mosaic type openings (USFS 1999, page 6, FRCC Analysis, page 2-1, 4-22). The non-lethal burns interrupted the succession of Douglas-fir and were an important agent in controlling density and species composition in VRU 1 and 2S.

Fire Regime III occurs on the moderately dry north and east aspects within VRU 2N and 3 and moderate to gentle topography within VRU 4 and 5. Fire regime III is dominated by infrequent, mixed severity, mosaic fires on a frequency of 35-100+ years. (The average fire return interval is 59 years.) Fires within this regime typically burn in a mosaic (USFS 1999, page 6, FRCC Analysis, page 2-2, 4-22). These fires would creep along the surface and occasionally flare up, killing trees in patches and favoring the fire tolerant western larch and ponderosa pine. During fire-free periods, the density of the more tolerant species would increase in the understory. The overstory trees become susceptible to crown fires when this occurs as ladder fuels provide access to tree crowns in an otherwise surface fire. This condition can result in severe, stand replacing fires.

Fire suppression activity has disrupted the low severity and mixed severity fire regime. Fire suppression has moved the landscape to one dominated by overstocked Douglas-fir, grand fir, and other tolerant species stands that are at risk for severe, larger scale stand replacing fires.

Fire Regime IV is a high severity, stand replacing fire on a frequency of 35 to 100+ years with an average return interval of 111 years. These fires typically kill more overstory than the mixed severity burns. High severity fires burn in a mosaic creating larger patches of openings and leave variable portions of the forest structure intact. Quite often, unburned patches occur in predictable micro sites (USFS 1999, page 6 and 7, FRCC Analysis, page 2-2, 4-22). The function of high severity, non-uniform burns is to replace the existing stand and move the vegetation back to the early seral stage. This regime is common on steeper slopes in VRU 4 and 5, and on all but the riparian areas and gentle and protected topographic areas (refugia) in VRU 7 and 9.

During fire-free periods, dense thickets of lodgepole pine regenerate and develop into dense stands with inter-connected crowns having a species composition of shade tolerant Douglas-fir, grand fir, and subalpine fir in the understory. These stands are then more susceptible to crown fires when fire does occur because ladder fuels provide access to the inter-connected crowns. Fire suppression activity has resulted in little disruption to the high severity fire regime. However, these stands are ripe for another stand replacing event due to the mortality in the lodgepole pine and the associated high down fuel loadings and fuel ladder provided by the tolerant species in the understory. Functionally, the majority of this landscape type is moving towards the outer end of a historic range of variability. However; some of the mid elevation lodgepole pine stands that have a moderate component of western larch and Douglas-fir (50+ basal area) may trend towards more mixed severity fire cycles, and longer periods between high severity fire events. Therefore, some of this area may be within the historic range of variability for high severity fire but will trend toward the outer range for mixed severity.

Fire Regime V is a high severity, stand replacing fire on a frequency of 200+ years with an average fire return interval of 223 years. These fires typically kill more overstory than the mixed severity burns and average 77% stand replacement. High severity fires burn in a mosaic across the landscape creating larger patches of openings and leaving variable portions of the forest structure intact. Quite often, unburned patches occur in predictable micro sites (termed refugia) (USFS 1999, page 6 and 7, FRCC Analysis, page 2-2, 4-22). The function of high severity, non-uniform burns is to replace the existing stand and move the vegetation back to the early seral stage.

This fire regime generally occurs on flat to moderately steep ground in the mid to upper elevations and is commonly within the riparian influence areas within VRU 4, 5, 7, and 9. Fire suppression activity has resulted in little disruption to the high severity fire regime in these areas.

In the Miller West Fisher project area periodic underburns that were common in the south and westerly aspects within VRU 1, 2, and 3 have not occurred since our more successful fire suppression activities starting in the early 1920's. The composition of the vegetation including forbs, shrubs, and trees, is continuing to shift toward a more tolerant climax mix with much greater abundance of Douglas-fir. This disrupts both the vegetation and animal species that have adapted to depend upon landscape components historically present. This may affect the function of species dependent upon the early seral, fire sustained successional stages and may affect the function of early-seral dependent species.

The influence of historic fire within the project area and surrounding landscape has created a mosaic of lodgepole pine and lodgepole pine mixed stands on the north and east aspects within VRU's 3, 4, 5, 7 and 9. Mixed stands in the western redcedar/western hemlock community types in the upper elevations and within riparian areas that historically have very long fire intervals but many were impacted by the 1910 stand replacement fire. The majority of stands are in a 90 year old age class with a variable amount of relic overstory.

Fire influence in the upper elevation VRU's 7, 9, and 10 can be highly variable. Fires vary from low or mixed severity in areas where fuels are discontinuous. Areas with continuous fuels are susceptible to severe fires that originate in the lower elevation VRU's and have the same characteristics of the mid elevation VRU group. Areas within this cold, moist VRU group were also impacted by the 1910 stand replacement fire with some residual areas that that were either topographically protected or had highly discontinuous fuels.

The area-wide stand replacement fire in 1910 created predominately even age stands across all VRU's. Some of the driest and some of the moistest sites had some surviving overstory and consequently have more age and size structure, but the dominant component originated from that stand replacing event. Stand replacement occurred over 80% of the analysis area with this fire.

For more information, please refer to VRU tables and map in the project file.

Fire Analysis:

Fire scar studies have been conducted extensively in northwest forests, and throughout Montana. In these methods, fire scars are cross-sectioned and unscarred seral species are aged to establish chronologies (fire intervals) and patterns of burning and regeneration across portions of the landscape. Fires of varying intensities, ranging from minor understory burns to stand-replacing fires are discernible using this approach. Fire scar studies, however are limited in what they can tell us about ecosystem composition and long-term disturbance and successional processes. First, they are limited to the life of the tree (about 300-400 years). Furthermore, not all fires leave scars and some fires may kill and destroy fire scarred trees. However, these studies give us information on non-lethal fire regimes during the past few hundred years. Successional information, the severity, and frequency of fire events on a time-scale greater than about 400 years must be inferred (Chatters and Leavell 1994, 1995).

Analysis of lake and pond sediment provides data that complements fire-scar analysis. Where fire scars indicate the frequency of non-stand-replacing fires in the relatively short-term, data on charcoal and pollen from lake sediments can be analyzed to show evidence primarily of the largest-scale fires, indicating the frequency of stand-replacement events and can also display area-wide vegetation successional patterns. On the Kootenai National Forest, three sites have been sampled for sediment analysis. These sample areas are Smeads Bench Fen, on the lower Clark Fork River, samples a moderately cool, moist habitat (western redcedar/western hemlock community types based on Regional Habitat Type Groupings), Harding Lake along the Yaak River, with a cool, moist habitat resembling the subalpine zone, and Little Dickey Fen, southeast of Tobacco Plains, which sampled a cooler, dry region. To date, there are draft reports for the Smeads Bench Fen and Harding Lake studies (Chatters and Leavell 1994, 1995 and USFS 1998). These samples and reports cover the last 6500 years with emphasis on the last 2500 years of climate relatively similar to what we are experiencing at present.

Past Fires and Fire Starts:

Historic large fire occurrence maps display three large-scale high severity fires which burned vast acres across this landscape. The famous regional fires of 1910 burned through this analysis area originating from the west side of the Cabinet Mountains and burning down drainage through Silver Butte, West Fisher, and Miller Creek. This fire impacted all but the mouth of the West Fisher and encompassed an estimated 68,000 of the 69,000 acres within the analysis area. While the 1910 fire is the most notorious and is better documented; two previous large fire events also marked this landscape. The 1885 fires burned the majority of the Silver Butte drainage from Silver Butte Pass north to the ridge between Silver Butte and the West Fisher, and east through the Porcupine Creek drainage and Jumbo Peak. The 1889 fires are speculated to have burned even more land than the 3-million-acre big blowup of 1910 (Arno 2003). Within the analysis area the 1889 fires came over from the west side of the Cabinet Mountains and burned the western third of this area from Silver Butte Pass north to the Midas Mine. Both of these fire areas re-burned in the 1910 fire. Refer to the project file for maps of these large fires. While mapping of historic fires is a broad-brushed approach and does not differentiate between high severity lethal and mixed severity fire the historic descriptions depict the latter two fires as stand replacing events. The Age Class map for this area indicates that the 1910 mapping was relatively accurate with areas of mixed severity leaving at least some measurable component of surviving overstory trees. These are generally located within the wettest and driest sites. Please see the Age Class Map in the project file for more information. Pollen and charcoal analysis from lake and fen sediments indicate these events were the most severe fire events of the last 2500 years, surpassing even the Little Climatic Optimum (1200's). While these events may appear to be on the outer range of historic variability for these

ecosystems, one must ask if these events will become the new range of variability and successional norm with global climate warming.

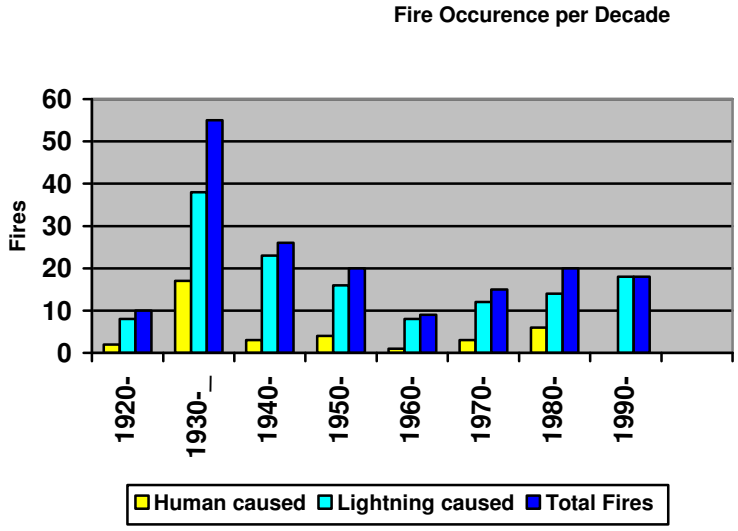
Table 3-7 displays the fire acreage burned by year since 1885 that were large enough to map. Refer to the fire/fuels report for a more complete discussion of fire starts.

Table 3-7 – Moderate to Large Fire Acreage by Year

FIRE YEAR	ACRES	LOCATION
1885	20,261	South side of Silver Butte Creek from Silver Butte Pass through the Waloven Creek drainage
1889	25,899	The western third of the analysis area from Silver Butte Pass north to the Midas Mine
1910	68,346	The majority of the analysis area
1919	512	Two fires north of Silver Butte in the vicinity of Trapper and Olsen Creek
1929	29	Canyon Peak area
1938	168	South aspects in lower Miller Creek
1939	832	Upper Standard Creek
1967	31	Porcupine Creek area
1970	20	Lower Standard Creek
1990	75	North aspect near lower Miller Creek

Estimates based on fire suppression history indicate that roughly 200 fires have occurred in the analysis area from 1920-2000. As displayed by the following graph the highest occurrence since the 1910 fires was in the 1930's with a declining trend through the 1960's and an increasing trend since the 1970's.

This fire occurrence is displayed by decade on the following graph:



Currently, wildland fire suppression responsibility in the Miller West Fisher project area is divided between the Kootenai National Forest, Libby District, and the Montana Department of Natural Resources and Conservation – Libby Unit, with small private lands protected by the Fisher River Valley Fire Department. The divide between Silver Butte and the West Fisher is the protection boundary with Silver Butte being MT DNRC and West Fisher and Miller Creek protected by USFS, with the private lands protected by the Fisher River Valley Fire Department.

Human Disturbance

Human disturbance in the analysis area include homesteading, subdivision, and site conversion to pasture and hay fields, as well as mining, access, timber harvest, thinning, fire suppression, prescribed and wildfire.

Timber harvest in the area has altered vegetation patterns in the following ways:

- Reinitiating early successional stage
- Changing species composition
- Fragmenting forest patches
- Altering vegetation diversity
- Changing forest structure (i.e., large trees and snags)
- Creating abrupt forest edges
- Changing patch size

Harvest associated with homesteading, mining, and recreation has occurred since the late 1800's. Documented harvest records have only been kept since the mid 50's. These are likely a good representation of harvest activity as this area experienced a high severity lethal fire event in 1910 resulting in minor available merchantable material until about the 1980's. The exception to this would be salvage by homesteaders after the 1910 burn with small, specific products such as cedar salvage, posts, rails, house logs, etc. Recorded harvest activities have occurred across the Miller West Fisher landscape since the mid 60's on National Forest System (NFS) lands; since the 50's on small private lands; and since the mid 80's on Plum Creek Timber Company lands. See the Cumulative Effects section for more information on Past Timber Sales on USFS Lands within the analysis area.

National Forest - Of the past harvest activity, 1,528 acres are stand replacing regeneration treatment for a total of 2.2% of the Miller West Fisher Area. Approximately 3,408 acres have been treated with an intermediate harvest treatment for a total of 4.9% of the analysis area.

Plum Creek Timber Company and small private ownership- Of the past harvest activity, 2,034 acres of stand replacing regeneration treatment has occurred or 2.9% of the Miller West Fisher Analysis Area. Approximately 1,850 acres have been treated with an intermediate harvest treatment over this same period for a total of approximately 2.6% of the analysis area.

Total Analysis Area – 5.1% in regeneration harvest and 7.6% in intermediate harvest has occurred over the past 50 years. The majority of this harvest took place in the in the 1980's. While the percentage of harvest in the analysis area is relatively low, it should be acknowledged that the majority of this harvest is concentrated on PCTC lands and on the lower elevation suitable timberlands on NFS lands. Of the roughly 69,419 acres within the project area 60,519 are NFS lands, 6,196 are Plum Creek Timber Company, 2,064 are in small private ownership and 640 acres are Montana Department of State Lands. Of the 60,519 acres in National Forest, 71% are unsuitable lands, meaning they are unsuitable for timber harvest under the Forest Plan, with 33% suitable.

Table 5.2 displays the acres of harvest, by decade, by ownership in the Miller West Fisher project area only.

Table 3-8 - Forest Service, Private (Mostly PCTC), and Small Private Harvested Acres Harvested by Decade

YEAR	FOREST SERVICE			PCTC AND SMALL PRIVATE			TOTAL		
	TYPE OF HARVEST (ACRES)								
	REGEN	INTERM		REGEN	INTERM		REGEN	INTERM	TOTAL
1950 -1959	0	0		0	41		0	41	41
1960 -1969	51	1711		0	0		51	1711	1762
1970 -1979	91	668		0	0		91	668	759
1980 -1989	1034	502		1764	1136		2798	1638	4436
1990 -1999	347	527		59	403		406	930	1336
2000 -2005	5	0		211	270		216	270	486
Total	**1,528**	**3,408**		**2,034**	**1,850**		**3,562**	**5,258**	**8,820**

KEY: REGEN = Regeneration Harvest INTERM = Intermediate Harvest

Fire Suppression

The management decision for fire suppression is a human-caused "disturbance" since it has effectively interrupted natural processes. The interaction is discussed in this document as well as in the Fire and Fuels section of the EA.

The Age Class Distribution map in the project file shows the current distribution of age classes across the Miller West Fisher landscape. This age class map displays the patterns of timber harvest as well as the 1910 fire. It also shows the areas that had surviving overstory from the 1910 fire because this component reflects an average stand age of over 100 years, even though the majority of the area sustained high severity fire in 1910. The average age of these stands would have been much lower if an overstory component did not survive the fires.

A comparison of timber harvest and past fires to existing forest conditions reveals current vegetation patterns. Timber harvest on Plum Creek Timber Company lands and NFS lands over the past 40 years has had an impact on the age class distribution, particularly in the lower elevation areas within the Miller Creek and West Fisher drainages. The area wide, stand-replacing fire in 1910 influenced the entire landscape and subsequently influenced the timing and method of harvest activities in the 20th century. The higher elevation, wetter habitat types and the driest habitat types have the highest proportion of 100–150 year class and 150+ year class trees because these areas had some surviving overstory from the 1910 burn. Many of the wetter sites sustained less mortality on the overstory due to higher moisture condition, less steep slopes, and/or topographic protection. The driest sites may have underburned more frequently and had less fuels to carry a stand replacing fire in 1910. While the 1885, 1889 and 1910 fires significantly influenced the current conditions, the frequency and above-normal high severity of the fires in the late 1880's and 1910 on the Kootenai may not be within the manageable range of variability (and therefore not a condition to reference for current and future management objectives) when considered in the context of the climatic period over the last 2,500 to 3,000 years, and societal needs.

Vegetation Response Units (VRU)

The VRU is an aggregation of land having similar capabilities and potentials for management and responds to disturbance in a similar manner. As mapped polygons, these units also have similar patterns in potential natural communities, soils, hydrologic function, landform, topography, lithology, climate, air quality, and natural disturbance processes. These VRUs are the suggested basic environmental stratification for relating repeatable landscape patterns to predictable ecological processes (USDA 1999).

This section documents reference conditions by VRU Group. Please refer to the VRU map at the back of this document. Attached charts in the project file display the following attributes for each VRU within the Fisher Landscape:

1. Fire frequency
2. Fire severity
3. Age class proportion
4. Distribution
5. Vegetation structure
6. Overstory species composition
7. Understory species composition
8. Insects and diseases
9. Noxious weeds
10. Cavity habitat (snags and coarse woody debris)

To look at landscape processes in this analysis area and to be consistent with the Fire Regime Condition Class Analysis, it makes sense to group the VRU's by Warm and Dry Forests on the southerly aspects (VRU 1 and 2S); by Moderately Warm and Moderately Dry on the lower elevation north aspects (VRU 2N and 3); by Moderately Warm to Moderately Cool and Moist in the mid elevations (VRU 4 and 5); Cool and Moderately Dry to Cool and Moist (VRU 6, 7 and 9); to Cool and Moderately Dry or Moist, to Cold and Moderately Dry in the upper subalpine zone (VRU 10, and upper elevation 7 and 9). These groups are based on aspect, topographic, landform, and solar radiation features.

We used the VRU groups within the affected environment to describe reference and current conditions. From that comparison we looked at trends, the departure from reference conditions and the processes and disturbance regimes that have been altered to identify desired conditions and recommend treatments that would begin to restore forest vegetation, patterns and processes.

VRU 1 and VRU 2S – Reference Conditions (12% of the analysis area)

Warm and Dry Settings - Occurring primarily on south and westerly slopes, these dry, lower elevation areas are composed of mixed Douglas-fir and ponderosa pine in well-stocked to fairly open grown conditions. Moist, upland sites and dense draws may also include western larch and lodgepole pine, with lesser amounts of ponderosa pine. Under natural conditions, tree regeneration occurs in patches and is largely absent in the understory due to frequency of fire. These sites can have low to moderate site productivity due to a general lack of soil moisture and the minimal presence of volcanic ash-influenced soils.

Prior to intensive fire suppression, fire was an important agent in controlling density and species composition in this VRU. Low to moderate severity fires on a frequency of 5-35 years (average 22 years, PPDF1, FRCC 2005) were the predominant disturbance, playing a major role in maintaining the seral community of conifers. These low severity fires would burn non-uniformly, consuming the litter and undergrowth. This usually left an open overstory of ponderosa pine and Douglas-fir largely intact and created small canopy gaps. Structural diversity remained high under these mosaic conditions. Mixed severity, mosaic fires typically occurred at the mid elevations and on steeper slopes. These fires would creep along the surface and occasionally flare up, killing trees in patches and favoring the creation of multiple age classes. Ponderosa pine was favored in this situation due to its fire tolerance and ability to regenerate under these conditions.

High severity fires occurred less frequently with an estimate of every 225 years (USDA 1999, page 6), and most likely in overstocked stands or in draws that may have contained heavy fuels due to longer

fire-free intervals. The probability of a lethal high severity crown fire causing greater than 90% overstory mortality in this VRU group is .011 or 24 percent of all fires. The probability of a non-lethal mixed severity fire that consumes surface fuels, and results in patchy overstory mortality is .035 or 76% of all fires (FRCC 2003, PPDF1).

Patches are areas of uniform vegetation that differ in structure and composition from that which surrounds them. Patch sizes resulting from stand-replacement events were typically 20-200 acres, (USDA 1999, page 6).

Existing Condition and Trend of VRU Group 1 and 2S

Areas within the lower elevation, south and western aspects with Miller, West Fisher and Silver Butte, and the same aspects within the small drainages that flow directly into the Fisher River are within these drier vegetation response units.

Some existing conditions in this VRU group differ from reference conditions. Depending on the amount of departure from historic conditions there may be a risk to ecosystem sustainability. The vegetation-fuel condition class and fire interval-severity condition class will be the indicators used to estimate existing condition and trends. The current departure in Vegetation/fuel conditions is 43% from historic conditions and the current fire frequency-severity is 66% from historic conditions. Uncharacteristic vegetation/fuel conditions in this VRU are generally the result of succession continuing past the maximum fire return intervals and generating vegetation community structures that were not sustained in the historical landscape.

Effective fire suppression and reduction in the low and mixed severity underburns have altered the species composition and stand structure in many of these dryland areas. The stand structure has changed from open, park-like stands of large ponderosa pine and Douglas-fir to single-to-two storied stands composed of predominately Douglas-fir, or more likely a higher proportion of Douglas-fir than would have occurred with frequent low severity fires. The lower canopy is frequently composed of a dense understory of smaller Douglas-fir. These high density understories can provide a fuel ladder to the crowns of larger trees and increase the potential for high severity, stand replacing fires.

Aspen clones that historically occurred within the moister zones of this dry land type are not being regenerated due to the lack of low and mixed severity fire, and the associated lack of sunlight and growing space.

Past harvest activity has focused on removal of the larger, shade-intolerant ponderosa pine and western larch that survived the 1910 burn, changing the structure and composition of these stands by removing this large component. While most of the federal and state land ownership still have a strong ponderosa pine component, much of the industrial private lands have lost the ponderosa pine component from these stands and are dominated by pole-to-small saw sized Douglas-fir stands.

Table 3-9 displays the reference condition by development class or seral stage, the existing age class distribution, the relative amount of the seral class compared to reference conditions, and the acres departed from reference condition.

Table 3-9
FRCC Reference and Current Seral Class Distribution, VRU1 and 2S

SERAL CLASS	FIRE REGIME CONDITION CLASS REFERENCE %	EXISTING AGE CLASS DISTRIBUTION %	RELATIVE AMOUNT	ACRES DEPARTED FROM REFERENCE (- = decrease)
Post Replacement (Early Seral)	15	3	Under Represented Trace	-999
Mid-development Closed (Mid-Seral Closed)	10	21	Over Represented	916
Mid-development Open (Mid-Seral Open)	25	9	Under Represented	-1,332
Late Development-Open (Late Seral Open)	40	25	Under Represented	-1,249
Late-development Closed (Late Seral Closed)	10	36	Over Represented Abundant	2,165
Uncharacteristic Forest*	0	5	Abundant	416
Invasive Plants	0	1	Abundant	83

*Includes PCTC and FS lands where Ponderosa Pine has been removed

The following information was derived from running the Fire Regime Condition Class Model. This VRU Group is in Fire Regime I, low severity, 0-35 years (average of 22 years).

The Current Vegetation-Fuel Departure from historic conditions score is a 43 which equates to a Fire Regime Condition Class 2, or Moderate Departure from natural conditions.

The Current Departure from fire Frequency and or Severity Departure from historic conditions score is 66 for a Condition Class 2 but almost a Condition Class 3, moderate to severe departure from natural conditions.

The Overall Fire Regime Condition Class for the VRU Group is a score of 67, with equates to a Condition Class 3 or Severe Departure from historic conditions. This is an ecologically-based index of the degree of departure of current vegetation, fuels, fire frequency and fire severity from reference conditions.

The departure from historic conditions in this VRU group is primarily a result of the reduction in low and mixed severity underburns, and past harvest.

The risk of losing key ecosystem elements is highest in the mid-seral open and late seral open types due to the lack of fire and the resulting lack of open stands in this VRU group. Within the late seral closed stands, the historically, uncharacteristic harvest has removed the large ponderosa pine component. The uncharacteristic amount of invasive plants within this VRU group also has a high departure from historic conditions. The FRCC Departure for this VRU group is on the high end of a condition Class 2 or moderate, to almost a high departure from the central tendency of the natural regime. The central tendency is a composite estimate of vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Moderate departure is considered to be outside the natural range of variability (FRCC 2005).

VRU 2N and 3 – Reference Conditions (8% of the analysis area)

Moderately Warm and Moderately Dry Settings - Occurring primarily on north and easterly slopes, these moderately dry, lower elevation areas are composed of mixed Douglas-fir, western larch, lodgepole pine, and ponderosa pine in well-stocked to moderately open-grown conditions. These sites include lodgepole pine, Douglas-fir and western larch (on the moist end of the gradient), with lesser amounts of ponderosa pine. These sites have higher soil moisture than VRU 1 and 2S due to aspect (generally having some volcanic ash-influenced soils with moderate site productivity).

Prior to intensive fire suppression, fire was an important agent in controlling density and species composition in this VRU. Periodic mixed severity, mosaic fires occurred during less severe climatic conditions. These fires would creep along the surface and occasionally flare up, killing trees in patches and favoring the creation of multiple age classes. Ponderosa pine and larch was favored in this situation due to their fire tolerance and ability to regenerate under these conditions. These mixed severity fires occurred on a variable frequency of 0-35 or 35-100+ years with an average of 30 or 59 years (FRCC 2005).

High severity fires occurred less frequently with an estimated 70-80 year return interval in lodgepole pine, and 100-250 year return in mixed stands (USDA 1999, page 6). These high severity fires most commonly occurred at the mid elevations and on steeper slopes, when fire-free intervals lead to overstocked stands that contained heavy fuels.

Patch size from stand-replacement events were typically 20-200 acres, with occasional patches over 500 acres (USDA 1999, page 6). The larger patch size was typical on the steeper slopes in the lodgepole pine forest type.

Existing Condition and Trend of VRU Group 2N and 3

Areas within the lower elevation, north and east aspects within Miller, West Fisher, and Silver Butte drainages and within the small drainages that flow directly into the Fisher River are within this VRU group.

Several existing conditions differ from reference conditions and present ecosystem health concerns. Depending on the amount of departure from historic conditions there may be a risk to ecosystem sustainability. The vegetation-fuel conditions class and fire interval-severity condition class will be the indicators used to estimate existing condition and trends. The current departure in vegetation-fuel conditions is 46% from historic conditions, and the current fire frequency-severity departure is 77% from historic conditions. Uncharacteristic vegetation-fuel conditions in this VRU are generally the result of succession continuing past the maximum fire return intervals, and generating structures that were not sustained in the historical landscape.

Effective fire suppression and reduction in the mixed severity underburns have altered the species composition and stand structure in many of these areas. The stand structure has changed from mid and late development open stands of large ponderosa pine, western larch, and Douglas-fir to single to two storied stands composed of predominately Douglas-fir, or a higher proportion of Douglas-fir than would have occurred with more frequent mixed severity fires. Aspen clones that historically occurred within the this VRU type are not being regenerated due to the lack of mixed severity fire, and the associated lack of sunlight and growing space. The lower canopy is frequently composed of a dense understory of smaller Douglas-fir and grand fir. These high density understories can provide a fuel ladder to the crowns of larger trees, and increase the potential for high severity, stand replacing fires.

Harvest activity on private ownership has focused on removal of the larger intolerant ponderosa pine and western larch, changing the structure and composition of these stands from medium to large size mixed species stands to pole to small saw-sized predominately Douglas-fir stands. Changes in species composition and structure from reference condition may also influence fire behavior. The higher component of smaller mid tolerant to intolerant trees with increased ladder fuels, may increase the overall rate of spread and fire severity, decreasing the probability for effective fire suppression, and a having a higher probability of larger scale stand replacing fire. However, the increased access due to high road densities and the lower stand density may mitigate this effect.

Although large scale stand replacing fire has historically occurred across this landscape, it is generally undesirable from a social and ecological perspective due to the high cost of management; and the impacts on merchantable wood products, soils, aquatic resources, air quality, old growth, wildlife habitat, and visual quality.

Fire, including frequent mixed severity fire and infrequent large-scale stand-replacing fire, is the primary ecological process that developed patch size in this area. Populations of native plants and animals have responded and adapted to this disturbance process, and associated patch size. Species abundance and distribution are a result of these dynamic processes, and the resulting vegetation patterns. Historic patch size varied from 20 to up to 500 acres in these VRUs. The majority of the harvest within this area has been intermediate harvest, and has not significantly fragmented the landscape.

Ponderosa pine, western larch, and aspen occur in lower than desired levels across much of this VRU group.

Table 3-10 displays the reference condition by development class or seral stage, the existing age class distribution, the relative amount of the seral class compared to reference conditions, and the acres departed from reference condition.

Table 3-10
FRCC Reference and Current Seral Class Distribution
VRU 2N and 3

SERAL CLASS	FIRE REGIME CONDITION CLASS REFERENCE %	EXISTING AGE CLASS DISTRIBUTION %	RELATIVE AMOUNT	ACRES DEPARTED FROM REFERENCE (- = decrease)
Post Replacement (Early Seral)	15	4	Under Represented Trace	-610
Mid-development Closed (Mid-Seral Closed)	25	33	Similar	444
Mid-development Open (Mid-Seral Open)	20	4	Under Represented Trace	-888
Late Development-Open (Late Seral Open)	25	6	Under Represented Trace	-1,055
Late-development Closed (Late Seral Closed)	15	53	Over Represented Abundant	2,110

The above information was derived from running the Fire Regime Condition Class Model. This VRU Group is in Fire Regime I, frequent surface and mixed severity fire, with an average frequency of 30 years.

The Current Vegetation-Fuel Departure from historic conditions score is a 46 which equates to a Fire Regime Condition Class 2, or Moderate Departure from natural conditions

The Current Departure from fire Frequency and or Severity Departure from historic conditions score is 77 for a Condition Class 3 or severe departure from natural conditions

The Overall Fire Regime Condition Class for the VRU Group is a score of 77, with equates to a Condition Class 3 or Severe Departure from historic conditions.

The departure from historic conditions in this group is primarily a result of the reduction in mixed severity underburns; the alteration of species composition from intolerant species such as western larch and ponderosa pine to primarily Douglas-fir; the change in stand structure from stands dominated by the early and mid seral classes to the late seral closed class; the increase in two to three storied stands; and the associated increase in fuel ladder to the crowns of larger trees, which may increase the potential for high severity, stand replacing fires.

VRU 4 and 5 – Reference Conditions (43% of the project area)

Moderately Warm to Moderately Cool and Moist-The majority of this VRU group is composed of VUR 5 and occupies the mid to lower slopes and valley bottoms. It is ecologically influenced by the moderating effects of the inland maritime climate and is typically bounded by the more moderate sites (VRUs 2N and 3), and cooler sites (VRU 7). This VRU is widespread and occurs on all aspects. Vegetation productivity is high, and soils are generally volcanic ash influenced loess overlying glacial tills. Hemlock is the climax species throughout most of this group, and stand composition includes western larch, lodgepole pine, western white pine, Engelmann spruce, Douglas-fir, and western redcedar. Lethal and moderately severe fires often create pure even-aged stands of lodgepole pine on steeper slopes.

This VRU group experienced a mosaic of mixed severity and high severity fire dependant primarily on slope. In the mixed severity regime, fire was an important agent in controlling density and species composition in this VRU. Periodic mixed severity, mosaic fires occurred during less severe climatic conditions. Western larch was favored in this situation due to its fire tolerance; western white pine was also favored due to its ability to regenerate under these conditions. These mixed severity fires occurred on a frequency of 35-100+ years with an average of 59 years (FRCC 2004)

High severity fires occurred less frequently with an estimated 125 years in lodgepole pine, steeper slope areas, and 250+ years in mixed stands (USDA 1999, page 6). These high severity fires most commonly occurred on steeper slopes, when fire-free intervals lead to overstocked stands that contained heavy fuels.

Patch size from stand-replacement events on the more gentle topography were typically 100-300 acres (USDA 1999, page 6). Larger patch size was typical on the steeper slopes in the lodgepole pine forest type.

Existing Condition and Trend of VRU Group 4 and 5

This is the dominant VRU group in the Miller West Fisher analysis area, and occupies the mid elevation areas across all aspects.

Several existing conditions differ from reference conditions and present ecosystem health concerns. Depending on the amount of departure from historic conditions there may be a risk to ecosystem

sustainability. The vegetation-fuel conditions class and fire frequency-severity condition class will be the indicators used to estimate existing condition and trends. The current departure in vegetation–fuel conditions is 30% from historic conditions; the current fire interval-severity is 50% from historic conditions. Uncharacteristic vegetation-fuel conditions in this VRU are generally the result of the large scale stand replacing fire in 1910 which created very high amounts of even-age single-storied stands, and the loss of the western white pine due to blister rust.

Effective fire suppression and reduction has altered the species composition and stand structure in some of the areas. The stand structure has changed from mid and late development open stands of large western larch and western white pine to two to three storied stands composed of predominately western larch, Douglas-fir, grand fir, hemlock, lodgepole pine, and Engelmann spruce. The lower canopy is frequently composed of an understory of smaller grand fir and hemlock with some western redcedar. In the even-age stands created in 1910, much of the lodgepole pine was killed by the mountain pine beetle in the early 1990's, and the majority is now down. The high fuel loading from the lodgepole pine mortality, combined with the higher density understories that can provide a fuel ladder to the crowns of larger trees, has increased the potential for another large scale, high severity, stand replacing fire in this area.

Harvest activity on private and federal ownership has focused primarily on regeneration harvest. The young stands are composed primarily of western larch, western white pine, and lodgepole pine.

Fragmentation of the landscape has occurred from past timber harvest. Infrequent, large scale stand-replacing fire is the primary ecological process that developed patch size in this area. Populations of native plants and animals have responded and adapted to this disturbance process, and associated patch size. Species abundance and distribution are a result of these dynamic processes, and the resulting vegetation patterns. Forest Service policy and the NFMA direction limiting opening size to 40 acres in areas with historic patch size of up to 10,000 acres, has resulted in a fragmented landscape with scattered openings that are smaller than reference conditions. In addition these openings are generally located on the upper 1/3 of the slope, and do not spatially simulate a natural process. Regeneration harvest completed in the late 1980's and 1990's average 16 acres in size on NFS lands, and 51 acres on PCTC lands. Most of these harvest units are surrounded by stands with high and increasing fuel loads.

Smaller patch size may also influence fire behavior. The smaller than reference condition patch size has a decreased chance of slowing the overall rate of spread and fire severity, resulting in a lower probability of effective fire suppression, and a lower probability of maintaining established vegetation within these regeneration openings. The increased fire extent and severity would increase the risk of mortality in late seral (old growth) stands and mature riparian forest. This is more prevalent on NFS lands than PCTC lands due to the non-continuous and smaller patch size on National Forest.

Although large scale stand replacing fire has historically occurred across this landscape, it is generally undesirable from a social and ecological perspective due to the high cost of fire fighting; and the impacts on merchantable wood products, soils, aquatic resources, air quality, old growth, wildlife habitat, and visual quality.

Fire, including moderately frequent mixed severity with infrequent, large scale stand-replacing events, is the primary ecological process that developed patch size in this area. Populations of native plants and animals have responded and adapted to this disturbance process, and associated patch size. Species abundance and distribution are a result of these dynamic processes, and the resulting vegetation patterns. Historic patch size varied from 100 to up to 10,000 acres. The higher patch size was generally on the steeper slopes that maintained the lodgepole pine type. The majority of the harvest within this area on

NFS lands has fragmented the landscape due to the 40 acre opening limitation. Private lands within this VRU group are much less fragmented.

Table 3-11 displays the reference condition by development class or seral stage, the existing age class distribution, the relative amount of the seral class compared to reference conditions, and the acres departed from reference condition.

Table 3-11
FRCC Reference and Current Seral Class Distribution
VRU 4 and 5

SERAL CLASS	FIRE REGIME CONDITION CLASS REFERENCE %	EXISTING AGE CLASS DISTRIBUTION %	RELATIVE AMOUNT	ACRES DEPARTED FROM REFERENCE (- = decrease)
Post Replacement (Early Seral)	15	10	Under Represented	-1,492
Mid-development Closed (Mid-Seral Closed)	45	27	Under Represented	-5,373
Mid-development Open (Mid-Seral Open)	10	3	Under Represented (Trace)	-2,089
Late Development-Open (Late Seral Open)	5	12	Over Represented	2,089
Late-development Closed (Late Seral Closed)	25	48	Over Represented	6,865

Up to 20% of this VRU may be uncharacteristic due to the loss of western white pine.

The following information was derived from running the Fire Regime Condition Class Model. This VRU Group is in Fire Regime III, mixed severity, with an average frequency of 59 years, and Fire Regime IV, high severity with an average frequency of 125 years in the LP type and 250+ in the mixed forest type on moderate to gentle topography.

The Current Vegetation-Fuel Departure from historic conditions score is a 30 which equates to a Fire Regime Condition Class 1, or Low Departure from natural conditions.

The Current Departure from fire Frequency and or Severity Departure from historic conditions score is 50 for a Condition Class 2 or moderate departure from natural conditions

The Overall Fire Regime Condition Class for the VRU Group is a score of 50, with equates to a Condition Class 2 or Moderate Departure from historic conditions.

The departure from historic conditions in this group is primarily a result of the large scale stand replacing fire in 1910, and the reduction in mixed severity underburns; the alteration of species composition from intolerant species such as western larch; the loss of the mid-tolerant western white pine; the increase in the late seral open stands as a result of mortality in the lodgepole pine; and the increase in down fuels and ladder fuels resulting from the lack of mixed severity fire.

VRU 6, 7, and 9 – Reference Conditions (30% of the analysis area)

Cool and Moderately Dry to Cool and Moist- Occurring on all aspects in the lower subalpine zone on gentle to moderately steep slopes. These sites are composed of mixed Douglas-fir, western larch, lodgepole pine, Engelmann spruce, and alpine fir in well stocked to fairly open conditions. Vegetation productivity is moderate to high depending on the aspect and soil moisture-holding capacity. Soils are generally from loess overlying glacial tills. Alpine fir is the climax species throughout most of this group. Lethal and moderately severe fires often create pure even-aged stands of lodgepole pine.

The fire regimes mixed severity and low severity with the dominant interval of 100+ years. Patch size resulting from stand-replacement events were typically 5,000 to 100,000 acres (USDA 1999, page 6 and 7), and an average of 111 years (FRCC 2005).

Existing Condition and Trend of VRU Group 6, 7 and 9

Several existing conditions differ from reference conditions and present ecosystem health concerns.

Depending on the amount of departure from historic conditions there may be a risk to ecosystem sustainability. The vegetation-fuel conditions class and fire interval-severity condition class will be the indicators used to estimate existing condition and trends. The current departure in vegetation–fuel conditions is 49% from historic conditions, the current fire frequency -severity is 15% from historic conditions, and the vegetation/fuel strata departure is 29%. Uncharacteristic vegetation-fuel conditions in this VRU are generally the result of the mortality in the lodgepole pine, the lack of younger age classes, and lack of western white pine in the moister sites.

A high buildup of ground and ladder fuels has occurred over the majority of this type, due to mortality from the mountain pine beetle, and the lack of mixed severity and high severity fire. This buildup could result in another large-scale, stand replacing fire, if a fire start were to occur and weather and climate were conducive to fire spread.

Although large scale stand replacing fire has historically occurred across this landscape, it is generally undesirable from a social and ecological perspective due to the high cost of fire fighting; and the impacts on merchantable wood products, soils, aquatic resources, air quality, old growth, wildlife habitat, and visual quality.

Current patterns of natural disturbance in the analysis area are consistent with those described for reference conditions of the broader geographical area. Fragmentation of the landscape has been minimal in this VRU group because the majority of the area is NFS lands that have not been within the suitable timber base.

Table 3-12 displays the reference condition by development class or seral stage, the existing age class distribution, the relative amount of the seral class compared to reference conditions, and the acres departed from reference condition.

Table 3-12
FRCC Reference and Current Seral Class Distribution, VRU 6, 7 and 9

SERAL CLASS	FIRE REGIME CONDITION CLASS REFERENCE %	EXISTING AGE CLASS DISTRIBUTION %	RELATIVE AMOUNT	ACRES DEPARTED FROM REFERENCE (- = decrease)
Post Replacement (Early Seral)	20	0	Under Represented Trace	-4,165
Mid-development Closed (Mid-Seral Closed)	35	19	Under Represented	-3,332
Mid-development Open (Mid-Seral Open)	15	2	Under Represented Trace	-2,707
Late Development-Open (Late Seral Open)	10	16	Over Represented	1,249
Late-development Closed (Late Seral Closed)	20	63	Over Represented Abundant	8,955

Up to 15% of this VRU may be uncharacteristic due to the loss of western white pine.

The following information was derived from running the Fire Regime Condition Class Model.
This VRU Group is in Fire Regime IV, Moderately long interval stand replacement fires with an average frequency of 111 years, and Fire Regime III moderately long-interval (50-100 year) mixed severity fires.

The Current Vegetation-Fuel Departure from historic conditions score is a 49 which equates to a Fire Regime Condition Class 2, or Moderate Departure from natural conditions

The Current Departure from fire Frequency and or Severity Departure from historic conditions is a score is 15 for a Condition Class 1 or low departure from natural conditions

The Overall Fire Regime Condition Class for the VRU Group is a score of 49, with equates to a Condition Class 2 or Moderate Departure from historic conditions.

Insect activity and fire are the most evident disturbance regimes in this area. The departure from historic conditions in this group is primarily a result of the mortality in the lodgepole pine; the loss of the western white component to blister rust; the reduction in the western larch component; and the lack of the younger age classes.

VRU 10, and Upper Elevation VRU 7, 9– Reference Conditions (7% of the analysis area)

Cool and Moderately Dry or Moist, to Cold and Moderately Dry - Occurring on all aspects in the upper subalpine zone on moderately steep to steep slopes. These sites are composed of mixed subalpine fir, Engelmann spruce, and whitebark pine, with lesser amounts of lodgepole pine and subalpine larch. Vegetation productivity is low to moderate depending on the aspect, elevation, and soil moisture-holding capacity. Soils are a complex of soil and rock outcrop with volcanic ash influenced loess overlying material weathered from the underlying bedrock.

The fire regimes are highly variable in this VRU group, and vary from mixed severity and non-uniform high severity with the high severity interval from 100-300 years. Patch size resulting from stand-

replacement events were highly variable dependent fuel continuity. Mixed severity fire events were highly variable and patch size varies from 200 to 30,000 acres (USDA 1999, page 6 and 7).

This VRU grouping makes up approximately 7% of the Miller West Fisher project area. Please refer to the VRU Map in the EIS and project file.

Existing Condition and Trend of VRU Group 10, and Upper Elevation VRU 7 and 9

Some existing conditions differ from reference conditions and may present ecosystem health concerns.

Depending on the amount of departure from historic conditions there may be a risk to ecosystem sustainability. The vegetation-fuel conditions class and fire interval-severity condition class are the indicators used to estimate existing condition and trends. The current departure in vegetation–fuel conditions is 32% from historic conditions, the current fire interval-severity is 31% from historic conditions, and the vegetation/fuel strata departure is 32%. Uncharacteristic vegetation-fuel conditions in this VRU are generally the result of the mortality in the lodgepole pine and the lack of the younger age classes.

A high buildup of ground and ladder fuels has occurred over some of this area, due to lodgepole pine mortality from the mountain pine beetle, and the lack of mixed severity and high severity fire. This buildup could result in another large-scale, stand replacing fire, if a fire start were to occur and weather and climate were conducive to fire spread.

Although large scale stand replacing fire has historically occurred across this landscape, it is generally undesirable for the reasons described previously

Current patterns of natural disturbance in the analysis area are consistent with those described for reference conditions of the broader geographical area. Fragmentation of the landscape has been minimal in this VRU group because the majority of the area is NFS lands that have not been within the suitable timber base.

Table 3-13 displays the reference condition by development class or seral stage, the existing age class distribution, the relative amount of the seral class compared to reference conditions, and the acres departed from reference condition.

Table 3-13
FRCC Reference and Current Seral Class Distribution
VRU 10 and Upper Elevation VRU 7 and 9

SERAL CLASS	FIRE REGIME CONDITION CLASS REFERENCE %	EXISTING AGE CLASS DISTRIBUTION %	RELATIVE AMOUNT	ACRES DEPARTED FROM REFERENCE (- = decrease)
Post Replacement (Early Seral)	20	12	Under Represented	-388
Mid-development Closed (Mid-Seral Closed)	25	10	Under Represented	-728
Mid-development Open (Mid-Seral Open)	25	16	Under Represented	-437
Late Development-Open (Late Seral Open)	15	31	Over Represented	777

SERAL CLASS	FIRE REGIME CONDITION CLASS REFERENCE %	EXISTING AGE CLASS DISTRIBUTION %	RELATIVE AMOUNT	ACRES DEPARTED FROM REFERENCE (- = decrease)
Late-development Closed (Late Seral Closed)	15	31	Over Represented (Abundant)	777

The following information was derived from running the Fire Regime Condition Class Model.
This VRU Group is in Fire Regime IV, Moderately long interval stand replacement fires with an average frequency of 111 years, and Fire Regime III moderately long-interval (50-100 year) mixed severity fires.

The Current Vegetation-Fuel Departure from historic conditions score is a 32 which equates to a Fire Regime Condition Class 1, or Low Departure from natural conditions

The Current Departure from fire Frequency and or Severity Departure from historic conditions is a score is 31 for a Condition Class 1 or low departure from natural conditions

The Overall Fire Regime Condition Class for the VRU Group is a score of 32, which equates to a Condition Class 1 or Low Departure from historic conditions.

Insect activity and fire are the most evident disturbance regimes in this area. The departure from historic conditions in this group is a primarily a result of the mortality in the lodgepole pine; the loss of the whitebark pine component to blister rust; the ladder fuel buildup; and the lack of the younger age classes.

Landscape Departure from Historic Conditions

Across the landscape, several existing conditions differ from reference conditions. This departure from historic conditions could pose a risk to overall ecosystem sustainability within this analysis area. The departure is summarized by the composite Fire Regime Condition Class for this landscape with a score of 53. This equates to a Condition Class 2 or moderate departure from reference conditions. The table below displays the reference condition, the existing condition and a restoration strategy recommended based on the difference between reference and existing condition, the current trends, management objectives, social needs, and potential climate change.

Table 3-14 displays the reference, existing condition, and restoration strategy summary by VRU Group.

Table 3-14
VRU Summary

VRU GROUP	TYPE	%	FIRE REGIME	FRCC DEPARTURE	FRCC	RESTORATION STRATEGY
VRU 1 and 2S	PPDF1	12	I Frequent Surface and Mixed Severity Fire (0-35 years) High Severity Fire (225 years)	66	2	Restore low to moderate severity fire Restore forest composition (primarily ponderosa pine and aspen) Restore forest density, and structure (focus on Mid-development and late development closed stands) Decrease competition and stress on forest stands Reduce density and risk of invasive plants (knapweed, St John's-wort, sulfur cinquefoil) Increase resilience to potential climate change
VUR 2N and 3	DFIR2	8	I and III Infrequent to Frequent Surface and Mixed Severity Fire (0-35 years) (35-100+ years) High Severity Fire (70-80 years LP, 100-250 years Mixed Stands)	77	3	Restore low to moderate severity fire Restore forest composition (primarily ponderosa pine, western larch and aspen) Restore forest density, and structure (focus on late development closed stands) Decrease competition and stress on forest stands Reduce density and risk of invasive plants (knapweed, St. John's-wort, hawkweeds, sulfur cinquefoil) Increase resilience to potential climate change
VRU 4 and 5	GFDF/ CHPI	43	III, IV and V Infrequent Surface and Mixed Severity Fire (35-100+ years) High Severity Fire (125 LP, 250+ Mixed Stands)	50	2	Restore moderate and high severity fire Restore forest composition (primarily western white pine) Restore forest density, and structure (concentrate on treating the late development and creating early and mid-development stands) Restore patch size and reduce fragmentation Increase diversity and heterogeneity Increase abundance and buffers in rarest habitat types (riparian areas) Decrease competition and stress on forest stands Create fuel breaks Reduce density and risk of invasive plants (primarily the hawkweeds) Increase resilience to potential climate change

VRU GROUP	TYPE	%	FIRE REGIME	FRCC DEPARTURE	FRCC	RESTORATION STRATEGY
VRU 6, 7 and 9	SPF11	30	III and IV Infrequent Mixed Severity Fire (50-100+ years) High Severity Fire (100+ years)	49	2	Restore moderate and high severity fire Restore forest composition (primarily western white pine and western larch) Restore forest density, and structure (concentrate on treating the late development closed stands and creating early and mid-development stands) Restore patch size and reduce fragmentation Increase diversity and heterogeneity Increase abundance and buffers in rarest habitat types (riparian areas) Decrease competition and stress on forest stands Create fuel breaks Reduce density and risk of invasive plants (primarily the hawkweeds) Increase resilience to potential climate change
VRU 7, 9 and 10	SPF12	7	III and IV Infrequent Mixed Severity Fire (50-100+ years) High Severity Fire (111 years)	32	1	Appropriate management response to natural fire; assist with tree improvement programs to breed genetically rust resistant white bark pine; Increase resilience to potential climate change by allowing natural process to occur. These are outside the scope of this project.

DESIRED CONDITIONS and RESTORATION STRATEGIES

Opportunities or strategies for the project area are aimed at the desired conditions of restoring or simulating the disturbance regimes and processes that have been disrupted, reducing stress, and increasing ecological resistance to change by protecting and preparing resources for the direct and indirect effects of predicted climate change, such as larger more frequent and more severe fires, increase risk of invasive plants, increase insect and disease infestations, and species distribution shifts. These opportunities are consistent with the purpose and need to maintaining vigor and long-term productivity, reducing hazardous fuels, and restoring natural fire regimes and providing forest products.

The opportunities are listed in the VRU summaries, and are highlighted in the remainder of this section. They include introducing fire back into the landscape and attempting to use fire similar to the fire regime for each VRU. Various timber harvest prescriptions are recommended to reduce fuels, reduce within stand stress, protect, buffer and maintain connectivity within the rarest habitat types, restore patch size, reduce fragmentation, and to re-establish historic species composition and structure. Tree harvest and planting is recommended to re-establish patterns of openings and different structural classes historic to each VRU, and to increase the resistance and resilience to potential climate change. Up to 25% of the seedlings planted could be from lower elevation stock to address potential climate change, while ensuring adequate survival of stock for current conditions. Silvicultural treatments such as burning and planting are recommended to establish white pine and aspen back into the system in historic locations.

On the dry habitats within VRU 1 and 2S, the most obvious change is the disruption of historic fire regimes as a result of effective fire suppression efforts over the last 70 + years, and the associated stand changes. This has changed insect and disease infestation levels, successional patterns resulting in changes of vegetation structure, pattern and composition. In conjunction with the disruption of historic fire regimes is the past harvest activity that focused on removal of the larger, shade-intolerant, fire resilient ponderosa pine and western larch, which changed the structure, composition and function of these stands by removing this large component.

Fuel build-up and fuel ladder increase has occurred in much of this area which would result in more severe fire when fire does occur. Invasion by exotic species are a high concern on these sites.

Restoration strategies include restoration of low to moderate severity fire, restoration of forest composition by focusing on retaining and promoting the large tree component, featuring ponderosa pine, western larch and aspen, reducing forest density, and associated competition and stress on forest stands, reducing density and risk of invasive plants, and increasing resilience to potential climate change.

On the moderately dry habitats in VRU 2N and 3, many of the stand conditions are once again ripe for a large scale stand replacing fire. Heavy mortality in the lodgepole pine stands from mountain pine beetle infestations in the late 1980's to early 1990's has resulted in heavy fuel build-up, and the potential for severe fire when it does occur on these steep slopes. Continuous high density even-age Douglas-fir stands are experiencing high competition and stress which is exacerbated by drought conditions and the associated insect and disease buildup. Understory density, fuels and fuel ladders are higher that reference conditions within most of the Douglas-fir stand types. Many of these stands are on steep slopes that contribute to the potential for severe stand replacing fire.

Restoration strategies include restoration of low to moderate severity fire, restoration of forest composition by focusing on retaining or restoring the large tree component, featuring ponderosa pine, western, larch and aspen, reducing forest density and the associated competition and stress on forest stands, focus on late development closed stands, reduce density and risk of invasive plants, and increasing resilience to potential climate change.

On the moist habitats within VRU 4,5,6,7 and 9 stand conditions across thousands of acres are once again ripe for a large scale stand replacing fire. Heavy mortality in the lodgepole pine stands from mountain pine beetle infestations in the late 1980's to early 1990's has resulted in heavy fuel build-up, and increased the potential for severe fire when it does occur. Many of these stands are also on steep slopes that contribute to the potential for severe stand replacing fire. The 1910 fire left little large tree component and little diversity or heterogeneity across the landscape. The introduction of white pine blister rust has reduced western white pine populations.

Restoration strategies include restoring moderate and high severity fire, while creating fuel breaks to reduce the potential for large scale stand replacing fire, restoring forest composition with emphasis on western larch and western white pine, reducing landscape homogeneity, and increasing diversity by creating early and mid-development stands, restoring historic patch size and reduce fragmentation from recent harvest, reduce competition and stress on forest stands, protect or restore the rarest habitat types, reduce the density and risk of invasive plants and increase resilience to potential climate change.

The upper elevation habitats within VRU 7, 9, 10 generally have low departure from reference conditions. Existing departure is primarily a result of reduction of mixed severity fire, increased stand density and stress, mortality in the lodgepole pine, the loss of the whitebark pine component, the ladder fuel buildup, and the lack of younger age classes.

Restoration strategies include restoring natural fire, restoring whitebark pine, reducing risk of invasive plant introduction, and increasing resilience to potential climate change. All but management activities to reduce the potential for invasion and spread of invasive plants are beyond the scope of this decision.

In a broad sense, the recommended restoration activities include vegetation and fuel management through prescribed and natural fire, slashing, intermediate and regeneration harvest, and tree planting. Returning fire into stands with heavy fuel loading or stands with ladder fuels could fatally damage overstory trees if fuel reduction activities were not undertaken prior to the prescribed fire.

Restoring ponderosa pine to a more sustainable condition will generally require some kind of silvicultural cutting (Fiedler 1996).

Restoring aspen on the dryer sites will require prescribed fire, or other site disturbance to reduce competition and stimulate aspen to sucker from existing clones or through aspen planting where clones have succumbed to conifer competition or big game browsing.

Restoring larch in stands that are predominately lodgepole pine and restoring western white pine will generally require harvest, site preparation, and reforestation activities. Restoring whitebark pine may require fire and genetic improvement for blister rust resistance, which is outside the scope of this project.

Restoring rare habitats may require protection, establishment of buffers and fuel breaks, and/or harvest to decrease competition and stress.

Reducing risk of insect disease infestations will require reducing stress on forest stands to at least a portion of the current forest.

Increasing resilience to potential climate change is consistent with restoration strategies above including decreased competition and stress, increase in heterogeneity, increase forest structural diversity, favoring intolerant species that are more resilient to drought, reducing the probability of a drainage wide stand replacement event in the event of a high severity fire, and use of climate projections to plan vegetation options. Resilience includes planning for climate change associated risks such as longer summers, lower snow pack, regular droughts, forest dieback, larger fires, off season fires, and fires in subalpine forests.

Desired Conditions within the Context of Forest Plan Management Area Objectives:

Most of the areas that were identified for harvest treatments are within Management Area 15, Timber Production, MA 14, Grizzly/Timber, MA 11 Big Game Winter Range/Timber, MA 12 Big Game summer Range, MA 18 Minimum Use Regeneration, MA 19 Minimum Use Steep Slopes, and MA 10, Big Game winter Range. There are a few stands in MA 23 Power Line Corridor, and MA 24 Minimum Use/Site Protection. Forest Plan goals for MA 15 include producing a programmed yield of timber while providing for other resources (Kootenai Forest Plan page III-64). Forest Plan goals for MA 12 are to maintain or enhance big game summer habitat and produce a programmed yield of timber products, and goals for MA 11 are to maintain or enhance big game winter range while also producing timber. In MA 14 the Forest Plan goal is to maintain or enhance grizzly bear habitat and reduce human bear conflict and produce a programmed yield of timber products. The Forest Plan goal in MA 18 is to maintain existing vegetation or defer regeneration harvest until techniques and practices are available to ensure the area can be regenerated within five years of harvest. In MA 10 the goal is to maintain or enhance the habitat effectiveness for winter use by big game species, and MA 24 is to protect soil productivity. The Forest Plan goal for stands within these management areas are identified in the Kootenai National Forest Land and Resource Management Plan, pgs. III-37-82. For the timber resource, in MA 15, MA 14, MA 11, and MA 12, adequate stocking will be maintained to produce a programmed

yield of timber within other resource objectives. In all MA's the desired species will generally be seral species consistent with historic conditions. Insect and disease levels will generally be low. The area will be managed to reflect historic forest structure, density, composition, patch size and age consistent with disturbance regimes. Fuel loadings will be maintained at acceptable limits identified by fuel type.

According to the Kootenai Forest Plan (III-11, 49, 65, 70, 75) Management Areas 11, 12, 15, 16 and 17 are all suitable for timber harvest. In MA 10, timber harvest is permitted for wildlife habitat improvement, and in MA 18, timber harvest is permitted to prevent the spread of insects or disease or it can be re-assigned to the suitable timber base if conditions are such that regeneration techniques can be assured, and if market conditions are such that the harvest of timber from this MA will contribute to the Net Public Benefit. The majority of the proposed vegetation treatments in MA 10, 18, 19, and 24 include slashing and burning to reduce natural fuels, and improve wildlife habitat, with minor acreage treated with partial timber harvest or shelterwood regeneration treatments on the areas with higher productivity soils. All treatments proposed on MA 10, 18, 19, and 24 are designed to restore natural density and composition, and to maintain or enhance wildlife habitat.

SITE SPECIFIC VEGETATION MANAGEMENT OPPORTUNITIES

Based on the general opportunities and restoration objectives outlined by VRU group in the previous section, the Miller West Fisher interdisciplinary team (IDT) identified site-specific areas where these opportunities to meet desired conditions would apply.

STAND SPECIFIC INFORMATION

The scope of the analysis for treatment needs was narrowed down to the stands included in the alternatives. Refer to Alternative summary Tables in the Project File 9 for a list of stands.

Site-specific information for most stands in the project area is available in the stand file system at the district.

Site-specific information on vegetation conditions in the project area has been gathered through systematic inventories and follow-up field reconnaissance. This information is used to diagnose individual stand conditions. Specific silvicultural diagnosis of stands within the project area is located in the project file. The diagnosis process identifies alternative management strategies to meet management objectives for a specific land area. Silviculturists use this process to systematically identify ways to manipulate existing vegetation on a given site (tree species, age and distribution, as well as shrubs, forbs, and grasses present on the site) that is compatible with site conditions, such as soil attributes, steepness of the ground, and potential to meet land management objectives.

The key to the diagnosis process is to identify different ways to meet management objectives. Note that the diagnosis process addresses all types of resource objectives. It does address timber management but only within the context of ecosystem health and other resource objectives. The Silvicultural Practices Handbook (FSH 2409.17) and a letter from the Regional Forester dated 1/6/89 give direction for the diagnosis process. This direction is consistent with both the Northern Regional Guide and Kootenai National Forest Plan.

For the Miller West Fisher project, the diagnosis was limited to stands that met certain parameters that were specified during project initiation by the District Ranger. These were:

- Overstocked or stagnant stands in need of basal area reduction or stand regeneration. See the Fisher NFMA, located in the project file, for more information.

- Stands that could be accessed minimal new road construction. Limiting new road construction was an objective due to the need to provide secure habitat for grizzly bear, so harvest opportunities were limited to areas with road access, or to those opportunities that were considered to be economical for helicopter harvest.
- Stands outside historic or desired conditions such as dry ponderosa pine stands, and stands with declines in early seral species such as western larch and western white pine. Other activities to address conditions outside historic conditions include restoring patch size; increasing the long-term productivity of forest stands suitable for timber production; increasing resilience and resistance to potential climate change, using prescribed fire to simulate natural processes, preventing natural and activity fuel build up, and creating habitat diversity while reducing suppression costs.

Silvicultural diagnosis involves the following steps:

STEP 1: Describe existing stand conditions.

STEP 2: Develop target stand description(s) based on resource management objectives. A target stand represents the way, over time; managers would like the stand to develop based upon the inherent attributes of the growing site plus management objectives for the area. Target stands for habitat type groups have been developed. These are described in detail in Habitat Type Groups and Target Stands (Gautreaux 1993).

STEP 3: Compare each stand's existing condition to its target stand description. This determines whether a stand needs treatment to move it towards the desired target stand condition. The following options are considered in priority order:

a. Defer treatment if the stand presently meets the target stand objectives.

If the stand currently does not meet the target stand objectives, the silviculturist considers the following options:

b. Modify existing stand by intermediate cutting, prescribed burning, supplemental planting, or other means to meet management objectives. Intermediate treatments may stabilize, reduce fuel loadings or improve the existing condition..
c. Modify existing stand by applying uneven-aged management treatments. This modification may occur in stands currently in a multistory structure or where management objectives include conversion to an uneven-aged stand. Management objectives for stands in the project area do not include conversion to an uneven-aged stand. Uneven-age management is not consistent with the natural processes and restoration objectives across this landscape.
d. Replace stand if stand modification cannot meet management objectives. Even –aged management with reserve tree systems, that which create different intensities of two-story stands, are included. Replacement methods include shelterwood cuts, seed tree cuts, or clearcuts to produce even-aged regeneration (single story or two-story stands).
   Silvicultural treatments were identified for all stands in the proposed action and all the alternatives to meet target stand parameters. Intermediate treatments or replacement methods were based on the composition, condition and density of the current stand, and the ability to meet objectives..
e. Defer due to external conditions that preclude treatment at this time. Examples might include: vegetation in an adjacent harvested stand is not tall enough to provide wildlife hiding cover; or watershed conditions in the area indicate that harvest is not appropriate at this time. In both

cases, even though a stand did not meet the target stand description, it would be appropriate to defer treatment in order to satisfy other concerns.

STEP 4: Review each stand more thoroughly for specific treatment options that would move the stand towards the desired target condition. Summarize the range of treatment alternatives for each stand.

Each stand identified as meeting the project parameters was diagnosed, with the specific treatment options identified.

STEP 5: This last step takes place after the responsible forest officer selects a treatment need for each stand that best meets management objectives. In this step, the silviculturist develops the detailed silvicultural prescription for each harvest or prescribed burn unit within the selected alternative. The prescription documents the detailed treatment needs, and outlines and clarifies the specific required activities for each individual unit. Activities may include layout and marking guides for units with leave trees, specific fuels management/site preparation requirements and objectives, details of the reforestation needs and any other specific objectives or management requirements for each unit.

Existing Stand Conditions

The majority of the existing stand conditions in the Miller West Fisher project area that have been selected for treatment were not within target stand conditions. Stocking levels are generally high on the dry lands and are heavy to Douglas-fir. On the moist and upper elevation sites, stocking levels vary from low in the lodgepole pine stands due to the mortality in the lodgepole pine, to high in areas that have not sustained significant mortality from mountain pine beetle. Fuel loading is generally high on the dryland types and in stands with heavy lodgepole pine mortality, and moderate to low elsewhere.

The detailed stand data that was used for this step can be found in stand files at the district office and in the diagnosis and summary tables in the project file.

ENVIRONMENTAL CONSEQUENCES

The analysis of direct, indirect and cumulative effects on vegetation is limited to the affected environment as described in Section V, Affected Environment. The potential effects described below represent the result of analysis and best professional judgment as a Silviculturist, and Ecologist, based on research, experience and monitoring to date.

The direct and cumulative effects of past harvest are primarily associated with regeneration harvest, intermediate harvests, stand improvement, salvage, and permanent land clearing.

Foreseeable actions will include additional commercial harvest on private lands, power line clearing, road access for mining and harvest activity, and prescribed burning on National Forest System Lands.

The direct, indirect, and cumulative effects of all action alternatives would result mainly from the vegetation management activities described in the alternative descriptions for National Forest System Lands and the foreseeable actions listed above.

The effects associated with actions on National Forest System Lands will be disclosed in terms of the purpose and need statements that are applicable to vegetation management and ecology, as well as the findings that must be consistent with the regulatory framework and environmental issues and concerns relative to vegetation. Applicable Purpose and Need includes:

- Maintain vigor and long-term productivity of forest stands;
- Reduce hazardous fuels and restore natural fire regimes;
- Provide forest products

MAINTAIN VIGOR AND LONG-TERM PRODUCTIVITY OF FOREST STANDS

REDUCE HAZARDOUS FUELS AND RESTORE NATURAL FIRE REGIMES

These two needs can be captured within the context of ecological integrity. Ecological integrity can be defined as an ecosystem that has the native components (plants, animals, and other organisms), and processes (such as growth and reproduction) intact. "At a landscape level, this requires the maintenance of ecosystem integrity, which means that a landscape has a range and distribution of forest structures, species composition, and biological diversity that are resilient and or are consistent with set standards such as the historic range of variation" (Lindenmayer 2000). A forest that is within the historic range of variation and resilient to disturbances and change will meet the objectives of maintaining forest vigor and long-term productivity.

The objective of ecological integrity is to keep the ecosystem intact. This would be accomplished in the project area by maintaining ecosystem function, restoring vegetation health, restoring natural fire regimes, reducing fuels, and maintaining resilience as reflected in the purpose and need statements.

Elements of Ecological Integrity, Forest Productivity and Vigor, and Resilience, and Fuels Reduction and Restored Fire Regimes Include:

- Stand stocking levels, or stand densities, consistent with historic conditions;
- Stand species composition, seral stage, landscape pattern and patch size consistent with historic conditions;
- Natural fuel composition consistent with historic conditions;
- Natural fire severity and frequency consistent with historic conditions (see fire/fuels report in this document for more detail);
- Ecosystem resilience to climatic change and variation.

Issue indicators for Ecological Integrity include:

- Acres of restoration treatment by Vegetation Response Unit (VRU) Group
- Acres of natural fuel reduction
- Acres of ponderosa pine restoration
- Acres of western larch restoration
- Acres of western white pine restoration
- Improvement in Fire Regime Condition Class
- Total acres treated that move VRU's toward target conditions
- Consistency of treatment with natural patterns
- Average patch size compared to historic or reference patch size
- Treatment acres resilient to climate change and disturbances (including decreased competition and stress, increase in heterogeneity, increase forest structural diversity, and use of climate projections to plan vegetation options). Resilience includes planning for climate change associated risks such as longer summers, lower snow pack, regular droughts, forest dieback, larger fires, off season fires, and fires in subalpine forests. "Climate variability influences forest structure and composition by influencing the frequency, severity, and extent of damage from fires, insect infestations, and disease" (Mote 2003). Increasing resilience based on natural conditions should also increase resilience and resistance to potential climate change to warmer and drier or warmer and moister with higher frost free days, by favoring intolerant species that are more resilient to drought, reducing vegetative density on a given site, and reducing the probability of a drainage wide stand replacement in the event of a high severity fire.

PROVIDE FOREST PRDUCTS (CONTRIBUTE TO A SUSTAINED YIELD OF TIMBER)

Elements that Contribute to a sustained yield of timber include:

- Acres harvested
- Estimated volume harvested

FINDINGS CONSISTENT WITH REGULATORY FRAMEWORK

Other impacts addressed in the vegetation effects analysis will be disclosed in terms of the findings that must be consistent with the regulatory framework and environmental issues and concerns relative to vegetation.

ALTERNATIVE 1 – NO ACTION

Direct and Indirect Effects

Description of Alternative 1 (No Action)

With this alternative none of the activities proposed through this project on NFS lands would occur. Pre-approved projects such as the Forestwide Fuels treatment units to be slashed and underburned would occur. Management activities on private lands would continue. Natural succession and natural disturbance process such as wildfire, insect and disease activities would continue. Fires would be suppressed in accordance with Forest Plan direction.

Ecological Integrity (Forest Vigor and Long-Term Productivity)

The long-term health of ecosystems is linked to natural disturbance processes. In the Rocky Mountain region, fire return intervals played an important role in the development and persistence of these ecosystems. Other disturbances such as insect and disease infestations and windthrow are support disturbances to fire return intervals. This means that these disturbances are related to fire return intervals by creating conditions conducive to fire. Fire Regime Condition Class is a classification of the amount of departure from the natural fire regime, and includes three condition classes for each fire regime. Condition Class 3 = High departure from natural conditions, Condition Class 2 = Moderate departure, and Condition Class 1 = Low departure.

The classification is based on a relative measure describing the degree of departure from the historical fire regime, which results in changes to one or more of the ecological components including vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern), fuel composition, fire frequency, severity, and pattern, and other associated disturbances such as insect and disease, grazing, harvesting, etc. Low departure is within the historic range of variability, while moderate and high departures are considered to be outside the historic range.

The Fire Regime Condition Class Analysis indicates the current departure for the **vegetation and fuels** in the Miller West Fisher landscape is a Condition Class 2, moderate departure from historic conditions. This will continue to trend toward a Condition Class 3, or high departure from historic conditions. The younger age classes or early seral stages will continue to be rare with a moderate to high risk to ecosystem integrity. The **fire frequency-severity** condition class is currently a Condition Class 2, moderate departure, and will also continue to trend toward a Condition Class 3, high departure from historic conditions. As the fire frequency interval extends, the risk for higher than natural fire severity

increases. Refer to the existing condition summary by VRU group and to the Fire Regime Condition Class Analysis located in the project file for more information.

Recurrence of natural disturbance and recovery within ecosystems is an important mechanism for energy flow and nutrient cycling, and for maintaining age, species, genetic, and structural diversity.

The long term health of ecosystems may also be dependant on the resilience of ecosystems to potential climate changes and the associated climate-related disturbances. Resilience to potential climate change is generally compatible with maintenance of historic conditions. But in addition to maintaining historic fire regimes, resilience to climate change requires increased forest structural diversity because…; maintenance of rare habitats and structures, which may potentially be eliminated by climate change; maintaining connectivity for species movement to allow animals and plants to relocate as suitable habitat moves north or south, or up or down in elevation; and increasing resilience changes in natural disturbances processes such as increases in insects and disease, larger fires, longer fire seasons, and fires in higher elevation areas. Another potential ecosystem change as a result of changing climate is expansion of some vegetation types or habitats and reduction of others. Even if maintenance of current native communities becomes impossible with climate change, maintenance of regional biodiversity and ecosystem function is important to promote resilience on a larger scale (Fox 2007).

Under this alternative, active wildfire suppression efforts would continue. No fuels or vegetation management would occur to reduce stand density or ladder fuels. With no vegetation management, the current successional pathway of stand and landscape would continue. If wildfires continue to be successfully controlled, intolerant species presently found on the sites, specifically western larch, ponderosa pine, lodgepole pine, and western white pine, would eventually be replaced with shade tolerant species such as Douglas-fir, grand fir, alpine fir hemlock and cedar. Stand density would continue to increase above historic or reference conditions, and would create unnaturally high stand density and fuel loadings, and increase the risk of insect and disease epidemics and broad scale, stand-replacing fires.

Without natural fire or vegetation management activities, the successional development may not be consistent with natural processes and may not create long-term resilient, sustainable forest systems. Without sustainable forest systems, the project area will continue to move outside the natural range of variability, and species viability may not be sustained. With the absence of fire in these ecosystems, less disturbance and more successional advancement would occur. Structural and compositional diversity may decrease over the next 50 to 100 years as tolerant species replace the intolerant species, and there will be no western white pine, western larch, ponderosa pine or aspen restoration.

Stand composition would trend toward Douglas-fir, grand fir, hemlock, cedar, and subalpine fir, depending on the VRU. Stand densities would continue to increase above historic levels and stands would continue to develop a multi storied structure with high ladder fuels. Without fire, the amount and depth of the fuel bed (both live and dead) will continue to increase. Existing seedlings of tolerant species would release and eventually grow into the dominant canopy layer. New seedlings of tolerant species would regenerate in openings created by insect and disease (Romme, Knight and Yavitt 1986). Insect and disease cycles and perpetuation of tolerant species will continue, potentially resulting in a community that is less resilient to disturbances and climate change.

If fire suppression efforts fail, a new pattern of fire frequency and severity may emerge, with severe stand replacing fires occurring across the landscape. On the drier sites where vegetation historically developed under a regime of frequent low severity fires, the intolerant species may not have the seed source to regenerate following this widespread, stand-replacing event. The area would progress very slowly from the grass/shrub stage to a forested landscape composed primarily of mid-tolerant Douglas-

fir. Old growth stands, replacement old growth stands, and vegetation within important riparian zones may be lost with a large scale high severity fire event.

In areas on the north and east slopes, mid to high elevations, and upper basins, where the dominant fire regimes are mixed-severity to high severity, a large scale stand replacing fire would be consistent with historic patch size, and seral stages; however it may not be consistent with social objectives, resilience to potential climate change objectives, and the specific objectives to restore ponderosa pine, western larch, and western white pine. Large-scale stand replacing fire also would not retain late seral stands and riparian zones.

Most of the successional changes would create conditions that are not resilient to potential climate change. Denser stands more susceptible to fire, insect and disease, are not likely to survive expected climate change, which will bring increases in fire, insect, and disease. "Good forest management in a time of rapidly changing climate differs little from good forest management under more static conditions, but there should be increased emphasis on protecting climatic refugia and providing connectivity" (Noss 2001). "Management is critical for a positive response of forest growth to a warmer climate, and selection of the best species for the new conditions will be of vital importance" (Saxe 2001).

Contributions to a Sustained Yield of Timber

There would be no intermediate or regeneration harvest or pre-commercial thinning on NFS lands if the no action alternative is selected. Up to 9 million board feet (MMBF) of timber would not be available for utilization by timber dependent industries or as products for the general public. There would be no dollars available through the value of timber for other restoration activities such as watershed restoration, vegetative restoration or noxious weed treatment, and there would be no culturing of managed stands. The long term growth, health and vigor of timber on suitable management areas would not be optimized, and the risk of loss through large scale insect and disease or fire would increase. This alternative is not consistent with Forest Plan Goals for timber or fuel management.

Cumulative Effects

Cumulative effects of the no action alternative that will effect vegetation and ecology include past activities and recurring management activities on private lands; and past actions, and pre-approved activities on NFS lands, such as the Forest Wide Fuels projects, Forest Herbicide EIS for noxious weed treatments, road maintenance, and fire suppression. All the past management activities have been incorporated into the existing conditions discussion on vegetation. All planned and reasonably foreseeable actions will be incorporated into the no action and the action alternatives as cumulative effects.

Past Management Activities

Past timber harvest has created a mosaic of openings and areas with reduced stand density in forested landscapes since the 1960's. The stands vary from sapling to saw timber size, and are generally dominated by intolerant species consistent with VRU objectives on NFS lands, and a mosaic of tolerant and intolerant species on private lands. Most of the regeneration harvest that occurred in the 1990's is still in the stand initiation phase. This phase begins immediately after a disturbance and continues until newly growing stems reoccupy the growing space. The invasion period varies from a few years to 2-3 decades, depending on soil and site conditions, and the species mix (Oliver 1990, page 145-146). The majority of the regeneration stands logged prior to the 1990's are in the stem exclusion stage, where recruitment of new individuals is low, and some of the existing individuals are starting to die due to

competition. Some of the more open areas may still be in the stem recruitment stage. A given stand may take several decades before all parts make the transition from the stand initiation stage to the stem exclusion stage (Oliver 1990, Pg 147). All past management activities have been incorporated into the existing condition analysis.

Past intermediate harvest opened some of the existing stands and may have created openings that return to the stem recruitment stage. The overall stand dynamics in these intermediate harvests still trend toward the stem exclusion stage, and stems have been removed by harvest, rather than by the usual mortality due to shading and competition. In some cases the stands move toward the understory re-initiation stage where shade tolerant shrubs, forbs, and conifers reestablish in the understory (Oliver, 1990, pg 143-152).

As of 2005, previous regeneration harvest has occurred on 3,562 acres or about 5.1% of the project area. Past intermediate harvest has occurred on 5,258 acres or approximately 8% of the project area. All harvest in 2006 through 2008 is analyzed as a planned and recently completed activity.

Past regeneration treatments (1,528 acres) on NFS lands have created a mosaic of openings, and reduced stand density in a densely forested landscape. All of the openings that are in a stand initiation or stem exclusion stage, are fully stocked, and include a component of intolerant species consistent with VRU objectives. However, due to the National Forest Management Act requirements that preclude openings in excess of 40 acres, combined with Forest Plan opening size standards, the average patch size of these openings is 16 acres. The average patch size of the regeneration openings and the location of these patches are not consistent with historic patch size of 20-200 acres on the drier VRU's and 100 to 5,000 acres on the moist VRU's. They are also not consistent with historic distribution of openings. The effects of these openings are increased amount of edge, and increased fragmentation from what would have occurred historically. In addition little overwood structure or snags were retained.

Past regeneration harvest on private lands including PCTC lands (2,034 acres) have also created a mosaic of openings, and reduced stand density in a densely forested landscape. Most of the openings are in a stand initiation or stem exclusion stage, are fully stocked, and include a component of intolerant species consistent with VRU objectives. The average patch size of these openings is 51 acres. Many of these are connected, and are within the historic patch size. They are not necessarily consistent with historic distribution due the limitation of ownership patterns. Amount of edge and fragmentation are most likely within the historic range for the VRU's, as most of these regeneration openings are clustered in the moist VRU's.

Past intermediate harvest (3,408 acres) on NFS lands have changed composition, structure, and potentially function by removing the larger more intolerant species. Prior to the 1980's most of the intermediate treatment was a liberation harvest that removed the larger intolerant species and relic trees. These stands are trending towards climax conditions described above at perhaps a more accelerated rate than the untreated stands. Changes in species composition and structure is trending to a higher than historic component of smaller mid-tolerant to intolerant trees with increased ladder fuels. Despite the removal of the overwood, past intermediate harvest on NFS lands have generally maintained more intolerant species than private lands. In the 1990's most of the intermediate harvest was a commercial thin that retained the best quality of the intolerant western larch, ponderosa pine and Douglas-fir.

Past intermediate harvest on private land (1,850 acres) has also changed stand composition, structure, and function by removing the larger intolerant trees as well as much of the co-dominant intolerant trees leaving stands that are often dominated by the mid-tolerant Douglas-fir and intermediate western larch and ponderosa pine as well as a component of other tolerant species. These stands are generally more

open than the stands with intermediate treatment on NFS lands, and most are regenerating to mid-tolerant and tolerant species in the understory.

Because the intermediate treatments did not replace the existing stands and are generally larger treatment areas, they are more consistent with historic patch size and have less edge and fragmentation than the regenerated stands.

Refer to the harvest by decade tables in the Affected Environment section of this report. This information has been incorporated into the existing condition analysis.

Past slashing and underburning (2,120 acres): The effects of the 820 acres of slashing and underburning in the Forest Wide Fuel units, and the 1,300 acre wildlife habitat improvement burn in Miller Creek have decreased the understory component of Douglas-fir, reduced stand density, and restored fire on the landscape. This treatment improved stand conditions and increased resilience to potential climate change by reducing stocking, decreasing within stand stress, decreasing ladder fuels, and increasing species composition of intolerant ponderosa pine and western larch. This burning was the first step, but much of the acreage is still overstocked with smaller Douglas-fir, and will take additional treatment to move the stands to desired conditions. The majority of this burning was within VRU 1 and VRU 2S treating approximately 25% of these dry VRU groups within the project area. These actions have been incorporated into the existing condition analysis.

Road Storage: Long-Term storage of roads on NFS lands has reduced the accessibility for future management actions such as salvage, pre-commercial thinning, and fire suppression. Over time, as these sites are re-vegetated with native vegetation, the amount of edge habitat and fragmentation will be reduced. The majority of these roads were not treated to control noxious weeds prior to storage. Initially with site disturbance, there was an increase in invasive plants. Once native plants have re-occupied the sites, most of the invasive plants experience a decline in density. The exception to this is the hawkweeds, which continue to expand even under forest or shrub canopy.

Weed Control – Spraying with herbicide to control weeds has been ongoing since the mid 1990's. The effects of past herbicide treatment have reduced the existing noxious weed infestations, but have also decreased native shrubs and forbs, and potentially increase native and non-native grasses. These effects are primarily associated with roadside corridors.

Bear Lakes Estates – this livestock access to a private in-holding in the project area will have minimal vegetative or ecological impacts. The notable exception is the opportunity to introduce invasive plants to an area essentially free of invasive plants. Mitigation that requires the use of weed free forage will minimize this potential, but not eliminate it.

Reasonably Foreseeable Actions

Tables 3-15 – 3-18 display the reasonably foreseeable actions.

Table 3-15
Planned and Recently Completed Harvest on Plum Creek Timber Lands

Unit	Acres	Planned Year	Treatment	% Crown Removal	VRU
3	9	2006	Improvement	60	1
6	125	2006	Improvement	60	2S, 4
7	40	2006	Improvement	60	5
10	31	2006	Regeneration	80	5
30	152	2006	Regeneration	85	3
32	13	2006	Improvement	60	3
33	137	2006	Regeneration	85	5

Unit	Acres	Planned Year	Treatment	% Crown Removal	VRU
29	175	2007	Improvement	60	2S, 2N
11	46	2008	Improvement	60	3
13	7	2008	Regeneration	80	2S
14	21	2008	Regeneration	80	2S,4
15	59	2008	Regeneration	80	2S, 5
16	12	2008	Regeneration	80	2S
17	9	2008	Regeneration	85	2S
18	18	2008	Regeneration	85	2S,5
19	62	2008	Regeneration	85	5,7
20	9	2008	Regeneration	85	4
23	16	2008	Improvement	60	5
28	77	2008	Improvement	60	2N
	1,018				

Table 3-16
Planned and Recently Completed Pre-Commercial Thinning on Plum Creek Timber Lands

Unit	Acres	Planned Year	Treatment	% Crown Removal	VRU
12	59	2006	PCT	20	4
22	94	2006	PCT	20	5
31	69	2006	PCT	20	4
34	48	2006	PCT	20	4
26	56	2008	PCT	20	5
	326				

Table 3-17
Planned Montanore Power Line Routes

Unit	Acres	Planned Year	Treatment	% Crown Removal	VRU
North Fork Miller Route	300	2010	Power line	100	1/2S-71 acres 3-19 acres 4/5-217 acres 7-52 acres
West Fisher Route	361	2010	Power line	100	

Table 3-18
Forest Wide Fuels Projects

Treatment Area	Acres	Planned Year	Treatment	% Crown Removal	VRU
5069	201	2008	Spring Burn	15	1 and 2S
5070	80	2008	Spring Burn	15	2S
5071	47	2008	Spring Burn	15	4S
5073	47	2008	Spring Burn	15	3

5082	77	2010	Spring Burn	15	2N
5083	19	2010	Spring Burn	15	2N
5090	283	2007	Spring Burn	15	2S
5095	302	2007	Spring Burn	15	2S (206) , 7and9 (96)
Total	1,056				
Total Minus Units 102,104,105, and 109	993				

**There are no harvest plans on State Lands in the project area within the 10-15 year planning period.

Planned intermediate harvest - The majority of the planned 1,018 acres of intermediate stand treatments on Plum Creek Timberlands are within the warmer VRU's, that are currently in a Fire Regime Condition Class 2 trending to a Condition Class 3, or high departure from historic conditions. While this treatment will reduce stand density and natural fuels, intermediate harvest that removes the intolerant species will continue the trend toward departure from historic composition and structure conditions.

Other similar harvests in the project area indicate that stand composition would move toward Douglas-fir, grand fir, hemlock and alpine fire, stand densities within the mid seral, pole size component would be sustained to increasing, and ladder fuels would continue to increase with regeneration of tolerant and mid tolerant trees in the understory. Stand structure would move from multi-storied stands with a large tree component, to multi-storied stands lacking the large tree component, and would develop into mid sized, multi storied stands with high ladder fuels. Without fire, the amount and depth of the fuel bed (both live and dead) will continue to increase, and perpetuation of tolerant species will continue until a large-scale stand replacing fire occurs. The potential for large-scale stand replacing fire would be increased with climate change to a warmer, dryer climate.

As these stands progress toward more shade tolerant species, insect and disease occurrences are likely to increase. Shade tolerant species are generally more susceptible to root and stem decays than are more shade-intolerant species such as western larch and ponderosa pine. These shade tolerant species would likely be less resistant to insect and disease impacts due to moisture stress during the warm periods of the year. Tolerant species are more nutrient and moisture demanding, thus are more stressed on lower productivity sites and during times of drought, and therefore predisposed to insect and disease attack. These effects would be amplified with potential climate change (Logan 2003).

The result of planned vegetative treatments would be forest stands that are outside the range of natural variability. Managing vegetation outside the historic range of variability is likely to result in reduced resilience and increased risks to sustainability of ecological and biological diversity.

As the fire frequency interval extends, the risk for higher than natural fire severity increases.

Because the proposed treatments are not stand replacing, and because 40-50% of the stand will be retained, the changes to the landscape patterns will be similar to historic conditions for location and patch size.

Planned slashing and underburning - the effects of the additional 1,056 acres of slashing and underburning in the Forest Wide Fuel units, will decrease the understory component of Douglas-fir, reduce stand density, and restore fire at a small scale on the landscape, but at a significant scale for the

drier VRU's. This treatment will improve stand conditions and increase resilience to potential climate change by reducing stocking, decreasing within stand stress, decreasing ladder fuels, and increasing species composition of shade intolerant ponderosa pine and western larch. Between the planned 1,056 acres and the recently treated 2,120 acres, approximately 37% of the driest VRU's within this project area would be treated. Additional burning or stand density reduction will be required on many of these stands to move the stands to desired conditions.

Planned regeneration harvest - The majority of the planned 517 acres of regeneration harvest on Plum Creek Timberlands are within the Warmer VRU's 2S and 2N, and the warm and moist VRU 5. Most of the treated areas are currently in a Fire Regime Condition Class 2, moderate departure from historic conditions. Generally, the regeneration harvest on Plum Creek Timber Lands is consistent with restoration objectives for species composition, but may not be consistent in patch size, and structure.

Montanore Mine - The majority of the proposed power line to supply the mine site will be within the Miller West Fisher project area. Permanent clearing of forest vegetation would occur on approximately 300 acres within the Miller Creek Drainage, and transects 60% warm and moist and 40% drier VRU's. This will create a continuous open corridor within a variable density forested landscape. This opening is not consistent with historic patch size, shape or location. This opening will increase the amount of edge and fragmentation over what would have occurred historically. In addition to the power line corridor, approximately nine miles of road would be constructed to access this line. This will further dissect a previously unroaded area, and potentially increase the amount of edge habitat, fragmentation, and invasive plants.

Wayup/Forth of July Mines – This project authorized access to two mining claims near the Cabinet Mountain Wilderness and included construction of 2.68 miles of new road in Lake Creek. It also authorized reconstruction and motorized use on 1.3 miles of non-system road at the head end of the West Fisher drainage. The new road construction will dissect a previously unroaded area, potentially increasing the amount of edge habitat, fragmentation, and invasive plants in an area that is essentially weed free.

Midas Mine Subdivision – This former mine property has been subdivided and sold. The property was previously harvested with a regeneration harvest, and the majority of the area will most likely continue to move through the seral stages, becoming a forested environment. Disturbance related to the subdivision and construction may increase the amount and number of invasive plants on the site.

Planned Road Storage

Long-Term storage of roads on NFS lands will reduce the accessibility for future management actions such as salvage, precommercial thinning, and fire suppression. Over time, as these sites are re-vegetated with native vegetation, the amount of edge habitat and fragmentation could be reduced. Planned road storage prisms will be treated with herbicide prior to storage work, and all exposed soil will be re-seeded the first growing season following work. These mitigations should reduce the potential for invasive species expansion, and over time, with the exception of hawkweeds that thrive under a shaded environment, noxious weed density should decrease due to establishment of native vegetation and the lack of access for weed introduction and spread.

Weed Control – Spraying with herbicide to control weeds is ongoing and is expected to continue in the project area. The effects of herbicide treatment will reduce the existing noxious weed infestations, but will also decrease native shrubs and forbs, and potentially increase native and non-native grasses. These effects will be primarily associated with roadside corridors.

Actions on Private Lands – Continued development of private lands within the analysis areas is expected. Activities may include commercial timber harvest, pre-commercial thinning, fuel treatment, land clearing, road construction, home construction, agriculture, and livestock grazing. Some of these activities have the potential to increase edge, increase fragmentation, increase infestation of invasive plants, and decrease diversity of native plants.

Table 3-19
Cumulative Potential Vegetation Treatment Summary

Treatment	Alt 1 No Action	Alt 2	Alt 4, 5, 7	Alt 6	Ongoing On NF	Plum Creek	Max Cumulative (Cum and PA)
Regeneration Harvest	0	1,169	514	712	0	517	1,686
Improvement Harvest	0	1,323	850	1,186	0	501	1,824
Fuel Treatment through Prescribed Fire	0	3,191	2,830	2,830	993	0	4184
Total Acres w/ Prescribed fire	0	4,794	3,302	3,816	993	0	5,787
Total Treatment Acres	0	5,683	4,194	4,728	993	1,018	7,694

- Cumulative prescribed fire includes treatments analyzed under the Forestwide Fuels EA
- Cumulative harvest on private lands is based on harvest information that PCTC provided for 2006 and beyond.

Activities and Features Common to All Action Alternatives

Timber Harvest Activities: Timber Harvest Activities: See Table 2-1, 2-7, and 2-15 in Chapter 2 of the EIS and the vegetation project file for harvest method by unit by alternative. Placement of harvest and stand improvement treatment locations were designed with careful consideration to stand treatment need, stand resilience to potential climate change, connectivity, fragmentation, and other resource needs. Refer to the Fisher Landscape Assessment 2003, located in the project file, for recommendations on connectivity, fragmentation and patch size. On the dry land, harvest and improvement treatments focus on restoring historic open connectivity, restoring resilient stands of intolerant species, and buffering old growth, replacement old growth and important riparian habitat with fuel treatments. On the moist forest types, harvest treatment locations were chosen by blocking areas close to past harvests where feasible, restoring resilient stands of intolerant species, buffering old growth, replacement old growth, and riparian areas with fuel treatments where feasible within other resource needs. Through these considerations all alternatives meet the objectives of restoring historic and resilient species and forest structures, increasing average patch size, maintaining forest connectivity, reducing fragmentation, and buffering important habitat with fuel treatments to some degree. "Management is critical for a positive response of forest growth to a warmer climate, and selection of the best species for the new conditions will be of vital importance' (Henrik 2001).

Stand Improvement (Intermediate Harvest): The improvement treatments are located in stands of moderately dry Douglas-fir types within VRU 2 that have higher than historic stocking or fuels, and within moist VRU's to reduce density in stands that have desirable forest composition but are currently overstocked. The moderately dry Douglas-fir types will be opened up to a basal area of 50-70 square feet, and the moist VRU sites will be opened up to a basal area of 70-90 square feet. An improvement treatment would remove the majority of the tolerant trees, the smaller Douglas-fir and western larch; any insect or disease infested trees. Co-dominant ponderosa pine, larch and Douglas-fir overstory would be

retained. Following treatment, there may be pockets of openings, but these would not exceed 15-20% of the stand. Some commercial harvest treatments in the drier VRU's may be followed by slashing and underburning.

Basal Area Reduction (Improvement Harvest) with Seed Tree Openings: This treatment will occur in moderately dry to moist stands that have higher than historic stocking and or fuels. These sites will be opened up to an average basal area of 35-40 square feet on the dry sites and 40-60 basal area on the moist sites. The treatment would remove the tolerant and mid tolerant species, and insect and disease infested trees, the smaller intermediate intolerant trees, and leave the majority of the co-dominant ponderosa pine and western larch. Up to 40% of the unit may be in seed tree openings (10-20 basal area) within these units. Seed tree openings will occur in areas with stagnant Douglas-fir, grand fir, hemlock, cedar, or lodgepole pine that lack acceptable leave trees and areas with heavy insect or disease infestations. These openings would be planted with ponderosa pine, western larch or western white pine seedlings. The objective is to improve stand conditions and increase resilience by reducing stocking, decrease within stand stress, decrease ladder fuels, decrease insect and disease, and increase the component of ponderosa pine and western larch through improvement and regeneration.

Basal Area Reduction (Improvement Harvest) with Shelterwood Openings: Basal area reduction with shelterwood openings will occur in moderately dry to moist stands that have higher than historic stocking and or fuels. These sites will be opened up to an average basal area of 40-50 square feet on the dry sites and 50-70 basal area on the moist sites. The treatment would remove the tolerant and mid tolerant species, and insect and disease infested trees, the smaller intermediate intolerant trees, and leave the majority of the co-dominant ponderosa pine and western larch. Up to 40% of the unit may be in shelterwood openings (25-40 basal area) within these units. Shelterwood openings will occur in areas with stagnant Douglas-fir, grand fir or lodgepole pine that lack acceptable leave trees and areas with heavy insect or disease infestations. These openings would be planted with ponderosa pine, western larch or western white pine seedlings. The objective is to improve stand conditions and increase resilience by reducing stocking, decreasing within stand stress, decreasing ladder fuels, decreasing insect and disease, and increasing the component of ponderosa pine and western larch through improvement and regeneration.

Shelterwood Harvest with Reserves: The purpose of the treatment is to reduce natural fuels (including heavy down lodgepole pine), initiate early seral conditions, restore ponderosa pine, western larch, western white pine and aspen, and improve stand and landscape condition consistent with historic processes. In addition some of these treatments will restore historic patch size to the degree possible within the 40 acre limitation, reduce fragmentation, buffer important late seral and riparian habitat with fuel treatment. Approximately 20-40 feet of basal area of western larch, Douglas-fir and ponderosa pine would be retained for seed, structure, shade, genetic seed reservoirs, relic overstory, and future snag replacements. The shelterwood treatment would create a regeneration opening. Planting of western white pine, ponderosa pine and or western larch is planned to restore these species, increase stand resilience to potential climate change, and assure regeneration on these sites.

Seed Tree with Reserves: The purpose of the treatment is to reduce natural fuels (including heavy down lodgepole pine), initiate early seral conditions, restore ponderosa pine, western larch, western white pine and aspen, and improve stand and landscape condition consistent with historic processes. In addition some of these treatments will restore historic patch size to the degree possible within the 40 acre limitation, reduce fragmentation, and buffer important late seral and riparian habitat with fuel treatment. Approximately 10-25 feet of basal area (a minimum of 10 trees per acre) of western larch, Douglas-fir and ponderosa pine would be retained for seed, structure, shade, genetic reservoirs, relic overstory, and future snag replacements. Planting of western white pine, ponderosa pine and or western

larch is planned to restore these species, increase stand resilience to potential climate change and assure regeneration on these sites.

Clearcut with Reserves: The purpose of the treatment is to reduce natural fuels (including heavy down lodgepole pine), initiate early seral conditions, restore ponderosa pine, western larch, western white pine and aspen, and improve stand and landscape condition consistent with historic processes. In addition some of these treatments will restore historic patch size to the degree possible within the 40 acre limitation, reduce fragmentation, and buffer important late seral and riparian habitat with fuel treatment. While they would not be retained to re-seed the stand, approximately 10-15 feet of basal area (10 trees per acre) of western larch, Douglas-fir and ponderosa pine would be retained for structure, shade, genetic reservoirs, relic overstory, and future snag replacements. Planting of western white pine, ponderosa pine and or western larch is planned to restore these species, increase stand resilience to potential climate change and assure regeneration on these sites.

Activity Fuel Reduction and Site Preparation: See Table 2-2, 2-6, 2-8, 2-13, and 2-19 in Chapter 2 of the EIS and the project file for specific fuel treatment by unit by alternative. The primary method of activity fuel reduction and site preparation would occur through yarding tops during harvest, and/or slashing of small diameter (un-merchantable trees) and underburning 1-2 years following harvest. Periodic underburning would be planned every 10-30 years on the dry sites to restore historic fire regimes and maintain fuel loading at desired levels. See fire and fuels report for estimated mortality of overwood by size class and species. If yarding tops does not remove the activity fuel on units with gentle topography that are not scheduled to underburn, activity fuel reduction would be accomplished through machine (excavator) piling and burning of those piles.

Natural Fuel Reduction through Slashing and Underburning: proposed treatments would reduce the amount of stagnant tolerant understory species, recycling nutrients, and stimulating browse for wildlife forage. The primary method of natural fuel reduction would be through slashing of small diameter, un-merchantable trees, and underburning after allowing the slash to cure from 1-2 years. Periodic underburning every 10-30 years on the dry sites would restore and maintain historic fire regimes, maintain historic intolerant species, and maintain fuel loading at desired levels. This treatment will improve stand conditions and increase resilience to potential climate change by reducing stocking, decreasing within stand stress, decreasing ladder fuels, and increasing species composition of intolerant ponderosa pine and western larch. See fire and fuels report for estimated mortality of overwood by size class and species.

Temporary Road construction: Temporary road construction will dissect previously unroaded patches and potentially increase the amount of edge habitat and fragmentation. This should be mitigated in the long term once the temporary roads are restored and native vegetation is re-established. It will also effect vegetation as described in the Weed and Sensitive Plant Reports.

Road Access Changes: The activities associated with the proposed road access changes described in Chapter 2 of the EA would have little or no effect to vegetation except as described in the Weed and Sensitive Plant Reports.

Road Storage and Decommissioning: The activities associated with the proposed storage and decommissioning listed in Chapter 2 of the EA have the potential to reduce linear fragmentation in the long term. These activities will reduce access for vegetation management, salvage and fire suppression activities.

Best Management Practices: The Kootenai National Forest Plan states that "Soil and water conservation practices as outlined in the Soil and Water Conservation Practices Handbook (FSH 2509.22, May 1988) would be incorporated into all land use and project plans as a principal mechanism

for controlling non-point pollution sources; meeting soil and water quality goals; and to protect resource values. Implementation of BMP's will not impact forest vegetation directly. These practices would benefit vegetation indirectly through protection of soil productivity and water resources.

Reserve Trees and Snags: All harvest prescriptions will emphasize retention and development of trees to function as genetic seed reservoirs, relic overstory and future snag replacements. The number and distribution of these trees will vary with existing stand conditions, safety considerations and site specific resource objectives, but all harvest units will maintain a minimum of 10 reserve trees per acre. Where quality snags are not present, or safety requirements mandate not leaving snags, the 10 reserve trees per acre will serve as long term replacement snags. Western Larch reserve trees with mistletoe infestation will be girdled to reduce the risk of infestation to the existing or planned stand. Reserve trees will also eventually contribute to coarse woody debris for future soil organic matter.

Damage to Residual Trees: Residual trees within harvest units are susceptible to damage from normal logging operations. This damage is dependent on the number and distribution of leave trees, topography, species and logging system. The amount of damage to reserve trees will be minimized by favoring intolerant species that are more resistant to diseases after basal scarring, utilizing designated skid trails, and utilizing a skyline system on cable ground.

Windthrow: Some leave trees are expected to die or blow down and provide additional snag and down woody debris habitat. Management activities may increase the risk within treatment areas and adjacent to them by opening up the canopy and increasing the wind to individual tree crowns.

Course Woody Debris (CWD): All harvest units would retain 8-30 tons per acre of downed woody material (or recruitment) greater than 4" in diameter to provide nutrient recycling and habitat for mammals and invertebrates. The volume and distribution of material will be subject to specific site conditions and VRU objectives and will be specified in the silvicultural prescription and incorporated into the timber sale contract. The general tons retained by VRU are described below:

- VRU 2 – retain 8-15 tons per acre of CWD on site after harvest and/or fuels treatment.
- VRU 3, 7 and 9 - retain 15-20 tons per acre of CWD on site after harvest and/or fuels treatment.
- VRU 5 - retain 15-30 tons per acre of CWD on site after harvest and/or fuels treatment.

Regeneration within Five Years: All regeneration harvest will be designed to assure the units can be satisfactorily restocked within five years after final harvest. Adequate stocking will be defined in the silvicultural prescription, and is based on VRU and Management Area Objectives.

Cumulative Effects: Cumulative effects from past activities and recurring management activities on private lands and past actions, and pre-approved activities on National Forest, such as the Forest Wide Fuels projects, Forest Herbicide EA for noxious weed treatments, mining activity, road maintenance and fire suppression are previously described in the no action effects. Refer to Current and Foreseeable Actions on pages 3-1 through 3-11 of the EIS and Cumulative Effects described for the no action alternative on page 38 of this report. In general, conditions improve on NFS lands as a result of our activities while private lands continue to be logged, or have had logging completed within the last 10 to 20 years. Some of these private lands have become residential rather than industrial private forest. Other activities such as mining do not contribute effects to forest vegetation. All activities proposed for the alternative under consideration have been included in the cumulative effects analyses below.

Contrasting Effects of Proposed Actions with Past Actions: The project objectives for the Miller West Fisher include maintaining ecosystem function and forest vigor and long-term productivity, reducing hazardous fuels and restoring natural fire regimes by improving species composition and

structural diversity, reducing natural fuels and restoring fire, and increasing forest resilience in a variety of biophysical or forest settings that are similar developmental and responses capabilities (VRU's).

The majority of the analysis area experienced stand replacing fire in 1910 fire. Most of the regenerated stands did not have volume and stand conditions that were conductive to or dictated regeneration harvest until the mountain pine infestation in the 1980's. Because of those conditions, there was minimal regeneration harvest prior to the 1980's. The majority of the regeneration harvest in the 1980's and 1990's were designed to salvage mountain pine beetle infested lodgepole pine stands and to regenerate mixed species western larch, ponderosa pine, western white pine and Douglas-fir stands. While these harvest units restored desired species such as ponderosa pine, western larch and western white pine, few reserve trees and snags were retained for structural diversity, genetic seed reservoirs, and replacement snags; and most machine scarification units had high disturbance and low retention of down woody debris. In addition, because of the 40 acre regeneration opening limitation and big game forage opening size recommendations, the average unit size during that period was 16 acres.

In contrast to the past regeneration treatments, the regeneration treatments proposed in the Miller West Fisher project also emphasizes restoration of ponderosa pine, western larch, western white pine and aspen through retention of these species in the overstory, and through natural regeneration and planting. In addition, a minimum of 10 reserve trees and or snags per acre would be retained to function as genetic seed reservoirs, relic overstory, current and future snags, and long-term coarse woody debris for future soil organic matter. All prescribed site preparation would adhere to "Best Management Practices to retain soil productivity, and scarification or mineral soil exposure would be to the minimum level required to meet regeneration objectives. In addition the harvest units are designed to restore the historic patch size to the degree possible within the 40 acre limitation, to reduce fragmentation, and to buffer important late seral and riparian habitat with fuel treatments.

Prior to the 1980's the majority of the intermediate treatments within this project area were liberation harvest that removed the larger more intolerant species such as ponderosa pine and western larch, and released the developing understory of primarily mid-tolerant Douglas-fir. These stands are trending towards climax conditions at potentially a more accelerated rate than the untreated stands. Species composition and structure are trending to a higher than historic component of smaller mid-tolerant to tolerant trees with increased ladder fuels.

Starting in the 1980's the majority of the intermediate treatments were commercial thinning that retained the best quality of the intolerant western larch, ponderosa pine and Douglas-fir, but may have removed some or all the relic trees.

As compared with the past intermediate treatments, the proposed intermediate harvest in Miller West Fisher are designed to maintain and improve the health, resilience, and sustainability of forest stands and the landscape by retention of the best quality dominant and co-dominant, intolerant fire adapted species such as ponderosa pine and western larch (with some Douglas-fir), to retain the majority of the intolerant relic trees that survived the 1910 burn, and to retain desired amounts of coarse woody debris. In addition clumps or individual western white pine or cedar may be retained for diversity or wildlife islands.

Silvicultural treatments in the Miller West Fisher are expected to improve forest conditions and to increase the stand or forest resilience. Areas or stands would be managed to restore intolerant species, to reduce stand density, improve tree growth and vigor, and to promote more open stand structure that is more resilient to managed and natural fire, insect and disease and potential climate change. In addition, impacts to soil productivity will be minimized through the adherence to "Best Management Practices",

and disturbance from fuel treatments and site preparation will be to the minimum level required to meet objectives.

ACTION ALTERNATIVES

Direct and Indirect Effects

Refer to Chapter 2 for a description of the alternatives, and the project file for a comprehensive summary table of each alternative.

ECOLOGICAL INTEGRITY: Forest Vigor and Long-term Productivity, Restoration of Natural Fire Regimes

Ecological integrity can be described by comparing forest composition, density, structure, patterns, and function, to historic disturbance regimes and conditions, and analyzing landscape resilience to climate change and disturbances. If ecological systems within a forested environment are operating within a range of historic variability, it is assumed to be a healthy, sustainable system (USDA Forest Service, Region 1, Sustaining Ecological Systems, 1991; Lindermayer 2000). Analyzing resilience to climate change can be done using current VRU objectives, since these are compatible with stand qualities necessary to survive expected future disturbances. Additional emphasis is placed on increasing protection of refugia and providing connectivity (Noss 2001). The effects to ecological integrity will be summarized by VRU group as described in the affected environment.

Warm and Dry VRU Group 1 and 2S (12% of the project area)

Because fire return intervals have lengthened due to fire suppression efforts over the past 80 years, particularly in this fire regime I (0-35 year low to mixed severity fires), the majority of these VRUs are not operating within the range of historic conditions, and are at risk for loosing key ecological elements. Ecosystem sustainability can be promoted by actions that decrease tree density and the Douglas-fir component, decrease natural and ladder fuels, and that disturb the existing ground vegetation, allowing a more diverse occupancy of the site by seral grasses, forbs, shrubs, deciduous trees, and conifer species. Current conditions are inconsistent with historic conditions, and will not be resilient to potential warmer and drier climates.

All the action alternatives would improve ecological integrity, resilience, and forest health on the Warm and Dry, VRU 1 and 2S Group. Improvement would be accomplished by reducing tree density, changing the seral stages, reducing natural fuels, reducing ladder fuels, and restoring ponderosa pine, aspen clones, and early seral grasses, shrubs and forbs, through harvest, slashing, prescribed fire and planting. In addition, composition and stocking, seral stages, and fuel reduction will be improved through prescribed fire outside the harvest units. The amount of improvement can be measured by determining the acres of reduced stand density, acres of fuel reduction, and the change in seral stages, through harvest and or prescribed fire; and the acres of ponderosa pine and western larch restoration. Quantifying aspen clone rejuvenation would be difficult, but harvest, prescribed burning, and mechanical scarification are known to restore aspen. Numerous techniques including burning, cutting, spraying, chaining, and ripping exist for use in restoring aspen (Bartos 2001, pg 12). The IDT developed target stands that reflected historic conditions for the VRU's across the Fisher Landscape, and these were refined by VRU groups for this analysis. More natural conditions are restored and resilience is increased when the treatment is moving the stand towards the VRU Group target conditions, and reducing the departure from historic conditions as measured by the indicators identified above and the fire regime condition class analysis.

Increasing resilience based on natural conditions should also increase resilience and resistance to potential climate change to warmer and drier or warmer and moister with higher frost free days, by favoring intolerant species that are more resilient to drought, reducing vegetative density on a given site, and reducing the probability of a drainage-wide stand replacement in the event of a high severity fire.

Restoration of historic landscape patterns is more difficult to measure. The historic landscape condition was a diverse mix of open park-like stands intermixed with larger openings and dense patches. Restoration of density and species composition across the landscape will restore some of the natural patterns. Due to past harvest design on private ownership, small past harvest unit size, and the old growth designations within this VRU group, it is not feasible to completely correct existing vegetative patterns with this entry. However, the treatment proposed in the action alternatives will move the landscape toward the historic matrix of natural openings, and open stands intermixed with dense patches, and will increase landscape heterogeneity.

Landscape function refers to the flow of mineral nutrients, water, energy, or species across the landscape, and how the compositional and structural elements of a landscape interact and operate. Landscape function is difficult to quantify and it is hypothesized where community composition and structure, and historic disturbance processes such as fire, occur within a historic range of conditions, the function of the landscape community will also be maintained within its historic range. All alternatives were designed within historic composition, structure, function, and patterns of vegetation, however, Alternative 2 most adequately addresses function due the larger amount of acres treated.

Alternative 2 was designed to buffer important old growth and replacement old growth (late-seral stands), and important riparian habitat, with fuel reduction treatments positioned in an attempt to improve the probability of successful fire suppression actions, or to modify potential fire behavior such that these habitats would be retained in the event a mixed severity to high severity fire event occurred in this drainage. Alternative 2 most effectively buffers these habitats. Alternative 4, 5 and 6 are similar.

Moving stands toward the desired conditions in our Vegetation Response Units will begin to restore historic density, structure, composition, and function, and increase stand and landscape resilience. Refer to Table 3-20 for a summary of issue indicators for Ecological Integrity in the Warm Dry VRU group.

Table 3-20
Treatments Trending Toward VRU 1 and 2S Historic Conditions

Treatment	Alt1 – No Action	Alt 2	Alt 4 and 5	Alt 6	Planned and Foreseeable Actions	Maximum Cumulative within/PSU
Natural Fuel and Density Reduction Acres	0	1,151	1,251	1,642	1,078	2,229
Acres of Density and Natural Fuel Reduction w/o Commercial Harvest	0	455	984	984	770	1,225
Acres of Density and Natural Fuel Reduction with Commercial Harvest	0	696	267	658	308	1,004
Acres of Ponderosa Pine Restoration through Planting	0	79	21	66	0	79
Acres of Western Larch Restoration through Planting	0	60	21	41	0	60
Acres treated to move toward VRU desired conditions, increase within stand resilience to potential climate change	0	1,151	1,251	1,642	847	1,998
Number of Treatment Units that Buffer w/in 600' Important Late-Seral Stands, or Riparian Habitat	0	25	8	19	13	38
	Existing					
Fire Regime Condition Class for Dry VRU Strata	2	2	2	2	2	2
% Veg-Fuel Departure	43	31	34	30	37	31
% Fire Frequency Departure	68	58	58	55	64	58
% Fire Severity Departure	65	58	58	56	62	58

Treatment	Alt1 – No Action	Alt 2	Alt 4 and 5	Alt 6	Planned and Foreseeable Actions	Maximum Cumulative within/PSU
% Departure Strata Average	66	58	58	55	63	58
Fire Regime Condition Class Strata Change %	0	8	8	11	3	8

Units within this VRU Group Include: 18, 21, 28, 33, 36, 37, 43, 45, 46, 47, 48, 49, 53, 56, 57, 101, 102, 105, 107, 109, 110, 112, 113, 115, 208, B9, B10, B14, B21, B22, and B23.

FRCC Analysis includes Planned and Foreseeable Actions

Discussion: Alternative 6 most effectively addresses ecosystem restoration in the VRU because it addresses vegetation departure, and fire frequency and severity departure to the highest degree; treats the most acres with density and fuel reduction; restores the highest amount of ponderosa pine through improvement harvest; increases resilience on the highest amount of acres, and buffers the highest amount of important late-seral and riparian habitat. Alternative 4 and 5 are the second most effective alternatives for ecological restoration, followed by Alternative 2. Alternative 1, the no action does not address the ecological restoration objectives for vegetation or fuels, or the ecological integrity for resilience to potential climate change.

Although the VRU Fire Regime Condition Class is still a Class 2, moderate departure for all alternatives, it trends toward a Condition Class 1 (no departure) with the treatment alternatives. Due to the amount of private ownership within this VRU Group in the project area, unless private industry adopts the same objectives for stand treatments and utilizes prescribed fire on these dryland types, there is a low probability of moving the landscape to a low departure. Continuing the trend to move the landscape to a lower departure may be feasible in the future with additional treatments on NFS lands in this type.

Moderately Warm and Moderately Dry-VRU Group 2N and 3 (lower elevation north aspects) (8% of the analysis area)

The action alternatives would improve ecological integrity, resilience, and forest health in the VRU 2N and 3 Group, by reducing tree density, reducing natural fuels, reducing ladder fuels, restoring ponderosa pine, restoring western larch, and western white pine and aspen clones where appropriate, restoring historic patch size and restoring early seral stages of conifers and early seral grasses, shrubs and forbs, through harvest, prescribed fire and planting. These treatments are also designed to increase stand and landscape resilience to potential climate change. The amount of improvement can be measured by determining the acres of reduced stand density, fuel reduction, and change in seral stages, through harvest and prescribed fire; the acres of ponderosa pine, western larch and western white pine, and the number of patches consistent with historic patch size. More natural conditions are restored where proposed treatment is moving the stand toward the VRU Group target conditions, and reducing the departure from historic conditions as measured by the indicators identified above and the Fire Regime Condition Class Analysis.

Increasing resilience based on natural conditions should also increase resilience and resistance to potential climate change.

Restoration of historic spatial, landscape patterns is more difficult to measure. Restoration of density and species composition across the landscape will restore some of the natural patterns. For the same reasons described above, it is not feasible to completely correct existing vegetative patterns with this entry. However, the treatments proposed in the action alternatives address connectivity and

fragmentation to the extent possible within other resource needs, and will move the landscape toward the historic matrix of seral stages.

Landscape function: All alternatives were designed to restore historic composition, structure, function, and patterns of vegetation, however, Alternative 2 most adequately addressed function due the highest treatment acres in this VRU group.

Moving stands toward the desired conditions in this VRU group will begin to restore historic density, composition, and function, and address the potential climate change. Refer to Table 3-21 for a summary of issue indicators for Ecological Integrity in the moderately warm and dry VRU's.

Table 3-21
Treatments Trending Toward VRU 2N and VRU 3 Historic Conditions

Treatment	Alt1 – No Action	Alt 2	Alt 4 and 5	Alt 6	Planned and Foreseeable Actions	Maximum Cumulative w/PA
Total Natural Fuel and Density Reduction Acres	354	791	393	454	537	1,308
Acres of Density and Natural Fuel Reduction w/o Commercial Harvest	143	232	232	232	143	375
Acres of Density and Natural Fuel Reduction with Commercial Harvest	211	539	161	222	394	933
Acres of Ponderosa Pine Restoration through Planting	0	208	21	82	0	208
Acres of Western Larch Restoration through Planting	0	213	21	61	0	213
Acres of Western White Pine Restoration through Planting	0	84	0	0	0	84
Acres treated to move toward VRU desired conditions, increase within stand resilience to potential climate change	0	771	393	454	295	1,066
Number of Treatment Units that Buffer Important Late-Seral Stands, or Riparian Habitat	0	27	8	10	6	33
Fire Regime Condition Class for Moderately Dry VRU Strata	3	2	3	3	3	2
% Veg-Fuel Departure	46	31	37	36	40	31
% Fire Frequency Departure	68	58	63	63	65	58
% Fire Severity Departure	87	58	85	85	86	58
% Departure Strata Average	77	58	74	74	75	58
Fire Regime Condition Class Strata Change %	0	19	3	3	2	19

**Units within this VRU Group include: 8b, 13, 15, 29, 30, 31, 34, 38, 44, 50, 54, 55, 58, 108, 111, 116, 123, 103, 104, 106, 201, 202, 210a, 210b, 214, 215, B14, and the following precommercial thinning units: T11, T12, T13, T14, T15, T16, T17, T18

FRCC Analysis includes Planned and Foreseeable Actions

Discussion: In this VRU group, Alternative 2 most effectively addresses ecosystem restoration, and resilience because it addresses vegetation departure and fire frequency and severity departure; it treats the natural fuels, restores ponderosa pine and western larch, and buffers important late-seral stands and riparian habitat to the highest degree. Alternative 6 is the second most effective, followed by Alternative 4 and 5 which treat the least acres in this VRU.

While the Fire Regime Condition class would be improved only to a Class 2, with moderate departure, it currently is a Condition Class 3. Proposed activity would trend this VRU group toward a condition Class 1, with the treatments proposed in Alternative 2.

VRU 4 and 5 – Moderately Warm to Moderately Cool and Moist: (43% of the analysis area)

The action alternatives would improve ecological integrity, resilience, and forest health on this VRU group, by reducing tree density, natural fuels, stand continuity; increasing age and structural diversity, increasing heterogeneity, restoring early seral species or conditions, restoring ponderosa pine, western

larch, western white pine, and aspen, buffering key habitats, and to a minor degree, reducing fragmentation from past management activities. These treatments should increase resilience to potential climate change by favoring intolerant species that are more resilient to drought, reducing stand density, and reducing the probability of drainage wide stand replacement in the event of a high severity fire. The amount of improvement can be measured by determining the acres of reduced stand density, fuel reduction, and change in seral stages, through harvest and prescribed fire; and the acres of ponderosa pine, western larch, and western white pine planted. Because of the 40 acre regeneration harvest limitation, no patches are proposed on National Forest that would be consistent with the 100-300 acre mixed historic patch size. Because target stands for each VRU were developed to mimic historic conditions, it is assumed that natural conditions are restored where treatment is moving the stand toward the VRU target conditions, and reducing the departure from historic conditions as measured by the indicators identified above and the Fire Regime Condition Class Analysis.

Complete restoration of historic landscape patterns may not be feasible due to existing vegetative patterns, past harvest design, old growth designations, 40 acre NFMA opening size limitation, and other resource and social needs. However, the treatments proposed in the action alternatives address connectivity and fragmentation to the extent possible within these other resource and social needs, and will move the landscape toward the historic matrix of seral stages.

Landscape function: All alternatives were designed to improve historic composition, structure, function, and patterns of vegetation.

Moving stands toward the desired conditions will begin to restore historic density, composition, and function. Refer to Table 3-22 for a summary of issue indicators for Ecological Integrity in the Moderately Warm and Moderately Cool and Moist VRU's.

Table 3-22
Treatments Trending Toward VRU 4 and 5 Historic Conditions

Treatment	Alt1 – No Action	Alt 2	Alt 4 and 5	Alt 6	Planned and Foreseeable Actions	Maximum Cumulative
Total Natural Fuel and Density Reduction Acres	0	2,756	1,724	1,743	965	3,721
Acres of Density and Natural Fuel Reduction w/o Commercial Harvest	0	1,530	828	828	373	1,903
Acres of Density and Natural Fuel Reduction with Commercial Harvest	0	1,226	896	915	592	1,818
Acres of Ponderosa Pine Restoration through Planting	0	97	115	115	0	97
Acres of Western Larch Restoration through Planting	0	401	258	258	0	401
Acres of Western White Pine Restoration through Planting	0	623	355	355	0	623
Acres treated to move toward VRU desired conditions, increase within stand resilience to potential climate change	0	2,756	1,724	1,743	583	3,336
Number of Treatment Units that Buffer Important Late-Seral Stands, or Riparian Habitat	0	52	29	29	7	59
	Existing					
Fire Regime Condition Class for VRU 4 and 5 Strata	2	2	2	2	2	2
% Veg-Fuel Departure	30	29	30	30	30	29
% Fire Frequency Departure	37	30	33	32	36	30
% Fire Severity Departure	63	60	61	61	63	60
% Departure Strata Average	50	45	47	46	49	45
Fire Regime Condition Class Strata Change %	0	5	3	4	1	5

**Units within this VRU Group include: 1, 2, 3, 4, 5, 6, 7, 8a, 10, 11, 12, 16, 17, 19, 20, 22, 23, 24, 25, 26, 27, 39, 40, 51, 52, 114a, 114b, 117, 118a, 118b, 119, 120, 121, 122, 124, 125, 127, 128, 129, 130, 131, 132, 133, 202, 203, B1, B2, B5, B6, B7, B13, B15, B16, B17, B20, B24, T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T19, T20

FRCC Analysis includes Planned and Foreseeable Actions

Discussion: In this VRU group, Alternative 2 most effectively addresses ecosystem restoration and resilience because it treats the largest amount of acres (over 1,000 acres more than Alternative 4, 5, and 6), addresses vegetation departure and fire frequency and severity departure; treats the natural fuels, restores ponderosa pine, western larch, and western white pine, and buffers important late-seral stands and riparian habitat. Alternatives 4 and 6 treat a similar amount of acres in this VRU group, and restore less western larch, western white pine, and ponderosa pine, treat less natural fuels, have less movement toward historic patch size, and less buffering of important late-seral or riparian habitat than Alternative 2.

While the resulting Fire Regime Condition Class is still a 2, with moderate departure, it is trending toward a condition Class 1, low departure with the treatments proposed in Alternative 2.

Moderately Warm and Moderately Dry to Cool and Moist to Cool and Moderately Dry Settings – VRU Group 7, and 9 (mid to upper elevation north to northwest aspects, 30% of the analysis area)

Because most of this VRU group is in MA 2, Semi Primitive, non-motorized recreation, an MA that is not suitable for timber management, almost all of the proposed treatments in this VRU are prescribed fire. In addition, most of this VRU is found within inventoried roadless areas, which also restricts managers from road construction and timber harvest. However a little stand replacement treatment is planned using fire. There is little difference in the acres treated between alternatives, but all alternatives would reduce natural fuels and tree density. The amount of improvement can be measured by determining the acres regenerated and moved into the early seral stages, the acres of fuel reduction, acres of western larch or western white pine restored, acres treated with prescribed fire, and the number of patches consistent with historic patch size and distribution. Natural conditions are restored where the planned treatment is moving the stand or landscape toward the VRU Group target conditions, and reducing the departure from historic conditions as measured by the indicators identified above and the Fire Regime Condition Class Analysis.

Restoration of historic spatial, landscape patterns is based on historic fire regimes, historic patch size, historic stand composition, and topography. The historic landscape condition was sustained through lethal fire events every 70-100+ years with occasional mixed severity fire when weather conditions were not severe enough to move the fire to a wind and topographic driven lethal fire. Due to the steep topographic conditions, and the prevailing southwest winds, lethal fires trended towards larger patch size in the upper elevations of the analysis area. Patch sizes up to 10,000 acres are likely in this area. Within this large stand replacement patch size, stringers and islands of mixed severity fire would occur. Due to the management area allocation, and the risk of prescribed stand replacing summer fire, and the prevailing southwest wind, it is not feasible to restore vegetative patterns with this entry. However, the treatments proposed in the action alternative's addressed natural fuel and density reduction in the acres proposed for prescribed fire, which should increase residual tree survival and heterogeneity in the event of another large scale high severity fire, which in the long term will move the landscape toward the historic matrix of patch size and seral stages.

Landscape function: all alternatives were designed to improve historic composition, structure, and patterns, within other resource needs, and management area allocation.

All action alternatives were designed to buffer important riparian and old growth habitat with fuel reduction treatments in an attempt to protect these stands from fire.

Moving stands towards the desired conditions will begin to restore historic density, structure, composition, and function, but because of the large amount of acreage in this VRU group and the management limitations, the amount of treatment does not effectively address resistance and resilience to potential climate change. Based on Rehfeldt's predictions of upward and northward shift of species and the associated severe reductions of subalpine fir and Engelmann spruce; sustaining those species will not increase resistance and resilience to potential climate change (Rehfeldt 2006).

Refer to Table 3-23 for a summary of issue indicators for Ecological Integrity this VRU group.

Table 3-23
Treatments Trending Toward VRU 7 and 9 Historic Conditions

Treatment	Alt1 – No Action	Alt 2	Alt 4 and 5	Alt 6	Planned and Foreseeable Actions	Cumulative
Total Natural Fuel and Density Reduction Acres	0	1,356	1,177	1,177	179	1,535
Acres of Density and Natural Fuel Reduction w/o Commercial Harvest	0	1,325	1,137	1,137	96	1,421
Acres of Density and Natural Fuel Reduction with Commercial Harvest	0	31	40	40	83	114
Acres of Ponderosa Pine Restoration through Planting	0	31	40	40	0	31
Acres of Western Larch Restoration through Planting	0	31	40	40	0	31
Acres treated to move toward VRU desired conditions, increase within stand resilience to potential climate change	0	1,356	1,177	1,177	127	1,483
Number of Treatment Units that Buffer Important Late-Seral Stands, or Riparian Habitat	0	18	10	10	0	18
	Existing					
Fire Regime Condition Class for VRU 7 and 9 Strata	2	2	2	2	2	2
% Veg-Fuel Departure	49	48	48	48	49	48
% Fire Frequency Departure	14	19	18	18	15	19
% Fire Severity Departure	16	15	15	15	16	15
% Departure Strata Average	49	48	48	48	49	48
Fire Regime Condition Class Strata Change %	0	1	1	1	0	1

**Units within this VRU Group include: Unit 31 and B3, B4, B8, B11, B12, B13, B15, B17, B18, B19, B20, B24

FRCC Analysis includes Planned and Foreseeable Actions

Discussion: Because all of the alternatives were designed to address ecosystem restoration needs, the differences in ecological restoration between the alternatives are proportionate to the acres treated. There has been very little past management activities within this VRU Group because of the management area allocation, so the existing condition is homogonous closed canopy timber stands with little diversity in seral stages, and no early seral stands in this VRU group. There is only one harvest treatment block in this VRU in each alternative, and that is the only treatment that would create an early seral stand.

All alternatives address vegetation/fuel departure, fire frequency and fire severity departure to some degree but it would take 8,000 to 10,000 acres of treatment to move the VRU to a Fire Regime Condition Class 1. The post treatment Fire Regime Condition Class would be a Condition Class 2 with moderate departure, but the treatments would slow the trend toward a Condition Class 3, high departure.

Cool and Moderately Dry or Moist to Cold and Moderately Dry – VRU Group 10, and upper Elevation 7 and 9 (7% of the project area)

Because most of this VRU group is in MA 2, Semi Primitive, non-motorized recreation, and Wilderness, there are no proposed treatments in this VRU group. Ecosystem sustainability can be promoted by

actions such as prescribed natural fire, breeding for and planting rust resistant whitebark pine, and converting subalpine fir and Engelmann spruce stands to more intolerant species such as western larch and whitebark pine. These actions are not within the scope of this project.

The effects of not managing within this VRU group while continuing fire suppression is that these areas will be less resilient to predicted climate change. Even with prescribed fire the climate change predictions are for an upward and northward shift in the primary species within these zones (subalpine fir, Engelmann spruce, and whitebark pine) thus a dramatic decline in the amount of this VRU group by 2090 (Rehfeldt 2006).

Landscape Assessment including all VRU's

Moving stands towards the desired conditions across all VRU's will begin to restore historic stand density structure, composition, and function. Refer to Table 3-24 for a summary of issue indicators for Ecological Integrity for all VRU's within the project area.

Table 3-24
Treatments Trending Toward all VRU Historic Conditions

Treatment	Alt1 – No Action	Alt 2	Alt 4 and 5	Alt 6	Planned and Foreseeable Actions	Cumulative w/PA
Total Natural Fuel and Density Reduction Acres	0	6,034	4,545	5,016	2,759	8,793
Acres of Density and Natural Fuel Reduction w/o Commercial Harvest	0	3,542	3,181	8,181	1,382	4,924
Acres of Density and Natural Fuel Reduction with Commercial Harvest	0	2,492	1,364	1,835	1,377	3,869
Acres of Ponderosa Pine Restoration through Planting	0	384	197	303	0	384
Acres of Western Larch Restoration through Planting	0	705	340	400	0	705
Acres of Western White Pine Restoration through Planting	0	707	355	355	0	707
Acres treated to move toward VRU desired conditions, increase within stand resilience to potential climate change	0	6,034	4,545	5,016	1,852	7,783
Number of Treatment Units that Buffer Important Late-Seral Stands, or Riparian Habitat	0	122	55	68	26	148
Fire Regime Condition Class for the Landscape	2	2	2	2	2	2
% Veg-Fuel Departure	35	33	34	33	35	33
% Fire Frequency /Severity Departure	40	37	37	36	40	37
Fire Regime Condition Class Strata	40	37	37	36	40	37
Fire Regime Condition Class Strata Change %	0	3	3	4	0	3

Discussion: Because all of the alternatives were designed to address ecosystem restoration needs, the differences in ecological restoration between the alternatives are generally proportionate to the acres treated. Past timber management activities were constrained by ownership patterns and many have a distinct linear edge between harvest and un-harvested areas, and do not mimic the pattern of natural fire on this landscape. While the alternatives are similar at a landscape level, Alternative 6 most effectively addresses restoration objectives to arrange vegetation restoration and fuel treatments to modify potential fire behavior, and buffer important riparian habitat. Alternative 6 treats more acres in the dryland types, which currently have the highest departure. Alternative 2 and 4 are similar.

All alternatives address vegetation/fuel departure, fire frequency and fire severity departure. While the Fire Regime Condition Class remains Class 2 with moderate departure, the treatments reverse the current trend of increasing departure.

The treatments proposed in the action alternatives address natural fuel and stand density reduction in the acres proposed for harvest and prescribed fire. This should increase residual tree survival and heterogeneity in the event of another large scale high severity fire, which in the long term, will move the landscape toward the historic matrix of patch size and seral stages. Alternative 2 most effectively addresses natural fuel reduction and density reduction due to the largest amount of treatment acres followed by Alternative 6, then Alternatives 4 and 5.

Landscape function: all alternatives were designed to address historic composition, structure, and patterns, within other resource needs, and Forest Plan direction. All alternatives address the potential for climate change and increase resistance and resiliency to the degree of planned treatments. Alternative 2 most effectively addresses landscape function due to the highest amount of treatment acres, and the largest amount of intolerant species restored. Alternative 6 is the next most effective then Alternative 4 and 5.

All action alternatives were designed to buffer important riparian and old growth habitat with fuel reduction treatments in an attempt to improve the probability of surviving a wildfire. Alternative 2 buffers the largest amount of these important habitats, followed by Alternative 6, then Alternative 4 and 5.

All planned and reasonably foreseeable actions combined with the alternative harvest and prescribed fire would treat up to 12% of the analysis area.

DIRECT AND INDIRECT EFFECTS OF HARVEST

Effects of Stand Improvement (Intermediate Harvest or Basal Area Reduction)

Basal area reduction is proposed for stands within VRU- 2, 3 and 5 that have higher than historic stocking levels, and natural fuels. These sites will be opened up to an average basal area of 50-60 on the dryer sites, and 70-90 basal area on the moist sites. Ponderosa pine and western larch will be strongly favored for leave where they exist. There may be pockets of open areas but they will generally not exceed 15% of the unit. During implementation units or portions of units may be dropped where basal area reduction is not viable due to harvest economics or lack of adequate leave trees. These residual basal area objectives are consistent with historic stand densities and species composition resulting from mixed severity fire.

This intermediate treatment will not replace the existing stand and will improve the existing species composition and forest health by removing less desirable Douglas-fir, lodgepole pine, grand fir, hemlock, cedar and native non-disease resistant western white pine, and some of the smaller western larch and ponderosa pine, and insect and disease infested trees. The harvest treatment will retain the best Douglas-fir and most of the ponderosa pine and western larch including the relic trees. The residual stand structure would vary in size and arrangement. The remaining overstory would not be evenly spaced, but would be variable based on existing stand structure, condition and species composition. Opening the stand density will increase the growth and vigor of the residual conifers and increased sunlight to the forest floor will stimulate growth of understory vegetation.

Prescribed fire or grapple piling is planned to reduce natural down and ladder fuels for some units. Spring underburning or grapple piling will reduce the amount of natural fuels, interrupt the succession of the more tolerant species, and help the ponderosa pine and western larch maintain dominance in these stands. Fire will also move the understory shrubs, grasses and forbs back to their early seral stages and increase forage amount, nutrition and palatability. Prescribed fire may be deferred if there is unacceptable risk of killing more than 10-15% of the leave trees either through the fire directly or by stressing the trees and increasing the risk of insect attack.

Yarding tops without prescribed fire or grapple piling is planned in units that are too steep to pile, and don’t have sufficiently large residual trees to sustain prescribed fire.

Effects of Improvement with Seed Tree Harvest

Basal area reduction (improvement harvest) with seed tree openings will occur in stands within VRU- 2, 3 and 4 that have higher than historic stocking. These sites will be opened up to an average basal area of 40-60 square feet per acre. Ponderosa pine and western larch will be strongly favored for leave where they exist. Up to 50% of the unit may be in seed tree openings (10-25 basal area) within these units. Seed tree openings will occur in areas with stagnant Douglas-fir that lack acceptable leave trees, areas with heavy insect or disease infestations, or currently under stocked areas.

These residual basal area objectives are consistent with historic stand densities and species composition resulting from mixed severity fire.

The basal area reduction portion of the harvest will not replace the existing stand and will improve portions of the existing species composition and forest health by removing less desirable Douglas-fir, lodgepole pine, and insect and disease infested trees, while retaining the best Douglas-fir and most of the ponderosa pine and western larch. The residual structure would vary in size and arrangement. Overstory trees would not be evenly spaced, but would be variable based on existing stand structure, condition and species composition. Opening the stand density will increase the growth and vigor of the residual conifers and increased sunlight to the forest floor will stimulate growth of understory vegetation.

The seed tree openings will replace the existing stand, but will retain the large overstory trees consistent with historic disturbance patterns. Stand structure will change from mid-late seral conifers to early seral conifers with reserve mature overstory of Douglas-fir, ponderosa pine and western larch, with basal area of 10-25 square feet. Opening the canopy will encourage regeneration of early seral understory vegetation and increased sunlight will stimulate growth and vigor of existing understory vegetation.

Prescribed fire or grapple piling is planned to reduce natural down and ladder fuels for all units. Spring underburning and grapple piling will reduce the amount of natural fuels, interrupt the succession of the more tolerant species, and help the ponderosa pine and western larch maintain dominance in these stands. Fire will also move the understory shrubs, grasses and forbs back to their early seral stages and increase forage amount, nutrition and palatability.

Natural seeding of the desired intolerant species is expected in these treatment units.

Effects of Improvement with Shelterwood Harvest

Basal area reduction (improvement harvest) with shelterwood openings will occur in stands within VRU2 that have higher than historic stocking. These dry Douglas-fir types will be opened up to an average basal area of 40-60 square feet per acre. Ponderosa pine and western larch will be strongly favored for leave where they exist. Up to 50% of the unit may be in shelterwood openings (25-40 basal area) within these units. Shelterwood openings will occur in areas with stagnant Douglas-fir that lack acceptable leave trees and areas with heavy insect or disease infestations.

These residual basal area objectives are consistent with historic densities and species composition. This intermediate basal area reduction treatment will not replace the existing stands, but will improve the existing species composition and forest health by removing less desirable Douglas-fir, retaining the best Douglas-fir and most of the ponderosa pine and western larch. Stand composition will vary from 80-90% Douglas-fir in the stands with little available ponderosa pine or western larch. The residual structure would vary in size and arrangement. Overstory trees would not be evenly spaced, but would be variable based on existing stand structure, condition and species composition. Opening the stand density will increase the growth and vigor of the residual conifers and increased sunlight to the forest floor will stimulate growth of understory vegetation.

The shelterwood openings will replace the existing stand, but will retain the large overstory trees consistent with historic disturbance patterns. Stand structure will change from mid-late seral conifers to early seral conifers with reserve mature overstory of Douglas-fir, ponderosa pine and western larch, with basal area of 25-40 square feet. Opening the canopy will encourage regeneration of early seral understory vegetation and increased sunlight will stimulate growth and vigor of existing understory vegetation.

Prescribed fire to reduce natural down and ladder fuels is planned for all units. Spring underburning will reduce the amount of natural fuels, interrupt the succession of Douglas-fir, and help the ponderosa pine and western larch maintain dominance in these stands. Fire will also move the understory shrubs, grasses and forbs back to their early seral stages and increase forage amount, nutrition and palatability and stimulate any aspen clones within the units.

Natural seeding is expected in these treatment units, but supplemental planting of ponderosa pine will ensure that this species is restored.

Effects of Shelterwood with Reserves Harvest

Shelterwood harvest would occur within VRU-2 and 3. These are regeneration openings that would retain 20-40 basal area of mid-late seral overstory to function as a seed source, shade, and stand structure, as well as genetic seed reservoirs, relic overstory trees, and future snags. Ponderosa pine and western larch will be favored for leave where they exist. In their absence, the larger, most vigorous Douglas-fir will be retained.

These regeneration openings will replace the existing stand, but will retain the large overstory trees consistent with the historic pattern of mixed severity to high severity fire. Stand structure will change from mid-late seral conifers to early seral conifers with a reserve mid-late seral overstory of ponderosa pine, western larch and Douglas-fir. The residual overstory would vary in size and arrangement. They would not be evenly spaced, but would be variable based on existing stand structure, condition and species composition.

The opening of the canopy will encourage regeneration of early seral understory vegetation and increased sunlight will stimulate growth and vigor of existing understory vegetation.

Site preparation will be through prescribed fire. Spring underburning will reduce the amount of natural fuels, prepare the sites for regeneration, interrupt the succession of Douglas-fir and help the ponderosa pine, and western larch establish dominance in these stands. Fire will also move the understory shrubs, forbs, and grasses back to their early seral stages and increase forage amount, nutritional value, and palatability, and stimulate any aspen clones within the site.

Some natural seeding of western larch, lodgepole pine and Douglas-fir is expected in these treatment units, but supplemental planting of ponderosa pine, western larch, and potentially aspen on appropriate sites will ensure that these species are restored.

Effects of Seed Tree with Reserves Harvest

Seed tree harvest would occur within VRU-2, 3, 4, 5, and 9. These are regeneration openings that would retain 10-25 square feet of basal area of mid-late seral overstory to function as a seed source, and stand structure, as well as genetic seed reservoirs, relic overstory trees, and future snags. Ponderosa pine and western larch will be favored for leave where available. Where ponderosa pine and larch are not available, the larger, most vigorous Douglas-fir will be retained. A minimum of 10 leave trees per acre will be retained.

These regeneration openings will replace the existing stand, but will retain the large overstory trees consistent with the historic pattern of fire. Stand structure will change from mid-late seral conifers to early seral conifers with a reserve mid-late seral overstory of ponderosa pine, western larch and Douglas-fir. The residual overstory would vary in size and arrangement based on existing stand structure, condition and species composition.

The opening of the canopy will encourage regeneration of early seral understory vegetation and increased sunlight will stimulate growth and vigor of existing understory vegetation.

Site preparation will be mostly through prescribed fire in the spring or fall with some grapple piling to prepare the sites for regeneration, interrupt the succession of tolerant to mid-tolerant species, restore ponderosa pine, western larch, or western white pine to a dominant component in these stands. Site preparation through prescribed fire or grapple piling will also move the understory shrubs and grasses back to their early seral stages and increase forage amount, nutritional quality, and palatability and stimulate any aspen clones within the site.

Natural seeding is expected in these treatment units, but supplemental planting of western larch, ponderosa pine, rust resistant western white pine, and potentially aspen on appropriate sites will ensure that these species are restored.

Effects of Clearcut with Reserves Harvest

Clearcut harvest would occur within VRU-2, 3, 4, and 5. These are regeneration openings that would retain 10-15 square feet of basal area of mid-late seral overstory to function not as a seed source, but for stand structure, genetic seed reservoirs, relic overstory trees, and future snags. Ponderosa pine and western larch will be favored for leave where they exist. Where western larch and ponderosa pine are not available to meet the minimum of 10 trees per acre, the largest or most vigorous Douglas-fir will be retained. A minimum of 10 leave trees per acre will be retained.

These regeneration openings will replace the existing stand, but will retain the large overstory trees consistent with the historic pattern of mixed severity to high severity fire. Stand structure will change from mid-late seral conifers to early seral conifers with a reserve mid-late seral overstory of ponderosa pine, western larch and Douglas-fir. The residual overstory would vary in size and arrangement based on existing stand structure, condition and species composition.

The opening of the canopy will encourage regeneration of early seral understory vegetation and increased sunlight will stimulate growth and vigor of existing understory vegetation.

Site preparation will be mostly through prescribed fire in the spring or fall and some grapple piling to prepare the sites for regeneration, interrupt the succession of tolerant to mid-tolerant species, and restore ponderosa pine, western larch, or western white pine to a dominant component in these stands. Site preparation through prescribed fire or grapple piling will also move the understory shrubs and grasses back to their early seral stages and increase forage amount, nutritional quality, and palatability and stimulate any aspen clones within the site.

Some natural seeding is expected in these treatment units, but planting of western larch, ponderosa pine, rust resistant western white pine, and potentially aspen on appropriate sites will ensure that these species are restored, and the sites are adequately stocked.

Effects of Regeneration Mosaic Harvest

Regeneration mosaics are proposed for units that vary between a clearcut and shelterwood, depending on the location within the unit. Overall effects will be most similar to a seed tree harvest as described above.

Effects of Planting

Enabling plantations to respond to potential climate change will be addressed by planting a minor component (up to 25%) of the seedlings from a lower elevation seed lot to address the predicted climate change, while ensuring the survival of plantations within the context of historic conditions. This is one

strategy to maintain resilient forests for projected future climates of an upward and northward shift of species. Managers need to think of planting stock that will survive now, but still grow well into the future (Fox 2007). All seedlings will be sown from local seed sources and a minimum of 75% of the planted stock will be suitable and adapted to the existing site conditions. Planting rust resistant western white pine will increase the presence of this species on the landscape measurable by the number of acres planted. While the proposed acres are small, they will incrementally increase the presence of this key species.

Harvest Treatments Individually and Collectively

Harvest treatments individually and collectively will create openings between residual trees, retain larger fire resistant trees and reduce fuel loads. These treatments will increase within unit survival rates in the event of a large scale fire; will decrease the likelihood of a crown fire, and to some degree buffer areas on the lee ward side of the treated stand. Collectively the treatments will allow the landscape to sustain itself in the aftermath of a wildfire (Skinner 2008).

Reducing stand density, treating fuels, and maintaining or restoring intolerant and mid-tolerant species such as western larch, ponderosa pine, rust resistant western white pine, Douglas-fir and aspen, combined with the buffering effects, will increase stand and landscape level resistance and resilience to predicted climate change.

Direct and Indirect Effects of Non-Harvest Treatments

Effects of Stand Density and Hazard Fuel Reduction, thru a Combination of Slashing, and Prescribed Fire

Density reduction and hazard fuel reduction is proposed for stands within VRU 2, 3, 5, 7 and 9 that have conifer stocking, natural fuels, and ladder fuels that are higher than would occur with historic fire regimes. The dry to moderately Douglas-fir types will be opened up to an average basal area of 40-60 square feet per acre, and the moist VRU's will be opened up to 60-120 basal area through a combination of slashing, and prescribed fire. Ponderosa pine and western larch will generally not be slashed. The residual basal area objectives are consistent with historic densities.

This treatment will not replace the existing stands, but will improve the existing species composition and forest health by removing less desirable Douglas-fir and other tolerant species, while retaining the larger thick barked Douglas-fir and most of the ponderosa pine and western larch. Stand composition will vary based on existing stand conditions, but will generally retain 70-80% intolerant to mid tolerant fire resistant species such as western larch and ponderosa pine. The residual stand structure would be variable based on existing stand structure, condition and species composition. There will be inclusions with basal area as low as 20 and as high as 140, but the overall averages will be consistent with the objectives described above. Opening the stand density will increase the growth and vigor of the residual conifers and increased sunlight to the forest floor will stimulate growth of understory vegetation and stimulate any aspen clones within the site.

Effects of Prescribed Fire

Prescribed fire, following harvest or without harvest, would reduce natural fuels, prepare the site for regeneration of intolerant conifers, interrupt the succession of Douglas-fir and help the ponderosa pine, western white pine and western larch maintain or establish dominance on these sites.

Prescribed fire without harvest treatment will open the canopy through mortality in the smaller trees and the larger tolerant to mid tolerant conifers, and prepare the site to encourage regeneration of early seral

understory vegetation. The increased sunlight, combined with the consumption of older plant material, will move the understory shrubs and grasses back to their early seral stages and increase growth, vigor, forage amount, nutrient quality, and palatability. Species that are maintained by fire disturbance such as aspen, redstem ceanothus and willow may become common across the dryer portions of this landscape, and willows, maples, alder, huckleberry and other shrubs may be common in the drier VRU's.

Emphasizing the ecological process of prescribed fire, in conjunction with structure and composition objectives may be an important decision in managing within uncertainty or a variable future (Miller 2007, pg 2146).

Prescribed fire will increase susceptibility of Douglas-fir to bark beetle attack if residual trees are stressed and beetle populations are high. Effects of implementing burning could therefore increase beetle attacks on residual Douglas-fir. Most of the tolerant species will also be susceptible to secondary insect and disease following damage and stress from underburning.

Fire suppression activities will continue in the project area. Composition of the vegetation in untreated areas, including forbs, shrubs and trees, will continue to shift toward a more tolerant, climax condition. This functionally disrupts both the vegetative and animal species that have evolved to depend upon landscape components historically present within the historic range of variability. In these areas, natural events such as wind and pests will continue to set the stage for stand replacing fire. The decision to allow natural fire to burn within the project area, rather than suppress fire, is beyond the scope of this project.

Prescribed Fire Treatments Individually and Collectively

Prescribed fire treatments individually and collectively will create openings between residual trees, retain larger fire resistant trees and reduce fuel loads. These treatments will increase within unit survival rates in the event of a large scale fire; will decrease the likelihood of a crown fire, and to some degree buffer areas on the lee ward side of the treated stand. Collectively the treatments will allow the landscape to sustain itself in the aftermath of a wildfire (Skinner 2008).

Reducing stand density, treating fuels, and maintaining or restoring intolerant and mid-tolerant species such as western larch, ponderosa pine, rust resistant western white pine, Douglas-fir and aspen, combined with the buffering effects, will increase stand and landscape level resistance and resilience to predicted climate change.

Harvest and Prescribed Fire Treatments Collectively

Proposed vegetation treatment activities are designed to increase adaptability of forest stands in the project area to environmental and climate change-related stress.

Potential for Increased Insect and Disease Activity

Disturbances caused by insect and diseases occur in all terrestrial ecosystems. Insect and disease are important causes of small to large gaps in forest canopies. They can affect major structural or species changes in the ecosystem. USDA Forest Service reports have consistently shown insects and pathogens cause more losses than any other damaging agent, including fire. Insects and pathogens often interact with each other as well as with climate and fire. Past management practices may increase the frequency, intensity and extent of many outbreaks. Such practices include harvest beyond historic rotation ages for a given species, removing intolerant species and leaving tolerant species, not removing diseased overstory trees and suppression of fires. The widespread droughts of the late 1980's to present preceded

and predisposed vast areas in the west to insect and pathogen attack (Haack and Byler 1993). Fire suppression increased stand densities that in turn indirectly increased insect and disease populations.

As untreated stands within the Miller West Fisher area progress towards more shade tolerant species, insect and disease occurrences are likely to increase. Grand fir and Douglas-fir are more susceptible to root and stem decays than are more shade-intolerant species such as western larch and ponderosa pine. On the warm and dry sites, these shade tolerant species would likely be less resistant to insect and disease impacts due to moisture stress during the warm periods of the year. On a given site, the tolerant species are more nutrient and moisture demanding, thus more likely to be stressed on these lower productivity sites and during times of drought. They are therefore predisposed to insect and disease attack due to stressed conditions.

Although it is difficult to quantify the increased risk and effects of defoliators, root disease, bark beetles, etc., that would result in a tolerant stand on a given site, experience on the Boise National Forest, the Idaho Panhandle and the Blue Mountains, shows that vast acres could be lost through insect and disease followed by a high probability of catastrophic fire. Significant problems in these climax species stands started within 60-80 years following fire suppression and harvest activities that increased the tolerant species component.

The potential for increased insect levels in untreated stands with predicted climate change is high. Forest pests are an important indicator species for assessing climate change. Assessing pest species response to climate change indicates intensification in all aspects of outbreak behavior, particularly with mountain pine beetle, gypsy moth, spruce beetle and spruce budworm (Logan 2003, Pg 135, 136).

Stands proposed for density reduction or regeneration will decrease in susceptibility to most insect and diseases in the long term due to favoring intolerant species and reducing stress on residual trees through reduction of competition for moisture, light and nutrients. All vegetation treatments in this project are designed to restore historic composition, density, structure and function consistent with historic disturbance processes; therefore the treated areas should be more resilient to insect and disease infestations with or without climate change than the untreated areas.

In the short term susceptibility to Douglas-fir beetle and other secondary insects may be increased following fire induced stress on residual trees.

Partial harvest in Douglas-fir dominated stands may increase the susceptibility of residual trees to root disease. Douglas-fir is more susceptible to root and stem decays than other species such as western larch, ponderosa pine, and lodgepole pine. In general, Douglas-fir is not the priority species to retain, but there will be a mix of Douglas-fir within the partially harvested stands.

Windthrow: Proposed treatments may increase windthrow above existing conditions, particularly in areas where regeneration openings are larger than 10 acres, where the unit is topographically unprotected, where density reduction is adjacent to an existing opening, or where leave trees have defective root systems due to root disease or over maturity. Units on more susceptible landtypes (landtype 101, 112, and 152) have a higher risk of windthrow. Refer to the Landtype summary in the soils report. All proposed treatments will open up the existing stand and may increase the risk of windthrow because the winds will move down closer to the ground. Windthrow is not expected to exceed 10-15% of the stand unless there are unusual circumstances.

Contribute to a Sustained Yield of Timber

The desired condition is to provide forest products within the sustainable capability of the ecosystem. One of the purposes provided by Congress for the management of NFS land is to “furnish a continuous

supply of timber for the use and necessities of the citizens of the United States" (Organic Act, 16 USC 475). One of the objectives of the Kootenai Forest Plan is to provide a sustained yield of timber volume responsive to national and regional needs, scheduled to encourage a stable base of economic growth in the dependent geographical area (Forest Plan page II-1): Forest Plan management area goals also call for a programmed yield of timber (Forest Plan, pages II-1, III-43, III-48, III-64, III-69, III-74). There is a need to supply wood products to contribute to the support of that segment of the local and regional economy dependent on timber products, which is based upon the need for forest health.

Table 3-25
Harvest Volume and Acres Harvested by Alternative

Indicator	Alternative 1 – No Action (MMBF)	Alternative 2 (MMBF)	Alternative 4 and 5 (MMBF)	Alternative 6 (MMBF)
Volume Removed	0	8.9	4.9	6.9
Acres Harvested	0	2,492	1,364	1,835

** Volume figures do not include roundwood volume.

The ability to sustain a programmed yield of timber is dependent on good forest management practices, and ecological sustainability. Good forest management practices are even more critical with the potential for climate change. This issue indicator will look at the acres by alternative that are treated that will move stands toward VRU target conditions. All treatments are designed to move the stand towards the VRU objectives. Alternative 2 most effectively addresses the purpose and need to contribute to a sustained yield of timber, and treats the highest number of acres, followed by Alternative 6, then Alternative 4 and 7.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, road storage and decommissioning, access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to forest vegetation because they do not involve the cutting of trees, or in the case of Lake Creek Campground, involve cutting as prescribed to achieve objectives for a pleasing recreation setting over a small area.

CONSISTENCY WITH THE FOREST PLAN AND APPLICABLE LAWS, REGULATIONS AND POLICY

Consistency with the National Forest Management Act (NFMA) of 1976

In accordance with the National Forest Management Act (NFMA) of 1976, timber harvest and regeneration practices shall be designed to assure lands are satisfactorily restocked within five years after final harvest. Restocking is satisfactory when the harvest area contains the minimum number, distribution, and species composition of regeneration as specified in a site-specific silvicultural prescription written or reviewed by a certified silviculturist. Five years after final harvest means five years after clearcutting; five years after final overstory removal in shelterwood cutting; five years after seed tree removal cut in seed-tree cutting or five years after selection cutting.

In order for a harvest area to be certified as stocked, it must meet the following criteria defined in the FS Reforestation Handbook (FS 2409.26b, 221):

1. Regeneration must be established. This requires natural regeneration to survive at least three full growing seasons, be in healthy condition and be a minimum of six inches high. Planted stock needs to survive two growing seasons and be in a healthy condition.
2. At least 60 percent of the land area that can be reforested in the stand meets prescribed stocking standards and age criteria.
3. A certified silviculturist has determined that the stand will require no further regeneration treatment or regeneration exams.

Regeneration survey records have been analyzed for each habitat type group affected by proposed units in the project. The results demonstrate assurance that these sites can be adequately restocked within the required timeframes. (Refer to the project file for a summary of past regeneration success on the District by habitat type groups.)

Biodiversity

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" (16 U.S.C. 1604(g)(3)(B)). In order to ensure that viable populations will be maintained, habitat must be provided to support at least a minimum number of reproductive individuals. The habitat must be well distributed so that those individuals can interact with others in the planning area.

The Miller West Fisher project ensures that biological diversity is maintained by managing stands, VRU's and the landscape consistent with historical disturbance processes.

All conifer planting will use local seed sources and all seeding of roads, landings, etc will be seeded with short duration annual weed free certified seed mixes, an approved native seed mix from local seed sources, or the Standard Kootenai Mix, which has been determined to be a non-invasive mix of annuals, biennials, and perennials.

Land Suitability

As a precursor to the diagnosis process, each stand is examined to determine its current condition and to provide a basis for silvicultural decisions. Suitability was determined for each stand in the analysis area in accordance with the Kootenai Forest Plan. This determination found each stand proposed for treatment as suitable for timber management based upon the following:

1. Each stand meets the definition of forestland as described in the Forest Plan.
2. Technological feasibility exists to ensure soil productivity and watershed protection. All sites considered for treatment will use established harvesting and fuel reduction methods. In combination with resource protection standards in the Forest Plan and applicable Best Management Practices, these methods will be sufficient to protect soil and water resource values.
3. There is reasonable assurance that lands can be restocked within 5 years of final harvest. Historical records on the Libby Ranger District in this area indicate that most of the stands treated with a final regeneration harvest have either met or are on the proper stocking trajectories to meet specified stocking levels for land management objectives within 5 years.

4. The stands proposed for treatment have potential growth (cubic/feet/acre/year) that classifies them as suitable for timber harvest in accordance with NFMA Findings - Uneven-age vs. Even-age, Optimality of Clearcutting

NFMA Findings - Uneven-age vs. Even-age, Optimality of Clearcutting

Target stands as described in the KNF Habitat Type Groups and Target Stands (USDA 1999), and supplemented by the target stands for VRU 1 and 2 in the project file, provide the basis for considering uneven-aged management. If an uneven-aged stand is ecologically feasible on the site and will benefit allocated resources, this target is described and compared to the existing stand.

If uneven-aged management is not ecologically feasible or will not provide forest conditions that benefit allocated resources, an uneven-aged alternative should not be carried forward as a viable alternative. Uneven-aged management in the areas proposed for harvest, is not consistent with the historic range for these sites. Uneven-age harvest would perpetuate regeneration of Douglas-fir, grand fir, subalpine fir, hemlock and cedar, retain the unnaturally high stocking and fuel conditions, and increase the probability of large-scale high-severity fire. Multi-age stands were common on some of the driest sites due to the periodic fire but the classic uneven-age stand is not within historic conditions. Based on this analysis, no uneven-aged management was proposed for this project area.

Even-age management is appropriate for most of the stands in the Miller West Fisher area. Even-aged management is similar to the natural occurrence of stand replacement fire and underburns that create two-storied stands. All alternatives propose intermediate harvest, even-age or two-age management.

Optimality of Clearcutting

A diagnosis was completed for each proposed unit that considered the historic conditions and target stand for the appropriate VRU. On the sites that even-age or two-age management was the target, a seed tree or shelterwood system was the first option that was considered. Clearcutting was only proposed for units or portions of units that did not have adequate seed trees to regenerate some of the desired species to meet target stand objectives. These units will still have a minimum of 10 overwood trees retained for structure, relic trees, and future snags, but these trees are will not be relied on for seeding the unit; therefore the appropriate silvicultural system is a clearcut. Refer to the diagnosis matrix in the project file that addresses the process of determining the appropriate silvicultural system and the determination of optimality of clearcutting for units or portions of units 1, 3, 4, 5, 7, 8b, 11, 12, 16, 17, 20, 24, 27, 30, 49, 51, 52, 58, 125, 201, and 202 in the Proposed Action (Alternative 2). There are substantially less units proposed for clearcutting in Alternatives 4 and 7, and Alternative 6.

All lands proposed for timber management activities have been site specifically reviewed and have been determined to be suitable for timber production.

Potential for Increased Insect and Disease Activity

Refer to page 32 and 33 of this report

Effect to Special Communities-Pacific Yew Populations

In 1992 guides were established to ensure the long-term viability of pacific yew. Although there are other sources of yew for extraction we still continue to disclose possible effects to yew populations. Yew is typically found within Habitat Group D, Warm and Moist VRU's. VRU group 4 and 5 is suitable and as some pacific yew populations primarily associated with riparian areas. No substantial

quantities of pacific yew have been noted within any treatment units primarily due to the stand replacing fire in 1910 and the late seral stage that pacific yew is generally associated with.

Effects on Residual Trees and Adjacent Stands (Windthrow)

See discussion on page 33 of this report.

Consistency with Forest Plan Direction

Proposed harvest treatment areas are within Management Area 10 - Big Game Winter Range, Management Area 11 - Big Game Winter Range/Timber, Management Area 12 - Big Game Summer Range/Timber, Management Area 14 - Grizzly Bear Habitat/Timber, Management Area 15 - Timber, Management Area 18 - Minimum Use due to Regeneration Concerns, Management Area 19 - Minimum Use Steep Slope, Management Area 23 - Electric Transmission Corridor, and Management Area 24 - Low Productivity

Regeneration harvest is generally proposed within Management Areas that are suitable for timber management. In the Proposed Action there are 12 acres of proposed regeneration harvest within MA 18 in units 32 and 111. These are MA 18 inclusions within suitable MA's, are not consistent with habitat types identified for MA 18, and are determined to be a mapping error. There are also 34 acres with MA 10 in units 102, 103, 104 that are proposed for stand density and natural fuel reduction and in unit 108 that is a proposed regeneration harvest to treat stagnant Douglas-fir on a productive east aspect within a predominantly dryland area. There are 41 acres within Management Area 19 in unit 9a that has been site specifically reviewed, has slopes less than 50%, which are stable, with no indication of pistol butting; and this is determined to be a mapping error. There are also 27 acres within unit 101 and 102 within Management Area 10; these are density reduction treatments, with helicopter logging. Alternative 4 and 7 proposes only unit 8a, and Alternative 6 proposes units 8a, 101, 108 and 111.

The density and hazard fuel reduction units have portions that are within MA 18 Minimum Use Regeneration, and Management Area 24, Low Productivity, are consistent with Forest Plan Direction, as they do not result in a regeneration treatment.

All treatments are designed to restore ecological conditions by moving stands and the landscape toward the VRU target conditions, while improving forest health and reducing natural fuels. All actions considered in depth were designed to manage vegetation consistent with big game habitat, and social objectives, and address the potential for climate change.

Forest Plan Goals and Objectives

Effects of the Alternatives on Producing a Programmed Yield of Timber

Alternative 2 would harvest and utilize almost 9 million board feet of green and dead timber. Alternatives 4 and 7 would harvest nearly 5 million board feet and Alternative 6 would harvest approximately 7 million board feet of green and dead sawlog timber. Roundwood volume would be in addition to this estimated sawlog volume. In addition to the amount of volume harvested, the ability to sustain a programmed yield of timber is dependent on good forest management practices. All harvest of green trees is designed to move stands toward VRU target conditions.

MITIGATION and MONITORING

Recommended Mitigation or Design Features

In addition to the appropriate BMP's, riparian guidelines and standard contract clauses, the following mitigation and monitoring should be included.

a) To maintain long term soil productivity and provide coarse woody debris (CWD) for small mammals and other wildlife species:

   - All harvest units would retain 8-30 tons per acre of downed woody material (or recruitment) greater than 4" in diameter to provide nutrient recycling and habitat for mammals and invertebrates.
   - Harvest units within VRU 1 and 2 – retain 8-15 tons per acre of CWD on site after harvest and/or fuels treatment.
   - Harvest units within VRU 3, 7 and 9 - retain 15-20 tons per acre of CWD on site after harvest and/or fuels treatment.
   - Harvest units within VRU 4 and 5 - retain 15-30 tons per acre of CWD on site after harvest and/or fuels treatment.

b) The volume and distribution of material will be subject to specific site conditions and VRU objectives and will be specified in the silvicultural prescription and incorporated into the timber sale contract. This material originates from unutilized portions of designated trees, cull materials, broken tops, etc.

c) All harvest units will be designed to retain adequate levels of replacement snags to provide for cavity-associated wildlife species, genetic seed reservoirs, relic overstory, and long-term soil productivity. Replacement trees would be scattered throughout harvest units to the extent possible. A minimum of 10 replacement snags (may vary from 8-12 based on actual marking) per acre will be retained. Where possible within safety requirements sound snags may be marked for retention. If they are felled for safety purposes, they will be retained on site. Silvicultural and burning prescriptions would be prepared with the goal of protecting large diameter relic trees, during site preparation and fuels treatment.

d) A marking review will be performed by a silviculturist on a minimum of 10% of proposed units to ensure marking guides are being implemented as per the prescription.

e) All tractor harvest units with an intermediate harvest prescription will have designated skid trails to facilitate removal of designated material while minimizing damage to less than 15% of the residual trees.

f) Skyline logging systems will be required on cable units that have an intermediate treatment and shelterwood harvest, to minimize damage to leave trees.

g) Soil productivity will be maintained through one of the following:

   - Utilizing cable or helicopter systems;
   - Utilizing winter logging requirements;
   - Restricting ground based equipment to designated trails;
   - Utilizing dispersed skidding only when soil moisture conditions are less than 18%.

h) Harvest treatments will be designed to mimic natural process, and marking guides will emphasize working with existing stand structures, and will not result in a uniform or evenly spaced residual stand or an evenly spaced seed trees or relic trees.

Recommended Monitoring

1. Monitor marking and layout on a minimum of 10% of the units.
2. Monitor all units following harvest to document existing condition, and recommend future stand treatment needs.
3. Monitor all regeneration units for reforestation success.
4. Monitor the effects of prescribed fire on vegetation within harvest units and prescribed fire outside harvest units on a minimum of 10% of the units to ensure objectives are met.

KV Projects

The list of KV projects is in order of priority for vegetation management, but do not include other resource needs.

a. Post harvest (4347 exams) on units with KV reforestation;
b. Site preparation as summarized in the Alternative summaries;
c. Planting for reforestation and restoration as summarized in Alternative summaries and detailed prescriptions for essential reforestation;
d. Planting for reforestation and restoration as summarized in Alternative summaries and detailed prescriptions for species restoration reforestation;
e. Survey (4341 and 4344 exams) in regeneration units for stocking levels.

HYDROLOGY

Summary

The activities proposed in this project have been reviewed to determine their effects to the water resource. Alternatives were developed from the proposed action to better protect the water resource. Based on existing, ongoing monitoring in the Fisher basin it has been determined that only alternatives 4, 6, and 7 would meet the requirements of the Forest Plan for the protection of water related beneficial uses in the Miller Creek watershed. Please see the following analysis for more detailed information.

Introduction

The purpose of this report is to analyze the existing condition and potential effects from proposed forest management on the watershed resource in the project area and downstream receiving waters. The proposed action and alternatives involve timber harvest, underburning, excavator piling and burning of piles, and thinning stands to reduce the existing stand density. The project also proposes road storage and decommissioning activities for all action alternatives. Temporary roads and landings needed to facilitate timber harvest would be constructed and decommissioned after use. See Chapter 2 for a complete description of the alternatives. Additional activities included in some alternatives include watershed restoration projects, fuels reduction in Lake Creek Campground, access to the private Irish Boy Mine property, trail construction and reconstruction, and improvement of trailheads as described in Chapter 2.

Separate from this report are several appendices for inclusion into the project file: (1) Forest Plan Standards and Guidelines (2) Kootenai National Forest best management practices (BMP's) process, (3) Landtype Information (4) Riparian Habitat Conservation Areas (RHCA's) for units in the project area, (5) Road Project Information, (6) References, (7) Best Management Practices specific to this project, and (8) Water yield modeling discussion.

The analysis area (project area) for watershed includes all lands in Miller Creek, West Fisher Creek, and Silver Butte Creek watersheds. The Fisher River is the downstream receiving water for the project areas.

Regulatory Framework

Federal Water Pollution Control Act

The Federal Water Pollution Control Act (FWPCA), 33 U.S.C. 1251 et seq., as amended, establishes Federal water quality policies, goals, and programs. In 1977, the FWPCA was renamed the Clean Water Act (CWA). Both the Environmental Protection Agency and States have the responsibility for carrying out the CWA. The sections pertinent to the Miller West Fisher Project Area are:

1. Objective/Goals/Policy (Section 101) of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."
2. Water Quality Standards (Section 303(c)). States are required to establish water quality standards that allow for protection of the beneficial uses made of the water. State water quality standards consist of: 1) designated beneficial uses of the waters involved; and 2) water quality criteria (either numeric or narrative) sufficient to protect the designated beneficial uses. Standards are established taking into consideration the use of the water body, and its value for public water

supplies, propagation of fish and wildlife, recreational, agricultural, industrial, and other purposes. The standards are the legal basis for control decisions under the Act.

The State of Montana has classified all the streams in the Miller West Fisher Project area as B-1. Specific changes from naturally occurring values of certain water quality characteristics, such as turbidity and temperature, are allowed under State water quality standards. Growth and propagation of a salmonid fishery and associated aquatic life are the beneficial uses identified by the State of Montana for these streams.

3. Water Quality Limited Segments (Section 303(d)). States are required to identify waters within their boundaries for which the effluent limitations are not stringent enough to implement any water quality standard applicable to such waters. States are to establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters. States are to also establish Total Maximum Daily Loads (TMDL's) for those pollutants causing the water quality standards not to be met. The Fisher River is included on the State of Montana's 1996 – 2006, 303(d) bi-annual list of impaired water bodies (305(b) Report). It is listed as partially supporting aquatic life and cold-water fishery. Probable causes of the impairments are listed as: nutrients, habitat alterations, thermal modifications, and siltation. Sources of impairment are listed as: agriculture, silviculture, removal of riparian vegetation, and channelization.

Antidegradation Policy

Although not a requirement of the Act, the EPA developed regulations in 1975 requiring states to adopt an antidegradation policy as a part of a state's water quality standard. States were also directed to spell out how they would implement the policy. 40 CFR 131.12 states, "The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:

1. Existing in stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
2. Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the inter-governmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirement for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.
3. Where high-quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected."

Montana Water Quality Standards

The Administrative Rules of Montana (ARM), Title 16, Chapter 20, Sub-Chapter 6, Surface Water Quality Standards establish water-use classifications for river drainages within the State based upon "present and future most beneficial uses." For each water-use classification, surface water quality standards of performance are assigned to protect the designated beneficial water uses. For all water-use classifications, standards for bacteria, dissolved oxygen, pH, and toxic substances (i.e., herbicides) are

defined by specific limits. Standards for sediment, turbidity, water temperature, and color are described in terms of "naturally occurring." See previous discussion for beneficial uses of the streams that flow through the Miller West Fisher Project Area.

Section 75-5-306 of the Montana Water Pollution Control Law (MCA) and the ARM 16.20.603(17) define "naturally occurring" as "conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil, and water conservation practices have been applied. Conditions resulting from the reasonable operation of dams at July 1, 1971, are natural."

The ARM 16.20.603(21) defines "Reasonable land, soil, and water conservation practices" as "methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and non-structural controls and operation and maintenance procedures. Appropriate practices may be applied before, during, or after pollution producing activities." These practices include Best Management Practices, but they are only considered "reasonable" if beneficial uses are protected.

For the Miller West Fisher Project Area, the Forest has applied the following process to insure compliance with the State water quality standards:

1. Best Management Practices (BMPs) were selected and designed by an interdisciplinary team (ID Team) based on site-specific conditions, technical, economic and institutional feasibility, and designated beneficial uses of the stream (see above).
2. BMPs were translated into required activities through the timber sale contract; they become legal requirements as "BT" and "CT" contract provisions.
3. BMP implementation would be monitored by a certified sale administrator who would insure that they are being implemented, and that they are effective in protecting designated beneficial uses.
4. The results of BMP monitoring would be evaluated by the ID Team and other forest specialists.
5. The results of BMP monitoring and evaluation would fed back into other activities. BMPs and other de-sign criteria would be redesigned if it were determined that they are not fully effective.

Montana Nondegradation Policy

MCA 75-5-303 states that (1) Existing uses of state waters and the level of water quality necessary to protect those uses must be maintained and protected; (2) Unless authorized by the department under subsection (3), the quality of high-quality waters must be maintained; (3) the department may not authorize degradation of high-quality waters unless it has been affirmatively demonstrated by a preponderance of evidence to the department that (a) degradation is necessary because there are no economically, environmentally, and technologically feasible alternatives to the proposed project that would result in no degradation, (b) the proposed project will result in important economic or social development that exceeds the benefit to society of maintaining existing high-quality waters and exceeds the costs to society of allowing degradation of high-quality waters, (c) existing and anticipated use of state waters will be fully protected, and (d) the least degrading water quality protection practices determined by the department to be economically, environmentally, and technologically feasible will be fully implemented by the applicant prior to and during the proposed activity.

ARM 16.20.708 states that (a) The water quality necessary to protect existing and anticipated uses must be maintained and protected on all state waters, and (b) For high-quality waters, degradation may be allowed only according to the procedure in ARM 16.20.711. These rules apply to any activity that may

cause degradation of high-quality waters, for any parameter, unless the changes in existing water quality resulting from the activity are determined to be nonsignificant under ARM 16.20.712 or 16.20.713.

> **Degradation** is defined in the 75-5-103 as: "a change in water quality that lowers the quality of high-quality waters for a parameter. The term does not include those changes in water quality determined to be non-significant pursuant to 75-5-301(5)(c)."
>
> **High-quality Water** is defined as: "state waters whose quality for a parameter is better than standards established pursuant to 75-5-301. All waters are high-quality..." (Only Class I waters are not high quality).

The ARM 16.20, Subchapter 7, Nondegradation of Water Quality provides the criteria for determination of nonsignificance in ARM 16.20.713. Specifically, 16.20.713 lists:

> (a) activities which are nonpoint sources of pollution where reasonable land, soil, and water conservation practices are applied **and existing and anticipated beneficial uses will be fully protected**;
>
> (c) changes in existing water quality resulting from an emergency or remedial activity that is designed to protect public health or the environment and is **approved, authorized, or required by the department**.

Streamside Management Zone Act

The STREAMSIDE MANAGEMENT ZONE ACT, House Bill 731, became effective October 1, 1991. This law prohibits seven forest practices in Streamside Management Zones (SMZ's). These include:

1. Broadcast burning;
2. Operation of wheeled or tracked vehicles except on established roads;
3. The forest practice of clearcutting;
4. Construction of roads, except when necessary, to cross a stream or wetland;
5. Handling, storage, application, or disposal of hazardous or toxic material in a manner that pollutes streams, lakes, or wetlands, or that may cause damage or injury to humans, land, animals, or plants;
6. The side-casting of road material into a steam, wetland or watercourse;
7. The deposit of slash in streams or other water bodies.

A streamside management zone is a minimum of 50 feet wide on both sides of a stream and includes adjacent wetlands. The seven forest practices prohibited within the SMZ may be permitted by the State with an "alternative practice." Approval for the activity must be obtained from the Department of State Lands before the practice begins. Alternative practices are site-specific and are only approved if the State determines that the integrity of the SMZ will be maintained.

Kootenai National Forest Plan/INFS

The Kootenai National Forest Plan was developed in 1987 and amended in 1995 by the Inland Native Fish Strategy (INFS). The standards and guidelines identified in those documents form the basis for this analysis. A complete list of standards and guidelines associated with the Forest Plan and INFS is included in Appendix 1. Where appropriate, standards will be included as design features and included

in this report and into any contract that should result from this assessment. Please also see the Fisheries report for a discussion on INFS.

Analysis Area

Geographic Scope

Watershed delineation was done using the Hydrologic Unit Code method devised by the USGS for delineating watersheds. The area analyzed includes Miller Creek, West Fisher Creek, and the Silver Butte Fisher River. These drainages are tributaries to the Fisher River approximately 25 miles upstream from the Fisher's confluence with the Kootenai River. The highest point in the project area is Flat Top Mountain at 7,608 feet of elevation. Land ownership in the drainages is displayed in the table below. Timber production, recreation, and hunting are the primary land uses in the drainage. The project area consists of the Silverfish Planning Subunit. Watershed impacts are also displayed at the Fisher River watershed scale, which is much larger than the Silverfish Planning Subunit.

Table 3-26
Land Ownership

Drainage	Forest Service	PCTC	Other Private	MT DNRC	Total (acres)
Miller Creek	4,759	2,583	221	0	7,563
West Fisher Creek	24,432	2,914	966	642	28,954
Silver Butte Creek	28,354	698	877	0	29,929
Fisher River (outside Silverfish Planning Subunit)	121,059	116,120	6,490	6,881	250,551

AFFECTED ENVIRONMENT

Consumptive use of water within the project area is primarily by wildlife and grazing. Non-consumptive uses include maintenance of amphibian, and macroinvertebrate biota. There are numerous surface and groundwater rights on file in the Fisher Watershed. Beneficial uses identified by the Montana Department of Health and Environmental Sciences under their B-1 classification include: drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life; waterfowl and furbearers; and agricultural and industrial water supply.

Water quality characterization for the project area is from West Fisher Creek which is a tributary to the Fisher River, and the main stem of the Fisher River at three locations. These values are based on samples collected during flow measurements between 2002 and 2006. West Fisher has a similar development history and geologic makeup to the other watersheds included in this analysis and represents average condition across the analysis watersheds. The watersheds feature snow melt streams, with peak runoff in April thru May. Based on sampling in similar sized basins, water temperatures are expected to vary from 0 to 15 degrees C. Average pH ranged between 6.0 and 7.9 depending on the season (lower pH values during snowmelt runoff conditions). Conductivity averaged less than 100 uhos/cm, a rating that indicates low mineral content and production potential. Optimum conductivity for fish production and diversity would be in the range of 150-500 uhos/cm. Based on sampling from other basins, dissolved oxygen concentrations throughout all flow periods were at or near saturation levels, and would be more than adequate for aquatic organisms. Water quality has also been reviewed using macroinvertebrate and suspended sediment sampling in West Fisher Creek and at two sites in the main

stem of the Fisher River. In general the water quality in West Fisher Creek is excellent while the rating in the Fisher River is only fair. Those findings are discussed in more detail later in this document.

Climate

The climate of the analysis area is strongly seasonal. The mean annual precipitation is approximately 41 inches in the larger Fisher River watershed but ranges from 35 to 60 inches in the project watersheds. The largest amount of precipitation falls as snow during the winter. Snowfall is heaviest at higher elevations and normal snow packs are retained into June.

The area is sometimes subjected to strong warm-frontal storms during the winter months that bring heavy rain, warm temperatures, and strong winds. Depending on storm intensity and soil and snow pack moisture conditions, these storms can produce very high stream discharges. These are commonly called "rain-on-snow" (ROS) events. In addition to causing high stream discharges, the high rate of water input to the soil can generate unstable conditions on hill slopes. The effects of rain-on-snow events are magnified in drainages where large amounts of the forest canopy have been removed. These large openings allow more wind and rain to reach the snow pack, which results in a more rapid melt and runoff and a "flashier" hydrologic response with shorter time of concentration and higher peak flows. Flow frequencies can be significantly altered in these basins such that higher flows become more common and base flows and low flows are reduced. During such high flows, stream channels may be altered by bank erosion, down cutting, and redistribution of sediment and large woody debris (Harr 1981). The majority of large landslides and large stream flows occur during these events. The project watersheds are oriented to the north and east with the majority of the drainages having low solar energy aspects.

Rain-on-snow events occurred on the Kootenai National Forest in 1990, and more recently during the fall and winter of 1995-96 and again in 2005. These events caused extensive damage to road drainage and stream crossing structures throughout the Kootenai National Forest. Channel alterations caused by ice flows associated with the ROS events occurred to most stream systems on Libby Ranger District and resulted in streambed scouring. Monitoring of these basins after the ROS event in February of 1996 showed that most perennial channels on the district down cut approximately 2-3 inches.

Stream Channel Types

Rosgen (1996) developed a stream channel classification system that is used to morphologically describe how channels operate within states of dynamic equilibrium. The classification considers dynamic processes such as sediment supply, stream sensitivity to disturbance, potential for natural recovery, channel response to changes in flow regime, and fish habitat potential. Stream channel morphology is the ultimate integrator of hill slope and stream channel responses to land management activities within a drainage basin. Therefore, it is the primary indicator of water resource effects. A stream channel has an upper level of tolerance to changes in the geomorphic processes. Channel aggradation or incision, stream bank cutting, and increasing rates of mass wasting are indicators of exceeding a geomorphic threshold. For a selected hydrologic event, the risk of upsetting geomorphic equilibrium and initiating adverse water resource effects is greatly increased as the watershed disturbance approaches the upper level of this tolerance.

Stream channels are variable in how they respond to changes in the natural levels of runoff (peak flows) and/or the amount of sediment that is input into the stream system. The response of streams to increased levels of these items above natural levels is dependent on the makeup of the stream channel and how that particular stream channel recovers from disturbances. The response of streams to imposed change is not uniform among stream types. The variability that exists is displayed in Table 3-28 where

interpretations are shown for sensitivity to disturbance, recovery potential, sediment supply, stream bank erosion potential and vegetation as a controlling influence. The major stream types found in the analysis area are discussed below.

"**A**" stream types are found in valley types that, due to their inherent channel gradients (>4%), exhibit a high sediment transport potential and relatively moderate in-channel sediment storage capacity. "A" stream types are well entrenched, have a low width/depth ratio and are totally confined. Large woody debris (LWD) plays an important roll in energy dissipation and sediment storage. "A" stream types are described as high energy/high sediment supply streams due to their inherently steep channel slopes and narrow/deep channel cross sections. Three of the sample sites were this channel type.

"**B**" stream types tend to be very stable, with a low sensitivity to disturbance such as increased peak flows or sediment, and also have an excellent recovery potential once the cause of the disturbance is corrected. These stream types have natural armoring in the form of larger materials with less fine materials that would potentially erode. These stream types exhibit rapids-dominated bed morphology. Stream bank erosion rates are normally low as are the channel aggradation/degradation process rates. Thirty of the sample sites were this channel type.

"**C**" stream types are described as response streams. This means that they are generally stable if all their developing conditions remain stable. If one of their controlling parameters is degraded, the result is a change in the channel. These channel types have a very high sensitivity to increases in peak flows and/or sediment and a very high stream bank erosion potential, due to the naturally high sediment sources. C stream types are located in wide valleys, constructed from alluvial deposition, with well developed floodplains. They have notably active lateral extension processes, and are inherently dependent on the natural stability of stream banks and stable watershed conditions. In general these streams offer good fisheries habitat. The data show that pools are normally found every 8 bankful widths (BFW's) but have a wide variability probably based on the small sample size for this stream type. The LWD has a very high frequency occurring about 1 every BFW. Bank stability is moderate for these channel types as they display more active bank erosion due to their normal transitional processes. Five of the sample sites were this channel type. One of these sites had the lowest bank stability rating.

"**D**" stream types are multiple channel systems exhibiting a braided pattern with a very high channel width-to-depth ratio. They are usually located in steep depositional fans, glacial outwash valleys and broad alluvial mountain valleys. The bed materials are courser than the bank materials and they have a moderate sensitivity to disturbance. Vegetation plays a significant role in maintaining the stability of the channel banks. Three of the sample sites were this channel type. Two were in Miller Creek and one at the mouth of West Fisher Creek.

"**E**" stream types are considered evolutionary in terms of fluvial process and morphology. While E stream types are considered highly stable systems, provided the floodplain and the low channel width-depth characteristics are maintained, they are very sensitive to disturbance and can be rapidly adjusted and converted to other stream types in relatively short time periods. Three of the sample sites were of this channel type.

"**F**" stream types are the typical entrenched meandering channels. F stream channels can develop very high bank erosion rates, lateral extension rates, significant bar deposition and accelerated channel aggradation and/or degradation while providing for very high sediment supply and storage capacities. Thirteen of the sample sites were this channel type.

"**G**" stream types are entrenched, narrow and deep, step/pool channels. G stream types have very high bank erosion rates and a high sediment supply. G stream types generate high bedload and suspended sediment transport rates. G stream types can be observed under conditions of instability or disequilibria

that are often imposed by watershed changes and/or direct channel impacts. Channel degradation and side slope rejuvenation processes are typical. Two of the sample sites were of this channel type.

Vegetation

Under natural conditions the type and degree of vegetative cover within a watershed is largely defined by the climate and soils that allow it to grow and reproduce. Natural levels of mortality due to wind events, insects and diseases, and fire do occur and can drastically alter the vegetative composition of the watershed. Depending on the degree of mortality and rate of stand decomposition, impacts to stream systems can be significant (Bethlahmy 1975, Tiedemann et al 1975). See the Forest Vegetation section of this document for a more detailed discussion on vegetation condition in the analysis tributaries. Land development, especially for timber harvest and road construction, has influenced vegetative cover throughout the project area. The impact of these activities is discussed in the existing condition portion of this analysis.

Riparian Areas and Wetlands

A healthy riparian area is vital to maintain a functional interface between the terrestrial ecosystem and the aquatic ecosystem. The loss or damage of riparian areas can affect water quality and fisheries habitat by limiting the amount and quality of detritus biomass input. Changes in sediment, water temperature, bank stability, and stream-flow regime can also occur if large percentages of the riparian areas in a watershed are damaged or harvested.

Both live and dead standing trees in riparian zones are an important source of stream shading, and should be retained within the riparian corridor. King (1993) discussed research conducted on sediment production and transport in forested watersheds in the northern Rocky Mountains. He states that LWD from the riparian areas accounted for almost half of the stored sediment in headwater streams.

There are approximately 85 miles of perennial stream channels, 70 miles of intermittent channels and 15 miles of dry draws and in the project area.

There are numerous documented wetlands in the project watersheds. Specifically; Miller, Upper West Fisher, Mill, Iron Meadows, Trapper, and Olsen Creeks all contain wetlands. There are no known wetlands in the proposed activity areas. Other wetlands outside the proposed activity areas would be associated with streams and as narrow strips along the stream banks. These wetlands are about twice as wide as the active stream channel. These areas also act as floodplains. These wetlands can support vegetation such as cattails, willow, dogwood, sedges and reeds. All of these wetlands provide habitat and forage for a variety of wildlife and are effective filters of sediment from off-site erosion. They also store water and sediment during over-bank floods and release water during low flow periods.

Existing Condition

Past Management

Timber harvest and road construction have been the principle management activities in the project area on both private and Forest Service lands. Table 3-28 displays the existing road density and acres of managed lands in the analysis area. This information is presented to show the existing predicted flow regime conditions from all past harvest and roading activities, and does not account for future or proposed timber management activities. Impacts from reasonably foreseeable actions will be discussed under the Environmental Consequences section.

Stream Flow Relationships to Harvest Activity

Because the greatest risk of degrading channel function occurs during high flow periods, it is the increase in magnitude and duration of peak flows that concerns land managers the most. Timber harvest often alters normal stream flow dynamics, particularly the volume of peak flows (maximum volume of water in the stream) and base flows (the volume of water in the stream representing the groundwater contribution). The degree these parameters change depend on the road density, percentage of total tree cover removed from the watershed, and the amount of soil disturbance caused by the harvest, among other things. For example, if harvest activities remove a high percentage of tree cover and cause light soil disturbance and compaction, rain falling on the soil will infiltrate normally. However, due to the loss of tree cover, evapotranspiration (the loss of water by plants to the atmosphere) will be much less than before. Thus, the combination of normal water infiltration into the soil and decreased uptake of water by tree cover results in higher stream flows. In general, timber harvest on a watershed scale results in water moving more quickly through the watershed (i.e. higher runoff rates, higher peak and base flows) because of decreased soil infiltration and evapotranspiration. The creation of openings in a forested canopy would tend to increase snow deposition (Christner and Harr 1982) and wind speeds (Chamberlin 1982). An increase in wind speeds could increase the rate of snowmelt during cloudy and rainy conditions resulting in greater stream flow (Harr 1981).

Water yield increases due to timber harvest activities are a function of canopy reduction and miles of road constructed. Hydrologic responses to these activities will depend on the natural characteristics of the watershed. They can include: increases in snow pack depth, melting rates, surface runoff, subsurface flow interception and landform energy aspects. As discussed under the stream flow regime section, ROS events can occur in the project area drainages. Water yield estimates for the project area were determined using the KNF beta version of the Equivalent Clearcut Acres Calculator (ECAC). This process is a GIS interface with management activity databases (Oracle and TSMRS) that allows watershed specialists to model (estimate) the current equivalent clearcut acres (ECA) within a watershed of interest. The model calculates disturbances based on the "ECA" (Equivalent Clearcut Acre) procedure. For example a 100-acre harvest area with 100 percent canopy removal would equate to 100 ECAs; a 100-acre harvest with a 52% crown removal would equate to 44 ECAs. The ECAC model calculates ECA for a specified watershed based on the most recent and most impactive (greatest crown removal) management activities associated with roads, timber harvest, prescribed fire and wildfire. The ECAC model does not model peak flows or sediment production and transport. Watershed specialists must use additional models, indices, measures, monitoring, site-specific data, and experience to analyze cumulative watershed effects.

The ECAC Model was not designed to develop estimates of flow. The development of flow estimates from ECAC output generally involves separating watersheds by size class and precipitation regime that had already been run through the R1-WATSED model and comparing their results with the above mentioned ECAC process to look at water yield estimates. This procedure has allowed a more simplified analysis path based on ECAs to generate water yield estimates that have been validated by comparison with the R1-WATSED model output. Regression lines created from R1-WATSED outputs are used to determine the number of ECAs required to generate a 1% increase in peak flows and also the number of ECAs that recover each year in a watershed. Copies of the regression graphs are included in the project file.

The ECAC Model was designed as a quick-analysis tool to enable watershed professionals to estimate the potential effects of forest management (harvest and roading). The utility of the Model is that it offers a quick and consistent method of providing information on past and proposed management activities. The values generated by the model are used, in concert with other water resource information, to interpret the potential effects to a stream channel as a result of implementing a proposed land

management activity. Values generated by the model are not to be considered as an absolute measure against verifiable standards, nor by themselves provide an answer as to the effects of implementing the proposed land management activity. Please see Appendix 8 for a more detailed discussion of the models used in this analysis.

There is one active stream flow measurement location in the proposed project watersheds and four located downstream of the project area on the main stem of the Fisher River. The stream flow station on West Fisher Creek was started in 2001 and 21 flow measurements ranging from 20 cubic feet per second (cfs) to 560 cfs have been completed. When reviewing a streams' stage/discharge relationship, the regression equation of the plotted data computes an R^2 value. In a perfect world (or a concrete flume study) the relationship equals 1.0, where an increase in water stage (feet) equals a corresponding increase in water volume (cfs). For natural stream systems if the R^2 value can maintain a R^2 value greater than 0.75 over the course of many years, the stream channel is considered to be stable. Values less than this are indicative of a stream channel in transition (either good or bad). Table 3-27 displays the existing R^2 values for the stream flow stations reviewed for this analysis.

Table 3-27
Stream Flow Information

STATION LOCATION	NUMBER OF MEASUREMENTS	R^2 VALUE
West Fisher Creek	21	0.94
Fisher River at US Hwy 2	15	0.95
Fisher River below Cow Creek	11	0.97
Fisher River below Smoke Creek	15	0.57
Fisher River at USGS Station	345	0.93

As can be seen from the data in the table above, the majority of the stream flow stations have a R^2 value that indicates it is a stable system. For the sites on the main stem of the Fisher River it is interesting to see the inherent stability of three of the locations while the Smoke Creek location is unstable. There is a large depositional bar below the measurement location and a large eroding bank above the measurement location. These two factors account for a good portion of the instability seen at this site. In general it can be said that as harvest and roading increases, there is a corresponding decrease in stream channel stability in the tributary channels to the Fisher River. For the main stem of the Fisher River, that system seems to have found its own threshold of stability for a portion of its length. It is unclear if the threshold is increasing or decreasing at this time due to the limited time frame the sites have been monitored. The location of the USGS stream flow station has been very stable since 1969.

Roads

Road systems increase the amount of compacted soil in the watershed and increase the size of the peak and advance the timing of the runoff for the watershed. The roads act as "tributaries" that intercept and redirect surface and subsurface water that would normally be filtered by the forest duff and soils (Wemple 1994). This redirected water is transported to the creek via the road ditches in larger quantities and shorter time periods. This leads to earlier and larger peak flows than would naturally occur. Roads are also one of the greatest sources of aquatic habitat degradation. Roads significantly elevate onsite erosion and sediment delivery, disrupt subsurface flows essential to the maintenance of base flows, and can contribute to increased peak flows. Road densities and water yields for the project watersheds and the Fisher River are displayed in Table 3-28. The data in the table includes the information from the Smoked Fish EA in regards to the larger Fisher River Basin. There are approximately 1,150 stream crossings in the Fisher River Basin.

Table 3-28
Water Yield Results - 2006

Drainage	Watershed Size (acres)	ECA (acres)	Cumulative Water Yield Increase (%)	Road Density (miles/mi2)
Miller Creek	7,563	1,253	7.4	2.56
West Fisher Creek	28,950	2,160	3.1	2.25
Silver Butte Creek	29,934	570	0.8	1.07
Fisher River	250,551	54,613	3.7	4.8

Floodplains

From the data that has been collected to date, channel conditions are mostly stable, and stream banks are well armored where no riparian harvest has occurred. There are isolated locations of in-channel erosion in the project watersheds. Adequate floodplain is available in all watersheds, but floodplains along the main stem of the Fisher River have been encroached by the railroad and the road 763, the Fisher River Road.

Channel Morphology

Increased peak flows can also impact channel geomorphology. Rosgen channel typing and RMO data was collected on 45 sites in project area streams between 1996 and 2005. All fifteen sites in Miller Creek were re-sampled in 2005. The vast majority of streams in the project area are in a stable morphological state. Stream width-to-depth ratios and channel bankful widths follow a normal pattern of increasing as the drainage area above the site increases, indicating that the channels are not changing drastically to meet the added inflow as tributaries are added to the system. All of the survey sites meet the desired width/depth (W/D) ratio based on channel morphology research (Rosgen 1996). Bank stability measurements at the sample locations are above that of data collected for reference locations across the Libby Ranger District at all locations except 5: Miller Cr. #'s 10 and 12, West Fisher Cr. # 3, Silver Butte Cr. #1, and Waloven Cr. #1. Bank stability is of prime importance in maintaining quality habitat conditions and reducing sediment introductions into the water column. The number of existing pools is below what would be expected in the majority of the sites in Miller Cr. (#'s 1, 3, 4, 5, 8, 11, and 13) although 4 of the sites showed an improving trend between 1998 and 2005. Sites not meeting pool numbers in Silver Butte Cr. Include #'s 1, 2, 2a, 4, and 6. Also: Waloven Cr. #2, Iron Meadows Cr. #1, West Fisher Cr. #'s 1, 3, 5, Bramlet Cr. #9, and Standard Cr. #11 do not meet the desired numbers of pools. Large woody debris is generally well distributed throughout the watersheds but 3 sites were found to be lacking. They include Miller Cr. #15, West Fisher Cr. #1, and Lake Cr. #7.

Water Quality

Roads affect water quality by contributing sediment to surface waters. Sediment is derived when road rock is crushed by traffic, then carried to streams by runoff; or derived from road erosion problems such as road fillslope, cutslope or road induced landslides. Inadequate drainage structures on roads can cause water to run long distances in wheel ruts, picking up speed and sediment that can be delivered to streams if not properly dispersed back onto the landscape. Reconstruction of haul routes to meet BMP standards corrects this situation as does road storage and decommissioning.

Erosion

Erosion is a natural process of geologic decomposition that occurs in all watersheds, and all stream systems need to transport this sediment downstream. There are three basic types of erosion: detachment and routing of individual soil particles from the land surface, mass movement such as landslides and slumps, and detachment and mobilization of stream channel banks or substrate material.

Sediment

Sediment can refer to a wide range of stream channel particle sizes, i.e., silt, sand, boulder, etc. All of the above processes can produce sediment throughout the range of size classes. In general, the larger particle sizes are produced through bank cutting or mass wasting. Finer particles, suspended in flowing water, are the main concern in relation to water quality. Management activities have the potential to alter these erosion processes and cause increases in sediment concentrations within the water column and the stream bottom substrate.

Timber harvest and road construction activities that remove forest canopy increase snow pack depths and melting rates, resulting in increases in surface runoff. These same activities cause varying degrees of soil exposure, soil compaction, and surface runoff routing. Given the right conditions, this additional runoff and suspended sediment can be transported to stream channels. Increases in surface flow during runoff events generally result in an increase in peak stream flow. As this peak discharge approaches magnitudes and durations beyond normal conditions, bank cutting, bedload movement, and mass slope failure can occur.

Stream Channel Sensitivity

The stream channel classification system developed by Rosgen (1996) has been used to morphologically describe stream systems operating within states of dynamic equilibrium. The classification process addresses questions such as sediment supply, stream sensitivity to disturbance, potential for natural recovery, and channel response to changes in flow regime. Forty-five sites in the project area were analyzed using the Rosgen channel typing method. The major channel types found in the project area are “B4” and “F4”.

Stream channels are variable in how they respond to changes in the natural levels of runoff (peak flows) and/or the amount of sediment that is input into the stream system. The response of streams to increased levels of these items above natural levels is dependent on the makeup of the stream channel and how that particular stream channel recovers from disturbances. The response of streams to imposed change is not uniform among stream types. Table 3-29 lists the interpretations for the stream’s sensitivity to changes in flows and sediment, recovery potential, natural sediment sources from the stream channel, and stream bank erosion potential for the geomorphic stream types found in the assessment area.

Table 3-29
Sensitivity of Stream Types in the Project Area to Changes in Stream flow and/or Sediment Supply (Rosgen 1996)

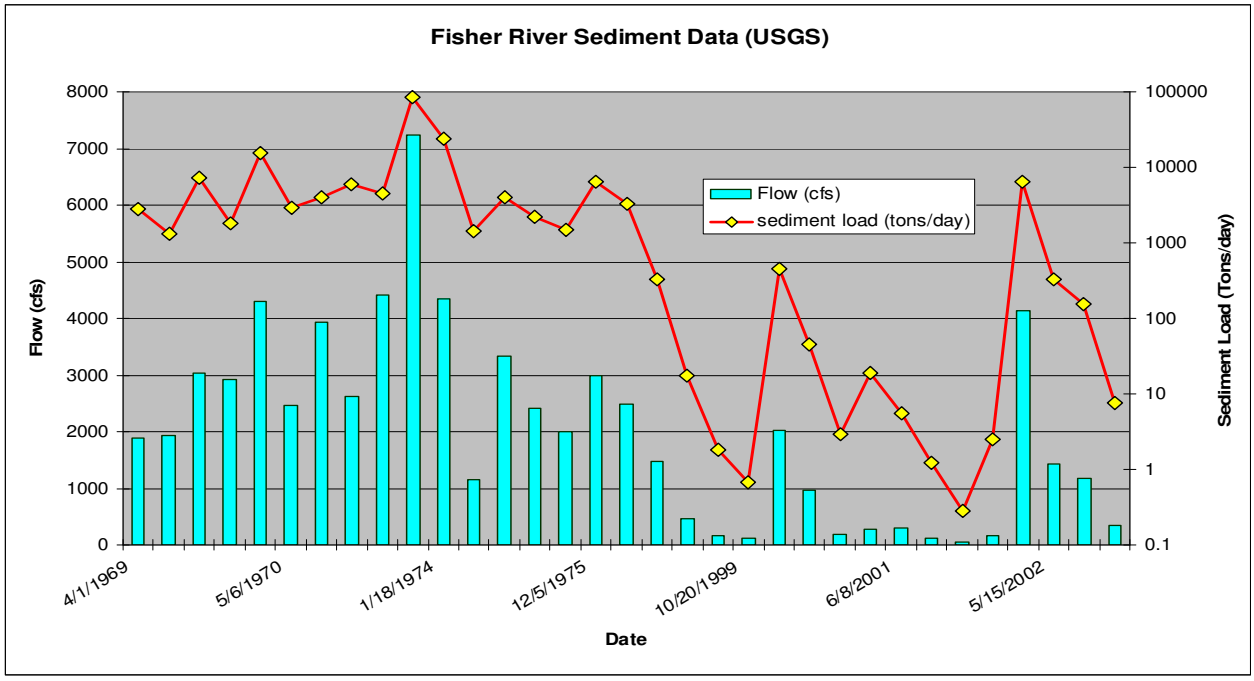
Rosgen Stream Type	Sensitivity to Increased Peak Flows and/or Sediment	Recovery Potential*	Natural Sediment Sources from Stream Channel	Stream bank Erosion Potential
A 3/4	extreme	very poor	very high	very high
B 3/4	moderate	excellent	moderate	low
C 3/4	very high	good	high	very high
D4	very high	poor	very high	very high
E5	very high	good	moderate	high
F 3/4	extreme	poor	very high	very high
G4	extreme	very poor	very high	very high

***The recovery potential assumes natural recovery once the cause of instability is corrected.**

Figure 3-1 displays selected flow and TSS conditions for the USGS measurement station on the main stem of the Fisher River above its confluence with the Kootenai River for selected dates between 1969 and 2004 and is presented to display the variability of the flow/suspended sediment relationship.

Newcombe and MacDonald (1991) discuss the effects of suspended sediments in aquatic ecosystems. Their work looks at not only the value of sediment concentration, but also the time period the sediment remains in the system. In general, their study shows that the longer a specific value of suspended sediment is in the ecosystem, the more damage it will do. The data shows a general trend of lowering sediment concentrations over the period. Monitoring completed by Wegner (1998) has shown that instream work involving culvert removals and stream channel reconstruction activities usually results in sediment inputs that last for less than 24 hours.

Figure 3-1: Sediment Data for the Fisher River



Nutrients and Contaminants

Because of the low road crossing density on perennial streams in the project watersheds, nutrients and contaminants are very low concerns with respect to water quality. The Fisher River is included on the state of Montana's (1996 -2004) 303(d) bi-annual list of impaired water bodies (305(b) Report). It is listed as partially supporting aquatic life and cold-water fishery. Probable causes of the impairments are listed as: nutrients, habitat alterations, thermal modifications, and siltation. Sources of impairment are listed as: agriculture, silviculture, removal of riparian vegetation, and channelization. The basin remains on the list and has the date of 2012 scheduled for the completion of a TMDL.

Water quality, as defined by macroinvertebrate populations, has been reviewed for the three locations in the project area and just down stream of the project area. Figures 3-2 through 3-7 display both macroinvertebrate community data and stream core fine sediment data. These two types of data show trends in water quality in the area and potential impacts to aquatic species. Biotic Condition Index (BCI) is an indication of how close an aquatic ecosystem is to meeting its own potential. The BCI is a prediction of the unimpacted benthic aquatic macroinvertebrate community structure based on physical and chemical variables. Invertebrate samples with BCI's > 90 are considered to come from streams in excellent condition, 80-90 good condition, 72-79 fair condition, and < 72 poor condition (Vinson 2003).

Stream core fine data was collected following the methods in Weaver and Fraley (1991). In general, their analysis of stream core data in respect to the level of percent fine material (< 6.35 mm) shows that

for both bull trout and westslope cutthroat trout that emergence success of fry is greatly diminished at levels where fine material makes up over 30% of the sample.

The data for West Fisher Creek shows a steady trend in water quality that remains in the good to excellent category while there is a corresponding downward trend in stream sediments. Data collected at reference locations have shown a constant level of excellent water quality where no management activities have occurred in the same time period. The sites on the Fisher River also show a decreasing trend. The upper site at US Highway 2 has shown a drop from excellent conditions to fair with a corresponding slight increase in fine sediments. It is assumed that given the right conditions that even the Fisher River could maintain an excellent water quality rating. The upper site in Silver Butte Creek shows a gradual drop from excellent to fair conditions with stable fine sediments, while the lower site has generally remained in an excellent condition with differing amounts of fine sediments. The site in Himes Creek is considered a reference location because no logging or road building has occurred and has displayed stable, excellent water quality levels and stable, low amounts of fine sediments.

Figure 3-2 - West Fisher Creek Sediment and Macroinvertebrate Data

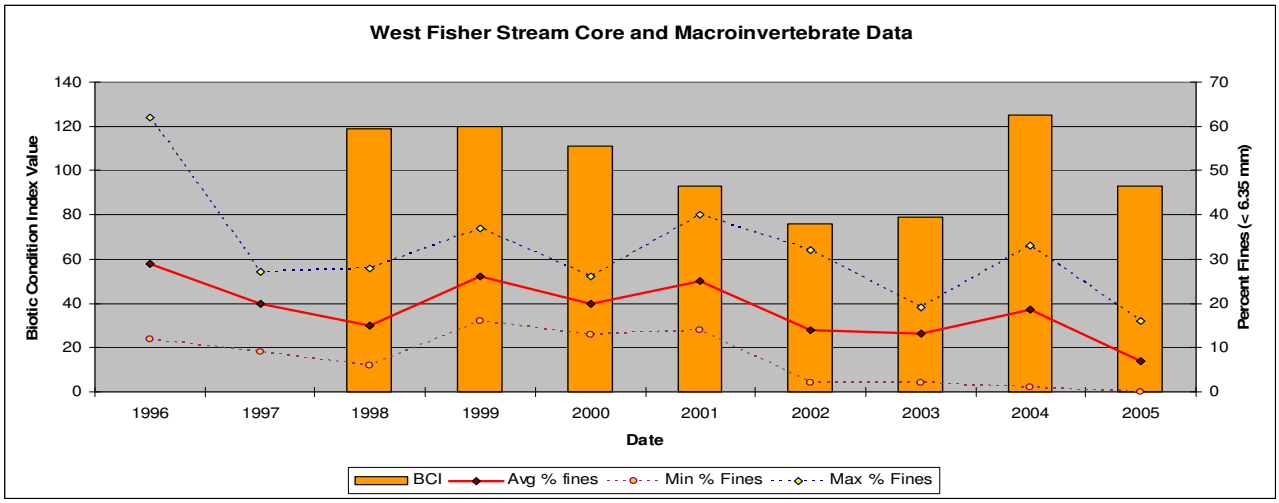


Figure 3-3 - Fisher River at US Highway 2 Sediment and Macroinvertebrate Data

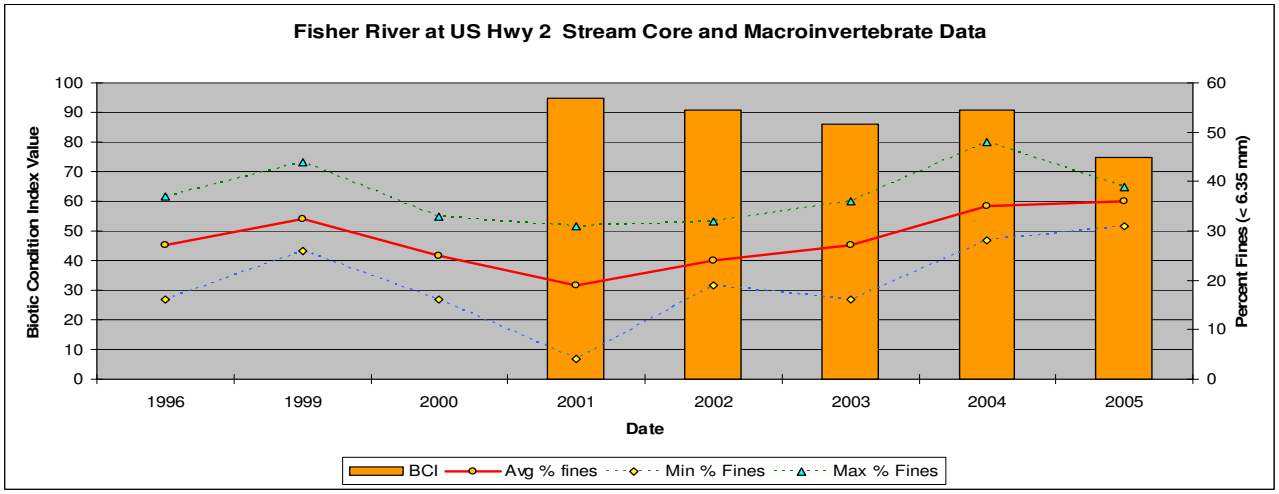


Figure 3-4 - Fisher River at USGS Station Sediment and Macroinvertebrate Data

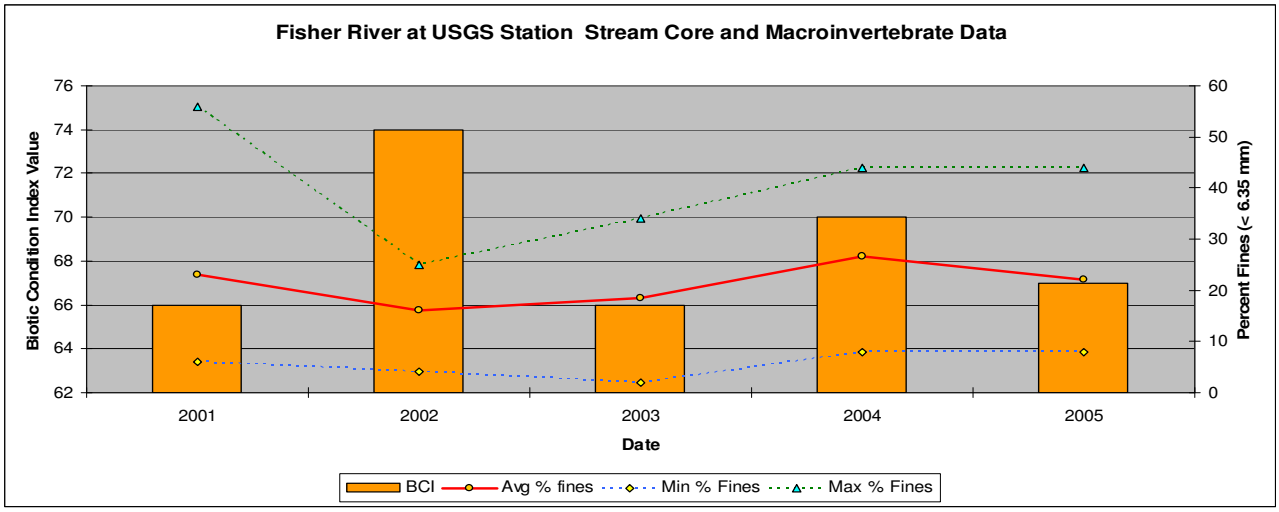


Figure 3-5 - Upper Silver Butte Creek Sediment and Macroinvertebrate Data

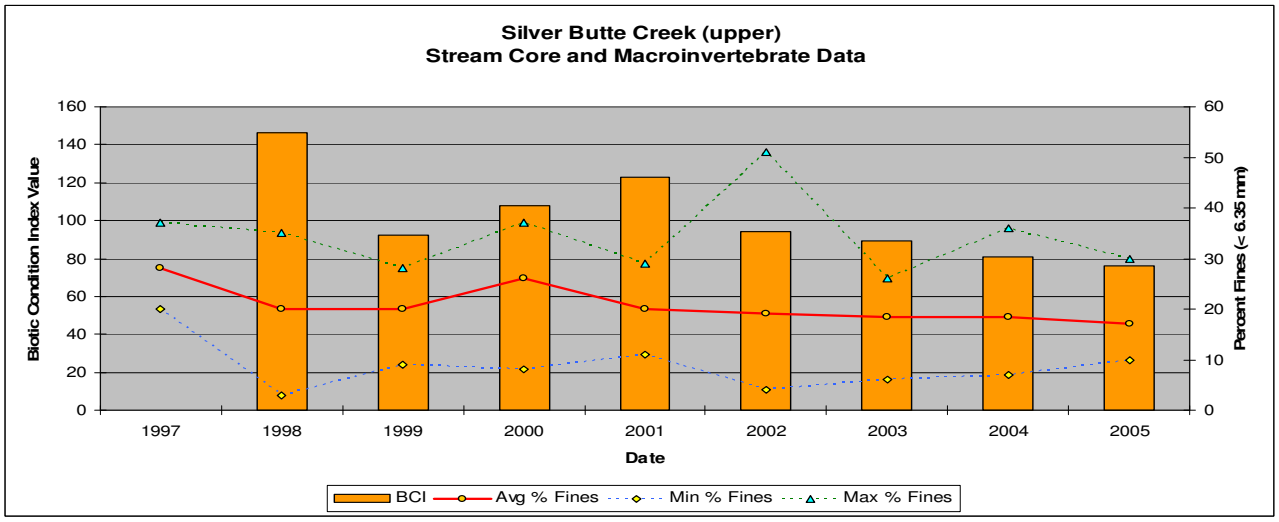


Figure 3-6 - Lower Silver Butte Creek Sediment and Macroinvertebrate Data

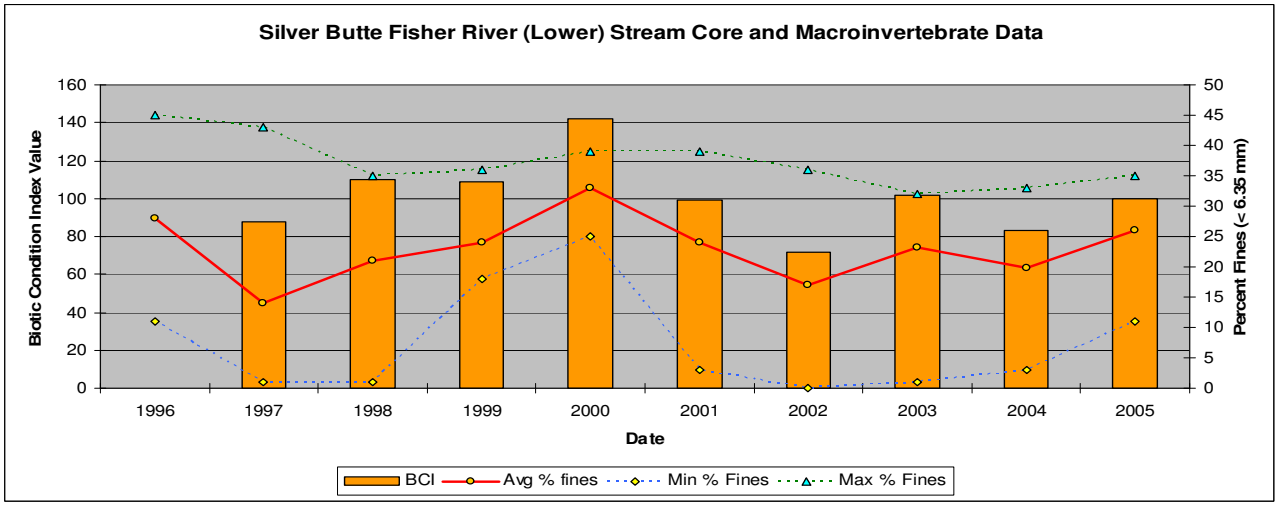
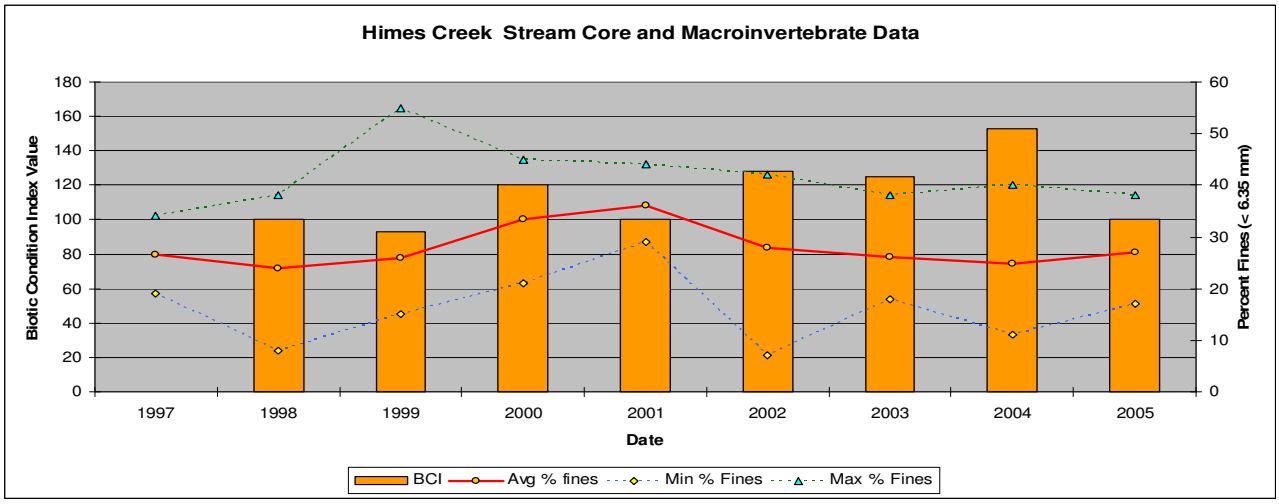


Figure 3-7 - Himes Creek Sediment and Macroinvertebrate Data



Riparian Habitat Conservation Area's (RHCA's)

Roads within riparian zones reduce shading and disrupt large woody debris sources beyond the life of the road. These effects degrade habitat by increasing fine sediment levels, reducing pool volumes, increasing channel migration and exacerbating seasonal temperature extremes. The largest road impacts in the project watersheds come form road crossings, as there are no long sections of road within RHCAs. Approximately 50% of the riparian areas in the project areas have experienced some level of timber removal; the tributaries have seen greater levels of management with approximately 60 % the tributaries having seen management activities. All of the watersheds in the project area have low to moderate stream crossing densities. Based on aquatic screening data (in project file) all of the project watersheds are considered to be functioning at risk.

Desired Condition

The following is a general description for the desired condition of stream systems in the project area. The natural characteristics of a watershed, such as annual precipitation, soil types, geology and vegetative cover will determine to what extent the ground disturbing activities may affect channel morphology, flow regime, water quality and ultimately downstream beneficial uses.

Under natural conditions a stream system is in a balanced state, neither static nor chaotic. It is continually changing in response to natural cycles of precipitation/runoff, geologic decomposition and vegetative succession. Normally these changes are of low degree and short duration, so that over time the stream is maintained by its physical, chemical and biological components. Natural events outside the routine cycle do occur, however, and may lead to stream changes beyond the normal short-term fluctuations. For example, unusually high levels of rain or snow may result in higher than average peak flows, or higher than average winds may result in wind thrown trees in the channels or wildfires may result in increased flows or erosion. Increased or diverted flows can result in bank cutting, bedload movement, scour and deposition. Increased sedimentation would alter flow patterns and velocities.

The desired condition is one of dynamic stability. The streambed and banks are stable, with naturally occurring disturbances providing short-term fluxes in the overall stability. Riparian vegetation contributes to stream bank diversity and stability; provides organic energy to the food chain; moderates stream temperatures both in summer and winter; provides input of large organic debris to the stream for streambed stability, sediment storage, and pool forming structures, provides filtering areas for down slope eroding sediment; and provides small organic debris for ground cover and soil nutrient cycling.

Water quality parameters, such as temperature, turbidity, dissolved oxygen, pH, alkalinity, and mineral content will be maintained at their natural, high quality levels, in accordance with state water quality laws. Wegner (1999) discusses the benefits of completing road storage and decommissioning activities that will help to improve the water quality and decrease the amount of detrimental soil conditions in the project area. The result of this work would also begin the process of removing the Fisher River from the State of Montana's 303(d) list of impaired streams.

There are over 85 miles of perennial stream in the project area. The remaining stream channels in the project area are intermittent in nature and comprise 49% of the channel network. The desired condition would be to improve riparian vegetation, which helps to increase shade, filter sediment from overland flow, and provide cover for aquatic organisms in the wetland and stream channels. Existing sediment sources, particularly those associated with roads would be eliminated through road storage and decommissioning activities, and by bringing roads into compliance with INFS standards and best management practices (BMP's). A Roads Analysis Process (RAP) has been completed for the Fisher Analysis Area (report in project file). That document indicates that approximately 75 miles of road in the Fisher Analysis area should be placed into a hydrologically neutral condition to help the sub-watersheds, and ultimately, the Fisher River begin to recover from past activities. Please see Table 2-3 for a list of the roads proposed for storage or decommissioning in the proposed action and Appendix 5 for a discussion on the techniques used to complete the activities.

BMPs have proven to be a cost effective treatment to help restore and maintain channel stabilities by improving stream crossing structures to a size where they will pass woody material and bedload, thus not constricting the channel where it meets a road. The implementation of road BMP's also helps reduce sediment delivery from road surfaces and ditches to live streams. This helps to lower sediment inputs to streams but also helps to off-set changes in flow dynamics caused by the efficient routing of captured water by road networks. Please refer to Appendix 2 for a discussion of the BMP process used on the Libby Ranger District, and Appendix 7 for a list of specific BMP's for this project.

Concerns and Opportunities

Water quality is the principle watershed concern in the project area. Past management activities include timber harvest, mining, and road construction, which are the major factors influencing both water and soil quality. The following are general objectives for watershed opportunities: 1) maintain/improve water quality, 2) minimize erosion, sedimentation, and soil compaction, 3) maintain/improve the integrity of riparian zones and wetlands, 4) identify and correct all existing unnatural sources of sediment.

PCTC and the USFS plan timber harvest in the larger Fisher River watershed as presented in the Smoked Fish EA (2006). Plum Creek Timber Company (PCTC) also has long-range timber harvest possibilities (2007-2020) in the project area. These plans include: 362 acres in Miller Creek, 235 acres in Silver Butte Creek, and 270 acres in West Fisher Creek. All harvest is planned off existing road systems. Because of shifting timber markets and the need for private companies to remain flexible in there actions, this potential harvest will be accounted for at the same time the proposed USFS harvest would occur. This should account for all probable activities in the watershed for the near future. These actions are described in the cumulative effects discussion for each alternative.

The Fisher River is included on the State of Montana's 1996 – 2006, 303(d) bi-annual list of impaired water bodies (305(b) Report). It is listed as partially supporting aquatic life and cold-water fishery. Probable causes of the impairments are listed as: nutrients, habitat alterations, thermal modifications, and siltation. Sources of impairment are listed as: agriculture, silviculture, removal of riparian vegetation, and channelization.

There are numerous opportunities for in-stream restoration activities in the West Fisher watershed where streambank erosion above and below bridges has occurred. This is especially true on FS Road 231 where it crosses Trail Creek, Lake Creek and Upper West Fisher Creek. In the Fisher River watershed, the Forest Service and PCTC have been actively cooperating at trying to obtain funding to complete instream projects to improve bank stabilization and pools and introduce large woody debris into the main stem of the Fisher River. Funding for one of these projects has been obtained and the project was completed in the 2007. Additional restoration activities will most likely come from partnership grants or appropriated dollars.

The Fisher RAP identified 14.2 miles of road work in the Silverfish Planning Subunit (project area). Due to existing grizzly bear core areas in Miller creek, 2 miles of proposed work had to be dropped from this proposal. The remaining work to be approved includes, 0.9 miles of road decommissioning and 11.3 miles of road that would be placed into “temporary stored service”.

ANALYSIS METHODS

Measurement and Issue Indicators

The following indicators were used to describe the existing condition for streams in the project area, and subsequent impacts of the proposed activities on those indicators. Although some of the indicators have a numerical standard associated with them, others are discussed only in qualifiable terms based on best professional judgment.

Hydrology (changes in flow volume)/ Geomorphology (instream channel conditions)

The Kootenai National Forest Plan contains water yield guidelines based on instream resource values (Guidelines for Calculating Water Yield Increases, Appendix 18, KNF Plan). The amount of road density and ECA changes also tier to the discussion of changes in stream flow volumes. Stream geomorphology conditions are based on data collected using techniques by Rosgen (1996). There are no Forest Plan standards for stream width-to-depth (W/D) ratios. Based on the current INFS direction (which was developed for streams draining the West side of the Cascade Mountains), a stream that is functioning appropriately should have a W/D ratio of less than or equal to 10. Based on current geomorphologic data from reference locations on Libby Ranger District (analysis in project file), the W/D ratio can be variable and is determined by the surveyed channel type. Based on those findings, A, E and G channel types have W/D ratios less than 12. Channel types that fall into the B, C, D and F categories have W/D greater than 12. The INFS standard for percent stable banks is greater than 80 percent stable.

The channel systems in the project area watersheds generally have bankful widths of less than 20 feet. Use of the standard INFS guidelines results in a desired pool frequency of 56 pools per mile or approximately 1 pool every 94 feet. A review of data collected from reference reaches on the Libby Ranger District indicates that for streams of this channel geomorphic type and size there should be a pool every 35 feet, and a piece of large woody debris every 20 feet. Bank stability in riffle sections of the channel should occur over 96 percent of the reach. There is no reference data available for larger stream systems such as the Fisher River which has an average bankful width of 100 feet. The INFS standards for channels of this size are 1 pool every 293 feet.

Riparian Management Objectives (RMO's)

INFS identifies numerous riparian management objectives using data from stream inventories. Included in this analysis are: pool frequency, large woody debris, and water temperature. These objectives have

been determined to be good indicators of ecosystem health and represent a good starting point to describe the desired condition for stable streams and fish habitat. Please see the fisheries section for a more detailed discussion of RMO's. The following categories were developed from the RMO's with specific attention to the water resource: Water Quality, and Riparian Habitat Conservation Areas.

Water Quality (temperature, sediment, nutrients and contaminants)

The Kootenai National Forest Plan, as amended by INFS, contains numerical standards for temperature but does not contain any standards for water quality other than a statement to meet or exceed State Water Quality Standards. There are no standards for sediment in the Forest Plan. For purposes of this analysis a qualitative assessment of existing and potential sediment is included, based on landtypes, stream channel types, and existing sediment sources. There are no numerical standards for nutrients and contaminants in the Forest Plan. Indicators are based on a qualitative assessment of levels from various sources and on the determination of water quality limited segments as identified in the State of Montana's 303(d) list of impaired water bodies.

Riparian Habitat Conservation Area's (RHCA's)

Disturbance history of riparian areas is of concern as it pertains to direct impacts to stream channels. An RHCA map for streams in the project area has been completed and was used to help in unit layout and design. A copy of the map is included in the project file.

Data Collection and Analysis

Rosgen channel typing and RMO data was collected on 45 sites in project area streams between 1996 and 2005. All fifteen sites in Miller Creek were resampled in 2005. There are nine existing flow monitoring stations in the Fisher River analysis area with over 200 measurements having been collected since 1992. Data is currently being collected in West Fisher, Fawn, Cody, Alder (2 sites), and Cow Creeks and three sites on the main stem of the Fisher River. The USGS has maintained a flow station on the Fisher River since 1948. More recently the USFS in cooperation with Plum Creek Timber Company have begun flow and suspended sediment sampling at three additional locations on the mainstem of the Fisher River in an effort to better characterize the system. All the mentioned data is kept in the district watershed files. Basic water quality parameters are also analyzed on samples collected during flow measurements. These include total suspended sediments, specific conductance, and pH.

ENVIRONMENTAL CONSEQUENCES

General Timber Sale and Road Impacts

Under natural conditions, a stream system is in a state of dynamic equilibrium. A stream channel develops over time by adjusting to changes in climate, flow regimes, and sediment inputs. Timber management activities can upset this balance by directly impacting the stream channel or adjacent stream banks. For example, road construction across stream channels can immediately increase sediment concentrations in the stream flow and harvest activities in riparian areas may add slash material to the channel, cause bank sloughing to occur or reduce shading, leading to modified water temperatures.

The cumulative effects of altering upslope runoff/erosion processes increase the possibility of indirectly changing the natural balance of the stream system. A reduction in the forest canopy can increase snow packs and melting rates. Heavy equipment operation could compact soils, thereby accelerating surface runoff. Skid trails and roads could intercept surface and subsurface flows and route this water down

slope. Riparian harvest activities may decrease the ability to filter upslope erosion or alter channel geomorphologic processes by reducing large woody debris in the channel. It can also affect water temperature regimes and eliminate stream habitat cover. Vegetation removal can also destabilize marginally stable slopes by increasing the subsurface water load, lower root strength, and alter water flow patterns on the slope. Road crossings can also partially constrict or channelize flows and limit a streams ability to maintain pools. As stream flow or sediment concentrations increase, the natural energy balance within the stream flow changes. Stream channels that are out of equilibrium exhibit varying degrees of bank cutting, channel scour, sediment deposition and channel braiding.

Management activities that disrupt the natural balance of stream systems may do so for as little as one day, or may continue for many decades. Surface erosion production from newly constructed roads normally drops rapidly within one to four years following construction. Although the level of erosion drops considerably with time, some lower level of increased erosion occurs as long as the roads are on the landscape. Increases in surface runoff due to timber removal may take 70-90 years for hydrologic recovery to occur.

Timber harvest activities such as road building and use, skidding logs, tree harvesting and burning increase the amount of bare, compacted soil exposed to rainfall and runoff resulting in higher rates of surface erosion. Some of this hillside sediment can reach streams via roads, skid trails, and/or ditches. Appropriate management precautions such as avoiding timber harvest in wet seasons, maintaining buffer zones below open slopes and skidding over snow can decrease the amount of surface disturbance and subsequent erosion. Harvest activities can also greatly increase the likelihood of mass soil movements occurring, particularly along roads and on clearcuts in steep terrain. Increased surface erosion and mass soil movements associated with timber harvest areas can result in an increase of sediment inputs to streams. Fine sediments infiltrate into streambed gravels affecting aquatic populations (Chamberlain 1982, Weaver and Fraley 1991).

Effects by Alternative

The hydrology analysis accounts for all land disturbing activities (past, present and proposed) within the watersheds. The effects analysis is based on the proposed activities displayed in Chapter 2. Alternative 1 is the no action alternative, which implies that none of the USFS activities displayed in Chapter 2 would be conducted. Alternative 1 does include the proposed harvest activities by PCTC. Alternative 2 is the proposed action. Alternative 4 is economically feasible, and addresses some issues raised during scoping. Alternative 6 analyses a different power line route for the cumulative effects of the Montanore Mine. Alternative 7 meets all Forest Plan standards. The analysis for all action alternatives includes the effects of implementing a portion of the Fisher RAP proposal through the timber sale. The remainder of the RAP work would be completed when funding was secured.

Alternative 1 – No Action

Direct and Indirect Effects

Timber harvest and other activities as proposed for this project would not occur under the no-action alternative. However, natural changes in climate and vegetation would continue to occur. Vegetative regeneration would continue on existing harvest units resulting in lower surface runoff and melting rates. Existing roads and skid trails would continue to intercept subsurface flows although sediment delivery from cut and fill slopes would decrease to a lower but constant level as stabilization and revegetation occurred.

Cumulative Effects

The no action alternative includes timber harvest on private lands in the project watersheds. Plum Creek Timber Company (PCTC) has long-range timber harvest possibilities (2007-2020) in all of the proposed project areas. These plans include: 362 acres in Miller Creek, 235 acres in Silver Butte Creek, and 270 acres in West Fisher Creek. All harvest is planned off existing road systems.

Please see the beginning of Chapter 3 for a detailed description of these activities. The harvest delay could give the watershed some recovery that has not been taken into account for this analysis due to the great variability in the private timber industry. The results displayed in Table 3-30 assumes that PCTC will complete all the activities in 2007, and assumes the ongoing natural vegetative and hydrologic recovery in the past harvest areas.

PCTC also plans on logging other areas in the Fisher basin between 2007and 2020. These activities were analyzed in the Smoked Fish EA and are incorporated by reference. The total ECA's in the time period are projected to be 7,712 acres. Because of the variability in the private timber industry, these harvest acres were analyzed for the year 2007. This harvest activity is anticipated to require the construction of 48 miles of additional road (equivalent to 192 ECAs) in the Fisher Basin (based on an average PCTC road density of 4 miles/square mile). Three recently completed USFS timber sale EA's within the Fisher River basin have also been included in this cumulative effects analysis for the Fisher River. The Alder Creek sale included 180 ECA's, the Cow Creek sale included 614 ECA's, and the Smoked Fish EA included 494 ECA's.

Table 3-30
Water Yield Results - Alternative 1 (2007)

Drainage	Watershed Size (acres)	ECA (acres)	Cummulative Water Yield Increase (%)	Road Density (miles/mi2)
Miller Creek	7,563	1,615	9.5	2.56
West Fisher Creek	28,950	2,430	3.5	2.25
Silver Butte Creek	29,934	805	1.1	1.07
Fisher River	250,551	63,192	4.3	4.8

Watershed Condition Discussion

Under the no action alternative the proposed PCTC activities in the project watersheds will be implemented and add to the existing peak flow level. The geomorphic channel types in West Fisher Creek, Miller Creek, Silver Butte Creek and the main stem of the Fisher River have a moderate to very high sensitivity to increases in stream flows. It is not expected that the cumulative peak flow increases in any of the drainages will cause a change in the existing stream channel stability. The Miller Creek drainage will remain below the Forest Plan standard of 15% peak flow and the majority of the harvest activity is located at the lower end of the watershed. No additional road construction is expected in any of the watersheds. The cumulative effects analysis associated with the Fisher River basin have been lumped into one year (2007). Because the proposed harvest actually extends to the year 2020, the amount of recovering ECAs in that time period will more than offset the additional harvest acres from the PCTC activities. Even with all the ECAs being lumped into one year the resulting increase is 0.6% in the Fisher basin. This level of water yield increase would be very difficult to separate from the amount of natural variability in the system and should be considered insignificant in the Fisher basin.

Alternative 2, Proposed Action

Activities proposed with this alternative include 1.2 miles of new road construction, timber harvest, site prep (burning and grapple piling), slashing, pre-commercial thinning and ecosystem burning on 6,034 acres resulting in the creation of an additional 2,540 ECA's in the project watersheds. The road projects listed in Table 2-3 are also included in this proposal. Only a portion of the road storage work would be completed through the timber sale although all of the RAP proposal in the Silverfish Planning Subunit would be approved for completion. In order to conduct timber harvest, landings and skid trails must be constructed, although exact locations are unknown at this time. Direct impacts are associated with activities within stream channels and/or riparian areas. Indirect impacts are associated with activities outside of these areas, which can influence water and sediment levels. Cumulative impacts also include the activities described in Alternative 1, above.

Direct and Indirect Effects

Alternative 2 proposes the construction of 1.2 miles of new road to access Units 129, 130, and 131. This road would be decommissioned after use. One new stream crossing may be necessary. Construction of landing areas, 42.72 miles of road reconstruction, and upgrading of stream crossing structures to meet BMP standards are also proposed. The Fisher RAP indicates that approximately 67 miles of USFS road in the Fisher analysis area should be considered for placement into a hydrologically neutral condition to help the sub-watersheds, and ultimately the Fisher River, begin to recover from past activities. Please see Table 2-3 for a list of the roads to be stored or decommissioned in this project area and Appendix 5 for a discussion on the techniques used to complete the activities. The Fisher RAP includes 20.85 miles of potential road work located in the Silverfish Planning Subunit. Due to existing grizzly bear core areas in Miller creek, 2 miles of proposed work had to be dropped from this proposal. Alternative 2 proposes that 11.36 miles of road that would be placed into "intermittent stored service". Of this work, 0.89 miles would be completed through the timber sale contract. The remaining miles would be completed when funding was obtained. Funding for these activities would most likely come from partnership grants and appropriated dollars.

The road storage work would leave the roads undrivable and in a stabilized condition. The proposed work includes the removal of 10 stream crossings structures that would result in the direct input of sediment to stream channels in the analysis area. The road projects are designed to improve the stability of these crossings. They would have a short-term detrimental effect on water quality but would result in long-term beneficial effects as a result (Wegner 1999).

Included in this alternative are 1,119 acres of fuel reduction using prescribed fire in West Fisher Creek, 1,781 acres in Silver Butte Creek and 275 acres in a face drainage to the Fisher River. Slashing and low intensity underburning has had no measurable effect on the water resource from past burns completed on the Libby Ranger District (see district BMP monitoring files).

Access changes as listed in Table 2-4, proposed for this alternative would likely have a beneficial effect on the water resource, though this benefit may not be measurable. Fuels reduction and hazard tree removal in Lake Creek Campground will have no measurable effect on the water resource.

Proposed trail work, tree planting, precommercial thinning, and fuels reduction and hazard tree removal in Lake Creek Campground would not have a measurable effect to watershed.

Cumulative Effects

As discussed previously for Alternative 1, PCTC plans to complete timber harvest in the project watersheds through 2010. Please see the Current and Foreseeable Actions section of Chapter 3 for a

detailed description of these activities. That delay could give the watershed some recovery that has not been taken into account for this analysis due to the great variability in the private timber industry. The proposed USFS harvest activities will add 1,757 ECA's in the following project watersheds: West Fisher, 599 acres; Silver Butte, 102 acres; and Miller, 1,056 acres. As mentioned above, 0.89 miles of the road storage work would be completed through the timber sale. The results of these activities are displayed in Table 3-31 and assume that PCTC and the approved USFS timber sales will all be completed in 2007. While the USFS timber sales will be later than 2007, the analysis was completed to look at all sales occurring at once for a "worst case" scenario relative to watershed.

Approximately 5 miles of road storage work in the Riverview Planning Subunit, Fisher River drainage, was completed in 2007 as required mitigation for the Smoked Fish EA. The remaining road storage for the Riverview Planning Subunit was completed in 2008. This work will help trend the Fisher River WQLS in a positive direction, reducing sediment inputs from road stream crossings.

Table 3-31
Water Yield Results - Alternative 2 (2007)

DRAINAGE	WATERSHED SIZE (ACRES)	ECA (ACRES)	CUMMULATIVE WATER YIELD INCREASE (%)	ROAD DENSITY (MILES/MI^2)
Miller Creek	7,563	2,698	15.9	2.56
West Fisher Creek	28,950	3,346	4.8	2.25
Silver Butte Creek	29,934	1,305	1.8	1.07
Fisher River	250,551	65,732	5.1	4.2

The proposed USFS timber harvest and the PCTC activities add to the peak flow level in each of the project watersheds. Increased peak flows can impact channel geomorphology. Rosgen channel typing and RMO data collected between 1996 and 2005 show that the vast majority of streams in the project area are in a stable morphological state. Stream width-to-depth ratios and channel bankful widths follow a normal pattern of increasing as the drainage area above the site increases indicating that the channels are not changing drastically to meet the added inflow as tributaries are added to the system. All of the survey sites meet the desired width/depth (W/D) ratio based on channel morphology research (Rosgen 1996). Bank stability measurements are above that of data collected for reference locations across the Libby Ranger District at all locations except; Miller Cr. #'s 10 and 12, West Fisher Cr. # 3, Silver Butte Cr. #1, and Waloven Cr. #1. The two sites on Miller Creek are in the upper watershed and will not be impacted by the majority of the proposed harvest. Bank stability is of prime importance in maintaining quality habitat conditions and reducing sediment introductions into the water column. The number of existing pools is below what would be expected in the majority of the sites in Miller Cr. #'s 1, 3, 4, 5, 8, 11, and 13, although 4 of the sites showed an improving trend between 1998 and 2005. Sites not meeting pool numbers were also found in Silver Butte Cr. #'s 1, 2, 2a, 4, and 6; Waloven Cr. #2; Iron Meadows Cr. #1; West Fisher Cr. #'s 1, 3, 5; Bramlet Cr. #9; and Standard Cr. #11. Large woody debris is generally well distributed throughout the watersheds but three sites were found to be lacking. They include Miller Cr. #15, West Fisher Cr. #1, and Lake Cr. #7.

Short of removing accumulated sediments from stream channels in the project areas, the reduction of sediments delivered from stream crossings and road surface drainage through the storage of road segments has proven to be a beneficial technique in lowering long-term sediment inputs to the affected systems (Wegner 1999). This alternative does include the construction of 1.2 miles of temporary road in the watersheds, which would be decommissioned after the use is completed. For the time period the sale is active and the temporary roads are in use, there will be a greater potential for additional sediment

input to the stream system. There would also be 0.89 miles of road storage work completed by the timber sale contract which would help to move the project watersheds towards a more stable condition.

The cumulative effects for the Fisher River basin have been analyzed using the assumption that activities have occurred as of 2007. Because the proposed harvest actually extends to the year 2020 the amount of recovering ECAs in that time period will more than offset the additional harvest acres from the PCTC activities. Even with all the ECAs being lumped into one year the resulting increase is 0.8%. This level of water yield increase would be very difficult to separate from the amount of natural variability in the system and should be considered insignificant in the Fisher basin.

Additional discussion of the ground disturbing activities in the project watersheds have been evaluated through the following categories: Hydrology/Geomorphology, and Water Quality.

Hydrology/ Geomorphology

The majority of the geomorphic channel types in Miller Creek are very sensitive to increases in peak flow levels. It is not expected that the projected peak flow increases in West Fisher, Silver Butte and the Fisher River will cause a change in the existing channel stability. The projected water yield increase in Miller Creek will be over the Forest Plan allowable water yield increase of 15%. It is expected that a water yield increase in this range would result in a degraded condition that would have impacts on the WQLS listed segment of the Fisher River. Based on the stream channel data, the majority of the expected impacts would occur in the tributary in Section 22 above the private land. Units 38, 39, 44, 49, 51, and 52 are seed tree units that will increase the water yield by 0.6% in Miller Creek. Units 34 and 58 in the North Fork of Miller are also seed tree units that will result in 0.3% increase in water yield. By dropping these units from Alternative 2 the projected water yield increase could be kept within the Forest Plan standards for water yield increases. In all, this alternative exceeds Forest Plan ECA harvest in Miller Creek by a total of 170 ECA's.

The application of RHCA buffers will help to assure that there are no in-channel disturbances that could upset their existing balance. The 10 stream crossing removals to be completed with this alternative are all located on tributary channels (six perennial) throughout the watersheds. These culvert removals will ultimately help to lower the crossing density in the watersheds and thus lower the chances of culvert failures. It should be noted that no funding for this work, other than that completed with the timber sale, is guaranteed. But the Forest has been successful in securing funding for this type of work.

Existing sources of road generated sediment will be mitigated through BMP's to insure that levels of sediment leaving the watersheds do not cause additional impairment to the water quality limited section in the Fisher River. The temporary road construction proposed with this alternative will increase the potential for new sediment input to the system during the life of the timber sale. In the long term, after the temp roads are decommissioned and the road storage projects are completed, there will be an overall reduction in sediment in the affected watersheds and the road density for the Fisher will reduce from 4.2 to 4.0 miles/square mile.

Water Quality

All proposed activities would be designed to meet standards and guidelines prescribed by INFS. These design features would prohibit timber harvest, including firewood cutting, in RHCA's. Appendix 4 includes RHCA's for all proposed harvest units in the project area. There is no harvest proposed adjacent to stream channels. Therefore, no additional change in water temperatures is expected from the existing conditions.

Alternative 2 also proposes numerous ecosystem burns and the burning of slash piles that could have some short-term indirect effects on site nutrient levels, although it would be minimal. Fires release nitrogen, phosphorous, and other nutrients into the soil where they are quickly used by plants. Given the distribution over time and space of these activities, and the dilution of any increased nutrients by the time they reach a stream, any effects from nutrient increases would be negligible. There would be no change in nutrients or contaminants over what currently occurs.

Alternative 4

Activities proposed with this alternative include 0.94 miles of temporary road construction, timber harvest, site prep (burning and grapple piling), slashing, pre-commercial thinning and ecosystem burning on 4,545 acres resulting in the creation of an additional 1,456 ECA's in the project watersheds. The road projects listed in Table 2-11 are also included in this proposal. Only a portion of the road storage work would be completed through the timber sale although all of the road work in Table 2-11 would be approved for completion. In order to conduct timber harvest, landings and skid trails must be constructed, although exact locations are unknown at this time. Direct impacts are associated with activities within stream channels and/or riparian areas. Indirect impacts are associated with activities outside of these areas, which can influence water and sediment levels. Cumulative impacts also include the activities described in Alternative 1.

This alternative also includes permitting access to the Irish Boy Mine private property.

Direct and Indirect Effects

This alternative proposes the construction of 0.94 miles of temporary road to access Units 21, 25, 26A, 37, 61, 121, and 123 with no new stream crossings. These temporary roads would be decommissioned after use. Constructed landing areas, 30.45 miles of road reconstruction and upgrading stream crossing structures to meet BMP standards are also proposed. The Fisher RAP indicates that approximately 67 miles of USFS road in the Fisher analysis area should be placed into a hydrologically neutral condition to help the sub-watersheds and ultimately the Fisher River begin to recover from past activities. Please see Table 2-11 for a list of the roads in this project area and Appendix 5 for a discussion on the techniques used to complete the activities. The Fisher RAP identifies 20.85 miles of potential road work located in the Silverfish Planning Subunit. Due to existing grizzly bear core areas in Miller creek, 2 miles of proposed work had to be dropped from this proposal. Alternative 4 proposes 1.43 miles of road decommissioning and 5.17 miles of road to be placed into "intermittent stored service". Of this work, 0.40 miles would be completed through the timber sale. The remaining miles would be completed when funding was obtained. Funding for these activities would most likely come from partnership grants or appropriated dollars.

As with Alternative 2, the road storage work would leave the roads undrivable and in a stabilized condition. The proposed work includes the removal of 7 stream crossings structures that would result in the direct input of sediment to stream channels in the analysis area. The road projects are designed to improve the stability of these crossings. They would have a short-term detrimental effect on water quality but would result in long-term beneficial effects as a result (Wegner 1999).

Included in this alternative are 551 acres of fuel reduction burning in West Fisher Creek, 1,520 acres in Silver Butte Creek, 553 acres in Miller Creek and 206 acres on a face drainage to the Fisher River. The effect from slashing and low intensity underburning has had no measurable effect on the water resource from past burns completed on the Libby Ranger District (see district BMP monitoring files).

This alternative also includes permitting access to the Irish Boy Mine private property. One mile of road reconstruction would be needed to allow motorized access to this property. This road is located within the RHCA of Lake Creek. An old road bed exists in the location to be used to access the property. This old road, which is currently undrivable, was the access to the former mine and would be brought up to BMP standards. Four acres of RHCA vegetation would be cleared to reconstruct this road, with the addition of 4 ECA's in the West Fisher. Implementation of BMP's would provide mitigation by reducing sediment delivery to Lake Creek, though an initial input of sediment after reconstruction is expected.

Access changes proposed for this alternative and listed in Table 2-10 would likely have a beneficial effect on the water resource, though this benefit may not be measurable. Fuels reduction and hazard tree removal in Lake Creek Campground and construction of stock corrals outside the campground will have no measurable effect on the water resource because they will not change peak flows or cause water routing. Stock corrals will be placed outside of the RHCA for Lake Creek. Alternative 4 ads the improvement of trail tread as described in Table 2-12 and the improvement in trailheads as described in Table 2-13. These projects will also have no measurable effect on the water resource. Proposed pool creation and stream bank stabilization will improve watershed conditions. Precommercial thinning will not have a measurable effect to the water resource.

Cumulative Effects

As discussed previously for Alternative 2, PCTC plans to complete timber harvest in the project watersheds through 2020. Please see Chapter 3 for a detailed description of these activities. That delay could give the watershed some recovery that has not been taken into account for this analysis due to the great variability in the private timber industry. The proposed USFS harvest activities will add 1,456 ECA's in the following project watersheds: West Fisher, 416 acres; Silver Butte, 19 acres; and Miller, 428 acres. As mentioned above, 0.40 miles of the road storage work would be completed through the timber sale. The results of these activities are displayed in Table 3-32 and assume that PCTC and the approved USFS timber sales will all be completed in 2007.

Table 3-32
Water Yield Results - Alternative 4 (2007)

DRAINAGE	WATERSHED SIZE (ACRES)	ECA (ACRES)	CUMMULATIVE WATER YIELD INCREASE (%)	ROAD DENSITY (MILES/MI^2)
Miller Creek	7,563	2,157	12.7	2.56
West Fisher Creek	28,950	2,961	4.2	2.25
Silver Butte Creek	29,934	1,157	1.6	1.07
Fisher River	250,551	64,648	5.0	4.2

Watershed Condition Discussion

Please see the discussion for Alternative 2. The cumulative effects associated with the Fisher River basin have been lumped into one year (2007). Because the proposed harvest actually extends to the year 2020 the amount of recovering ECAs in that time period will more than offset the additional harvest acres from the PCTC activities. Even with all the ECAs being lumped into one year the resulting increase is 0.7%. This level of water yield increase would be very difficult to separate from the amount of natural variability in the system and should be considered insignificant in the Fisher basin.

Additional discussion of the ground disturbing activities in the project watersheds have been evaluated through the following categories: Hydrology/Geomorphology, and Water Quality.

Hydrology/ Geomorphology

The majority of the geomorphic channel types in Miller Creek are very sensitive to increases in peak flow levels. It is not expected that the projected peak flow increases in West Fisher, Silver Butte, and the Fisher River will cause a change in the existing channel stability. The projected cumulative water yield increase of 12.7% in Miller Creek will remain below the recommended allowable water yield increase of 15%, thus meeting Forest Plan standards. It is expected that the projected water yield increase would not result in a degraded condition.

The application of RHCA buffers will help to assure that there are no in-channel disturbances that could upset their existing balance. The 7 stream crossing removals to be completed after the timber sale are all located on tributary channels (six perennial) throughout the watersheds. These culvert removals will ultimately help to lower the crossing density in the watersheds and thus lower the chances of road failures.

Existing sources of road generated sediment will be mitigated through BMP's to insure that levels of sediment leaving the watersheds do not cause additional impairment to the water quality limited section in the Fisher River. The temporary road construction proposed with this alternative will increase the potential for new sediment input to the system during the life of the timber sale. In the long term, after the temp roads are decommissioned and the road storage projects are completed, there will be an overall reduction in sediment in the affected watersheds and the road density for the Fisher will reduce from 4.2 to 4.0 miles/square mile.

Water Quality

See the discussion in Alternative 2.

Alternative 6

Activities associated with this alternative include 3.29 miles of temporary road construction, timber harvest, site prep (burning and grapple piling), slashing, pre-commercial thinning and ecosystem burning on 5,079 acres resulting in the creation of an additional 1,735 ECA's in the project watersheds. The road projects listed in Table 2-18 are also included in this proposal. Only a portion of the road storage work would be completed through the timber sale although all of the RAP proposal in the Silverfish Planning Subunit would be approved for completion. In order to conduct timber harvest, landings and skid trails must be constructed, although exact locations are unknown at this time. Direct impacts are associated with activities within stream channels and/or riparian areas. Indirect impacts are associated with activities outside of these areas, which can influence water and sediment levels. Cumulative impacts also include the activities from past projects and on private lands as described for Alternative 1.

Direct and Indirect Effects

This alternative includes the construction of 3.29 miles of temporary road to access Units 8A and 10, 21, 25 and 61, 26A, 37, 112 and 113, 121, 123, 129 and 130, with no new stream crossings. These temporary roads would be decommissioned after use. Constructed landing areas, 38.99 miles of road reconstruction and upgrading stream crossing structures to meet BMP standards are also proposed. The Fisher RAP indicates that approximately 67 miles of USFS road in the Fisher analysis area should be placed into a hydrologically neutral condition to help the sub-watersheds and ultimately the Fisher River begin to recover from past activities. Please see Table 2-18 for a list of the roads in this project area and Appendix 5 for a discussion on the techniques used to complete the activities. The Fisher RAP includes

20.85 miles of potential road work located in the Silverfish Planning Subunit. Alternative 6 would allow for the road storage work, approximately 2 miles, in the Miller Creek drainage that is currently in grizzly bear core habitat. The remaining work proposed includes 0.9 miles of road decommissioning and 11.3 miles of road that would be placed into "intermittent stored service". Of this work, 0.89 miles would be completed through the timber sale. The remaining miles would be completed when funding was obtained. Funding for these activities would most likely come from partnership grants, or appropriated dollars.

The road storage work would leave the roads undrivable in a stabilized condition. The proposed work includes the removal of 13 stream crossings structures that would result in the direct input of sediment to stream channels in the analysis area. The road projects are designed to improve the stability of these crossings. They would have a short-term detrimental effect on water quality but would result in long-term beneficial effects as a result (Wegner 1999). Alternative 6 implements the most watershed restoration work, in terms of road storage and stream crossing removal, of all the alternatives.

Included in this alternative are 551 acres of fuel reduction burning in West Fisher Creek, 1,520 acres in Silver Butte Creek, 553 acres in Miller Creek and 206 acres on a face drainage to the Fisher River. The effect from slashing and low intensity underburning has had no measurable effect on the water resource from past burns completed on the Libby Ranger District (see district BMP monitoring files).

Access changes proposed for this alternative as described in Table 2-17 would likely have a beneficial effect on the water resource, though this benefit may not be measurable. Fuels reduction and hazard tree removal in Lake Creek Campground and stock corral construction outside the campground will have no measurable effect on the water resource. Alternative 6 ads the improvement of trail tread as described in Table 2-12 and the improvement in trailheads as described in Table 2-13. These projects will also have no measurable effect on the water resource. Precommercial thinning will also have no measurable impact on the water resource. Proposed pool creation and stream bank stabilization will improve watershed conditions.

Cumulative Effects

The activities described under Alternative 1 for cumulative effects are the same as those analyzed here in combination with Alternative 6 activities. The results of these activities are displayed in Table 3-33 and assume that PCTC and the approved USFS timber sales will all be completed in 2007.

Table 3-33
Water Yield Results - Alternative 6 (2007)

DRAINAGE	WATERSHED SIZE (ACRES)	ECA (ACRES)	CUMMULATIVE WATER YIELD INCREASE (%)	ROAD DENSITY (MILES/MI2)
Miller Creek	7,563	2,275	13.4	2.56
West Fisher Creek	28,950	3,122	4.5	2.25
Silver Butte Creek	29,934	1,157	1.6	1.07
Fisher River	250,551	64,927	5.0	4.2

Watershed Condition Discussion

Please see the discussion for Alternative 2. The cumulative effects associated with the Fisher River basin have been lumped into one year (2007). Because the proposed harvest actually extends to the year 2020 the amount of recovering ECAs in that time period will more than offset the additional harvest acres from the PCTC activities. Even with all the ECAs being lumped into one year the resulting increase is

0.7%. This level of water yield increase would be very difficult to separate from the amount of natural variability in the system and should be considered insignificant in the Fisher basin.

Additional discussion of the ground disturbing activities in the project watersheds have been evaluated through the following categories: Hydrology/Geomorphology, and Water Quality.

Hydrology/ Geomorphology

The majority of the geomorphic channel types in Miller Creek are very sensitive to increases in peak flow levels. It is not expected that the projected peak flow increases in West Fisher, Silver Butte and the Fisher River will cause a change in the existing channel stability. The projected cumulative water yield increase of 13.4% in Miller Creek will remain below the recommended allowable water yield increase of 15%, and thus, meet Forest Plan standards. It is expected that the projected water yield increase would not result in a degraded condition.

The application of RHCA buffers will help to assure that there are no in-channel disturbances that could upset their existing balance. The 13 stream crossing removals to be completed after the timber sale are all located on tributary channels (six perennial) throughout the watersheds. These culvert removals will ultimately help to lower the crossing density in the watersheds and thus lower the chances of road failures.

Existing sources of road generated sediment will be mitigated through BMP's to insure that levels of sediment leaving the watersheds do not cause additional impairment to the water quality limited section in the Fisher River. The temporary road construction proposed with this alternative will increase the potential for new sediment input to the system during the life of the timber sale. In the long term, after the temp roads are decommissioned and the road storage projects are completed, there will be an overall reduction in sediment in the affected watersheds and the road density for the Fisher will reduce from 4.2 to 4.0 miles/square mile.

Water Quality

See the discussion in Alternative 2.

Alternative 7

The effects of Alternative 7 are essentially the same as those displayed for Alternative 4 above. The only difference is that winter logging would occur in the units described in Chapter 2, and that the one mile of new access road to the Irish Boy Mine private property is not proposed. Therefore the effect of Alternative 7 would be less than that displayed for Alternative 4 above.

Mitigation and Design Features for All Alternatives

Required Mitigation

Roads – Alternatives 2 and 6 would require the 1.07 miles of road storage work (all of road 5326). Alternative 4 would require approximately 0.60 miles of road storage work (first half of road 5326). These mitigations would need to be included in the timber sale contract. The remaining 11.3 miles of road storage work from the Fisher RAP would be completed by 2011.

Design Features

The Kootenai National Forest Plan states that "Soil and water conservation practices as outlined in the Soil and Water Conservation Practices Handbook (FSH 2509.22, May 1988) will be incorporated into

all land use and project plans as a principal mechanism for controlling non-point pollution sources; meeting soil and water quality goals; and to protect beneficial uses. Activities found not in compliance with the soil and water conservation practices or State standard will be brought into compliance, modified, or stopped" (Kootenai National Forest Plan, pg II-23). Montana State Water Quality Standards require the use of Reasonable Land, Soil, and Water Conservation Practices (analogous to BMP's) as the controlling mechanism for non-point pollution. Use of BMP's is also required in the Memorandum of Understanding between the Forest Service and the State of Montana as part of our responsibility as the Designated Water Quality Management Agency.

Monitoring currently in place includes daily stream flow and Total Suspended Sediment (TSS) data collection at four locations on the main stem of the Fisher River in conjunction with PCTC (data in watershed files at District) for the development of a TMDL for the Fisher Basin. Sporadic stream flow monitoring and TSS data collection will continue and the stream geomorphology attributes will be resurveyed every 3 to 5 years. Monitoring also includes stream core fines at 3 sites and macroinvetebrates at 3 sites. This data set helps to monitor trends in both the project watersheds and the main stem of the Fisher. Potential funding for this work is appropriated dollars, or partnership grants.

Consistency with Regulatory Framework

Forest Plan Consistency

The proposed activities in Alternative 2 are not consistent with the Forest Plan for the water resource. It does not meet the requirement of "*maintaining or improving*" the factors listed as the probable causes for the Fisher River to be included on the 303(b) list of impaired watersheds. This finding is based on increases in peak flows in Miller Creek that would be over the allowable recommended limit to maintain channel stability. Alternatives 4, 6, and 7 technically meet the forest plan standard for the protection of streams and water quality based on the morphological condition of the stream channels. The implementation of Alternatives 4, 6, or 7 would best meet the goal of improvement to the project watersheds and the larger Fisher watershed. Implementation of Alternative 2 could be brought into compliance with the Forest Plan for water yield guidelines by dropping enough harvest units to reduce the projected water yield increase to the standard. As proposed, only Alternatives 4, 6, and 7 (including the mitigation) would be consistent with the Kootenai National Forest Plan's direction for protection of water resources. Forest Plan consistency is measured through the implementation of: Guidelines for Calculation Water Yield Increases (Forest Plan - Appendix 18); INFS Guidelines (Appendix 4); and Best Management Practices (Appendix 2).

Riparian Habitat Conservation Areas

Riparian Habitat Conservation Areas (RHCA's) and the Montana Streamside Management Zone Act (SMZ) help protect streams, riparian areas and fisheries habitat. All the units would use the default RHCA widths (or larger) as outlined in the Forest Plan and listed in Appendix 4.

Montana Water Quality Act Consistency

The Montana Water Quality Act requires that water quality be maintained or improved to the level necessary to support beneficial uses. The Fisher River is included on every bi-annual list the state of Montana has created in its 305(b) program to list impaired water bodies. It is listed as partially supporting aquatic life and coldwater fishery. Probable causes of the impairments are listed as: nutrients, habitat alterations, thermal modifications, and siltation. Sources of impairment are listed as: agriculture,

silviculture, removal of riparian vegetation, and channelization. Per the Montana DEQ, the current completion date for the Fisher TMDL document is scheduled for 2012.

In a letter dated September 22, 1994, the State of Montana Water Quality Bureau states: "Since these streams are water quality limited none of the causes of impairments may increase. This does not mean additional harvest activity cannot occur. It does mean that if additional management activity occurs a major objective of that activity should be to improve the situation or at the very least not impede current recovery."

As discussed above, as proposed only Alternatives 4, 6, and 7, which include the approval of the road storage projects, would meet the desired water yield limits to maintain beneficial uses in Miller Creek and would not impede recovery of the Fisher River drainage.

SOILS

INTRODUCTION

This report analyzes the existing condition and potential effects from proposed forest management on the soils resources in the Miller West Fisher project area and incorporates by reference the Watershed analysis. The analysis area (project area) includes all lands in the project watersheds listed in Table 3-26. The proposed action involves timber harvest, underburning, excavator piling and burning of piles, and thinning stands to reduce the existing stand density. The project also proposes road storage activities for all action alternatives. Temporary roads and landings needed to facilitate timber harvest would be constructed and decommissioned after use. Other activities as described in Chapter 2 for each alternative are also analyzed.

Separate from this report are several appendices for inclusion into the project file that relate to the soils resource:

1. Forest Plan Standards and Guidelines
2. Kootenai National Forest Best Management Practices (BMP's) process
3. Landtype Information
4. Road storage and decommissioning information
5. References
6. Best Management Practices specific to this project

Desired Condition

The natural characteristics of a watershed, such as annual precipitation, soil types, geology, and vegetative cover will determine to what extent the ground disturbing activities may affect the soil resource. The desired condition for the soil resource is to maintain the natural characteristics (permeability, bulk density, productivity, etc) that help to maintain both healthy vegetation and aquatic function in the watershed. This desired condition is a mandatory requirement on NFS lands. This analysis takes into account activities on private timberlands that contribute to cumulative effects within the analysis area. The analysis recommendations only apply to NFS lands within the project area.

Concerns and Opportunities

Past management activities include timber harvest and road construction, which are the major factors influencing soil quality. The following goals are general objectives for the soil resource:

- Minimize erosion, sedimentation, and soil compaction, and
- Identify and correct all existing unnatural sources of sediment.

The proposed Plum Creek Timber Company (PCTC) timber harvest in the project watersheds will add 867 acres of harvest. The proposed road storage and decommissioning of 12.2 miles by the USFS would help to offset this by allowing 49 acres to re-establish more natural soil characteristics and vegetative cover after the roads are treated.

Management Direction

The following standards, guidelines, and direction are used to guide the Forest Service in the implementation of this project in respect to soil resources. It must be recognized that these standards

relate only to National Forest lands. Private landowners (including corporate landowners like PCTC) adhere to a different set of standards (State BMP's).

Kootenai National Forest Plan/INFS

The Kootenai National Forest Plan was developed in 1987 and amended in 1995. The standards and guidelines identified in those documents form the basis for this analysis. A complete list of standards and guidelines associated with the Forest Plan is included in Appendix 1. Where appropriate, standards will be included as mitigation and included in any contract that should result from this assessment.

Measurement/Issue Indicators

The following indicator was used to describe the existing condition for soils in the project watersheds, and subsequent impacts of the proposed activities on those indicators. Please see the fuels write-up for a discussion on course woody debris in the analysis area.

Percent of Harvest Area in a Detrimentally Disturbed Condition

The FSM Regional Supplement 2500-99-1 will be used for this indicator. This supplement states that no more than 15% of an activity area may be detrimentally disturbed or if the area has >15% disturbance presently there will be a net improvement after the activity is complete. This includes harvesting and site prep activities.

AFFECTED ENVIRONMENT

Landtype information was obtained from the Soil Survey of Kootenai National Forest Area, Montana and Idaho (1995). The landforms identified through this inventory are differentiated by a number of criteria including: topography, geology, habitat types, soils, and climate. These elements will determine the relative suitability of each landtype for various management activities. The landtypes identified within the project area are listed in Table 3-34 which displays the amount of each landtype in the analysis area. Please see Table 3-35 and Appendix 3 for a more detailed description of these landtypes.

Table 3-34
Landtypes in the Project Area and their Associated Productivity

LANDTYPE	ACRES	PERCENT OF ANALYSIS AREA	RELATIVE SOIL PRODUCTIVITY
101	419	0.6	High
103	1,323	2.0	High
105	88	0.1	*
108	3,088	4.4	High
112	1,953	2.8	High
201	400	0.5	*
251	123	0.1	High- Low
252	491	0.7	High
301	1,348	1.9	Moderate
302	2,852	4.1	Moderate
303	2,668	3.8	Very Low
351	1,448	2.0	High
352	14,514	20.9	High
353	1,328	1.9	Very Low
355	15,000	21.6	High
360	725	1.0	Very Low
381	410	0.5	Low

401	5,531	7.9	*
403	3,452	4.9	*
404	2,738	3.9	High
405	4,143	5.9	Very Low
406	2,748	3.9	Low
407	1,832	2.6	High
408	687	0.9	High
555	1	0.00001	High

* These landtypes are not included in the timber base.

Table 3-35 displays landtypes in the project area and their sensitivity to management actions such as timber harvest and road construction. For a more detailed discussion of each of the factors listed in the table please see the reference listed above.

Table 3-35
Sensitivity of Soil Types in the Analysis Area to Disturbance

LAND TYPE	TIMBER MGMT AND PRODUCTIVITY		ROAD CONSTRUCTION AND MAINTENANCE		
	Tractor operation	Sediment hazard timber	Cut/fill slopes	Road surfacing	Sediment hazard roads
101	soil damage	severe	none	tread	severe
103	soil damage	severe	none	tread	severe
105	*	*	none	none	moderate
108	soil damage	moderate	none	tread	severe
112	soil damage	moderate	slough	ruts	severe
201	*	*	none	rock	moderate
251	slope/rock	severe	none	rock	moderate
252	soil damage	moderate	slough	ruts	severe
301	none	moderate	slough	tread	moderate
302	slope	moderate	slough	tread	moderate
303	rock	moderate	none	rock	slight
351	slope	severe	none	tread	severe
352	soil damage	moderate	slough	tread	moderate
353	soil damage	moderate	slough	tread	moderate
355	rock	moderate	none	none	moderate
360	rock	slight	none	none	slight
381	slope	severe	slides	tread	severe
401	*	*	avalanche	rock	moderate
403	*	*	avalanche	rock	moderate
404	soil damage	moderate	none	tread	moderate
405	rock	moderate	rock	rock	slight
406	soil damage	moderate	ravel	none	slight
407	soil damage	severe	ravel	rock	severe
408	rock	severe	none	rock	moderate
555	slope	moderate	none	none	slight

* These landtypes are not included in the timber base

The Forest has identified the following landtypes as being potentially sensitive to management activities: 102, 112, 325, 351, 365, 370, and 520. These landtypes are referred to as soils of concern. Of those landtypes, only 112 and 351 are found within the project area. Landtype 112 comprises less than 3% of the project area soils, while landtype 351 comprises 2% of the project area. The table below identifies Alternative 2 treatment units that contain these landtypes, and the acres of soils of concern within the treatment unit.

Table 3-36
Alternative 2 Treatment Units with Soils of Concern

UNIT NUMBER	SENSITIVE LANDTYPE	ACRES IMPACTED
2	112	12
43	112	2
45	112	2
46	112	3
47	112	2
49	112	16
50	112	4
53	112	1
54	112	17
55	112	2
56	112	21
101	112	7
107	112	5
108	112	1
201	112	15
B7	351	30
B16	351	27
B19	351	85
Total		252

Soils data collection also included field visits to all units with previous harvest activities to examine the existing level of soil disturbance and to help determine if any mitigation measures are needed to maintain the soil productivity and meet Regional standards for the allowable level of disturbed soils in the activity areas. The field survey forms and photos from these surveys are included in the project file.

The project watersheds are tributary to the Fisher River. The highest point in the project area is Flat Top Mountain at 7,608 feet of elevation. Land ownership in the drainages is displayed in Table 3-26. Timber production, recreation, and hunting are the primary land uses in the project areas.

The lands are located in a region referred to as the Belt basin. The basin derives its name from the Proterozoic age meta-sedimentary rocks of the Belt Supergroup, which is within the Precambrian time period. These rocks are composed mostly of alternating argillites (compressed clays) and siltites (compressed silts) which contain varying degrees of carbonates and dolomites. The various ice advances, especially the last (the Cordilleran) entered the Fisher drainage and began a transformation of the area. It is estimated that the ice sheet was approximately 4,000 feet thick in the Jennings area near the confluence of the Fisher River and the Kootenai River. The ice mass covered most of the landscape within the planning area. The ice mass scraped and plucked at the underlying bedrock. This scraping along with the filling of the drainage-ways with glacial debris left a subdued, rounded landscape. When the ice mass melted, because the topography sloped to the north, water ponded at the foot of the retreating ice flow. Many recessional lakes were formed over the decades as the Fisher River flowed north into the ice sheet.

When the front of the East Kootenai glacier began to retreat northward, either glacial lake Missoula expanded so as to cross the divide (about 3,500 feet above sea level) near Bootjack Lake, or local proglacial lakes ponded in the headwater branches of the Fisher River expanded until they formed a single branching lake. In either instance, large lakes were formed and vast amounts of lacustrine deposits were laid down (Alden 1953). The former is a more likely possibility in the area around the lakes and the latter a more likely possibility in the lower portion of the Fisher River drainage. The majority of these deposits were silt materials with varying amounts of clay. The present-day river now

migrates through these lacustrine sediments. The presence of deposits of till overlain by laminated lacustrine silt in the lower parts of the valleys of the East and West Fisher Creeks a few miles southwest, west, and northwest from Manicke suggests that small terminal lobes of the Kootenai Glacier blocked those valleys for a time and maintained proglacial lakes in them (Alden 1953).

Soils and Productivity

The practice of timber management can have long-lasting impacts on the soil resource if precautions are not taken. The following three design and management criteria relate to soil productivity in the Project Area. These three criteria include: 1) detrimentally disturbed soils; and 2) maintenance of large woody debris and organic matter.

Detrimentally disturbed soils within activity areas (harvest units)

Detrimental soil impacts are defined as displacement, compaction, rutting, erosion, or severe burning due to a particular management activity such as harvest or fuels treatment. The soils in an activity area are considered detrimentally disturbed when the following soil conditions exist as a result of Forest practices:

Soil displacement results in the loss of or 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. Roading, ground-based yarding, dozer piling and cable corridors are the major contributors to displacement.

Soil compaction that results in a 15% or more increase in bulk density, or a 50% reduction in water infiltration rates typical for volcanic ash influenced surface soils is considered detrimental. Soil compaction reduces the supply of air, water, and nutrients to plants. Roading, ground based yarding, dozer and grapple piling are the major contributors to compaction.

Surface erosion is indicated by rills, gullies, pedestals, and localized soil deposition and should be kept within tolerable limits by retaining enough ground cover, depending upon onsite conditions. Generally less than 1 to 2 tons per acre soil loss per year results.

Rutting is defined as machine-generated soil displacement having smeared the soil surface in a rut. Wheel ruts are at least 2 inches deep in wet soils.

Severe burning consumes most woody debris and the duff and litter layer, often exposing mineral soil. Burn ash that is white or reddish color 2 inches deep indicates that much of the carbon was oxidized by fire (Burned-Area Emergency Rehabilitation Handbook FSH 2509.13). Burns that create very high temperatures at the soil surface when soil moisture content is low result in an almost complete loss of surface and upper soil horizon organics. Many of the nutrients and ectomycorrhizae associated with these organics can be lost to the atmosphere through volatilization and removed from the site in fly-ash (Garrison and Moore 1998) or lost to high ground temperature flux (Harvey et al. 1986 p. 7). Sever burning generally has more than 80% of the plant canopy consumed; litter is absent; root crowns of sprouting brush and grasses are consumed or heavily damaged; soil surfaces are baked; soils have strong continuous hydrophobicity. These characteristics are found on >40% of the area.

Soil mass movement is an indicator of detrimental disturbance that can be initiated naturally or from management activities. If soil mass movement is present, it will be recorded as displacement. If there is a risk of soil mass movement appropriate analysis methods will be used. Indicators of mass movement will be collected in field notes.

Maintenance of Large Woody Debris and Organic Matter

The second soil productivity criterion relates to the management of coarse woody debris (CWD) and organic matter and follows the research guidelines contained in Graham et al. (1994). Retaining coarse woody debris and organic matter is important to maintaining the soils most productive layer. Coarse woody debris is defined as material derived from tree limbs, boles, and roots greater than three inches in diameter and in various stages of decay (Graham 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 contains 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 average optimum level of fine organic matter is 21 to 30 percent (Graham et al. 1994), which equates to 1 to 2 inches of surface litter and humus. Optimum levels of fine organic matter relate to ectomycorrhizal fungus, which is a good indicator of healthy forest soil. In moist western hemlock and cedar habitat types, strong levels of ectomycorrhizae exist when organic levels exceed 30 percent.

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. Following recommendations from Graham et al. (1994), approximately 5 to 15 tons/acre should be present to maintain forest productivity on dry sites whereas 17 to 33 tons per acre should remain in moister cedar/hemlock habitats. However, the amount of coarse woody debris will likely be kept at the lower end of the recommendations in several locations near roadsides in order to address the hazardous fuels reduction requirements. Retention of more desirable existing overstory trees in many areas, especially ponderosa pine and larch, will also contribute litter and provide potential CWD in the future. In regeneration harvest stands, where more of the overstory is being removed, each activity area has been assigned a VRU-specific retention level for CWD (Soils Table 3-37). In partial harvest units such as improvement harvests, enough overstory would remain post-harvest to 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. The amounts of coarse wood listed for each VRU is listed in Soils Table 3-37.

Table 3-37 - Recommended Levels of CWD (> 3' diameter)

FOREST TYPE	VRU(S)	CWD – TONS PER ACRE
Warm/Dry - Ponderosa Pine, Douglas-fir, ninebark, and larch Habitat Types	1-3	5 to 20 tons/acre
Warm/Moist and Cool/Moist - Lodgepole Pine, Grand fir, and Lower Subalpine Fir Habitat Types	4-6	8 to 30 tons/acre
Cool/Dry - Lodgepole Pine, Lower Subalpine Fir, Whitebark pine, and Douglas fir Habitat Types	7-11	6 to 12 tons/acre

Harvest Units with Past Management Activity

Table 3-38 displays those units that have seen previous harvest activities and their existing level of soil disturbance. These units are important to track as their cumulative soil disturbance level could exceed Forest Plan standards depending upon the harvest type selected for this entry.

Table 3-38
Previously Harvested Units

Unit #	Year of Past Harvest	Drainage	Affected Acres	Existing Soil Disturbance Level (%)	Applicable Alternatives
1	1982	Miller	5	2	2
2	1988	Miller	4	5	2,4,6
12	1980's	Miller	1	0	2,4,6
17	1980's	Miller	1	0	2,3
21	1980's	Miller	1	0	2,3,4,6
46	1989	Miller	22	2 - 3	2,3,6
47	1989	Miller	18	4	2,3,6
49	1989	Miller	2	1	2,4,6
50	1980's	Miller	2	3	2
54	1988	Miller	1	2	2
55	1988	Miller	2	2	2
56	1988	Miller	36	5	2,3,6
101	1966	West Fisher	27	3	2,3,6
102	1966	West Fisher	16	2	2,3
103	1966	West Fisher	5	1	2
104	1966	West Fisher	7	1	2
105	1966	West Fisher	11	2	2
106	1966	West Fisher	12	2	2,3
107	1966	West Fisher	15	1	2,3,6
108	1966	West Fisher	7	1	2,3,6
109	1966	West Fisher	27	2	2,3
110	1966	West Fisher	30	4	2,3,6
111	1966	West Fisher	40	5	2,3,6
112	1966	West Fisher	16	3	2,3,6
113	1966	West Fisher	4	1	2,3,4,6
114	1985	West Fisher	35	4	2,3,4,6
115	1966	West Fisher	20	5	2,3,6
116	1978	West Fisher	23	2	2,6
117	1978	West Fisher	24	2	2,3,4,6
119	1978	West Fisher	1	0	2,4,6
121	1993	West Fisher	40	2	2,3,4,6
122	1993	West Fisher	3	2	2,4,6
124	1980's	West Fisher	5	2	2,3,4,6
127	1960's	West Fisher	3	1	2,3,
128	1960's	West Fisher	5	2	2,3,4,6
201	1960's	Silver Butte	4	2	2,3,4,6
203	1960's	Silver Butte	2	1	2
208	1994	Silver Butte	7	3	2,3
210A	1960's	Silver Butte	8	5	2,3
210B	1960's	Silver Butte	10	1	2,3
214	1960's	Silver Butte	5	4	2,3
215	1960's	Silver Butte	15	3	2,3
Total			**522**		

The monitoring conducted by the Forest Soil Scientist for the Soil Analysis Guidelines (data in project file) has shown that since 1995, detrimental soil disturbance from logging activities on the KNF has been less than 10 percent. Skyline operations generally disturb less than two percent of the harvest area. Forwarder operations generally disturb less than three percent of the harvest area. Winter operations for ground-based equipment generally disturb less than four percent of the harvest area. Summer operations for ground-based equipment is generally less than 10 percent. All of the proposed timber harvest would be helicopter, tractor or skyline harvested. Fire line construction detrimentally disturbs one percent or less of an activity area. No detrimental disturbance is associated with broadcast burning or ecosystem burning. Please see Appendix 7 for a list of BMP's specific to this project.

ENVIRONMENTAL CONSEQUENCES

Effects by Alternative

The soils analysis accounts for all land disturbing activities (past, present and proposed) within the project areas. The effects analysis is based on the proposed activities described in Chapter 2. All proposed logging systems would be conducted through helicopter, tractor, or skyline harvest methods. Alternative 1 is the no action alternative, which implies that none of the USFS activities displayed in Chapter 2 would be conducted. Although detrimental soil disturbance levels are only monitored on USFS lands to meet the regional standards, a running tally of the amount of disturbed acres in the project watersheds has also been completed to better understand the cumulative impacts to the soils resource. Alternative 1 does not include any USFS proposed harvest activities but the cumulative effects analysis of this alternative does include those activities proposed on private lands, namely PCTC.

Alternative 1 – No Action

Direct and Indirect Effects

Timber harvest and other activities as proposed with this project would not occur under the no-action alternative. However, natural changes in climate and vegetation would continue to occur. Vegetative regeneration would continue on existing harvest units resulting in lower compaction due to root growth and increased soil nutrients from the decomposition of forest litter and CWD.

Cumulative Effects

PCTC timber harvest is planned in the project watersheds and in the larger Fisher River watershed as presented in the Smoked Fish EA (2006). Plum Creek Timber Company (PCTC) also has long-range timber harvest possibilities (2007-2020) in the project area. These plans include: 362 acres in Miller Creek, 235 acres in Silver Butte Creek, and 270 acres in West Fisher Creek. All harvest is planned off existing road systems. Please see Chapter 3 for a detailed description of these activities. Because the harvest on private lands is not held to the same standard as the USFS harvest activities, this cumulative effects analysis reviews the total amount of land in the watersheds that has been impacted by harvest and roading.

Table 3-39
Plum Creek Timber Company Harvest Acres (2007)

DRAINAGE	WATERSHED SIZE (ACRES)	ECA (ACRES)	PERCENT OF WATERSHED IN A HARVESTED CONDITION	ROAD DENSITY (MILES/MI^2)
Miller Creek	7,563	1,615	21.3	2.56
West Fisher Creek	28,950	2,430	8.3	2.25
Silver Butte Creek	29,934	805	2.6	1.07
Fisher River	250,551	61,037	24	4.2

Discussion

As can be seen from Table 3-39, all the watersheds fall below 25 percent of the basin that has been harvested and roaded. This level of harvest activity has not displayed adverse effects on soils due to the small amount of disturbance in the watersheds. As can be seen from the information in Table 3-38, the previous harvest areas have a maximum disturbance level of 5%. The NFS lands continue to display adequate soil productivity as displayed by the higher than normal stocking rates and basal areas growing on the sites.

Alternative 2

Ground disturbing activities associated with this alternative include 1.2 miles of temporary road construction, timber harvest, site prep (burning and grapple piling), slashing, pre-commercial thinning and underburning on 6,034 acres. The road projects listed in Table 2-3 are also included in this proposal. In order to conduct timber harvest, landings and skid trails must be constructed, although exact locations are unknown at this time. Direct impacts are associated with activities within harvest units. Indirect impacts are associated with activities outside of these areas such as sediment delivered to RHCA buffers. Cumulative impacts will also include the activities on private lands as described in Alternative 1.

Direct and Indirect Effects

This alternative includes the construction of 1.2 miles of temporary road to access Units 129, 130, and 131. These new roads would be decommissioned after use. Reconstruction of 42.72 miles of road to meet BMP standards is also included.

Included in this alternative are ecosystem fuel reduction treatments in West Fisher Creek, Silver Butte Creek and a face drainage to the Fisher River. Broadcast burning within prescription in the presence of high soil moisture levels has little or no effect to the surface soil material (Meurisse 1996 as cited in Kuennen 2007). Please see Table 3-40 below for cumulative soil disturbance by harvest unit.

Effects of Other Activities

A combination of additional activities is included in this alternative. These include road reconstruction and implementation of BMP's, road storage and decommissioning, access changes, trail reconstruction, fuel reduction and hazard tree removal in Lake Creek Campground. These activities will not contribute a measurable effect to soils because they will not cause detrimental soil disturbance.

Cumulative Effects

As discussed previously for Alternative 1, PCTC plans to complete timber harvest in the project area through 2010. Please see the Current and Foreseeable Future Actions section of Chapter 3 for a detailed

description of these activities. As mentioned above, 0.89 miles of the road storage work would be completed through the timber sale. The results of all the proposed activities are displayed in Table 3-40.

The development of temporary roads, skid trails, fire lines, and landings would expose new soils. Heavy equipment operation would compact the soils and accelerate surface runoff. It is assumed that all harvest units on NFS lands will meet the Forest Plan standards for soil disturbance based on the work completed by Kuennen (2003). Table 3-40 displays the units with previous harvest and the predicted cumulative soil disturbance level from the proposed action.

Table 3-40
Previously Harvested Units - Alternative 2

Unit #	Year of Harvest	Drainage	Affected Acres	Existing Soil Disturbance Level (%)	Estimated Cumulative Soil Disturbance Level (%)
1	1982	Miller	5	2	2
*2	1988	Miller	4	5	15*
12	1980's	Miller	1	0	2
17	1980's	Miller	1	0	10
21	1980's	Miller	1	0	2
46	1989	Miller	22	2 - 3	5
47	1989	Miller	18	4	14
49	1989	Miller	2	1	3
50	1980's	Miller	2	3	13
54	1988	Miller	1	2	12
55	1988	Miller	2	2	12
56	1988	Miller	36	5	7
101	1966	West Fisher	27	3	13
102	1966	West Fisher	16	2	2
103	1966	West Fisher	5	1	1
104	1966	West Fisher	7	1	1
105	1966	West Fisher	11	2	2
106	1966	West Fisher	12	2	2
107	1966	West Fisher	15	1	1
108	1966	West Fisher	7	1	1
109	1966	West Fisher	27	2	2
110	1966	West Fisher	30	4	4
111	1966	West Fisher	40	5	5
112	1966	West Fisher	16	3	3
113	1966	West Fisher	4	1	1
114	1985	West Fisher	35	4	14
115	1966	West Fisher	20	5	5
116	1978	West Fisher	23	2	4
117	1978	West Fisher	24	2	4
119	1978	West Fisher	1	0	10
121	1993	West Fisher	40	2	12
122	1993	West Fisher	3	2	12
124	1980's	West Fisher	5	2	12
127	1960's	West Fisher	3	1	1
128	1960's	West Fisher	5	2	4
201	1960's	Silver Butte	4	2	12
203	1960's	Silver Butte	2	1	1
208	1994	Silver Butte	7	3	3
*210A	1960's	Silver Butte	8	5	15*

Unit #	Year of Harvest	Drainage	Affected Acres	Existing Soil Disturbance Level (%)	Estimated Cumulative Soil Disturbance Level (%)
210B	1960's	Silver Butte	10	1	11
214	1960's	Silver Butte	5	4	14
215	1960's	Silver Butte	15	3	13
Total			**522**		

* Units 2 and 210A would need specific mitigations to be completed to reduce the area to the regional standard

In the long term, after the proposed road projects are completed, there should be a reduction of 49 acres of compacted soils in the watersheds, as the road density will reduce from 4.2 to 4.0 miles per square mile.

Discussion

As can be seen from Table 3-39, the watersheds range between 4 and 36% for the percent of the basin that has been harvested and roaded. The NFS lands in the project watersheds continue to display adequate soil productivity due to the higher than normal stocking rates and basal areas growing on the sites. Two of the proposed units with past harvest would need additional mitigations to help them remain below the Regional standard for the level of compacted soils. These additional mitigations for units 2 and 210A are required and include utilizing existing skid trails and ripping and seeding of skid trail convergence areas. With this additional mitigation applied, all of the units with past harvest are expected to meet the Regional standard. Based on field surveys completed by the Forest Soil Scientist of past harvest units, it is expected that all the proposed harvest units that have not had past activities will remain below the allowable Regional soil compaction limit.

Alternative 4

Activities associated with this alternative include 0.94 miles of temporary road construction, timber harvest, site prep (burning and grapple piling), slashing, pre-commercial thinning and ecosystem burning. The road projects listed in Table 2-11 are also included in this proposal.

Direct and Indirect Effects

This alternative includes the construction of 0.94 miles of temporary road to access Units 21, 25 and 61, 26A, 37, 121, and 123. These new roads would be decommissioned after use. Decommissioning of temporary roads will greatly reduce the soil impacts caused during construction.

Included in this alternative are ecosystem fuel reduction in West Fisher Creek, Silver Butte Creek, Miller Creek and a face drainage to the Fisher River. Broadcast burning within prescription in the presence of high soil moisture levels has little or no effect to the surface soil material (Meurisse 1996 as cited in Kuennen 2007).

Effects of Other Activities

A combination of additional activities is included in this alternative. These include road reconstruction and implementation of BMP's, road storage and decommissioning, access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North

Fork of Miller Creek. These activities will not contribute a measurable effect to soils because they will not cause detrimental soil disturbance.

Cumulative Effects

As discussed previously for Alternative 2, PCTC plans to complete timber harvest in the project area through 2010. Please see Chapter 3 for a detailed description of these activities.

The development of temporary roads, skid trails, fire lines, and landings would expose new soils. Heavy equipment operation would compact the soils and accelerate surface runoff. It is assumed that all harvest units will meet the Forest Plan standards for soil disturbance based on the work completed by Kuennen (2003). Table 3-41 displays the units with previous harvest and the predicted cumulative soil disturbance level from the proposed action.

Table 3-41
Previously Harvest Units - Alternative 4 (2007)

Proposed Unit #	Year of Past Harvest	Drainage	Affected Acres	Existing Soil Disturbance Level (%)	Estimated Cumulative Soil Disturbance Level (%)
2	1988	Miller	4	5	15*
12	1980's	Miller	1	0	2
21	1980's	Miller	1	0	2
49	1989	Miller	2	1	3
113	1966	West Fisher	4	1	1
114	1985	West Fisher	35	4	14
117	1978	West Fisher	24	2	4
119	1978	West Fisher	1	0	10
121	1993	West Fisher	40	2	12
122	1993	West Fisher	3	2	12
124	1980's	West Fisher	5	2	12
128	1960's	West Fisher	5	2	4
201	1960's	Silver Butte	4	2	12
Total			**129**		

** this unit will require mitigation to remain below the Region soil compaction limit

Discussion

The NFS lands in the project area continue to display adequate soil productivity due to the higher than normal stocking rates and basal areas growing on the sites. Unit 2 has past harvest and would need additional mitigation measures to help them remain below the Regional standard for the level of compacted soils. These measures include utilizing existing skid trails and ripping and seeding of skid trail convergence areas. With this additional mitigation applied, all of the units with past harvest are expected to meet the Regional standard. Based on field surveys completed by the Forest Soil Scientist of past harvest units, it is expected that all the proposed harvest units that have not had past activities will remain below the allowable Regional soil compaction limit.

Alternative 6

Activities associated with this alternative include 3.29 miles of temporary road construction, timber harvest, site prep (burning and grapple piling), slashing, pre-commercial thinning and ecosystem burning on 5,079 acres. The road projects listed in Table 2-18 are also included in this proposal. In order to conduct timber harvest, landings and skid trails must be constructed, although exact locations are unknown at this time.

Direct and Indirect Effects

This alternative includes the construction of 3.29 miles of temporary road to access Units 8A and 10, 21, 25 and 61, 26A, 37, 112, 113, 121, 123, 129, and 130. These new roads would be decommissioned after use. Decommissioning of temporary roads will greatly reduce the soil impacts caused during construction.

Included in this alternative are ecosystem fuel reduction burns in West Fisher Creek, Silver Butte Creek, Miller Creek and a face drainage to the Fisher River. Broadcast burning within prescription in the presence of high soil moisture levels has little or no effect to the surface soil material (Meurisse 1996 as cited in Kuennen 2007).

Effects of Other Activities

A combination of additional activities is included in this alternative. These include road reconstruction and implementation of BMP's, road storage and decommissioning, access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to soils because they will not cause detrimental soil disturbance.

Cumulative Effects

As discussed previously for Alternative 2, PCTC plans to complete timber harvest in the project watersheds through 2010. Please see Chapter 3 for a detailed description of these activities.

The development of temporary roads, skid trails, fire lines, and landings would expose new soils. Heavy equipment operation would compact the soils and accelerate surface runoff. It is assumed that all harvest units will meet the Forest Plan standards for soil disturbance based on the work completed by Kuennen (2003). Table 3-42 displays the units with previous harvest and the predicted cumulative soil disturbance level from the proposed action.

Table 3-42
Previously Harvest Units - Alternative 6 (2007)

Proposed Unit #	Year of Past Harvest	Drainage	Affected Acres	Existing Soil Disturbance Level (%)	Estimated Cumulative Soil Disturbance Level (%)
*2	1988	Miller	4	5	15*
12	1980's	Miller	1	0	2
21	1980's	Miller	1	0	2
46	1989	Miller	22	2 - 3	5
47	1989	Miller	18	4	14
49	1989	Miller	2	1	3
56	1988	Miller	36	5	7
101	1966	West Fisher	27	3	13
107	1966	West Fisher	15	1	1
108	1966	West Fisher	7	1	1
110	1966	West Fisher	30	4	4
111	1966	West Fisher	40	5	5
112	1966	West Fisher	16	3	3
113	1966	West Fisher	4	1	1

114	1985	West Fisher	35	4	14
115	1966	West Fisher	20	5	5
116	1978	West Fisher	23	2	4
117	1978	West Fisher	24	2	4
119	1978	West Fisher	1	0	10
121	1993	West Fisher	40	2	12
122	1993	West Fisher	3	2	12
124	1980's	West Fisher	5	2	12
128	1960's	West Fisher	5	2	4
201	1960's	Silver Butte	4	2	12
Total			**383**		

*Unit 2 will require mitigation to remain below the Region soil compaction limit

Discussion

The NFS lands in the project watersheds continue to display adequate soil productivity due to the higher than normal stocking rates and basal areas growing on the sites. Unit 2 has past harvest and would need additional mitigation measures to help them remain below the Regional standard for the level of compacted soils. These measures include utilizing existing skid trails and ripping and seeding of skid trail convergence areas. With this additional mitigation applied, all of the units with past harvest are expected to meet the Regional standard. Based on field surveys completed by the Forest Soil Scientist of past harvest units, it is expected that all the proposed harvest units that have not had past activities will remain below the allowable Regional soil compaction limit.

Effects of Other Proposed Activities

Proposed precommercial thinning will be conducted on foot, without equipment, and will not impact soil resources. As discussed above, prescribed fire within prescription in the presence of high soil moisture levels has little or no effect to the surface soil material. The prescribed burns are expected to fit this description and therefore have little or no impact to project area soils. Road reconstruction and BMP implementation will occur on the designated road network. These improvements will not impact soils outside the dedicated road network, and will reduce erosion and sediment routing from the road network within the project area. Trail improvements similarly will reduce erosion and sediment routing while occurring only on the dedicated trail system.

Trailhead improvements will disturb some soils within the dedicated trailhead area. This disturbance amounts to a maximum of 15 acres within the project area, when considering one acre or less disturbance at each of up to 15 trailheads. This level of disturbance is not expected to measurably change soil productivity in the project area.

Fuel reduction and hazard tree removal at Lake Creek Campground will be completed largely by hand and is not expected to impact soil resources. Similarly construction of stock corrals outside the campground will occur on less than one acre, and will not impact project area soils measurably. Stream bank stabilization would involve walking equipment into West Fisher Creek to complete the work, and would not impact soils.

Granting private access to the Irish Boy Mine through reconstruction of an existing old road will involve use of heavy equipment and implementation of BMP's. Since soil impacts took place during construction of the existing roadway, minimal additional impacts to soil resources are expected.

Mitigation and Design Features

Alternative 2 - Units 2 and 210A would need mitigations such as utilizing existing skid trails, obliteration of skid trails, change of treatment type, or winter logging to meet the Regional standard for soils. These mitigations would be required to be included in the timber sale contract.

Alternative 4, 6, and 7 - Unit 2 would need mitigations such as utilizing existing skid trails, obliteration of skid trails, change of treatment type, or winter logging to meet the Regional standard for soils. These mitigations would be required to be included in the timber sale contract.

Design Features:

The Soil Analysis Guidelines recommend that skid trails be minimized in harvest areas with an ash cap as most of the proposed units have. Therefore, ***skidding will be conducted on designated trails only***. All of the proposed harvest units in the sale area should remain below the guidelines set forth in the FSM R1 Supplement.

Based on soil monitoring activities on the Kootenai National Forest between 1988 and 2005, the harvest activities are not expected to exceed the Regional standard for allowable levels of detrimental soil disturbance with the implementation of standard BMP's and contract clauses (USDA Forest Service KNF Forest Plan Monitoring for FY 2000). Unit specific BMP's have been created for this sale and are located in Appendix 7.

Proposed road storage and decommissioning work will return 49 acres of existing road to a more productive state and erosion will be reduced. Monitoring of previous road storage activities completed by the Libby Ranger District has shown dramatic improvements in lowered erosion rates and decreased sediment delivery to streams (Wegner 1999).

Consistency with the Forest Plan and Regulatory Framework

Forest Plan Consistency

The proposed activities are consistent with the Forest Plan for the soils resource. All alternatives are expected to meet the forest plan standard for the protection of soils with their required mitigations implemented. Forest Plan consistency is measured through the implementation of Best Management Practices (Appendix 2) and adherence to the FSM Regional R1 Supplement which limits detrimental soil disturbance to less than 15% of the harvest area. Soil productivity will be maintained through the implementation of the mitigations and design criteria and the retention of CWD.

FISHERIES

Introduction

Existing conditions were determined through field surveys and review of existing data sources to develop effects analysis for fisheries resources in project area watersheds. Effects to fish populations were assessed based on effects to habitat. This analysis was done to the nearest point of effect for all threatened, endangered or sensitive species.

Analysis Area

Potentially affected watersheds in the Miller-West Fisher project area include: Miller Creek, West Fisher Creek, Silver Butte Fisher River, and the Fisher River. The project area map at the back of this document shows the watersheds affected by the proposed actions.

Regulatory Framework

Clean Water Act

The Fisher River is a Water Quality Limited Segment (WQLS) (see Water Resources section). Probable causes include**:** agriculture, channelization, removal of riparian vegetation and silviculture. The water quality limited listing includes all upstream tributaries to the listed segment. Because the entire Fisher River channel has been listed, activities in the Miller West Fisher project area must not further impair the listed uses in the WQLS.

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 the only two listed fish species on the Kootenai National Forest as threatened and endangered, respectively, under the ESA.

National Forest Management Act

The National Forest Management Act directs that the Forest Service must maintain diverse populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System Lands (NFS).

Executive Order

Executive Order 12962 mandates disclosure of effects to recreational fishing.

Kootenai Forest Plan

The Inland Native Fish Strategy (INFS) amended the Kootenai Forest Plan in 1995 (USDA Forest Service 1995). INFS establishes stream, wetland and landslide-prone area protection zones called Riparian Habitat Conservation Areas (RHCA's). INFS set standards and guidelines for managing activities that potentially affect conditions within the RHCA's. These standards are listed in the table below. Widths of RHCA buffers are based on current scientific literature that documents them to be adequate to protect streams from non-channelized sediment inputs and provide for other riparian functions. These riparian functions include delivery of organic matter, large woody debris recruitment, and stream shading. INFS also established riparian management objectives (RMO's) that provide guidance with respect to key habitat variables (Table 4). RMO's as established by INFS as standards for forested systems include pool frequency, large woody debris, temperature, and width/depth ratio. Actions that retard attainment of these RMO's, whether existing conditions are better or worse than objective values, are inconsistent with INFS.

Table 3-43 - INFS RHCA Buffer Widths

STREAM TYPE	RHCA WIDTH (FEET)
Fish Bearing Stream*	300
Perennial flowing streams, non-fish bearing*	150
Intermittent stream priority bull trout watershed*	100
Intermittent stream non-bull trout watershed*	50
Ponds, lakes or wetlands > 1 acre	150
Ponds, lakes or wetlands < 1 acre	100
Landslide prone areas	100

* The RHCA buffer represented in the chart is for single side of the stream channel. The total length of the buffer would be 2X the listed value.

Affected Environment

Sensitive species are managed under the authority of the National Forest Management Act and are administratively designated by the Regional Forester (FSM 2670.5, Kimbell 2004). Threatened and Endangered species are under the jurisdiction of the United States Fish and Wildlife Service (USFWS) under the authority of Section 7 of the Endangered Species Act (ESA). The Forest Service is directed to maintain viable populations of native species and to avoid actions that may trend towards a species become threatened or endangered. Threatened, endangered, and sensitive fish species known to exist on the Kootenai National Forest are displayed in Table 3-44. The table includes presence and/or absence of species in the project area.

Table 3-44 – TES Fish Presence in the Project Area

Species	Status	Presence in project area or downstream receiving waters
Bull trout (*Salvelinus confluentus*)	Threatened	Known
White sturgeon (*Acipenser transmontanus*)	Endangered	Found only below Kootenai Falls
Westslope cutthroat trout (*Oncorhynchus clarki lewisi*)	Sensitive	Known
Columbia basin redband trout (*Oncorhynchus mykiss gairdneri*)	Sensitive	Known

Data Sources, Methods, and Assumption

Libby Ranger District records and the Montana Fisheries Information System (MFISH) were reviewed to determine current known fish and amphibian distribution in the project area. Fisheries surveys conducted in the past found trout distributed throughout the main stems of numerous project area streams. Genetic analysis was completed for fish in project area streams including: Silver Bow Creek, Trail Creek, Himes Creek, East Fisher Creek, West Fisher Creek, Miller Creek and the Fisher River. The results of the analysis found that the middle section of the streams and larger tributaries contained westslope cutthroat x rainbow trout hybrids, while the upper reaches and smaller tributaries had some genetically pure trout populations. The project area contains pure strain redband trout and westslope cutthroat trout.

There is one known natural barrier on the main stem of West Fisher Creek. There are no other known barriers on any main stem project area stream. The barrier on West Fisher Creek is a partial barrier found only during low flows. The barrier is created by the large amount of bedload produced in the drainage and the relatively flat terrain at the confluence with the Fisher River. There are, however, tributary streams that have both natural and man made barriers. Surveying in 2006 found two problem culverts in the project area. The first is on road 2314 (Photo 1) and is situated on an un-named tributary to West Fisher Creek. Electro-fishing surveys found native salmonids up to the culvert and only non-native brook trout above the barrier (no bull trout were found above or below the culvert in this drainage).

Photo 1 Fish barrier on Un-named tributary and road 2314

The other problem culvert was found on Porcupine Creek in the Silver Butte Fisher River drainage (Photo 2). The culvert is situated on private property and should be replaced in the future with the permission of the land owner.

Photo 2

There is also a known barrier on Silver Bow Creek in the headwaters of Silver Butter Fisher River on road 148. The culvert has been left in place to ensure that the 100% pure population of westslope cutthroat trout above the barrier maintains its genetic integrity.

Amphibian surveys have been conducted in Silver Butte River and West Fisher Creek drainages. The project area contains many small wetlands, beaver ponds and lakes that are believed to contain amphibian species. Wilderness lakes and wetlands will not be surveyed because the proposed action will be far removed and downstream from these aquatic areas.

FISH POPULATION STATUS

A detailed map of the project area can be found at the back of this document.

There are small populations of westslope cutthroat trout in Silver Butte Fisher River, West Fisher Creek and Miller Creek drainages. There are mixed redband, coastal rainbow, and westslope cutthroat x rainbow hybrids in Silver Butte Fisher River, West Fisher Creek and the Fisher River and their tributaries. Some of the drainages contain brook trout and/or hybrid rainbow x westslope cutthroat in their lower segments. These include: Silver Butte Fisher River, East Fisher Creek, Himes Creek, Colonite Creek, Bayhorse Creek, West Fisher Creek and its tributaries, Miller Creek, Waloven Creek, Trapper Creek, the Fisher River and its tributaries. The Fisher River in the project area is a resident and migratory stream for fish including: bull trout, rainbow trout, westslope cutthroat trout, brook trout, whitefish, suckers, kokanee salmon, redside shiners, and sculpins. Bull trout streams in the project area include: Silver Butte Fisher River, East Fisher Creek, and West Fisher Creek. These three streams are considered priority watersheds for the recovery of the threatened bull trout. The Fisher River is a migratory corridor for bull trout and contains no spawning or rearing habitat.

Historical data on fisheries abundance and distribution exists for some drainages in the project area. This data is limited and dates back to the late 1800's. Historic data includes archived articles from local newspaper detailing fishing stories as well as fish planting by the local Rod and Gun Club. The data is on file at Libby Ranger District and included in the project file. Historical information from State and Federal agencies is limited for the Fisher River. Fishing stories in the Western News indicate large populations of fish from the late 1800's to the mid 1930's in drainages across the Kootenai National Forest. It is also evident by these articles that the Libby Rod and Gun Club were extensively stocking fish in project area lakes and streams. Stocking seemed to be random and included both native and non-native fishes.

It is known from historical stocking records that fish were planted in the Kootenai River around Libby as early as 1900 (Huston 1999). Stocking records from 1900 to 1930 are sketchy, however as mentioned above, the Rod and Gun Club were stocking many fish in streams and lakes around Libby during this time frame. Most plantings were done by hand without documentation or protocols to follow as to what, where, when, and how many fish were to be planted. It appears, from news articles, that the State of Montana would ship millions of fish to Libby and have the Rod and Gun Club distribute them into local waters.

The earliest stocking records for the Fisher River are from 1914. There were some 50,000 Yellowstone cutthroat trout released into Fisher River tributaries. The next earliest recorded planting was 1922 when 40,000 rainbow trout were released into Libby Creek and Fisher River tributaries. It is important to note that in the eight years between stocking records, numerous brook trout, Yellowstone cutthroat and coastal rainbow trout were brought into the Libby area.

During the time frame 1900-1931 four hatcheries were operating in Lincoln County. The first hatcheries were located around Troy, and included: Kilbrennan Lake, Rainbow Ranch (Duck Lake, Slee Lake and

Alvord Lake), and Yaak ponds (Okaga Lake). These hatcheries operated for just over 50 years starting around 1910 and ending in the early 1960's.

The first hatchery around the Libby area was located on Cedar Creek. This hatchery operated from 1925 through 1930. The Libby Hatchery, off of Farm to Market Road, replaced the Cedar Creek hatchery in 1931. Fish stocking reports from 1931 through 1960 are not complete. Biennial reports do give some numbers of fish that were planted in the Libby area from 1931 through 1960. It is known that about 9.2 million cutthroats, 2.6 million rainbows, and about 5 million brook trout were planted around the Libby area from the Libby Hatchery (Huston 1999). This number is assumed to be low, as it does not considered fish plantings from the Troy facilities but gives a good indication of the amount of stocking that occurred during the time frame. The Libby Hatchery was in operation up to 1970. The State of Montana started phasing out the planting of streams in 1972. With the level of past planting occurring in the Fisher River drainage it is probable that fish were planted in drainages in the project area.

Montana Fish Wildlife and Parks (MFWP) continue to plant lakes throughout Lincoln County, many of which are headwaters streams where downstream migration brings non-native fish into contact with native species. There are many fish bearing headwater lakes in the West Fisher Creek, Silver Butte Fisher River, and the Fisher River drainages. These lakes will contribute to downstream migration of non-native fishes into the project area steams to some extent.

THREATENED, ENDANGERED, AND PROPOSED FISH SPECIES

White Sturgeon (Acipenser transmontanus)

Description of Population and Habitat Status

The white sturgeon is restricted to 168 miles of the Kootenai River between Cora Linn Dam in Canada and Kootenai Falls in Montana. They migrate freely throughout the area, but are uncommon upstream of Bonners Ferry, Idaho (Apperson and Anders 1991, Graham 1981). Above Bonners Ferry there are very few fish: in 1980 Graham (1981) estimated only 1 to 5 individuals.

Operation of Libby Dam is considered the primary cause for the white sturgeon decline (Holton 1980, Apperson and Anders 1991). Overt or inadvertent harvest of the species by anglers is thought to be virtually non-existent, and a no-kill harvest regulation is in effect throughout the range of this population.

No activities are proposed that would directly affect potentially inhabited white sturgeon habitat. The proposed activities are situated over 30 stream miles from Kootenai Falls in the lower reaches of the Fisher River drainage. No riparian or upland activities immediately adjacent to sturgeon habitat are proposed and, as such, the proposed activities would have no effect on white sturgeon or their habitat.

Description of the Population within the Project Area

The proposed activities are situated over 20 stream miles from Kootenai Falls. No habitat exists for the sturgeon in the project area.

Bull Trout (Salvelinus confluentus)

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 (MTBSG 1998). Bull trout have declined by perhaps more than 50 percent because of disruptive land management practices, expansion of introduced fish populations, non-sustainable recreational harvest, and loss of habitat connectivity (Lee et al. 1997; MTBSG 1998). Forest management, mining and dam operations have adversely affected spawning and rearing habitat conditions for bull trout in the middle Kootenai River population. (The middle Kootenai River is that segment of river from Libby Dam down to Kootenai Falls.) Current bull trout habitat is also inhabited by non-native brook trout that threaten the persistence of bull trout by hybridization and interspecific competition. Bull trout and brook trout are genetically similar species, both being members of the genus *Salvelinus*. These fish were historically separated geographically; bull trout in the western side of the continental divide, and brook trout in the east along the Appalachian Mountains. Both species are fall spawners and will hybridize with other species in the genus *Salvelinus*. This hybridization causes the loss of pure strain bull trout and threatens the species viability and genetic integrity throughout its range.

Management Goals and Objectives

The Kootenai Forest Plan (1987) was amended by the Inland Native Fish Strategy (INFS) on August 30, 1995. This interim strategy was designed to provide additional protection for existing populations of native trout, outside the range of anadromous (migrating between fresh and salt water) fish, on 22 National Forests in the Pacific Northwest, Northern and Intermountain Regions. Implementing this strategy was deemed necessary as these species were at risk due to habitat degradation, introduction of exotic species, loss of migratory forms and over-fishing. As part of this strategy, the Regional Foresters designated a network of priority watersheds. Priority watersheds are drainages that still contain excellent habitat, or assemblages of native fish, provide for meta-population objectives, or are watersheds that have excellent potential for restoration. The priority watersheds on the Kootenai National Forest include Rock Creek, Vermilion River, Bull River, lower Yaak River, Wigwam River, West Fisher Creek, Phillips/Sophie Creeks, Pipe Creek, Libby Creek, Lake Creek, Silver Butte Fisher River, Quartz Creek, O'Brien Creek, Grave Creek and Callahan Creek.

INFS also established Riparian Management Objectives (RMOs) and Riparian Habitat Conservation Areas (RHCA). RMOs are habitat parameters that describe good fish habitat. Where site-specific data is available, these RMOs can be adjusted to better describe local stream conditions. These RMOs for stream channel conditions provide the criteria against which attainment or progress toward attainment of riparian goals is measured. RHCAs are portions of watersheds where riparian dependent resources receive primary emphasis. The RHCAs are defined for four categories of stream or water body dependent on flow conditions and presence of fish. The RHCAs are areas within which specific management activities are subject to specific standards and guidelines.

Bull trout are only transitional in the Fisher River, meaning that they migrate through the river, rather than taking up residence, or spawning.

Description of the Population within the Project Area

Historically, bull trout were well distributed in the Kootenai River, and its major tributaries on the Libby Ranger District. Redd surveys conducted by MFWP and the USFS in the project area over the past 10 years have shown that only West Fisher Creek in the project area is a primary spawning tributary for migratory bull trout (Table 3-45). The population seems to fluctuate for some unknown reason from

over 20 redds to no redds in any given year. The project area has a resident bull trout population that is still not well understood in Silver Butte Fisher River, East Fisher Creek and West Fisher Creek. Priority watersheds within the project include West Fisher Creek, East Fisher Creek, and Silver Butte Fisher River. These streams were identified as priority watersheds for their high quality habitat and the potential to recover bull trout populations in the Kootenai River watershed.

Environmental Baseline - Species Indicators and Habitat Indicators

The following species indicators refer to the entire project area populations. Electro-fishing data and snorkel surveys from Libby Ranger District personnel, redd surveys from MFWP and USFS, and the MFSIH data base are main source for species composition information. Forest Service hydrologic and fisheries habitat inventories have been conducted on project area watersheds.

1) **Subpopulation Size*:*** Population data exists on drainages from redd surveys (Table 3-45) and MFWP surveys (Tables 3-46 and 3-47). Surveying on West Fisher Creek, and to a lesser extent Silver Butte Fisher River, shows the variability of bull trout populations in the Fisher River System. Based on existing data, as well as, habitat and barrier inventories this subpopulation is thought to be **functioning at unacceptable risk**. This designation comes from the small amount of spawning occurring, hybridization, and the year to year variability.

Table 3-45 Bull Trout Redd Counts for Streams in the Middle Kootenai River Section 7 Consultation Population

Year	Pipe Creek	Quartz	Bear	Libby	West fisher Creek	Silver Butte	Total Redds
1990	6	76	*	*	*	*	82
1991	5	77	*	*	*	*	82
1992	11	17	*	7	*	*	35
1993	6	89	*	*	*	*	95
1994	7	64	*	*	*	*	71
1995	5	66	6	6	3	*	86
1996	17	47	10	10	4	*	88
1997	26	69	13	13	*	*	121
1998	34	105	22	22	8	*	191
1999	36	102	36	36	18	*	228
2000	30	91	23	23	23	3	193
2001	6	154	4	11	1	*	176
2002	11	62	17	17	1	*	108
2003	10	55	14	14	1	*	94
2004	8	49	14	6	13	*	90
2005	2	71	3	*	27	*	103

* = No data available

2) **Growth and Survival:** The only data for this factor is from the Kootenai River. Other streams in the project area have insufficient data to determine growth and survival rates. Field data including redd surveys and juvenile bull trout densities gathered in the project area have variable numbers, thus fish in project area drainages do not have stable populations. Tables 3-46 and 3-47 are mark recapture work (fish were fitted with a tag that could be read to identify individual fish) done on bull trout in the Kootenai River (surveys conducted by MFWP). This data reveals

the fairly high densities of bull trout in the Kootenai River. Furthermore the recapture work in Table 3-47 shows evidence of growth patterns of fish in the river. It is apparent that fish in the Kootenai River are healthy and are putting on weight once they enter the system. Whereas bull trout are doing well within the Kootenai River, bull trout in project area streams are not displaying this type of growth and survival success. Using redd count data and past electro-fishing and snorkel survey data it is evident that this criterion is **functioning at unacceptable risk** due to the small amount (and variable) spawning and the fairly small population of bull trout in the project area.

Table 3-46 – Kootenai River Bull Trout Population Estimates

Date of data collection	NUMBER MARKED	NUMBER RECAPTURED	TOTAL POPULATION ESTIMATE (95 % CI)	FISH PER MILE (95 % CI)
April 8 and 15, 2004	109	N/A		
April 21 and 22, 2004	103	13	918 (511 – 1,326)	262 (146 – 379)
May 5 and 6, 2004	61	14	1,068 (600 – 1,537)	305 (176 – 434)
August 18 and 19, 2004	28	11	906 (494 – 1,318)	259 (144 – 374)
April 20 and 21, 2005	38	13	1,012 (608 – 1,415)	289 (177 – 401)
Total	339	51		
Mean	68	13	976 (553 – 1,399)	279 (158 – 400)

Table 3-47 – Kootenai River Bull Trout Growth and Survival Data

ORIGINAL TAG DATE	RECAPTURE DATE	PIT TAG NUMBER	LENGTH AT CAPTURE (MM)	WEIGHT AT CAPTURE (G)	LENGTH AT RECAPTURE (MM)	WEIGHT AT RECAPTURE (G)	LENGTH INCREASE (MM)	WEIGHT INCREASE (G)
4/8/2004	4/20/2005	3D9.1BF1C59ED4	689	3878	765	5979	76	2101
4/8/2004	4/20/2005	3D9.1BF1C4F0B6	672	3209	740	4630	68	1421
4/8/2004	4/21/2005	3D9.1BF1C725D0	558	1591	668	3444	110	1853
4/8/2004	4/21/2005	3D9.1BF1C63390	551	1582	730	3262	179	1680
4/15/2004	4/20/2005	3D9.1BF1C68E63	700	3336	778	5364	78	2028
4/15/2004	4/20/2005	3D9.1BF1C679AA	697	2780	739	4303	42	1523
4/15/2004	4/21/2005	3D9.1BF1C6798C	593	1903	705	3915	112	2012
4/15/2004	4/21/2005	3D9.1BF1C6816B	735	4366	763	6244	28	1878
4/21/2004	4/20/2005	3D9.1BF1C70756	744	3975	803	5818	59	1843
4/22/2004	4/20/2005	3D9.1BF1C68F1E	745	5056	828	8606	83	3550
4/22/2004	4/21/2005	3D9.1BF1C479C2	820	6631	875	9305	55	2674
4/22/2004	4/21/2005	3D9.1BF1C5A309	446	755	604	2660	158	1905
4/22/2004	4/21/2005	3D9.1BF1C633C6	644	2715	733	5310	89	2595
4/22/2004	4/21/2005	3D9.1BF1C5A804	657	2814	730	5065	73	2251
Mean			**660.8**	**3,185.1**	**747.2**	**5,278.9**	**86.4**	**2,093.9**

3) **Life History Diversity and Isolation:** West Fisher Creek, Silver Butte Fisher River, and East Fisher Creek have resident and adfluvial life forms present. Fish enter these systems from the Kootenai River and spawn and rear in the drainages. As mentioned above there is not a strong population of bull trout in the project area. Considering that spawning occurs sporadically from large migratory fish, the fact that only small populations of resident fish are known from the project area, and the fact that brook trout have invaded most of the bull trout habitat in the project area, it is appropriate to say this indicator is **Functioning at Risk.**

4) **Persistence and Genetic Integrity***:* The middle Kootenai River bull trout are connected to the Fisher River drainage. There are no known man-made barriers in the main stems of Silver Butte Fisher River or West Fisher Creek. A thermal barrier exists during the summer on the lower Fisher River. As mentioned above, spawning occurs mainly in West Fisher Creek and seems to have large fluctuations from year to year. Brook trout were introduced into the project area as early as the 1920's; however stocking records are not accurate for brook trout. It is reasonable to assume brook trout were introduced into streams in the project area as early as the turn of the century. Brook trout are now known from the main stems and headwaters of all drainages in the project area. The presence of brook trout threatens the persistence and the genetic integrity of bull trout. The probability of hybridization and displacement from competition is high. Considering these factors, this population criterion is **Functioning at Risk**.

SENSITIVE FISH SPECIES

Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*)

Description of General Population and Habitat Status

The distribution and abundance of westslope cutthroat trout has declined from historic levels across its range, which includes western Montana's Kootenai River drainage. Westslope cutthroat trout persist in only 27 percent of their historic range in Montana. Due to hybridization, genetically pure populations are present in only 2.5 percent of that range (Rieman and Apperson 1989). Introduced species have hybridized or displaced westslope cutthroat trout populations across their range. Hybridization causes loss of genetic purity of the population through introgression, which is backcrossing of hybrid populations to introduce new genes into a wild population. Some of these remaining genetically pure populations of westslope cutthroat trout are found above fish passage barriers that protect them from hybridization, but isolate them from other populations. Westslope cutthroat trout are common on the Kootenai National Forest.

Westslope cutthroat trout exhibit both migratory and resident life histories on the Kootenai National Forest. Westslopes are capable of traveling over 100 miles on their spawning migration. Migratory fish typically rear in their natal streams until their third year, and a length of 7-9 inches, when they migrate to either a larger stream or lake to rear to maturity. Resident fish are significantly smaller than their migratory counterparts. Sexual maturity is attained at either age 4 or 5, and a length of 4-16 inches, at which time these fish migrate back to their natal streams to spawn. Westslopes can typically reach lengths in excess of 20 inches and weigh in excess of three pounds. Common lifespan for this species is seven years. Westslopes feed primarily on aquatic insects in streams and larger zooplankton in lakes.

Habitat fragmentation and the subsequent isolation of conspecific (belonging to the same species) 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 on habitat quality and proximity to other populations (Rieman and McIntyre 1993).

Description of the Population within the Project Area

Historically, pure strain westslope cutthroat trout were likely distributed throughout streams in the project area. The suspected pure westslope cutthroat trout population within the planning area is composed of a resident component that rears and spawns mostly in the upper segments of West Fisher Creek, Silver Butte Fisher River, and Miller Creek. Migratory cutthroat from the Kootenai and Fisher River systems probably spawn in the lower reaches of these drainages. Past genetic sampling of fish has

found pure westslope cutthroat trout in project area streams including: South Fork Miller Creek, Himes Creek, Silver Bow Creek, one site on Silver Butte Fisher River, and Standard Creek. Genetic sampling conducted in other project area streams found many swarms of hybrid fish. Electro-fishing surveys conducted in 2006 found numerous populations of potentially pure strain westslope cutthroat trout. Further genetic analysis is needed to determine genetic makeup of fish in these streams. For the purposes of this analysis, the headwater streams will be considered pure strain westslope cutthroat trout streams.

Environmental Baseline - Species Indicators and Habitat Indicators

The following species indicators refer to the entire project area populations. Electro-fishing data completed by the FS on Libby Ranger District is the main source for species composition information. Forest Service hydrologic and habitat inventories have been conducted across watersheds in the project area.

1) **Subpopulation Size:** No population data exists for streams in the project area; however redd surveys have been completed on streams in the project area. This data is incomplete and redd numbers are probably misrepresented due to the fact that streams in the area have high muddy water in the spring, which is when westslopes spawn. Thus, redd count surveys for westslopes are extremely difficult to complete with any accuracy on the KNF. Electro-fishing surveys have shown extremely low numbers of fish in the project area. Genetic analysis of project area westslope populations shows a great deal of genetic introgression from other salmonids. Project area streams have poor quality habitat due to lack of pools, low amounts of large woody debris (LWD), high amounts of bedload, and high water temperatures. Barriers to fish passage exist in the project area. Due to these factors, the project area subpopulation size of westslope cutthroat trout is thought to be **functioning at risk**.
2) **Growth and Survival:** There is insufficient data to determine growth and survival rates of fish in the project area watershed. Field data, including Libby District electro-fishing results and the MFISH database, have shown stable numbers of fish over time on streams where information is available. Furthermore, this data has provided information on multiple year class fish. Genetic analysis has shown pure westslope cutthroat trout as well as hybrid westslope cutthroat x rainbow trout. Since growth rates have not been determined in the project area, this factor is largely rated based on the survival aspect. Survival of westslope cutthroat trout is jeopardized by hybridization with other salmonids and by the limited populations of pure strain westslope cutthroat trout. Removal of barriers to fish passage facilitates genetic exchange with other westslopes, but also facilitates movement by introduced salmonids, which causes hybridization. The man-made barriers on Silver Bow Creek and Porcupine Creek seem not to be negatively affecting fish populations. However their long term effect is the elimination of genetic exchange with other westslope cutthroat trout, which will potentially damage these populations. The culvert on the un-named tributary to West Fisher Creek has prevented passage of native fish upstream of this structure and should be replaced immediately. Considering these factors it is believed that growth and survival of westslopes in the project area is **functioning at risk**.
3) **Life History Diversity and Isolation:** The upper headwaters and upper main stems of the larger streams as well as the small tributary streams in the project area probably contain resident fish only, meaning that they do not migrate out of those stream reaches. Furthermore, these populations appear to be successfully spawning and maintaining viable populations. It is assumed that the fish in many small tributary streams in the project area are pure strain westslope cutthroat trout. Genetic sampling is needed to determine purity of fish in these drainages. However, for this analysis, these fish will be considered pure westslope cutthroat trout. The

Fisher River, Silver Butte Fisher River, and West Fisher Creek probably have both resident and migratory westslope cutthroat trout. However, due to high percentage of hybrid genetics with other salmonids, fish in these larger streams should be considered hybrids. Considering all factors described above, this species indicator would be considered **functioning at risk**.

4) **Persistence and Genetic Integrity***:* The headwater populations of westslope cutthroat trout are disjunct (not connected) from cutthroat trout populations in the main stems of the Fisher River, Silver Butte Fisher River, and West Fisher Creek. Spawning habitat exists in these drainages and fish are utilizing the spawning gravels to populate available habitat within the drainages. However, non-native trout have invaded the lower drainages and have hybridized with westslope cutthroat trout. Pure strain westslopes exist in the headwaters of many project area streams. Overall westslope cutthroat trout seem to be holding their own in these areas. Because there is such a high amount of hybridization in the lower drainages, this characteristic would be **functioning at risk**.

Interior Redband Trout (*Oncorhynchus mykiss gairdneri*)

Description of General Population and Habitat Status

The redband rainbow trout is a widely distributed northwestern North American native salmonid. Resident Interior redbands can be further divided into two forms - the adfluvial (migratory) interior redband or "Kamloops rainbow" and others that annually migrate between a lake and tributary river in order to complete its lifecycle, and the fluvial Interior redband that remains in a river system throughout its life. The potential for both types exists in the Upper Kootenai Subbasin.

The historic range of the interior redband trout included freshwaters west of the Rocky Mountains, extending from northern California to northern British Columbia, Canada (Behnke 1992). Presently populations of pure strain redbands in the Upper Kootenai Subbasin (the Kootenai River up to Libby Dam) occur in many drainages including Callahan Creek and in numerous drainages on the Libby Ranger District. Genetically pure redband trout inhabit portions of Wolf Creek, many tributaries in Libby Creek and Fisher River drainages, and also in Parmenter Creek, which drains directly into the Kootenai River.

Redbands spawn in the spring from March-June (Kunkel 1976). Fry emerge from the stream-bottom approximately two months after spawning and begin a stream residence that may last one year to a lifetime (Scott and Crossman 1973). Adfluvial and migratory fluvial redband juveniles will typically move downstream to their ancestral lake or river after one to three years of residence in the headwaters. Sexual maturity typically occurs at three to five years of age except in cold or hot climates where life expectancy is shortened. Where native interior redbands and westslope cutthroat are sympatric (or occur together), the two species appear to have evolved strategies to limit introgression as evidenced in Libby Creek and Yaak River tributaries where limited hybridization of these two species has occurred.

Redband rainbows are known to occupy waters between 2,000 and 5,000 feet in elevation (Perkinson, personal communication). The distribution of this subspecies may be influenced by watershed productivity, presence or absence of barriers, channel hydraulics, distribution of prey species, presence of large-river fluvial forms (which are larger fish because they come from large bodies of water with more forage fish), suitable riparian overstory cover, and substrate conditions.

Interior redband have been found in watersheds as small as three square miles, but the subspecies is generally known from far more productive waters where piscivory (fish eating fish) supports fish up to thirty-five pounds (Perkinson 1995; Scott and Crossman 1973). Redbands select riffle habitats with an

apparent preference for cobbly channels and bouldery pocket-water (pockets of slow moving water created by large instream substrate) in summer (Kunkel 1976; D. Perkinson, personal communication).

One species that ranks high on the threat scale to redbands is the coastal rainbow trout and its hybrids. The widespread culture and stocking of coastal rainbow, or hybrid redband, steelhead and rainbow, throughout the redband's range has lead to substantial losses of the pure native genotype (Behnke 1992).

Description of the Population within the Project Area

Historically, genetically pure redband trout were likely well distributed throughout the Fisher River drainage and the lower segments of large tributary steams in the project area. Genetic analysis shows that pure strain redbands still make up a portion of fish that occur in the main stem of the Fisher River and are widespread in Silver Butte Fisher River, and West Fisher Creek and a few of their larger tributaries. The current redband trout population within the planning area is composed of both resident and adfluvial component that rears in the Fisher River and possibly the Kootenai River and returns to spawn in the Fisher River and the lower segments of other streams in the project area.

Environmental Baseline - Species Indicators and Habitat Indicators

The following species indicators refer to the entire population of redband trout in the project area. Electro-fishing data from MFWP and Libby Ranger District personnel, as well as snorkel surveys from Libby District are the main source for population size information. Forest Service habitat inventories were conducted on select stream segments in the project area. These can be found in Table 3-50, 51, 52 below.

1) **Subpopulation Size:** No population data exists for streams in the project area; however redd surveys have been completed on streams in the project area. This data is incomplete and redd numbers are probably misrepresented due to the fact that streams in the area have high muddy water in the spring, which is when redbands spawn. Thus, redd count surveys for redbands are extremely difficult to complete with any accuracy on the KNF. Electro-fishing data in the project area show extremely low numbers of fish. Results of genetic analysis of project area fish show genetic introgression from other salmonids. Habitat in the project area is of poor quality because of lack of pools, low amounts of LWD, high amounts of bedload, high water temperatures, and existing fish barriers. Therefore, this subpopulation is thought to be **functioning at risk**.
2) **Growth and Survival:** There is insufficient data to determine growth and survival rates of fish in the project area streams. The limited available data, including Libby District and MFWP electro-fishing surveys, snorkel surveys, and the MFISH database have shown stable numbers of fish over time on streams where data was collected. Furthermore, this data has provided information on multiple year class fish. Genetic analysis shows pure redband trout exist in the project area. Barriers do exist as described above. However, due to the fact that hybridization is known to occur in the project area, and the fact that hybridization threatens the long-term survival of this species, this criterion is believed to be **functioning at risk**
3) **Life History Diversity and Isolation:** Redband rainbows in East Fisher Creek, Himes Creek, Trail Creek, Lake Creek, and Silver Butte Fisher River are probably only resident fish while fish in the Fisher River are probably both resident and migratory. Streams in the project area appear to have successfully spawning fish. Migratory fish are likely to move between the Kootenai River and the Fisher River. However, due to the high amount of hybridization in the project area this characteristic is considered to be **functioning at**

unacceptable risk.

4) **Persistence and Genetic Integrity:** As mentioned above, there are known and potential pure strain redband rainbows in the project area. Genetic surveying determined that Lake Creek, Trail Creek, East Fisher Creek, West Fisher Creek, Silver Butte Fisher River, and Himes Creek all had strains of redband rainbows in the project area. The majority of fish sampled have been hybridized with westslope cutthroat trout and coastal rainbow trout. There are no barriers to migration in any of the mainstems of large streams. The few small known barriers are on westslope cutthroat trout streams and would not affect redband rainbows. The probability of hybridization or displacement by competition is high and only documented cases of hybridization are known from the project area. This population characteristic is **functioning at risk** due to these facts.

DESIRABLE NATIVE AND NON-NATIVE FISH SPECIES

Rainbow Trout (Coastal strain) (*Oncorhynchus mykiss*)

Description of General Population and Habitat Status

The coastal rainbow trout is a widely distributed western North America native salmonid that is genetically similar to the interior redband rainbow. These rainbows are non-native fish on the Kootenai that were derived from steelhead and other rainbow trout strains and stocked into local waters on the Forest. Although these fish are non-native they are important in terms of recreational fishing. Rainbows can be divided into two forms - the adfluvial rainbow that annually migrates between a lake and tributary river in order to complete its lifecycle, and the fluvial rainbow that remains in a river system throughout its life. The potential for both exists in the main stem of the Fisher River and the lower segments of streams in the project area.

The historic range of the rainbow trout included freshwaters west of the Rocky Mountains, extending from northern California to northern British Columbia, Canada. Presently there are a large number of populations of rainbows in the Upper Kootenai Subbasin. They occur in numerous drainages and lakes on the Libby Ranger District from stocking.

Like redbands costal rainbows are spring spawners, spawning from March through June (Scott and Crossman 1973). Fry emerge from the stream-bottom approximately two months after spawning and begin a stream residence that may last one year to a lifetime (Scott and Crossman 1973). Adfluvial and migratory fluvial rainbow juveniles will typically move downstream to their ancestral lake or river after one to three years of residence in the headwaters. Sexual maturity typically occurs at three to five years of age except in cold or hot climates where life expectancy is shortened.

Rainbow trout have been found in watersheds as small as three square miles, but the subspecies is generally known from far more productive waters where piscivory supports fish up to 35 pounds in size (Scott and Crossman 1973).

The widespread culture of stocking of coastal rainbow stocks (as described above) or hybrid rainbow, steelhead and rainbow, throughout the range of other native trout species, has lead to substantial losses of the native genotypes (Behnke 1992).

Description of the Population within the Project Area

Historically, it is believed that only native redband rainbows were present and distributed throughout the larger streams in the analysis area. The current population of costal rainbows was introduced to the

project area in the early 1900's and later as described above. The current population of costal rainbow trout is probably composed of a resident component that rears and spawns in the Fisher River and lower segments of other streams (where migration is not blocked) in the project area. Migratory costal rainbows from the Fisher River and the Kootenai River may spawn in the Fisher River, as well as the lower segments of smaller project area streams.

Environmental Baseline - Species Indicators and Habitat Indicators

The following species indicators refer to the entire population of costal rainbow trout in the project area. Fish are suspected in streams in the project area where barriers to migration do not exist. Electro-fishing data and snorkel surveys by Libby Ranger District personnel are the main sources for species composition information in the drainages.

1) **Subpopulation Size:** No population data exists for streams in the project area. Redd surveying in the spring does not occur on the Libby Ranger District because high and muddy water make surveying in the spring extremely difficult. Based on electro-fishing data, MFIS, and Libby District records, this subpopulation is thought to be **functioning** due to the fact these fish are non-native and threaten the genetic integrity of native stocks of trout.
2) **Growth and Survival:** There is insufficient data to determine growth and survival rates. Using data from MFIS database along with district electro-fishing and snorkel data it is known that multiple year class fish have been found in the project area. Therefore, this population characteristic is believed to be **functioning** again due to these fish being non-native**.**
3) **Life History Diversity and Isolation:** Rainbows in smaller drainages are probably resident fish while fish in Silver Butte Fisher River, West Fisher Creek, and the Fisher River are probably both resident and migratory. Migratory fish are likely to move between the Kootenai River and the Fisher River. This characteristic is considered to be **functioning** since the fish are non-native.
4) **Persistence and Genetic Integrity:** As mentioned above there are no pure coastal rainbows stocks in the project area. All fish sampled have been hybridized with westslope cutthroat trout and redband rainbow trout. There are no barriers to migration in the main stem of larger project area streams. Yellowstone cutthroat and non-native hybrid cutthroat trout were introduced as early as 1910 and subsequent planting followed through the mid 1970's. There is a high amount of hybridization on-going in the project area. However, fish are currently being stocked in headwater lakes and migration from the Kootenai River is occurring in the Fisher River. This population characteristic is **Functioning at Risk** due to the lack of genetic integrity.

Brook Trout (Salvelinus fontinalis)

Description of General Population and Habitat Status

The brook trout is widespread across the Kootenai National Forest. This species is endemic to the Eastern United States. It is an exotic species in western streams that competes directly with native fish for food and habitat, and in some instances, completely replaces them from water bodies. This is especially true with westslope cutthroat trout. The brook trout is closely related to native bull trout and can interbreed with them. Hybrid brook/bull trout are sterile and do not contribute to the genetics of either bull trout or brook trout. Historic stocking of brook trout started around the turn of the century on the Kootenai National Forest as mentioned above. This fish species was stocked in almost all fish bearing streams, as well as a number of lakes on the KNF and still maintains viable populations on the Forest in many watersheds to this date.

Brook trout are considered to be a desirable non-native species from a sport fishing perspective, and so are analyzed here. From the perspective of native fish species diversity, however, brook trout are considered a real threat due to hybridization and competition for food and habitat.

Brook trout are fall spawners with spawning normally occurring between September and November. Fry emerge in the spring after high flows and live up to five years (Scott and Crossman 1973). Sexual maturity comes for most fish at age three; however in some cases individual fish may become mature as early as two years old. Spawning occurs mostly in headwater streams but can also occur in lower gradient streams and lakes with sandy substrate with spring upwelling (Scott and Crossman 1973).

Brook trout exhibit a large number of migratory patterns. Most fish live in a particular area for the majority of their lives. However, some exhibit both fluvial and adfluvial migrations both for spawning and for finding new home ranges. It is not uncommon for these fish to colonize an entire drainage in a short time period if no barriers to upstream migration are present.

Description of the Population within the Project Area

Management objectives, by both the USFS and MFWP, are to remove brook trout from native trout watersheds due to the threat they pose to the survival of native trout. Brook trout are known from many streams in the project area. Large populations of brook trout are known from Silver Butte Fisher River, West Fisher Creek, Miller Creek, and the Fisher River.

Mountain Whitefish (*Prosopium williamsoni*)

Description of General Population and Habitat Status

The mountain whitefish is widespread across the Kootenai National Forest. There numbers however are only high in the Kootenai and Fisher River systems in the project area. They are a native fish that seeks cold, clean water and is almost entirely an insectivore. These fish normally become sexually mature between the ages of three and four. Spawning occurs in the late fall or early winter. The life span of the mountain whitefish can be upwards of 15 years (Scott and Crossman 1973).

The mountain whitefish has both fluvial and adfluvial life histories. Fish in lakes will seek out streams for spawning. Numerous fish leave the Kootenai River and spawn in the tributary drainages including the Fisher River.

Description of the Population within the Project Area

High populations of whitefish are known only from the Fisher River in the project area. It is suspected that only small populations of mountain whitefish exist in the Silver Butte and West Fisher Creek drainages. Other small drainages including Miller Creek have no known whitefish populations. Whitefish are a desirable native and recreational fisheries component in project area streams.

Longnose Dace (*Rhinichthys cataractae*)

The longnose dace is widely distributed across north central North America from the Atlantic to the Pacific. They prefer the riffle areas of streams, but can be found along the shoreline of lakes where the substrate is composed of small rubble. It is a benthic species, living among the stones on the bottoms of streams. Longnose dace spawn in late spring/early summer on gravel bottoms of shallow riffles. Eggs, about 400 to 3,300 per female, are adhesive and are scattered on the substrate. The food of this species is primarily aquatic insect larvae. They mature at a size of three to six inches. The adults and fry serve as food for a variety of game fish.

The longnose dace was only found in the Fisher River during snorkel surveys. It is highly likely that the fish is present in other project area streams, including Silver Butte and West Fisher Creek near their mouths with the Fisher River.

Dace are native to the project area and are desirable from the perspective that they are a natural component of healthy streams in the project area.

Redside Shiner (*Richardsonius balteatus*)

The redside shiner is a western minnow found from northern British Columbia to southern Oregon and eastward to the Rocky Mountains. It is found throughout the Columbia River drainage. It prefers ponds, lakes, ditches, springs, sloughs, and rivers where the current is slow or absent. Spawning usually occurs in early summer, when females move into shallow waters and broadcast eggs that sink to the bottom and adhere to the substrate. Females produce from 800 to 3,600 eggs each year. Shiners feed on small planktonic organisms, and then switch to insects, mainly terrestrial, later in their life. Redside shiners mature at four to five inches in length, although they can reach six to seven inches in some localities. They are fed upon by a variety of fishes and fish-eating birds.

The MFISH database shows redside shiners as being rare in the Fisher River drainage. Snorkel surveys by Libby Ranger District found that their numbers were fairly high and they are probably common in the watershed. The fish have been found in Silver Butte Fisher River in one oxbow lake. It is expected that the fish exist in the lower reaches of the larger drainages where they enter the Fisher River. These fish are desirable due to the fact they are a natural component of healthy streams in the project area.

Slimy Sculpin (*Cottus cognatus*)

The slimy sculpin is a wide-ranging species found in Siberia, and in North America from Alaska to Wisconsin, across Canada and in the eastern U.S. Generally this species is found in riffle areas among rocks of cold, clear streams, but it can be found along gravel beaches of lakes. This species spawns in the spring. Females lay eggs under rocks and are guarded by males, as is the case with other sculpin species. They feed on a variety of aquatic invertebrates. They may attain lengths of four inches or slightly more, but most adults are two to three inches in length. Salmonids, char, and burbot are known to prey upon the slimy sculpin.

Records from District electro-fishing surveys have confirmed the presence of sculpin in the Fisher River, Silver Butte Fisher River, East Fisher Creek, West Fisher Creek and Miller Creek. Furthermore, the fish are abundant in all these drainages and exist in many tributary streams.

These fish are desirable in the fact that they are a natural component of healthy streams in the project area.

Amphibians

Threatened and Endangered Species: No threatened or endangered amphibians are known or suspected for the Kootenai National Forest.

The **long-toed salamander** (*Ambystoma macrodactylum*) is the most common salamander in western Montana and is found in a variety of habitats from sagebrush to alpine. They typically breed in ponds or lakes, usually without fish. Adults go to the breeding ponds immediately after snowmelt, and in western Montana, are usually the first amphibians to breed. Following breeding, they move to adjacent uplands. Eggs hatch in three to six weeks and metamorphosis takes two to14 months (Reichel and Flath 1995).

The long-toed salamander is known to occur in the project area. Past surveying found these salamanders to be wide-spread across the project area. In fact, most sites visited in the project area contained long-toed salamanders. The project area contains many sites, that were not surveyed, that probably contain long-toed salamanders.

The **Pacific tree frog** (also known as the Pacific chorus frog) (*Pseudacris regilla*) is only regularly found in water during the breeding period in spring. They announce their presence during this time by calling frequently at night and sporadically throughout the day. Following breeding, they move into adjacent uplands and are rarely seen. In western Montana they breed in temporary ponds in lower elevation forests and intermountain valleys shortly after snowmelt. Eggs hatch in two to three weeks and tadpoles take eight to ten weeks to metamorphose (Reichel and Flath 1995).

The Pacific tree frog is known from the project area. Surveying in the past found the tree frog to be well distributed across the project area. Numbers were not extremely high in any location but numerous sites contained tree frogs.

The **Columbia spotted frog** (*Rana luteiventris*) is the most common frog in western Montana and is very common on the KNF. Spotted frogs are regularly found at water's edge in or near forest openings and wetlands at or near tree line.

Breeding takes place in lakes, ponds (temporary and permanent), springs, and occasionally backwaters or beaver ponds in streams. All egg masses in a particular pond are often found in the same location at the margin of the pond. Young and adult frogs often disperse into marsh and forest habitats, but are not usually found far from open water (Reichel and Flath 1995).

Surveying in the past found the spotted frog well disturbed across the project area. It is likely that the spotted frog is the most prolific amphibian species within the project area.

The **Rocky Mountain Tailed Frog (***Ascaphus montanus*) is a fairly common amphibian in northwestern Montana in suitable stream habitat, and is very common on KNF mountain streams. Tailed frogs are unique in that they spend their entire lives in small streams and have adaptations that allow them to thrive in that environment.

Breeding takes place in late summer. Eggs are attached to the underside of rocks in streams. Tadpoles have a unique suction disk mouth that allows them to stick to the rocky substrate in high velocity water. It may take a tadpole up to three years to metamorphose depending on water temperature. Sexual maturity is reached at six or seven years of age. This is the longest juvenile phase of any North American amphibian (Reichel and Flath 1995). Males have a specialized cloacal tail which they use for internal fertilization. They are the only North American amphibian to do so (Werner et al. 2004).

The tailed frog is known from the project area. Past surveying found this species to be well disturbed across the project area. Many electro-fishing surveys have found this frog to be present. The tailed frog is the most prolific amphibian species within the project area and is probably the most widespread of any amphibian as well. Electro-fishing in 2006 found the presence of these frogs in almost every small tributary stream in the project area.

Reptiles

No threatened, endangered, or sensitive reptiles are known or suspected for the Kootenai National Forest.

The common garter snake (*Thamnophis sirtalis)* is one of the most common snakes in Montana (Reichel and Flath 1995), as well as the Kootenai National Forest. The snakes become active early in the year

and are often seen in the spring. After breeding they may move several miles from a den to their summer active sites. During the day and warm nights common garter snakes forage around wetlands or in the water. They often prey on amphibians, fish and snails and are a major predator of tadpoles (Werner et all 2004).

The common garter snake is known from the project area. Adults were found during amphibian surveys. The snake was seen in many wetlands preying upon amphibians especially spotted frog tadpoles.

The terrestrial garter snake (*Thamnophis elegans*) is also common in Montana and is one of Montana's most adaptable reptiles, being found at the highest elevation of any snake in Montana and also being found in the lowest elevations of the state. Their habits are similar to the common garter snake as described above. The major difference between the common and terrestrial garter snake are some forms of feeding mechanisms and also coloration (Werner et all 2004).

The terrestrial garter snake was seen in the project area during amphibian surveying. The species was less common then the common garter snake. Overall this snake would be considered moderately common in the project area.

The above list provides data from actual surveys. The reader is referred to the wildlife section for specific analysis for effects to the sensitive amphibian species.

Watershed Existing Condition as Related to Fisheries Habitat

Westslope cutthroat trout and redband rainbow trout are the only sensitive fish species in the project area. Coastal rainbow trout and their hybrids and brook trout are the only potentially affected desirable non-native fish species in the project area. This analysis will center on their habitat needs. As previously described above, the population of potentially pure strain westslope cutthroat trout exist only in the extreme upper reaches of the drainages while redband rainbows occur more in the middle reaches of streams. Genetic analysis has shown that a hybridized population of coastal rainbows and westslope cutthroat trout are found in the lower reaches of the drainage as well.

This section compliments the existing condition narrative in the watershed and soils section of this document. In an effort to minimize repetition, only select watershed condition information is summarized as it relates directly to the local threatened, endangered, and sensitive fish populations. For a thorough review of the existing hydrologic condition, the reader is referred to the Water Resources section of this document. As discussed earlier in the Data Sources section, there are 19 habitat indicators in the USFWS bull trout matrix (USFWS 1998) used to evaluate the effects on fish species, starting with the baseline condition. The following discussion addresses those 19 habitat characteristics.

Habitat Indicators: Existing conditions for each habitat indicator are described and rated at a single scale, the project area, which is within the Columbia River Basin (CRB) 5th code hydrologic unit code (HUC). Stream habitat data is extensive for some project area streams. The bulk of the information collected is focused on habitat and species composition.

1) Temperature: Functioning at Risk

Riparian harvest on National Forest System (NFS) lands along the mainstems of project area streams has occurred extensively beginning sometime around the 1900's and slowing after the 1910 fires until the 1960's when logging started again in the area (Mark White personal communication). Riparian harvest has occurred on over 50% of the riparian zones in the project area. It is likely that there has been a noticeable change in stream temperature as a result of this harvest. PCTC has been actively managing their lands within the project area over the past 10 years. Water temperature monitoring occurred on both Silver Butte Fisher River and West Fisher Creek. Both monitoring sites were located in the lower portions of the watersheds. Temperatures were measured on Silver Butte Fisher River from 12/17/1995 through 9/18/1997. The data shows that the 59 degree limit for salmonids was exceeded for nearly a month in 1996 and was exceed for 2.5 months in 1997. West Fisher Creek had similar water temperatures. Data was collected from winter of 1995 through the summer of 1999 and from 2003-2004 and 2006 using AquaRods. Most data showed the 59 degree F limit being exceeded during parts of June, July, August, and even September. The stream is showing signs of warming more then would be expected under unaltered conditions. Other streams where temperatures are exceeding this limit include the Fisher River and East Fisher Creek. Smaller Streams in the project area are in good shape with regards to temperature.

2) Sediment: Functioning at Risk

The existing road system contains numerous stream crossings in both drainages. This factor coupled with high road densities and high road RHCA densities has the capacity to move large amounts of sediment into the mainstems of streams in the project area. Stream surveys have shown the drainages are having trouble maintaining pools, indicating that sediment is moving into and down streams and filling pools. Land management has been extensive in these drainages and the road system used to implement that land management has reduced riparian function in many places due to the location of roads and the past harvest that occurred in RHCAs. The RMO for pool quantity was not met in many measured reaches (Table 3-50, 51, 52). Another factor in the consideration of this criterion is rain on snow (ROS) events. ROS events create large flows which erode banks and move large amounts of bedload. Sediment from these events can alter stream channels and fill pools.

McNeil Core samples can be used to determine the amount of fine sediment that exists within the gravels of a stream. Weaver and Fraley (1991) showed that fine sediment (less then 6.35mm or ¼ inch material) entombs bull trout eggs when this size material exceeds 35% of the spawning gravel in bull trout redds. Looking at the measured data it is evident that the drainages have stayed near or below this threshold in average fines (Tables 3-26 through 3-31 in watershed portion of this document). Although some of the data shows the maximum value exceeding 35%, over all sediment conditions are still highly productive for spawning areas.

3) Nutrients and contaminants: Functioning at Risk

The Fisher River is included on the state of Montana's list of impaired water bodies (1996, 1998, 2000 and 2002) 303(d) bi-annual list of impaired water bodies (305(b) Report). This designation includes all tributary streams to the listed stream. The Fisher River is listed as partially supporting aquatic life and cold-water fishery. Probable causes of the impairments are listed as nutrients, habitat alterations, thermal modifications, and siltation. Sources of impairment are listed as agriculture, silviculture, removal of riparian vegetation, and channelization. The basin remains on the list and has the date of 2007 scheduled for the completion of a TMDL.

As mentioned above, the existing road system has had major impacts to the drainages in the project area. The road network can act as a channel where products from upland activities can be routed directly into stream channels. Most roads occur in the lower and middle reaches of the drainages or on intermittent channels. Because of the intermittent flow in these channels, nutrients and contaminants will be moderated. However, with the high densities of road and the high densities of stream crossings in the project area, the probability exists that overland flow could directly input nutrients and contaminants into live streams.

Biotic Community Index (BCI) is a good indicator of water quality in streams. BCIs have been calculated for the three monitoring sites in the project area (figures 3-2 through 3-7 in watershed portion of this document). BCI numbers <70 indicate poor water quality, while numbers from 70-80 indicate fair water quality, numbers from 80-90 indicate good water quality, and numbers >90 indicate excellent water quality. Water quality in the project area appears to be variable with regards to BCI. Over all conditions were mostly in the fair to good range with conditions showing excellent and poor being represented as well. It is unknown why these oscillations in water quality have occurred. It is assumed that stochastic (or random) events have changed communities within given years but recovery seems to occur fairly quickly when favorable conditions return.

4) Physical Barrier: Functioning at Risk

As described previously there are three barrier culverts on tributary streams in the project area. These structures have been on the road system for a number of years (probably in excess of 40 years). Fish populations continue to exist in fair numbers above and below the pipes. To meet INFS standards, one of these barriers will need to be replaced in the near future (the un-named tributary to West Fisher Creek). The culvert on Silver Bow Creek will be left in place to protect the pure population of westslope cutthroat in that drainage. The pipe on private land in Porcupine Creek needs to be replaced; however repair of this structure will require the permission of the land owner.

In West Fisher Creek, the mouth of the stream has become extremely braided. There are numerous small side channels connecting the Fisher River with West Fisher Creek. These channels create very little passage for large migratory bull trout. Migrational bull trout from the Kootenai River stack up in the Fisher River under the US Highway 2 Bridge and wait until rain brings enough water to open up access into the drainage. This unnatural stream channel braiding is a result of high sediment loads in West Fisher Creek resulting partly from road stream crossings, high peak flow increases (PFI), and riparian harvest in the drainage.

Miller Creek also has a partial barrier due to lack of flow connecting the stream with the Fisher River. The stream enters a large depositional area before it enters the Fisher River, which is characterized by numerous channels and low stream gradient. The stream is only connected to the Fisher River during

extremely high flow events in the spring or fall. This is a natural occurrence due to the lay of the land in that area.

5) Substrate: Functioning

The dominant substrate size class varies from stream to stream in the project area. Most of the larger streams have cobble as dominant substrate while smaller tributary streams have either gravel or bedrock depending on their location in the drainage. Streams that are inherently stable have large stable streambed substrates that are not mobile under most flows. If these substrates become mobile they only move short distances before they become stable again. Gravel substrates are inherently unstable. Large flows could easily move these substrates, which can cause significant bedload movement. As mentioned above, project area drainages have the potential for rain on snow events. Large flows like ROS events easily move steam bed substrates, which can cause significant bedload movement.

6) Large Woody Debris: Functioning

Large woody debris (LWD) was measured as part of fisheries habitat surveys. Tables 3-50 through 3-52 show the results of these surveys. The RMO for LWD in different stream size classes is listed in Table 3-49. In general streams in the project area meet the RMO for LWD. In the 1970's and early 1980's as part of fisheries improvement work, LWD was actively removed from streams by the USFS. The thinking at that time was that LWD created many problems for fish passage and needed to be removed. Past timber management activities utilized both one and two sided riparian harvest. These drainages also share high densities of riparian roading. Riparian roading is highly impactive on LWD delivery to streams not only through cutting of trees for the right of way but also from firewood cutters taking wood that would have fallen into the stream. Despite these past actions, as shown in the table below, LWD still meets objectives in the majority of measured reaches. Although this factor is still mostly functioning, it is important to keep in mind the impacts of all activities that have and are occurring on these drainages with respect to this habitat criterion, and to avoid addition impacts.

7) Pool Frequency: Functioning at Risk

Pool frequency was measured at the same time as LWD. The RMO for pool frequency (Table 3-49) was met in only 20 of the 60 sites, thus did not meet objectives over half the time. This is not the case for the small Cabinet Face streams, which are mostly meeting the RMOs. Generally, it is the larger streams that have a past history of management in RHCAs and high densities of roads in the RHCA that do not meet the RMO. Pool generation in small streams is directly related to production of LWD in RHCAs. As trees fall into the stream, they modify stream flows and create pools. Lack of LWD causes stream velocities to be faster and more direct, resulting in a lack of scoured pools. Although the RMO for LWD was mostly met in measured reaches, future production of LWD in RHCAs will be limited in some streams due to the high densities of road and past riparian harvest. Fine sediment will continue to be produced from activities and roads on lands of all ownerships in the larger streams and will continue to negatively impact pools throughout the project area.

8) Pool Quality: Functioning at Unacceptable Risk

Quality pools are pools that are deep (minimum of three feet) and have sufficient cover to hide fish. Pool quality in the project area varied by drainage for this criterion. Smaller streams generally have less deep pools then the larger streams. Fisheries habitat inventories measured numerous pools in measured reaches. Overall the surveys found deep pools to be more common in larger streams but pools in general were further apart than is desirable for fish habitat in these streams. Deep pool creation in small streams is also difficult, because many of the streams lack the hydrologic power to create and maintain

pools of this depth. Another factor affecting pool quality in these drainages is the high amount of bedload moving during rain-on-snow events and high spring peak flows.

The USFS completed bank stabilization work on West Fisher Creek, which did include some pool creation. This work was completed in approximately 1996. The stream project on West Fisher Creek has been mostly stable thus far. The project is starting to show signs of stress from high flows and will need some additional work in the future to stabilize the area. At the highest flows, the stream comes close to leaving the constructed channel and accessing the adjacent West Fisher Road 231, which has washed out in the past. Please refer to pictures of the stream restoration project located in the fisheries project file.

9) Off Channel Habitat: Functioning at Risk

Off channel habitat is habitat that exists for fish and other aquatic organisms in side channels, tributary streams and springs in the RHCAs of larger streams. This condition of this criterion again varies by stream in the project area. The overall types of stream in the project area are classic mountain streams with moderate gradients and moderate entrenchment ratios. This changes to deeply incised boulder/bedrock dominated streams in the headwaters and gentler gradient wide flood plain with low incision ratios in the lower segments of the major streams. The project area contains almost every type of stream channel on the KNF, including channels with braiding, deeply incised single thread streams, beaver ponds, debris jams and sloughs and springs. An extensive amount of off channel habitat exists in the project area. However the high densities of road in the RHCAs limit the streams' ability to make adjustments and create off channel habitat. The large number of stream crossings in the drainage will continue to increase the probability of culvert failure, disrupting the long-term stability of this type of habitat.

10) Prime Habitat (Refugia): Functioning at Risk

There are very few areas of high quality habitat in the project area due to extensive riparian roading and timber harvest in the lower portions of project area streams. Surveying has found that streams partially meet INFS RMOs for pool quantity (Table 3-7). Management has occurred along the banks of nearly every major stream channel in the project area. However the Cabinet Face has many untouched drainages where high quality waters and high quality habitat exists. Streams in the Cabinet Mountains would be considered prime habitat because no management has occurred on these streams and human impacts are almost non-existent. These streams have pristine conditions which will continue to input high quality waters into downstream systems and will continue to provide refugia for aquatic resources into the future.

11) Pool Width/Depth Ratio: Functioning at Risk

The majority of pools measured on the lower segments of stream channels in the project area were shallow and wide. By contrast those pools measured in headwater reaches were narrow and deep. Measured reaches appear to be representative of other project area streams. The threat to pools in the project area is high peak flow from spring runoff and rain-on-snow events combined with large quantities of bedload in many of the larger project area streams. This makes pool creation and maintenance extremely difficult because the pools fill in with transported material. Headwater streams will maintain and create more pools which will benefit all streams in the project area. Because some streams have adequate pool width/depth ratios, which meets objectives, while other streams do not have adequate ratios and do not meet objectives, this criterion is rated as functioning at risk.

12) Stream Bank Condition: Functioning at Risk

The standard for stream bank stability is banks that have greater then 80% linear stability. District surveying found bank stability to be very good in streams in the project area (see the table below), especially the upper reaches of streams. There were some measured reaches, especially the lower portions of larger streams, that showed unstable bank condition but overall streams in the project area are in good shape. Some private lands in the project area have experienced grazing through the RHCA. Grazing in stream channels causes banks to become unstable due to hoof action by grazing animals. Stream bank vegetation tends to become disturbed and stream bank sediment is readily available to be deposited into the stream. Overall most streams are in good condition; though rain-on-snow events and high spring peak flows have the ability to destabilize banks. The larger streams show signs of high flows and unstable banks.

13) Flood plain Connectivity: Functioning at Risk

Flood plains in the project area remain mostly intact with some minor alterations where roads and private land encroach or bisect on the flood plain. Riparian values and functions remain mostly intact along stream channels due to fertile soils and high growth rates of shrubs and trees in the drainages. The functioning at risk designation results from impacts to flood plains as a result of roads constricting stream channels, which does not allow streams to access historic flood plains.

14) Peak and Base Flows: Functioning at Risk

Peak flows normally occur in May but can occur anytime between November and June. Silver Butte Fisher River and West Fisher Creek are considered to be very unstable streams, with flooding regularly occurring, annually high suspended sediment levels, high bedload movement, and numerous channel adjustments. Since the turn of the century, timber harvest, road construction, mining, and human development have changed the character of the watershed and its response to weather events. Road densities and current harvest levels are considered to be high and beyond what these streams can effectively handle. The mainstem of West Fisher Creek appears to have reached its geomorphic threshold. This means these channels have been destabilized in a way that they cannot recover from on their own. Various stream reaches have become intermittent in nature due in part to the large depositions of bedload, channel braiding and widening. While these streams naturally had high peak flows during spring snow melt and ROS events, past human activities, such as high PFI from past timber management and riparian road construction have created a situation where peak flows are more damaging to the streams.

15) Drainage Network: Functioning at Risk

Drainage network is the network of streams within the project area. This stream network is impacted by the road network, which impedes the streams' natural migration, particularly during peak flow events. Road densities in West Fisher Creek, Silver Butte Fisher River and Miller Creek drainages are considered moderate to low (Table 3-48). However, road failures have been a common occurrence throughout these drainages and their tributaries probably due to high precipitation events in the project area, rapid snowmelt and runoff from high elevation areas, and ROS events. Road and bridge failures have been an annual occurrence due in part to the naturally volatile nature of these systems. Sediment input due to road surface and ditch erosion is high. Road systems parallel or traverse every major tributary and the mainstems of large project area streams. Many of these roads have been in place for decades, constructed to mining locations in the late 1800's and early 1900's.

Table 3-48 - Water Yield and Road Densities

Drainage	Watershed Size (acres)	ECA (acres)	Cumulative Water Yield Increase (%)	Road Density (miles/square mile)
Miller Creek	7,563	1,253	7.4	2.56
West Fisher Creek	28,950	2,160	3.1	2.25
Silver Butte Creek	29,934	570	0.8	1.07
Fisher River	250,551	54,613	3.7	4.8

16) Road Network: Functioning at Risk

Road systems parallel most of the length of West Fisher Creek, Silver Butte Fisher River and Miller Creek. Many of these roads were constructed within the RHCAs of these streams. Road densities in these drainages are considered low to moderate (Table 3-48). Some roads were originally constructed in the early 1900's, are low standard, and are maintained very infrequently. There have been numerous impacts to streams associated with these roads, including increased sedimentation, water routing down ditch lines, road stream crossing failures, hill side slumping, and removal of riparian vegetation due to road construction.

17) Disturbance History: Functioning at Risk

Natural disturbance regimes are highly variable in these drainages. Catastrophic in-stream disturbances are common, including flood events, high bedload movement and deposition, channel braiding, and mass wasting. Windstorms resulting in blowdown have been minor and are generally associated with clearcuts. Fires have been relatively small with no major wildfires occurring in several decades, though a large portion of the project area burned in 1910. Because the project area does have the potential for natural disturbance events that may impact streams, this criterion is rated as functioning at risk.

18) RHCA's: Functioning at Risk

Timber harvest has occurred throughout the project area, with the exception of the inventoried roadless and wilderness portions of the project area. Some streams have been left in their natural state in the Cabinet face. Lower drainages like West Fisher Creek, Miller Creek, and the lower segments of Silver Butte Fisher River have been managed extensively in the past. This has included both one and two sided riparian harvest. These harvests were conducted prior to INFS direction being adopted. Roads parallel these major drainages and impact the RHCA at different locations. Impacts to RHCAs include timber harvest, road encroachment, firewood harvest, and road crossings.

19) Disturbance Regime: Functioning

Natural disturbance regimes are stable in the project area. Silver Butte Fisher River and West Fisher Creek experience periodic rain on snow floods or debris torrents. These events have caused major changes to the stream banks and overall watershed health. Windstorms resulting in blowdown have been minor, generally associated with clearcuts. Fires have been relatively small with no major wildfires occurring in since 1910. Although certain indicators of habitat quality have been compromised, overall conditions are considered good in project area watershed.

Integration of Species and Habitat Conditions: **Functioning at Risk**

The quality of trout habitat throughout the lower drainages in the project area has been compromised to some extent from land management practices for natural resource extraction. RHCA harvest along with high densities of road and high densities of stream crossings has likely been a contributing factor to the high water temperatures and high fine sediment load. Road construction in riparian areas along the main stems of larger streams has affected natural channel movement and riparian vegetation. Additional impacts to tributaries have occurred through riparian harvest and road construction. Major events have occurred in these drainages over the past 10-20 years, such as large windstorms, and 100-year flood events. Although minor, isolated impacts were seen, overall systems continue to remain stable.

Once individual streams that currently display signs of instability recover, it is highly likely that improvements in the overall watershed conditions will be seen. Drainages along the Cabinet face will continue to input high quality waters into the lower drainages and will continue to function as high quality refugia for fish. Genetic analysis has shown the existence of genetically pure populations of westslope cutthroat and redband trout. It is expected that further genetic analysis on the upper headwaters of streams will show more pure native fish stocks. Bull trout will continue to exist in the project area to some extent. It is possible that the West Fisher will become a major spawning tributary to the Kootenai River if conditions in the Fisher River improve. Resident bull trout will continue to populate the major drainages to some extent. Overall the area contains many streams that have high numbers of fish. It is apparent that fish in the project area are spawning and maintaining stable populations throughout project area streams.

DESIRED FUTURE CONDITION

As a result of the analysis, it was determined that the lower reaches of Silver Butte Fisher River, West Fisher Creek, and the middle and upper reaches of Miller Creek are restoration priority streams. This is due to the known bull trout, westslope cutthroat trout, and redband rainbow populations, fish passage issues, and past management in riparian areas. The data for each measured reach of stream in the project area (Tables 3-49) was compared to the INFS Interim Riparian Management Objectives.

Table 3-49 -Stream Geomorphology Data for Project Area Streams.

INFS - Riparian Management Objective Standards				
Bankfull Width (ft)	Pools per Foot	LWD per foot (> BFW)	Bank Stability (%)	Width/Depth Ratio
< 10	1 per 55	1 per 250	> 80	< 10
10 to 20	1 per 94	1 per 250	> 80	< 10
20 to 25	1 per 112	1 per 250	> 80	< 10
25 to 50	1 per 203	1 per 250	> 80	< 10

Table 3-50 - Miller Creek RMO Data

Site	Year	Rosgen Type	BFW (ft)	Pools per Foot	LWD per foot	% Bank Stability	Width/ Depth Ratio
1– Main stem	1998	B3c	12.1	1/115	1/9.6	100	15.78
1- Main stem	2005	B4	16.4	dry	1/10	95	11.47
2– Main stem	1998	B4c	10.8	1/34	1/80	100	14.8
2– Main stem	2005	F4	10.9	1/54	1/18	100	29.02
3 –Main stem	1998	F4	11.2	1/120	1/243	93	13.3
3 –Main stem	2005	E4	13.2	1/270	1/45	86	10.19
4– Main stem	1998	B4c	13	1/54	1/39	97	16.6
4– Main stem	2005	B4c	11.3	1/139	1/132	100	12.99

Site	Year	Rosgen Type	BFW (ft)	Pools per Foot	LWD per foot	% Bank Stability	Width/ Depth Ratio
5– Main stem	1998	B3c	9.2	1/185	1/16.2	100	16.17
5– Main stem	2005	B4a	9	1/47	37.6	100	13.64
6 – Tributary	1998	Da4	4.3	Dry	nc	nc	21.5
6 – Tributary	2005	Da4	3.8	Dry	1/5	100	9.87
7 – Tributary	1998	B4	6.9	1/46	1/6	80	9.1
7 – Tributary	2005	B4	6.1	Dry	1/8.5	100	22.59
8– Main stem	1998	B4c	9.8	1/66	1/28	87	13.24
8– Main stem	2005	F4b	11.5	1/5	1/18	100	25.68
9 – Tributary (South Fork)	1998	B4	6.7	1/33	1/8.7	80	17.96
9 – Tributary (South Fork)	2005	E4b	7	1/36	1/72	100	4.86
10 – Tributary (South Fork)	1998	C4b	5.2	1/32	1/8	32	20.08
10 – Tributary (South Fork)	2005	E4b	6	1/3.7	1/6.2	100	5.77
11– Main stem	1998	F4b	9.7	1/70	1/15	82	21.04
11 – Main stem	2005	B4	8.4	1/46	1/11	100	20.48
12 – Tributary (North Fork)	1998	F3b	10	1/40	1/9	24	31.05
12 – Tributary (North Fork)	2005	F4b+	8.84	dry	1/10	50	32.81
13– Main stem	1998	F4b	6.8	1/64	1/128	83	28.33
13– Main stem	2005	F4	5.8	1/39	1/8	100	17.44
14– Main stem	1998	G4	4.7	1/24	1/7	100	9.79
14– Main stem	2005	G4	5.7	1/28	1/5	100	15.8
15– Main stem	1998	B4a	5.5	1/28	1/6	99.94	13.41
15– Main stem	2005	F4B	3.0	1/10	0/60	100	16.6

Gray shading means sites do not meet current INFS guidelines

Table 3-51 - West Fisher Creek RMO Data

Site	Year	Rosgen Type	BFW (ft)	Pools per Foot	LWD per foot	% Bank Stability	Width/ Depth Ratio
1- West Fisher	1996	D4	98	1/673	1/1,009	100	109
1- Trail Creek	1996	C3	18.3	1/77	1/27	97	31.6
3- West Fisher	1996	B3c	18.3	1/324	1/93	24	32.9
4- Standard Creek	1996	F3	16.2	1/47	1/36	88	19.4
5- West Fisher	1996	C4	19.1	1/96	1/77	89	25
6- 4th of July Creek	1996	B3a	13.4	1/30	1/134	100	18.8
7- Lake Creek	1996	B4	21.6	1/86	1/432	92	18.6
8- West Fisher	1996	B3a	15.2	1/53	1/45	100	17.8

9- Bramlet Creek	1997	B4	16.2	1/111	1/12	100	21.1
10- Mill Creek	1997	B3a	21.3	1/69	1/70	100	17
11- Standard Creek	1997	A3a+	6.7	1/140	1/16	100	8.5

Table 3-52 - Silver Butte Fisher River RMO Data

Site	Year	Rosgen Type	BFW (ft)	Pools per Foot	LWD per foot	% Bank Stability	Width/ Depth Ratio
1 – Iron Meadows Cr	1997	B3a	12.1	1/131	1/29	100	19.8
1 – Olson Creek	1997	F4b	6.61	1/9	1/4	99	23.1
1-Trapper Creek	1997	B3a	7.2	1/11	1/36	100	18
1- Silver Butte Main stem	2000	C3	56.6	1/229	1/60	7	40
2-Silver Butte Main stem	1997	B3c	46.4	1/935	1/132	87	52.7
2a-Silver Butte Main stem	2000	C3	54.2	1/553	1/20	100	39.35
3-Silver Butte Main stem	1997	B4c	27.6	1/32	1/61	80	36.1
4-Silver Butte Main stem	1997	F3b	23.1	1/235	1/32	100	25.1
5-Silver Butte Main stem	1997	B3	13.4	1/69	1/15	100	20.6
6-Silver Butte Main stem	1997	B4	11.5	1/152	1/23	98	17.1
7-Silver Butte Main stem	1997	B3a	18.8	1/63	1/12	97	44.4
8-Silver Butte Main stem	1997	B3a	10.7	1/43	1/17	96	23.9
9-Silver Butte Main stem	1997	B3a	9.3	1/41	1/8	100	18.6
1– Waloven	1996	B4c	14.7	1/63	1/25	65	16.9
1– Waloven	1997	F3b	14	1/70	1/11	67	25.5
2– Waloven	1996	F3	10.2	1/73	1/17	85	18.3
2– Waloven	1997	B3a	11.7	1/33	1/80	100	14.8
3– Waloven	1997	A3	8.5	1/46	1/10	87	10.8
4– Waloven	1997	A3	6.7	1/22	1/12	100	17.5

***These figures were determined by converting the desired number of pools and LWD from pools/LWD per mile to pools and LWD per foot. For purposes of this analysis only individual reaches of each stream were measured rather than the entire channel length. Those figures that are shaded do not meet INFS RMO standards.**

The fish habitat data collected shows that many conditions currently meet or exceed interim Riparian Management Objectives with the exception of pool frequency in 30% of the measured reaches. The desired future condition would be all RMOs meet or exceed INFS standards. This would require future fisheries restoration work to construct habitat enhancement structures in project area streams. Associated with this work would be some level of sedimentation from excavating the structures.

Equipment may be used for this process, which could kill fish directly from being crushed or indirectly from sedimentation. The detrimental effects from this project will be short term. Sediment will drop out quickly after the construction of the structures. The overall effect would be positive from the creation of pools and adding complexity to fisheries habitat.

Fish passage is a Regional priority and, as mentioned above, barriers exist on some stream crossings in the project area. The desired condition would be that no such barriers existed.

Non-native fish hybridize with native fish species within project area streams. An additional desired condition would be that healthy populations of only native fish species would exist within the project area. This may not be possible due to the extent of the presence of non-native fish species as a result of years of stocking. Additionally, the general public may oppose removal of non-native fish species.

ENVIRONMENTAL CONSEQUENCES

To remain productive, a fish population must have relatively stable habitat conditions over time. Forest management actions produce changes that are similar in kind and intensity to natural environmental variability. However, human-caused changes tend to persist for longer periods, either because they are more widespread, or because they add to natural factors that are already affecting fish productivity. Fish species vary in their tolerance for, and reaction to, adverse or positive environmental changes. Further, the response of one species may act as an additional negative effect on another species. Native trout species (bull trout, redband rainbows, and westslope cutthroat trout) are particularly vulnerable to habitat changes and to sediment effects (Weaver and Fraley 1991).

The project area provides a small to moderate amount of recreational fishing on National Forest System lands. Alternatives that degrade fish habitat can limit the number of adult fish available for fishing. Alternatives that change the current accessibility to fisheries resources can also impact recreational fishing opportunities. There may be some short-term adverse effects to fish habitat as a result of proposed timber harvest and road building. However, these effects are not expected to affect entire fish populations and would not result in a long-term trend in fish abundance. As long as INFS is met for given activities within an alternative, there should be no effect to recreational fishing. None of the alternatives decreases access to fishing in any areas. There are no other known potential effects to recreational fishing.

ALTERNATIVE 1 - NO ACTION

Direct and Indirect

Vegetation in previously harvested units will continue to mature over time resulting in gradually decreasing water yield for all watersheds. This recovery should improve overall watershed conditions. If wildfires are successfully suppressed and prescribed burning does not occur fuel loadings would increase resulting in an increasing risk of high intensity wildfires, which could affect watershed conditions. The current Douglas-fir bark beetle infestation would continue for 2-5 years. Encroachment of Douglas-fir would continue in dry ponderosa pine habitat. Stands of Douglas-fir and ponderosa pine would remain at stocking levels higher than historic conditions. The risk of insect and disease activity would therefore remain high or increase. Wildfire potential and intensity would also remain high or increase. Wildfire potential and intensity would also remain higher than historic conditions. Existing roads would continue to channel surface flow and sediment to the streams. This would keep flows elevated until a majority of vegetative recovery has occurred and hydrologic recovery begins. If these problems were not corrected, they would continue to contribute to aquatic habitat degradation. Peak flow increases will never fully recover to a natural condition with the existing road system in place.

Undersized culverts could plug and wash out resulting in large increases of sediment to the streams. Fish barrier culverts would be left in place continuing the loss of genetic flow and impeding migration between sections of streams.

Activities on private lands would continue with change in watershed condition consistent with past activity. These activities include PCTC accessing their lands as well as human development in lower Silver Butte.

Cumulative Effects

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 and there is a high likelihood that approved agency actions would be implemented. These activities would incrementally affect fisheries habitat and fish populations. However, due to Plum Creek Timber Company (PCTC) Habitat Conservation Plan (HCP), INFS, and past BMPs, the level of effects would be similar to what currently exists and would not decrease the viability of native fish populations within the project area. Impacts from forest management will continue as PCTC and other private lands remove timber and prepare lands for development. There will still be continued watershed improvement as vegetation recovery continues, stream enhancement projects by MFWP are potentially implemented, and some stream barriers are replaced during regular road maintenance activities.

The major impacts to streams in the project area would continue to be from existing forest management, natural high peak flows and high amounts of bedload and fine sediment. These impacts would not be reduced by long-term storage and culvert removal on roads in the project area drainages as described in Chapter 2. Proposed road storage under action alternatives would not restore stream crossings and sediment routed to streams from roads would remain high. Since fisheries habitat improvement projects would not be implemented, stream conditions would largely stay the same. Natural events such as wildfire and flooding would slow or set back fisheries habitat recovery.

The Fisher River basin would continue to be managed and fisheries populations and habitat in the drainage would continue to be impacted from sedimentation and channelization (along US Highway 2). Hydrologic recovery would occur in the basin and contribute to some amount of recovery; however channelization from the highway, railroad location, high water temperatures, and the large amount of roading in RHCA's would continue to negatively impact fisheries in the lower Fisher River.

The Cabinet Face, including the Silver Butte and West Fisher Creek drainages will continue to be managed as roadless and wilderness and will not be developed by humans. This will ensure that high quality habitat will remain and clean, cold water will continue to be received by downstream waters.

PCTC plans on logging within the project area between 2008 and 2020. The total ECA's in the time period are projected to be: 362 acres in Miller Creek, 235 acres in Silver Butte Creek, and 270 acres in West Fisher Creek. All harvest is planned off existing road systems. A detailed list of the proposed harvest can be found at the beginning of Chapter 3 of this document.

PCTC also plans on logging other areas in the Fisher basin between 2008 and 2020. These activities were analyzed in the Smoked Fish EA and are incorporated by reference. The total ECA's in the time period are projected to be 7,712 acres. Because of the variability in the private timber industry, these harvest acres were analyzed for the year 2008. This harvest activity is anticipated to require the construction of 48 miles of additional road (equivalent to 192 ECA's) in the Fisher Basin (based on an average PCTC road density of 4 miles/square mile). Three recently completed USFS timber sale ECA's within the Fisher River basin have also been included in this cumulative effects analysis for the Fisher

River. The Alder Creek sale included 180 ECA's, the Cow Creek sale included 614 ECA's, and the Smoked Fish EA included 494 ECA's.

The Montanore Mine project would move forward and effects associated with this project would impact West Fisher Creek and Miller Creek fisheries resources in these drainages. Activities included in the Montanore Mine proposed action that are within the project area include construction of a power line to the mill site, along with a road network needed for the construction and maintenance of this power line, among other activities as described at the beginning of Chapter 3. These actions would impact fisheries and will be fully described in the Montanore EIS. Impacts related to the mine adit, mine waste water, or other actual mining impacts would all be outside the Silverfish Planning Subunit. Impacts from the power line supplying power to the mine facilities are the only impacts that would be cumulative with the Miller West Fisher project. The mine impacts to fisheries in the project area from the power line include additional road stream crossings, which will increase sediment delivery to streams, particularly Miller Creek and West Fisher Creek. Peak flows would increase by approximately 100 equivalent clearcut acres (ECA's) due to the clearing of all trees and tall growing vegetation along the power line corridor.

Statement of Findings/Forest Plan Consistency

The no action alternative is consistent with INFS because existing conditions would remain stable. However, problems that would likely develop associated with aquatic habitat (sediment, pools, fish barriers, etc.) would need to be addressed in the near future to promote long-term recovery of project area watersheds.

EFFECTS COMMON TO THE ACTION ALTERNATIVES

Direct and Indirect Effects

Based on the potential level of effects to fish habitat and fish populations there is a small difference between the action alternatives. The level of proposed harvest, burning, and temporary road construction varies among the action alternatives and varies with respect on the effects to fisheries. Another concern regarding effects from this proposed project is cumulative effects to the WQLS Fisher River.

Because increases in water yield as a result of the action alternatives are not expected to cause channel degradation, they should not have a measurable effect on trout habitat. RHCA's would protect habitat from non-channelized sediment inputs, maintain large woody debris recruitment and ensure nutrient delivery and storage. The surface flow and sediment that is channeled to the streams by roads would be reduced with BMP work and water barring, accelerating hydrologic recovery of affected watersheds and reducing the potential for further degradation of fisheries habitat. By replacing culverts where fish barriers are located, connectivity would be restored.

Short-term increases of small amounts of sediment are expected with the decommissioning and long-term storage roadwork. Because increasing sediment production can decrease habitat diversity, degrade spawning and rearing habitat, and reduce aquatic insect production, the proposed roadwork could involve short-term effects to trout populations. However, the long-term benefits of reducing water routing and sediment input would outweigh the short-term effects caused by the roadwork.

Timber Harvest and Associated Activities

Under the various action alternatives, timber harvest, burning and watershed restoration would occur in the project area watersheds. Pre-commercial thinning will have no effect on the fish species and will not

be discussed further. Equivalent clearcut area (ECA) increases in all affected watersheds under action alternatives are not expected to exceed 2,581 acres. Cumulative peak flow increase (PFI) from these additional ECA's would not cause additional in-channel sediment production or changes in channel morphology in any channel except Miller Creek, which will be above Forest Plan standards with the proposed project.

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. Channel instability occurs when the scouring process leads to degradation (down cutting), or excessive sediment deposition results in aggradation (deposition) (Rosgen 1996).

Increasing sediment production is generally associated with ground based harvest systems and particularly road construction. Sediment decreases habitat diversity, degrades spawning and rearing habitat and consequently fish reproduction and survival. It also reduces aquatic insect production. 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. Fine sediment has also been shown to cause alterations in macroinvertebrate abundance and diversity.

Default RHCA's would protect streams from non-channelized sediment inputs. Non-channelized flow is overland flow, rather than that found in ditches or other channels. A review associated with INFS (USDA Forest Service 1995) concluded that non-channelized sediment flow rarely travels more than 300 feet, and that 200 to 300 foot riparian buffers are generally effective at protecting streams from sediment from non-channelized flow. The implementation of default INFS RHCA's would insure that these riparian characteristics are protected within the project area. Typically, there is a 3 to 4 year increase in nitrogen and phosphorus in streams draining a newly harvested area. This brief increase in the two nutrients critical to stream productivity is the result of the breakdown of logging slash, the flushing of some soil nutrients normally taken up by trees, and from slash burning. These short-term indirect and cumulative water quality effects do not generally extend very far downstream because of settling out of in-stream sediments, and absorption by plants and animals. However, these nutrients are in general short supply in the affected area and the potentially affected waters downstream would increase aquatic productivity for a short time.

The vegetative treatment in drainages is mitigated, either naturally or through project design, for minimal effect. All streams will be buffered by INFS RHCA's. Nearly all of the treatments are basal area reductions, and most of the streams near harvest units are intermittent. However, some units are near perennial fish bearing streams and maximum RHCA buffers have been applied. Sedimentation, large woody debris and temperature, the most crucial factors for salmonid habitat, will not be affected by the harvest activity.

Road Construction, Reconstruction, and BMP's

The Action Alternatives would result in BMP work on all haul roads associated with harvest units. In addition, up to 3.29 miles of temporary road are proposed. These new roads would be recontoured, seeded and fertilized upon completion of activities.

BMP work would be conducted on all haul roads in the project area. The surface flow and sediment that is channeled to streams by roads would be reduced with this work. This would accelerate hydrologic recovery of affected watersheds and reduce the potential for further habitat degradation. A list of

existing roads to be put into long-term storage and decommissioned can be found in the Watershed Specialist section of this document and in the alternative description in Chapter 2. This work would further drop road densities in the project area below Forest Plan standards of 3miles/square mile. This would restore the drainage network and would reduce the likelihood of sediment introduction from failed culverts.

In addition, all disturbed areas will be seeded. Nonetheless, short-term increases in sediment are possible because of the risk of rain events occurring before the vegetation in disturbed areas is established.

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 stream flow, sediment loading, 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 RHCA's and especially if they cross streams where they can intercept water and sediment and directly route it to streams.

Prescribed Fire

The burning included in the action alternatives would have minimal offsite effects. The project will utilize both spring and fall burns. Springs burns occur when soils are moister which protect soils and retain a larger portion of the organic duff layer. As a result sediment production from the burned areas would be minimal. Fall burns are also prescribed for this project. These burns will be used more for stand replacement treatments. This will help open some of the forest canopy and create openings and forage for wildlife. Some burn units may have fire line constructed, which exposes bare soil. Standard erosion control practices would be applied to minimize sediment production. 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 streams near operations. Since the magnitude of the expected sediment change is so small, the minor additional load that may result from the proposed action is anticipated to have an immeasurable effect.

The proposed fuel treatment activities will have some short-term indirect effects on site nutrient levels. The effects of any increased nutrient levels due to the prescribed burning would be similar to natural environmental fluctuations. Given the distribution over time and space of the proposed burn units and the dilution of any increased nutrients within fish habitat, any effects from nutrient increases would be minor or neutral.

Within individual watersheds, the prescribed burns comprise only a small proportion of the total project area. As a result, any changes in fish habitat due to the prescribed burning would be within natural environmental fluctuations.

Watershed Restoration Work

The bulk of the watershed restoration proposed with this project includes long-term storage of roads. Restoration would occur under all action alternatives. See chapter two for description of road treatments for watershed restoration by alternative.

Fisher RAP recommended nearly 67 miles of USFS road in the Fisher analysis area to be placed into a stabilized condition to help the sub-watersheds, and ultimately the Fisher River, begin to recover from

past activities. Approximately 5 miles of road storage work was completed in 2008 as required mitigation for the Smoked Fish EA. While these roads to be stored are outside of the Miller West Fisher project area, they do contribute to improvement of the Fisher River WQLS. The Fisher RAP can be found in the project file.

The Fisher RAP includes 14.2 miles of road work located in the Silverfish Planning Subunit. Due to existing grizzly bear core areas in Miller Creek, two miles of proposed work had to be dropped from this proposal. The remaining work to be approved includes, 0.9 miles of road decommissioning and 11.3 miles of road that would be placed into long term intermittent stored service. Roads to be stored and decommissioned vary by alternative as displayed in Chapter 2.

Removing culverts would prevent them from plugging and having the associated fill slope fail. This would prevent large increases in stream channel sediment. Unnatural channel width, slope and streambed form occur upstream and downstream of stream crossings (Lee et al. 1997). Removing culverts and reconstructing the stream channels where the culverts were located would reconnect the stream channel and aquatic habitats. The number of stream crossings restored varies by alternative. The proposed action would restore 12 stream crossings, while Alternative 4 would restore 9, and Alternative 6 would restore 15. Alternative 6 would most benefit fish from the perspective of improving stream connectivity and reducing sediment inputs because it would restore the most stream crossings. The following table shows where stream crossings would be restored by Alternative. Alternative maps also show where streams and roads to be stored or decommissioned intersect.

Table 3-53 – Stream Crossings Restored by Alternative

ROAD TO BE STORED OR DECOMMISSIONED	ROAD NAME, LOCATION	STREAM CROSSED	FISH BARING (YES/NO)	NUMBER STREAM CROSSINGS RESTORED	ALTERNATIVES
148A	Silver Butte Pass A	Tributary to Silver Butte Fisher River	No	2	2, 4, 6, 7
2314M	Porcupine Ridge M	None	NA	0	2, 4, 6, 7
5009	Viking Mine	Silver Butte Fisher River	Yes	1****	2 only
5326	Standard Ck. Miller Ck. Oldie	Tributaries to West Fisher Creek	No	2	2, 4, 6, 7
6744	Standard Ck. West Fisher	Standard Creek and West Fisher Creek	Yes	2	2, 4, 6, 7
6745	Standard Creek	Standard Creek	Yes	1****	2 only
99816	Iron Meadow Ck.	None	NA	0	2, 4, 6, 7
99816A	Iron Meadow Ck. A	Tributary to Iron Meadow Creek	No	1	2, 4, 6, 7
99803	King Mine	Silver Butte Creek Tributary	No	2	2, 4, 6, 7
99803A	King Mine	None	NA	0	2, 4, 6, 7
99813	King Mine	None	NA	0	2, 4, 6, 7
4725	North Fork Miller	Tributary to Miller Creek	No	1	6 only
5200	Teeters	Tributary to West Fisher Creek	No	1	6 only
5007A	Teeters	None	NA	0	6 only

ROAD TO BE STORED OR DECOMMISSIONED	ROAD NAME, LOCATION	STREAM CROSSED	FISH BARING (YES/NO)	NUMBER STREAM CROSSINGS RESTORED	ALTERNATIVES
5199	Teeters	Tributary to West Fisher Creek	No	1	6 only
5198	Teeters	Tributary to West Fisher Creek	No	2	6 only
6743	Teeters Mountain	Tributary to West Fisher Creek	No	1	6 only

**** Road 5009 crosses the Silver Butte Fisher River with a ford, rather than a culvert or bridge. Standard Creek rd. 6745 crosses Standard Creek with a ford. These fords are armored and stable and do not produce sediment.

A short-term increase in sediment is expected with the culvert removal especially at live stream crossings. However, past culvert removal has shown very little sediment actually enters the stream and settles out quickly downstream of the pipe removal (Switalski et al 2004). Monitoring done during stream crossing improvements on the Libby Ranger District has documented that the increase in turbidity and sedimentation is of very short duration (Wegner 1998). Associated sediment transport is also very limited. The long-term benefits of reducing water routing and sediment input and restoring aquatic connectivity will outweigh the short-term effects of roadwork. Stream channels will also be reconstructed to minimize the channel's adjustment process and resulting sedimentation following culvert removal. Large rocky substrate and woody debris would be used to armor the new channel. Additionally seeding disturbed areas would also minimize sediment input.

Restoring stream and riparian function through the continued growth of harvested areas would increase depth, complexity and shading within project area watersheds providing for cooler water temperatures, reduced evaporation, and potentially more stable flows through the summer low flow period. Similar benefits would occur during winter low flows. Intact riparian communities provide insulation from temperature fluctuations that prevents streams from freezing during extreme cold. Deeper water also provides better aquatic habitat as it is also less likely to freeze completely. Increasing the frequency of LWD not only can increase in-stream complexity but also serves as a long-term nutrient supply.

Cumulative Effects

The expected ECA's from the alternatives range from 1,456 to 2,581 acres in project area drainages. PCTC plans on managing their lands in the Fisher Basin between 2008 and 2020. The Miller West Fisher project area comprises a portion of the Fisher Basin, which also includes the Riverview and McElk Planning Subunits. The total ECA's in the time period is projected to be 7,712 (please refer to the watershed section of the document). Because of the variability in the private timber industry, these harvest acres will be analyzed for the year 2008. This harvest activity is anticipated to require the construction of 48 miles of additional road (equivalent to 192 ECA's) in the Fisher Basin (based on an average PCTC road density of 4 miles/mi^2). Table 3-54 shows the cumulative PFI, ECA and road density from proposed management in the Fisher Basin. Please see Chapter 3 for a detailed description of activities within the Silverfish Planning Subunit.

Table 3-54
Water Yield Results - Alternative 2 (2007)

Drainage	Watershed Size (acres)	ECA (acres)	Cumulative Water Yield Increase (%)	Road Density (miles/mi2)
Miller Creek	7,563	2,698	15.9	2.56
West Fisher Creek	28,950	3,346	4.8	2.25
Silver Butte Creek	29,934	1,305	1.8	1.07
Fisher River	250,551	65,732	5.1	4.2

The expected peak flow increase from USFS and Plum Creek activities does not exceed Forest Plan guidelines (Forest Plan Appendix 18) of less then 15% in any drainage except Miller Creek.

The prescribed fire would help to reduce fuel loadings in treated areas within the project area. The overall effects of this burning would be minimal. There will be a reduced likelihood of excessive crown reduction and a stimulation to grass and shrub growth. The site preparation associated with regeneration units would not occur in any RHCA.

The effective road density with the proposed activities would be incrementally reduced within the project area due to road storage and decommissioning activities. Effective road density includes roads that have not been rehabilitated to disperse water and sediment. This would cumulatively decrease water routing and sediment input from roads into stream channels.

There would be a reduction of 12 stream crossings through watershed restoration for Alternative 2, which is the greatest long-term benefit to fisheries resources. Alternative 4 proposes to remove 12 stream crossings, while Alternative 6 proposes to remove 19 stream crossings. This work would prevent large increases in stream channel sediment from occurring had the culverts failed. By removing culverts and reconstructing the stream channels where these culverts were located, the stream channel and fish habitat would begin to be restored at those crossings. Removing those culverts could also restore connectivity by reconnecting aquatic habitat. Short-term negative effects from watershed restoration would be addressed and mitigated through timing restrictions and BMP implementation.

Implementation of this project in conjunction with the current activities in the project area, which include all the ongoing agency actions and reasonably foreseeable actions described at the beginning of Chapter 3 would not measurably affect fisheries habitat. Habitat conditions currently partially meet or exceed INFS standards (Tables 3-50, 51, and 52).

Montanore Mine

This project includes permitting a silver/copper mine in the Cabinet Mountains as described in Chapter 3 in the Cumulative Effects section. The main activity of concern for effects to fish in the Miller West Fisher project area is the construction of the power line to the mill site. For Alternatives 2, 4, and 7, the power line location considered for cumulative effects is the North Miller Creek route, which would clear trees in the power line location itself, and construct 9.9 miles of access route to install and maintain the power line. Of the total new road miles to be constructed, approximately 3.7 miles would be within the project area. The additional permanent road in the project area would add four new stream crossings in the North Fork of Miller Creek. While the channels that would be crossed are intermittent, sediment from these roads would still be delivered into downstream waters during storm events and spring snow melt. Approximately 1.67 miles of these roads cross sensitive landtypes more prone to delivering sediment to streams. These landtypes are found surrounding Miller Creek and the Fisher River. Please see the soils section and soils project file for more detail.

Cumulative effects analysis for Alternative 6 considers the Montanore power line route through the West Fisher (West Fisher Creek) for analysis. This power line route would construct approximately 2.35 miles of new road within the project area, of which approximately 0.88 would fall within sensitive landtypes prone to delivering higher levels of sediment to streams. Impacts to fish as a result of cumulative effects with Montanore Mine would be less with the West Fisher Creek power line route than with the North Miller Creek route, with less than half the amount of road constructed on sensitive landtypes in the riparian zone.

The power line itself would also cross streams and RHCA's. Removal of tree canopy within RHCA's would increase sunlight and temperatures within portions the North Fork of Miller Creek and West Fisher Creek. Peak flows would also be increased by approximately 100 acres due to power line clearing. These affects would add to the effects of the Miller West Fisher project. Complete effects analysis for the Montanore Mine will be displayed in the Montanore EIS. As described for Alternative 1, no mining impacts would occur within the project area, since all mine facilities except the power line would occur outside the project area.

Forest Plan Consistency

The proposed activities implement INFS RHCA's to protect riparian resources and function. None of the action alternatives propose harvest in RHCA's. Prescribed fire will be allowed to back into RHCA's in burns B3, B4, and B9. Higher humidities and soil moisture generally keep burn intensities low within RHCA's and no adverse effects are expected. Road decommissioning and storage will remove from 6.60 to 16.43 miles of road and from 7 to 13 stream crossing structures in the project area. These factors will prevent retarding the attainment of Riparian Management Objectives. Based on these factors it is determined that all the action alternatives are consistent with INFS and the Forest Plan.

EFFECTS SPECIFIC TO THE ACTION ALTERNATIVES

Alternative 2 – Proposed Action
Timber Harvest and Associated Activities

The proposed action was designed to meet the purpose and need and address issues and concerns identified internally and by the public. This alternative was also designed to manage vegetation while meeting habitat standards for the grizzly bear in cooperation with the U. S. Fish and Wildlife Service (USFWS). This alternative includes the North Miller Creek route for the Montanore Mine power line (as described above) for cumulative effects analysis.

Activities associated with the proposed action are described in Chapter 2 above.

This alternative includes 1.2 miles of new road construction, timber harvest, site prep, slashing and underburning on 2,508 acres. This will result in the creation of an additional 2,540 ECA's. Table 3-31 in the watershed specialist report shows the amount of PFI from harvest in specific watersheds in the project area. Road projects listed in Table 2-3 are also included in this proposal. Only a portion of the road storage work would be completed through the timber sale.

Presently there are self-sustaining populations of salmonids in many project area streams. Electro-fishing surveys found existing and possible pure strain populations of westslope cutthroat and redband rainbow trout in the project area. Past genetic surveys have discovered both pure strain redband rainbow and westslope cutthroat as well as hybridized costal rainbow x westslope cutthroat and redband rainbows.

Other watersheds supporting fish populations that would be affected by timber harvest include only the Fisher River. The Fisher River watershed would have an increased ECA of < 1% and a PFI of < 1% from this project. This amount of change would result in an undetectable change in the Fisher River system and no effect to fish.

Riparian values in the project area such as temperature, filtration of sediment and contaminants, large woody debris recruitment and stream bank condition would not be compromised due to the implementation of INFS RHCA's. The implementation of RHCA's would insure that this alternative would not retard the attainment of RMO's.

Sediment produced by harvest activities would be mitigated by design through the implementation of RHCA buffers. Additional buffering is provided by the lack of connectivity between most stream sections. The upper watersheds are dry or subsurface before they reach the larger main stems of project area streams.

Prescribed Burning

Total acres affected by prescribed burning for this alternative are displayed in Table 2-2. As a result of this burning any changes in fish habitat would be within natural environmental fluctuations.

Approximately 56% of total treatment acres, or 3,175 acres, is proposed for prescribed fire under this alternative. Prescribed fire may be preceded by slashing, if necessary, to reduce the chance for ladder fuels to carry fire to tree canopies and to assist in carrying fire throughout the treatment unit. Some burns will be conducted in the spring when conditions are within prescribed parameters for weather and fuel moisture. Some burning will occur in the fall and is designed to be stand-replacing. The stand-replacing burns proposed would create openings in an otherwise continuous mature tree canopy. These openings would provide foraging areas for bears and other wildlife species.

Most of the burns will occur outside RHCA's. However, there are some burns that include RHCA's within the unit boundaries. Incidental and designed inclusion of RHCA's in burns will likely result in low intensity fire due to moist habitat in RHCA's.

Road Construction, Reconstruction, and BMP's

This Alternative would result in approximately 12.56 miles of road related disturbance, including 1.2 miles of new road construction and 11.36 miles of decommissioning and storage. Spot reconstruction would occur on the existing road systems that are identified as haul routes to improve surface drainage. One stream crossings will be improved to INFS standards in the project area which is currently a barrier to fish migration. This crossing is on road 2314, Trail Creek. The other two known fish barriers will be left in place due to one being located on private land and the other is maintaining a genetically pure population of westslope cutthroat trout.

BMP work would be conducted on 42.72 miles of road in the project area. Surface flow and sediment that is channeled to streams by roads would be reduced with BMP work. This would accelerate hydrologic recovery and reduce the potential for further habitat degradation.

Watershed Restoration Work

The bulk of the watershed restoration proposed with this alternative includes road storage and decommissioning. This watershed restoration would occur under all action alternatives.

Roads to be decommissioned and put into long term storage total 11.36 miles in Alternative 2. The drainage network will be partially restored and the likelihood of sediment introduction from failed culverts will also be reduced. Roads slated for storage and decommissioning are listed in Table-2-3.

This alternative removes 10 stream crossings and includes BMP and INFS improvement on stream crossing structures in the project area.

Other activities, including precommercial thinning, fuels treatment in the Lake Creek Campground, trail improvement and reconstruction, and access changes as described in Chapter 2 will have no measurable effect on fish species in the project area.

ALTERNATIVE 4

Timber Harvest and Associated Activities

Activities associated with this alternative include 0.94 miles of temporary road construction, timber harvest, site prep, slashing, pre-commercial thinning and ecosystem burning on 1,715 acres resulting in an additional 1,456 ECA's. The road decommissioning and storage projects listed in Table 2-11 are also included in this proposal. Only a portion of the road storage work would be completed through the timber sale.

The effects from proposed vegetation management treatments would be similar to those described for Alternative 2, though treatment acres would be over 1,000 acres less than Alternative 2.

Prescribed Burning

This alternative would have about 2,830 acres of prescribed burning as shown in Table 2-8. Additionally harvest units would be grapple piled and burned as part of the fuels reduction. Effects from this burning would be similar to those described for Alternative 2.

Road Construction, Reconstruction, and BMP's

This Alternative would result in 0.94 miles of temporary road construction, and 30.45 miles of BMPs on haul routes. Effects of these activities would be similar, though less than, those of the proposed action (Alternative 2) as described above.

One notable difference from Alternative 2 is the reconstruction of approximately one mile of road into the private Irish Boy Mine property. This road (6748) was constructed for access to the mine at the time of its development and is located entirely within the RHCA of Lake Creek. The existing historic road produces some sediment that may be delivered to Lake Creek, but largely consists of stable rocky cobble material. The reconstructed road will be required to meet current BMP standards, but has a high probability of depositing sediment into Lake Creek because of its close proximity to the stream, and due to the soil disturbance necessary to bring the road up to a drivable surface that meets BMP standards. Required seeding of disturbed area will stabilize the road. Impacts to fish include increased sediment delivery to Lake Creek, which is a tributary to West Fisher Creek, which contains bull trout, westslope cutthroat trout, and redband trout.

Watershed Restoration Work

The bulk of the watershed restoration proposed with this alternative includes road storage and decommissioning. Alternative 4 proposes 6.6 miles of storage and decommissioning of road with 7 stream crossings restored. This alternative also includes the creation of pools in Miller Creek to meet INFS standards. Stream bank stabilization within West Fisher Creek is also proposed, and is described

in more detail below. The watershed restoration work would have effects similar to those described for Alternative 2, though 4.76 miles less of this work would be completed, so the beneficial effect would not be as large. The addition of pool creation in Miller Creek and stream bank stabilization within West Fisher Creek would directly and measurably improve fish habitat within Miller and West Fisher Creeks.

Aquatic Habitat Improvement

Pool creation is proposed in Miller Creek. This work would include the creation of pools through placement of logs and rocks in the stream channel by hand. This work would move Miller Creek closer to meeting and exceeding RMO's and improve overall habitat conditions in the drainage.

Stream bank stabilization is proposed on West Fisher Creek in T26N R30W Section 2 where the stream enters a corner and has eroded the toe of the hill inputting many tons of fine sediment into the stream. The corner would have four rock veins constructed along the radius of the curve to push the water away from the bank. This work would require a large piece of machinery such as an excavator to place to rock for the structure. The effect of this work would be a temporary increase in sediment during the work, followed by a large reduction in sediment input to the stream for the long term, and improved survival of salmonid eggs and fry in the West Fisher and Fisher River system. Effects to the Fisher River would likely be too small to measure, and many more similar sediment sources exist in that system. But improvements to West Fisher Creek would likely be more beneficial.

Standard Lake has become more of a stream through a meadow than a lake. Work is proposed to rehabilitate the lake into a shallow wetland complex. There is a large partially blown out beaver dam at the outlet of the lake. A slat dam could be built with large planks to raise the water level in the lake up to three feet which would restore about 20 acres of wetland. The effect of restoring this lake would largely benefit amphibians by creating suitable habitat for egg laying and rearing. Other wildlife species would likely benefit from the rehabilitation of what once was an aquatic ecosystem. The lake would still not provide habitat for fish. Standard Lake has always been too shallow to support fish through winter because it would likely freeze solid in at least some winters. The restored lake would also freeze out in at least some winters.

Effects of Other Activities

A combination of additional activities is included in this alternative. These include access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, and fuel reduction and hazard tree removal in Lake Creek Campground. These activities will not contribute a measurable effect to fisheries in the project area because they will not occur within streams or involve equipment use in RHCA's and will not contribute sediment to project area streams.

ALTERNATIVE 6

This alternative is designed to respond to potential changes in cumulative effects activities, specifically the Montanore Mine. This alternative considers the proposed Montanore power line route that runs through the West Fisher (Montanore Alternative E - West Fisher Creek) for cumulative effects analysis. The reason for analyzing this alternate route is that it is a potential choice for the Montanore project, with very different effects to the Miller West Fisher project area than the North Fork of Miller route. Opportunities for additional vegetation treatment and grizzly bear core creation would be possible if the Montanore power line were not located in the North Fork of Miller Creek. Please see Chapter 2 for a complete description of this alternative.

Activities associated with this alternative include 3.29 miles of temporary road construction, timber harvest, site prep, slashing, and pre-commercial thinning, on 2,249 acres resulting in an additional 1,456 ECA's. The alternative includes the road storage and decommissioning projects listed in Table 2-18.

Prescribed Burning

This alternative would have the same 2,830 acres of prescribed burning as Alternative 4. Effects from this burning would be similar to those described in Alternative 2.

Road Construction, Reconstruction, and BMPs

This Alternative would result in the most temporary road construction of all alternatives, with 3.29 miles of temp road construction. This road would be obliterated when they units were completed. Though the temporary roads are short spurs into harvest units, or are high up on the slope away from streams or RHCA's, they increase the potential for sediment delivery to streams. Best management practices would be completed on approximately 38.99 miles of haul routes. Included are stream crossing improvements in the form of upsized culverts to meet current INFS standards. Implementation of these road improvements would benefit fisheries by reducing sediment input to streams.

Watershed Restoration Work

The bulk of the watershed restoration proposed with this alternative includes 15.00 miles of road storage and 1.43 miles of decommissioning as described in Table 2-18. This Alternative also includes the creation of pools in Miller Creek to meet INFS standards. Stream bank stabilization in West Fisher Creek is also proposed. The effect of these actions is similar to that described for Alternative 4, although there would be 9.8 miles more road storage, increasing the benefits of this work to fish.

The Standard Lake restoration is also included in Alternative 6, with benefits the same as described for Alternative 4.

Effects of Other Activities

A combination of additional activities is included in this alternative. These include access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to fisheries in the project area because they will not occur within streams or involve equipment use in RHCA's and will not contribute sediment to project area streams.

ALTERNATIVE 7

The effects of Alternative 7 are the same as those described for Alternative 4, with the exception that units accessed on Road 4782 off the West Fisher Road 231 would be winter logged in order to keep from increasing open road density in MA 12, big game summer range. The only change in effect to fish and aquatic species in the project area would be the result of plowing for winter logging. Snow plowing will occur within the West Fisher drainage. The snowplowing will follow mitigation measures set in INFS to ensure that there will be no effect to bull trout. Therefore the effects of Alternative 7 will be the same as those described above for Alternative 4.

STATEMENT OF FINDINGS FOR ALL ALTERNATIVES

Threatened, Endangered and Sensitive Species

The action alternatives would have **No Effect** on white sturgeon. This conclusion is based on the lack of evidence linking forest management to sturgeon viability.

Alternatives 4, 6, and 7 **May Affect and are Likely to Adversely Affect** bull trout from the proposed project. These alternatives include the stream bank stabilization project in West Fisher Creek. This work will occur directly in the stream channel of West Fisher Creek near known migratory bull trout spawning habitat. The work will have a short term negative impact but a long term positive effect by reducing sediment in the drainage.

Alt 2 **May Affect and is Not Likely to Adversely Affect** bull trout due to the ground disturbing activities and sediment production within a bull trout watershed that may deliver sediment into bull trout waters. The chance of impacting bull trout with Alternative 2 activities is reduced through implementation of INFS buffers (RHCA's), and timing restrictions for sediment producing road work to protect eggs and fry in occupied streams from the effects of such sediment.

As part of this project a BA for bull trout will be submitted to the USFWS for concurrence.

This assessment constitutes the biological evaluation for sensitive species.

Alternatives 2, 4, 6, and 7 **May Impact habitat or individual westslope cutthroat and/or redband rainbow trout but will not likely contribute to a trend towards federal listing or cause loss of viability to the population or species**. Alternatives 4, 6, and 7 include the fisheries habitat and stream bank stabilization projects. The fisheries habitat work will occur directly in Miller Creek and has the possibility of directly killing westslope cutthroat trout individuals from crushing during structure construction. Sediment produced downstream may also impact spawning gravels. This would be a short term negative impact while the increased habitat would have many long term positive benefits. The bank stabilization project will occur in known westslope and redband rainbow habitat. The possibility of individual redbands and westslope cutthroat trout being crushed and causing mortality is high. Again, this work will cause short term negative impacts but will have long term benefits that far outweigh these detrimental effects. All action alternatives include BMP implementation, which will improve fisheries habitat by reducing sediment inputs to project area streams. Sediment will be produced and input into streams during BMP implementation, though this would be a short-term impact with long-term benefits. Other soil-disturbing activities may also deliver sediment to fish-bearing waters, though INFS standards reduce that possibility to a manageable level.

FIRE AND FUELS

INTRODUCTION

Analysis Area

This analysis is limited to the Miller West Fisher project area, which consists of the Silverfish Planning Subunit.

EXISTING CONDITION

Comparison of Historic Versus Present Fire Regimes

The Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin (PNW-GTR-382, September 1996) includes an assessment of changes in fire regime including the Miller West Fisher project area. This was a coarse scale analysis, so 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/lethal fire regime (a fire regime under which most trees are killed during a fire episode). At a finer scale this is generally true although it does not apply to the entire project area, particularly the wetter habitat types and areas of extensive timber management.

The current fire regime within the analysis area is the result of a complex series of events that have influenced the development of the current vegetation. This includes weather patterns, insect and disease outbreaks, forest succession, human management and many other influences. While we cannot predict precisely when fires will occur, or how impactive they will be, we can generalize about how today's fire regime is different than 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, existing federal fire policy in the project area is suppression and there is currently no policy in place to allow a naturally ignited fire to burn. Fires are aggressively extinguished upon detection and not limited by weather and fuels over time as in the past, so they are much smaller now than if they were left to burn over the summer. Over a period of time, this will result in an increased probability of larger more intense fires as fuels accumulate. In summary, historical 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 usually limited due to suppression efforts that reduce the time a fire will burn as well as the area they burn. When intense fires do occur they tend to be lethal.

Forest Fuels, Historic and Existing

The materials we refer to as "fuel" is a portion of plants, predominantly trees in the case of the Miller West Fisher project area, which are available to be consumed by fire. This includes both live and dead material. The amount and size of fuel that contribute to fire spread and intensity vary by time of year as well as long- and short-term weather conditions. During late summer, when many plants have finished their seasonal growth and the lack of precipitation (perhaps as a result of extended drought) combined with hot weather, much of the live and dead fuel is available for consumption by fire. Conversely, during the spring when most plants are growing vigorously and moisture is abundant, available fuels are limited to the most flammable dead fuels on the driest sites. During the fall season the increase in rainfall as well as the change to shorter days and cooler weather again limits the availability of fuels to burn. Across these seasonal changes in fuel availability we see a range of possible outcomes should a

fire occur. While it is not possible to predict when a fire will occur we can say that most lightning ignited fires do occur during July and August. For the Miller West Fisher area, fire season is usually halted by an episode of rainy weather that traditionally occurs between the third week of August and the third week of September. The exceptional years when this rain does not occur will see the fire season extending perhaps as late as mid-October.

Historically, fires that resulted from either lightning or, possibly American Indian ignition, burned until they were either halted by weather changes or by breaks in fuel continuity. During the time span these fires burned, weather conditions changed constantly as the fire progressed through the available fuel. Fuel availability also changed as the season progressed. Across this ever changing set of conditions a wide range of fire effects occurred, ranging from light underburning, torching small groups of trees, to stand replacing crown fires.

In general, fuels on sites that supported open stands of timber with a surface covering of grass and shrubs, had light fuel loading since these sites burned fairly often, on the scale of a few years or a few decades. Here, the primary process of carbon cycling was fire. On sites occupied by more dense forests, which burned less often, on the scale of several decades, fuel loading was somewhat higher. Here, the process of carbon cycling was primarily through fire with decomposition also important. On sites that seldom burned, on the scale of several decades to more than a century, fuel loadings tended to be much higher. Here the primary process of carbon cycling was decomposition with fire playing a minor role.

The existing condition of natural fuels in the Miller West Fisher 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, with the rate of accumulation exceeding the rate of decomposition, resulting in an increasing fuel load. Forest succession and insect and disease processes are increasing 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.

Fire Occurrence

Historic large fire occurrence maps indicate the famous regional fires of 1910 moved though 99% of the Miller West Fisher project area. Large fire returned to the area in 1919 at two isolated areas in the main Silver Butte and the head of Trapper creek.

During the time period from 1908 to the present, fire occurrence records identify a total of 281 fires recorded in the Miller West Fisher project area; 228 were lightning ignited. The remaining fires were predominantly human-caused occurring along the river/creek bottom corridors, where travel and human occupation existed.

Currently, dual wildland fire suppression responsibility in the Miller West Fisher project area is provided by the Montana Department of Natural Resources and Conservation (DNRC) – Libby Unit for the Silver Butte drainage and by the United States Forest Service (USFS) – Libby Ranger District for the West Fisher and Miller Creek drainages.

Potential Prescribed Fire Use to Meet Management Objectives

Prescribed fire used as a primary management tool, is limited to areas that are relatively open, have a light fuel load, and do not have a significant ladder fuel component. Non-forested openings can also be managed with fire if they support a grass/shrub community. An exception would be where managers want to create large canopy openings where other types of management are excluded, such as

inventoried roadless areas. Openings such as these can provide forage for big game, or possibly berry producing shrub fields to provide food for bears.

Prescribed fire as a secondary management tool, specifically, burning after timber harvest or thinning, has the greatest potential for use. This would include broadcast burning of clearcuts, burning of piled material and underburning. For stands that are heavily stocked and have a major ladder fuel component or a heavy natural fuel loading, some other form of management is needed prior to burning, if the objective is to keep a live overstory. This management could include pre-commercial thinning, slashing to remove ladder fuels, and mechanical fuel reduction piling in areas not limited by steep slopes.

Burning of piled material is best suited to stands that are commercially thinned and have an overstory component that is too small or a species susceptible to fire mortality. This type of burning is generally less expensive and allows for a wider window of opportunity to meet air quality and prescription constraints. If the vegetation management prescription includes restoration of fire processes, this treatment is of limited value to meet that objective.

Underburning is best suited to thinned stands that have a larger tree component of fire resistant species. This treatment is most effective if the amount of natural and activity fuel is not excessive. At high fuel loadings the risk of overstory mortality can be unacceptable, especially if the leave trees are less than 14" in diameter or are species other than ponderosa pine, western larch or Douglas-fir. Prescribed fire prescription windows for underburning are narrow since weather and fuel conditions greatly affect fire behavior and intensity and the probability of success. If properly applied, this treatment is effective to reduce fuel loadings and to restore fire dependant plant communities.

Broadcast burning is best suited to clearcut stands that do not have a residual live tree component, which is to be retained. Broadcast burns are not as common as they once were since clearcut prescriptions are being used less frequently. Prescribed fire prescription windows for broadcast burns are not as restrictive as for underburning. This treatment is effective in fuel reduction and restoring a portion of fire dependant species and preparing the site for tree seedling planting.

Wildland Urban Intermix/Interface (WUI)

Wildfire is a real threat to private property, especially to homes built in a forested setting. Nationwide, this problem is becoming more evident as development increases. For fire protection agencies, protection of structures takes resources away from the wildfire suppression effort. For the homeowner, the threat to life and property is increasingly real. Wildfires destroy homes each summer across the nation and this trend will continue into the future.

There are several residences located along the Fisher River, Silver Butte, West Fisher and Miller Creeks throughout the project area. Plum Creek timber company (PCTC) is selling off land in all drainages in the project area. It should be expected that an increase in development will occur in the near future on these lands.

Structure ignitability research by Jack Cohen was considered in the project area. Area homeowners are responsible for fire-wise home design, construction materials, landscaping, and flammable debris maintenance on their property.

Priorities for the Restoration of Short Return Interval, fire-dependant ecosystems

1. Short fire return interval types (VRU1 and drier inclusions of VRU2) where prescribed fire can be used without mechanical manipulation (e.g. slashing, thinning and timber harvest), are the highest priority for restoration. These areas are generally found on steep south aspects and have a limited overstory due to shallow soils and lack of moisture. These areas are essentially fire

regime maintenance where burning would be low intensity and would reduce dead surface fuel. The result would be the top kill of brush and regeneration, reduction of fine fuels and stimulation of plant species that require burning as part of their life cycle. Opportunities of this type are included in the proposed action and alternatives to the proposed action as "burn only" areas. The effectiveness of these treatments would be limited since many such areas have discontinuous fuels, rock outcrops, and thin rocky soils limiting plant growth.

2. Short fire return interval types (VRU2 and drier inclusions of VRU3) where there is a manageable overstory of trees of desired species, size class and age distribution are the next priority. These areas are generally found on south aspects with better soil and moisture conditions than found in situation 1 above. Fire exclusion has allowed overstocking of trees and a shift of species composition. The in-growth of Douglas-fir into ponderosa pine stands is a good example of this situation. Here, some type of mechanical manipulation may be required to begin the restoration process. This could include slashing, thinning and commercial timber harvest to reduce stand density and ladder fuels. Depending on the residual stand, burning may or may not be desirable. This would depend on the size, species and stand density of the residual stand. This is the most widespread opportunity for restoration of this type. Since these stands occur on more productive soils post-treatment fuel loadings would higher and more continuous.

3. Short fire return interval areas (VRU2 and drier inclusions of VRU3) which do not have a manageable overstory due to past harvest practices and a shift of species composition toward Douglas-fir. High levels of insect and disease are affecting these stands. For these areas, regeneration harvest followed by burning and planting may be the only realistic strategy for restoration. This would include previously harvested stands where large overstory trees were removed.

4. Moderate interval fire-dependant ecosystems (VRU3, VRU4). This includes types where fire historically acted as a thinning agent and includes mixed conifer stands where ponderosa pine, western larch and Douglas-fir were stand components. These types occur on sites with better soils and moisture. Fuel loadings can be high due to stand dynamics and insect and disease processes. Restoration of this type may be accomplished through slashing, thinning and commercial timber harvest where the objective is to maintain a component of the overstory, i.e. removal of suppressed and diseased Douglas-fir and retention of ponderosa pine, western larch and healthy Douglas-fir. Burning may or may not be desirable after this type of treatment since fire intensity would depend on the amount of fuel generated and survivability of the overstory would be affected by the size of the residual stems. Whole tree yarding and spot grapple piling, where it is feasible, would be the treatment of choice.

Activity Fuels

Activity fuels, resulting from the implementation of one of the action alternatives, would result in an increased risk of resource damage caused by both person-caused and lightning ignited wildland fires unless adequate fuel reduction treatment occurs. Activity fuels fall in two general categories, logging slash and pre-commercial thinning slash.

In general, pre-commercial thinning slash is not treated due to the high cost associated with the most probable treatment method, hand piling. If a fire should occur in thinning slash before the needles drop and are compressed by snow, there is a high probability that a wildland fire would kill a significant portion of the stand.

Logging slash has several treatment options that are commonly used to reduce the fire risk. Slash treatments fall into three general categories: prescribed burning (broadcast, underburning, pile and jackpot burning), isolation, and natural abatement. The choice of treatments depends on several factors including economics, vegetative management objectives, potential soil impacts, risk of escape, terrain, wildlife habitat objectives and fire occurrence risk. In general, timber harvest slash is burned on the KNF and pre-commercial thinning slash is left to abate naturally. Isolation, which is the process of keeping fire out of an area you wish to protect, is not often used since it does not meet other resource objectives.

Timber management has changed over the past several years. Where clear cutting was once the selected option, there is now an increase in silvicultural treatments that retain an overstory of seral trees. The objective of these treatments is to retain the overstory in a healthy condition to meet one or more objectives such as ecosystem health, visual concerns, seed source, age class diversity, etc. Many of these trees are of small diameter, which makes broadcast underburning difficult since fire intensities can easily reach lethal levels. The greater the amount of tree canopy left after harvest, the more difficult broadcast underburning becomes.

Activity fuels that are not treated increase the rate of spread and intensity of wildland fires. Since most wildland fires occur during the warm summer months when fuels are at their driest and live fuel moistures are at their lowest, the potential for overstory mortality is high. A fire burning in pre-commercial thinning slash that has not abated naturally is likely to cause near-total if not total stand mortality. Similarly, a fire burning in commercial thinning slash which has not yet been treated or which has been left to abate naturally, can also result in high levels of overstory mortality. Wildfires burning during the summer months in regeneration harvest areas without fuel treatment, which can include live overstory trees, also have a high probability of causing mortality.

Untreated fuels can persist for several years. There are areas within the Miller West Fisher project area that were pre-commercially thinned five to twenty years ago that still have a loading of larger diameter fuels, generally the boles and larger limbs > 3”. The amount of fuel varies by the moisture regime of the stand as well as the aspect. The small diameter fuels are the first to abate, reducing the potential for fire spread, while the larger fuels persist the longest and will increase fire intensities and burning residence time should a fire occur.

In terms of fuels and fire potential, the majority of the unmanaged stands within the project area currently have fuel loads that are best represented using the Fire Behavior Fuel Models; fuel model 10 (timber and litter) and fuel model 8 (closed timber litter) in areas where a closed stand condition occurs. Fuel model 2 (timber, grass understory) and fuel model 9 (long needle pine) are present where open stands occur. In the closed canopy, fuel model 10, surface fuel loads are generally moderate with dead downed bug kill lodgepole pine and intolerant species, such as grand fir and alpine fir in the understory. The canopy has a high live fuel load since most stands are well stocked to over-stocked. Where larger openings in the canopy occur, understory regeneration is present and provides a ladder fuel for surface fire to move into the main crown canopy. Under normal conditions fire occurrence is low, rates of spread are low, and potential for resource loss is low. In part this is due to the sheltered environment that exists under a heavy crown canopy. Wind and sunlight do not penetrate a heavy canopy to the degree they penetrate an open canopy. As a result, fuel moistures are somewhat higher, fuel temperatures are lower, and twenty foot winds are sheltered resulting in low mid-flame wind speeds than adjoining areas with exposed or partially sheltered conditions. The combined effects of closed canopy environmental conditions and moderate surface fuel loading equates to a moderate fire potential.

There are some areas with high fuel loads resulting from both past management activities and natural events. Activity fuels were not treated in some past timber harvest areas where lop and scatter treatment

occurred. Currently, there is a mixture of regeneration and other live fuels growing through this untreated fuel. If the untreated fuels burn, it would likely result in high mortality of trees within the burned area. Pre-commercial thinning slash, in both natural stands and planted stands, has increased fuel loadings. Insect and disease processes, particularly root rot and ongoing Douglas-fir bark beetle mortality, will contribute to fuel accumulation. Weather damage, including wind throw and snow breakage; have increased fuels in those stands of the project area. Stresses associated with overstocked stands, have and will continue to, result in mortality. In all these areas the fuel profile is changing from a low fire occurrence frequency and low intensity situation to a low frequency and increased intensity situation. In short, forested ecosystems are not static across time but are continually changing.

Economics

In preparing the proposed fuel treatment plan for each of the action alternatives, several factors were taken into consideration. These factors include the type of treatments available for each harvest area, the treatment objectives for each harvest area, the expected outcome for each treatment option, and the economics of the fuel treatment options when compared to the overall economics of each alternative.

For stands which are composed of species that are not desirable, such as Douglas-fir in areas of high root rot activity, regeneration harvest is often prescribed. In these situations it is desirable to reduce activity slash for fire hazard reduction, wildlife habitat improvement as well as to reduce obstacles to tree planting. The slash can either be broadcast burned in place or can be concentrated by piling or whole tree yarding followed by landing pile burning.

For stands that are overstocked with commercial-sized timber, and have a desirable stand component, commercial thinning is often prescribed as a means of improving forest health. In this harvest type the objectives are somewhat different than those for regeneration situations. Since tree planting is not planned, slash treatment solely to remove regeneration obstacles is not a consideration. Underburning or piling slash for fire hazard reduction to protect ecosystem health as well as to improve wildlife habitat are usually objectives. In situations where the stand is located in a scenic area, retention of live trees to maintain visual quality is desirable and may be the overriding objective.

Fuel treatment methods available to meet objectives vary by harvest prescription as well as access, overall economics, topography, slope, and aspect. If a harvest unit is bound by roads it is far easier to meet objectives as compared to a helicopter yarded unit with poor access. Units on steep slopes are more difficult that those on flat ground. Units on south aspects can be spring burned when risk of escape is low as opposed to units on north aspects, which must be burned under drier conditions of summer or fall weather. Units with no live tree component are easier to burn than units with live trees, which must be protected from mortality.

Fuel treatment for areas harvested by ground-based equipment is, for the most part, economical meaning that the amount of money needed to do the job is adequate relative to the value of the timber to be removed. However, the cost of treating fuels where helicopter yarding is the only option is far higher. If areas are to be helicopter harvested then the decision is whether or not to treat the fuels and by which treatment method: burning, natural abatement, or isolation.

ACTIVITY FUELS – Direct Effects

Alternative 1 – No Action

No activity fuels would be created if this alternative were selected so there were no direct effects to activity fuels identified. Fire suppression would continue in accordance with federal wildland fire policy.

Alternatives 2, 4, 6, and 7

A direct effect of the implementation of the action Alternatives 2, 4, 6, and 7 would be the creation of activity fuel (slash). Table 3-56 displays the changes in the fuel loading that will occur. The fuel model change indicates the difference in tons per acre (TPA), of increased fuel loading that would occur prior to any planned fuels treatment from implementing an action alternative.

Table 3-55 displays the standard fire behavior fuel models (Albini 1976) and is used to estimate tons per acre fuel loading for each fuel model as follows:

Table 3-55 – Fuel Model Loading

FUEL MODEL #	VEGETATION TYPE	FUEL MODEL LOAD (Tons/acre (TPA))
2	Timber, grass and understory	4.00
8	Closed timber litter	5.00
9	Long needle pine litter	3.48
10	Timber, litter and understory	12.02
11	Light logging slash	11.52
12	Medium logging slash	34.57
13	Heavy logging slash	58.10

Table 3-56 - Increase in Fuel Loading by Project Activity Prior to Fuel Treatment

PROJECT ACTIVITY	FUEL MODEL CHANGES	INCREASE IN FUEL LOADING (tons/acre)	ALT. 1	ALT. 2 (acres/ton)	ALT. 4/7 (acres/ton)	ALT. 6 (acres/ton)
Commercial Harvest Regeneration Cut	From 8,9,10 To 12	29.57	0/0	1,202 ac/ +35,543 tons	590 ac/ +17,446 tons	723 ac/ +21,379 tons
Commercial Harvest Intermediate Cut	From 8,9,10 To 11	6.52	0/0	1,306 ac/ +8,515 tons	834 ac/ +5,438 tons	1,175 ac/ +7,661 tons
Pre Commercial Thinning	From 8,9 To 11	6.52	0/0	351 ac/ +2,288 tons	351 ac/ +2,288 tons	351 ac/ +2,288 tons

As a direct effect of the creation of activity fuels, fire hazard from increased fuel loading would greatly increase over the existing condition and would remain high until fuel hazard treatments have been accomplished or until fuels abate naturally. The greatest increase in fire hazard would occur on upper slopes, particularly on south and west aspects, where the density of the residual stand is low and the fuel loading from project activity is high. These ridge top locations are more prone to lightning occurrence and are exposed to higher wind speeds so fires that start during dry, windy conditions would likely spread rapidly.

Stands with a higher residual density, like that found in a commercial thinning treatment, would be less exposed to wind penetration, fuel moistures would be slightly higher, and activity fuels would be lighter so the increase in fire behavior is comparatively less. Stands on north aspects would not dry as soon as those on south and west aspects but once dried would also support intense fires if ignition should occur.

In stands where whole tree yarding is prescribed, fuels would be much lighter (fuel model 11) than in similar stands where fuels are left on site (fuel model 12), so fire intensity would be less in stands where whole tree yarding occurs. However, if no further fuel treatment would occur because of other resource concerns, such as scenic quality or species composition, the increased fire hazard would persist until natural abatement occurs. Pre-commercially thinned stands would fall into this category. In stands where the slash is excavator piled, the fire hazard would be very similar to the pre-treatment condition, with the short term hazard consisting of the concentrated slash until the piles are burned.

Stands that are pre-commercially thinned would have an increased fire hazard until the resulting fuel abates naturally. The needles and smaller branches would fall from severed stems after the first two to three years and snow pack would compact smaller fuels, resulting in lower fire potential. The larger diameter stems would persist for twenty or more years and add to the intensity of a wildland fire if it should occur.

A direct effect from implementation of fuel reduction treatment options for activity fuels would be a reduction of the activity fuel loading and subsequently a reduction of the fire hazard. With fire behavior variables such as weather and terrain remaining constant or static, a reduction in the fuel loading will reduce the fire intensity and flame length. Rates of spread may increase when a closed timber stand (fuel

model 8) is opened up (fuel model 2). The increase is due to reduced sheltering on wind effect, sunlight promoting growth of fine fuels and increasing fuel temperatures. However, fire intensity would not increase without a change that increases fire behavior variables (weather and terrain). Table 3-57 illustrates the changes in fuel model loadings when fuel treatments are applied.

Table 3-57 - Reduction in Fuel Loading By Project Activity after Fuel Treatment

PROJECT ACTIVITY	FUEL MODEL CHANGES	REDUCTION IN FUEL LOADING	ALT. 1	ALT. 2 (acres/ton)	ALT. 4/7 (acres/ton)	ALT. 6 (acres/ton)
Prescribed Fire Underburning	From 12 To 2, 9	31.09 tons/acre	0/0	972 ac/ -30,219 tons	463 ac/ -14,395 tons	596 ac/ -18,530 tons
Grapple Pile / Burn Piles	From 11 To 2, 9	7.52 tons/acre	0/0	230 ac/ -1,730 tons	127 ac/ -955 tons	127 ac/ -955 tons

Table 3-58 - Summary of Activity Fuels Created and Fuel Reduction Treatments

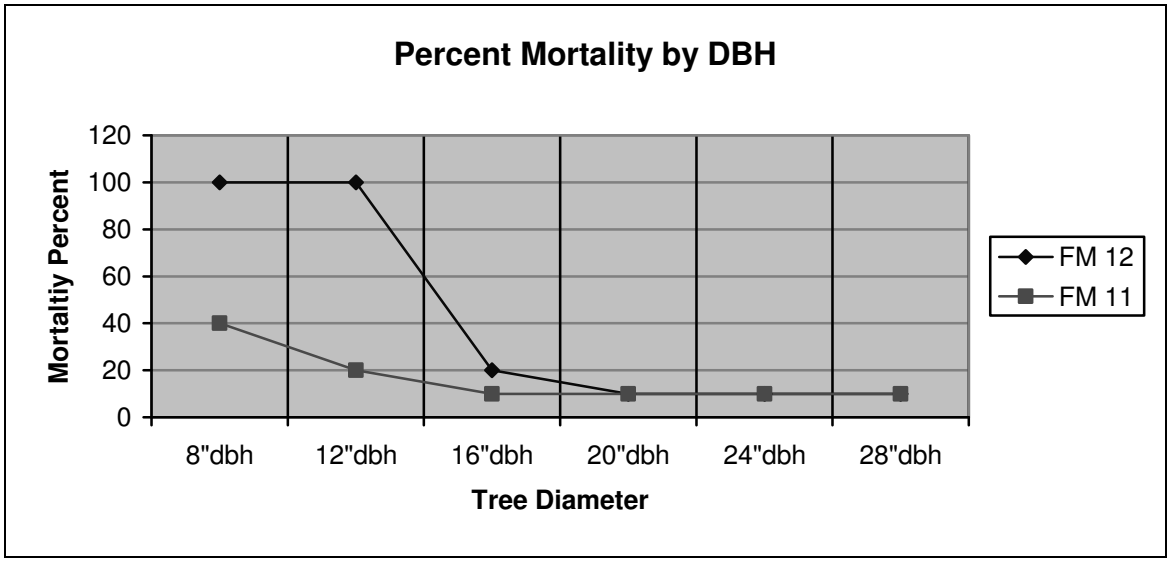
PROJECT ACTIVITY	ALT. 1	ALT. 2	ALT. 4/7	ALT. 6
Fuels Created from Regeneration Harvest	0	+44,058 tons	+17,446 tons	+21,379 tons
Fuels Created from Intermediate Harvest	0	+8,515 tons	+5,438 tons	+7,661 tons
Fuels Created from Pre Commercial Thinning	0	+2,288 tons	+2,288 tons	+2,288 tons
Fuels Reduced by Underburning and Grapple Pile/Burn Piles	0	-31,949 tons	-15,350 tons	-19,495 tons
TOTAL	0	+22,912 tons	+9,822 tons	+11,833 tons

The burning of activity fuels has the potential to cause mortality of residual trees within and adjacent to areas to be treated. Tree species, stem size, weather conditions, physiological state of the trees, fuel loading and moisture content, and the ignition method all can affect the level of mortality. For broadcast underburn treatments in activity fuels, up to twenty percent mortality can be expected from fire effects resulting from areas with higher fuel concentrations or topographic features, such as draws that funnel heat. Some small areas within a treatment area may have near total mortality, while other areas will have none. Burning prescriptions designed to meet burn objectives will be developed to limit mortality.

The following table illustrates the potential for overstory mortality from a surface fire based on fuel loading of fuel model 11 and fuel model 12, burning under a diameter range of leave-trees. For this analysis, typical weather was used for a spring or fall burning prescription window; 12% moisture in ¼ - 1 inch fuel size and six mph midflame wind speed. Modeling of mortality levels is in Douglas-fir and western larch (leave trees) using First Order Fire Effects Model (FOFEM). The mortality levels shown are for strip head fire ignition. Ignition patterns that utilize a flanking or backing ignition patterns would have reduced fire line intensity and flame length, so a lower mortality level would be expected. These modified ignition patterns require a more restrictive burn window, would take more time to implement and result in higher cost. The results from the chart clearly indicate the need to leave trees at least

sixteen inches diameter at breast height and the need to reduce fuel loadings (from FM 12 to FM 11) in some instances to assure survival of over-story trees. Yarding tops is one method to reduce fuel bed loading prior to burning.

This chart shows the percent mortality for varying tree diameters in Douglas-fir and western larch. This data was developed using the BEHAVE program and FOFEM.



Direct effects on soil, water and vegetation resulting from the prescribed burning of activity fuel would vary by the fuel loading, the fuel and duff moisture at the time of burning, the species, physiological state and physical characteristics of residual trees, and weather conditions during the burn and ignition technique. Burning prescriptions are developed to meet multiple objectives for each site-specific area.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, and spring developments in the North Fork of Miller Creek. With the exception of fuels treatments in the campground, which will reduce fuels, these activities will not contribute a measurable effect to fuels in the project area because they do not involve creation of activity fuels.

ACTIVITY FUELS – Indirect Effects

Alternative 1 – No Action

For the no-action alternative, there would not be any activity fuels generated so there are no known indirect effects. Fire suppression would continue in accordance with federal wildland fire policy.

Alternatives 2, 4, 6, and 7

The indirect effect of action alternatives on air quality from prescribed burning smoke is addressed in the Air Quality section of this document.

An indirect effect of the prescribed burning associated with the implementation of the action alternatives would be a change in the plant communities occupying the understory. Plants that remain green most of

the year would occupy more moist sites. These plants would tend to decrease the rate of spread of surface fires. Grasses and other plants that die and cure during hot summer weather would occupy the drier sites. These plants would increase the rate of spread of surface fires.

ACTIVITY FUELS – Cumulative Effects

Alternative 1 – No Action

The cumulative effects of past, present and reasonably foreseeable future actions would include the completed and uncompleted activity fuels management associated with the KNF Forest-wide Fuels Reduction and Wildlife Enhancement Project. There are other reasonably foreseeable harvest activities planned for this area on corporate-private (Plum Creek) lands with limited fuel treatment that may meet Montana state slash law minimums.

Alternatives 2, 4, 6, and 7

The cumulative effects of past, present and reasonably foreseeable future actions would include past timber management and prescribed burning activity that resulted in modification of forest fuels. The action alternatives would create additional activity fuels. Regeneration harvest units on NFS lands have fuel treatment plans proposed to address the associated increased fuel loading. Some of the intermediate harvest units and all of the pre-commercial thinning units do not have fuel reduction plans and the activity fuels created in these units will be left to abate naturally over time. Upon completion of the fuel treatment plans for the regeneration harvest units, the level of surface fuel loading will be near to the condition before project activity. The overstory stand condition in all units will be greatly improved and will be resistant to intense lethal crown fires from greater crown spacing and a short term reduction of ladder fuels.

The combined effect of past activity and fuels treatments or lack of fuels treatments would create a landscape with areas of untreated activity fuel left to abate naturally over time, particularly on the private lands and on NFS lands within the pre-commercial thinning units. Other areas of the landscape would have activity fuels present for a period of time between timber harvest and fuels treatments. Some areas would receive harvest treatments with whole tree yarding, leaving a stand with reduced fuels but a more open tree canopy. The effect on wild fire size and intensity would depend on the stage of activity fuels creation or abatement on the landscape at the time and location of a given fire start. Another important factor is that a large portion of the Silverfish PSU would not be treated because of the wilderness or inventoried roadless status. Thus activity created fuels would not be an issue in those areas.

NATURAL FUELS

Alternative 1 – No-Action

Direct Effects

There is no treatment of natural fuels in the no-action alternative in the Miller West Fisher project area. Natural processes would continue and accumulation of forest debris would increase natural fuel loadings until a fire disturbance event occurs. Fire suppression would continue in accordance with federal wildland fire policy.

Indirect Effects

The indirect effect on natural fuels of the no-action alternative would be that no treatment would occur so, over time, fuels would accumulate over time increasing the probability of a damaging wildland fire.

Cumulative Effects

The cumulative effects of past, present and reasonably foreseeable future actions would be the total of past and present actions that have reduced natural fuels. Under this alternative, no additional fuels management reduction of natural fuels would occur. Natural fuels units within the Miller West Fisher project area, as described in the KNF Forest-wide Fuels Reduction and Wildlife Habitat Enhancement EA, are scheduled and would continue to be implemented.

The combined effect of minimal natural fuels treatment (Forest-wide fuels treatment units) and the sale and subdivision of private industrial forest lands in the project area would create a situation where homes are constructed in the expanding wildland urban interface while natural fuels accumulate. This trend occurs throughout the western United States currently and can result in the loss of private property if and when natural fuels are ignited in the area.

Alternatives 2, 4, 6, and 7

Direct Effects

The direct effect of the action alternatives on natural fuels would be the reduction of fuel loading by prescribed burning of natural fuels. An ecosystem burn type objective is prescribed, which includes wildlife habitat enhancement.

Table 3-59 – Miller West Fisher Natural Fuel Treatment by Alternative (Acres)

PROJECT ACTIVITY	ALT. 1	ALT. 2	ALT. 4, 7	ALT. 6
Prescribed Fire Underburn for Wildlife and/or Fuel Reduction Objectives	0	3,175	2,830	2,830

Depending on the results of the post-harvest fuel inventory and air quality limiting factors, some commercially thinned areas may be underburned to reduce fuel loadings and to restore fire dependant plant communities. This burning would be limited to stands with fire resistant trees in the residual stand. In stands with fire susceptible species, burning would not occur.

The effect of treatment of natural fuels would be to reduce the intensity, size, and duration of wildfire, should it occur, in a portion of the project area. Burns are proposed in all action alternatives that would create fuel breaks along major ridge lines in the project area (see alternative maps). These fuel breaks, once implemented, would allow for a higher potential of successful suppression of wildfire in the project area by reducing the chance of wildfire spreading across the ridge lines into areas of heavy natural fuel loading in the inventoried roadless areas in the Silver Butte drainage.

Indirect Effects

The indirect effect of action alternatives on air quality from prescribed burning smoke is addressed in the Air Quality section of this document.

For all action alternatives, an indirect effect of burning natural fuels would be the change in vegetative cover that would occur after burning. Plant communities that require or tolerate fire would increase after burning. These plants include grasses and other plants that serve as the carrier of fire spread during the dry summer months when these fuels have cured. In areas where natural fuels are treated fire intensity

will be reduced, but due to the increase in fine fuels, the rate of spread may increase. Beneficial effects to shrubs used for wildlife forage may also result.

Cumulative Effects

The cumulative effects on natural fuel reduction from past, present and reasonably foreseeable future actions is treatment of associated natural fuels in the units by prescribed burning in the Miller West Fisher project area. Portions of the KNF Forest-wide Fuels Reduction and Wildlife Habitat Enhancement project within the Miller West Fisher project area are scheduled for treatment in 2008 through 2012.

The cumulative effect of active natural fuels treatment in the project area along with the increase in subdivision and private residential properties will result in a higher probability of protection to homes in the wildland urban interface in the project area. As this development progresses, continued active fuels management would be required in the project area to protect individual homes and property.

WILDFIRES

Alternative 1 – No Action

Direct Effects

The direct effect on wildfires from implementing the no-action alternative is that fire occurrence; intensity and size would be similar to fires in the recent past. Historic records from the past 9 decades indicate that, on average, 3 (> .1 Acre) fires occur within the Miller West Fisher project area every year. Of these wildfires, 228 were lightning caused and 53 were human caused. The current fire regime in the Miller West Fisher project area ranges from small areas of non-lethal to mixed-lethal and is shifting toward mixed-lethal to lethal as fuel loading and forest biomass accumulate over time. Fire suppression will continue in the project area following federal wildland fire policy. The Montana Department of Natural Resources and Conservation (DNRC) – Libby Unit is responsible for wildfire suppression in the Silver Butte drainage of the project area.

Indirect Effects

An indirect effect on wildfires from implementing the no-action alternative would be the gradual change in the existing fuel complexes as dead woody fuels accumulate secondary to insect, disease, and weather disturbance. Live fuels, especially ladder fuels, would also increase over time as stand density increases from understory shade tolerant species growth. As the fuel loadings increase, the intensity of wildfires would increase. The current non-lethal to mixed-lethal fire regime would trend toward a mixed-lethal to lethal regime.

Alternatives 2, 4, 6, and 7

Direct Effects

The direct effect from implementing the action alternatives would be an increased risk of larger wildfire size, due to increased activity fuel loading from slash, between the time of harvest activity and the time when activity fuel treatment reaches completion in the regeneration units with planned fuel treatments. After the fuel treatment, the risk would be reduced or returned to near pre-harvest levels where fuels contribute to surface fires. Crown fire risk would be significantly reduced in areas where the tree canopy

is opened up and ladder fuels are not present. In areas where prescribed fire is not applied and natural abatement occurs, the risk would remain over time depending on various rates of decay.

Road storage and decommissioning activities as planned will have a negative detrimental effect on fire suppression access in the Miller West Fisher project area. Vehicle access by fire engines and initial attack crews is effectively removed. Increased fire size and increased suppression costs to the taxpayer should be expected by removing the initial attack fire equipment access. Sections of road may remain which could serve as a helicopter landing area for initial attack flight crews, but aircraft and helitack availability is not certain, especially during periods of lightning fire occurrence across the district or forest. The Silver Butte area is under protection of DNRC – Libby Unit, which uses fire engines for initial attack. They do not staff a fire hand crew. The nearest DNRC helicopter is located in Kalispell and its primary use is water bucket drops during initial attack.

Indirect Effects

The indirect effect on wildfires from implementing one of the action alternatives would be that, over time, as vegetation recovers in response to both the burning and the increase in available sunlight, the potential rate of spread of fire would increase with the increase in fine surface fuels; but the fire intensity would generally decrease as the larger diameter fuels have been reduced.

Open stand conditions inhibit intense crown fire potential. Developed crown fires moving through aerial three dimensional fuels of dense timber, would drop to the surface as it moves into treated open stand conditions. Firefighter safety, suppression and control opportunities increase when wildland fire burns in surface fuels.

Alternatives 1, 2, 4, 6, and 7

Cumulative Effects

The cumulative effect of past, present and reasonably foreseeable future actions would include the continual ecological changes that occur in a forested ecosystem. Fire suppression would continue in accordance with federal wildland fire policy.

Past management activities that would affect wildfires include past and present logging, pre-commercial thinning, ecosystem burning, road building, and road decommissioning.

Areas that were logged in the past and did not include fuel treatment have increased the potential for high intensity fire behavior levels during wildfires. The same is true for pre-commercially thinned stands and harvest units where an intermediate cut is prescribed without planned fuel treatment. Some of these areas are identified for proposed treatment using vertical fuel loading reduction of ladder fuels (slashing) with natural abatement over time for surface fuels.

Prescribed burning projects have occurred in the project area over the past several years resulting in areas that have a decreased fuel load. These treated areas would have reduced fire intensity levels as fire burns through upon another fire return interval. As an example, in the summer of 2000, a lightning fire ignited in Warland Creek and burned seventy-five acres through an area that was treated with an ecosystem burn in 1994. The fire burned only surface fuels during a summer drought condition and the resulting fire effects displayed very little mortality in the overstory timber (Cardwell, D5 FMO personal observation 2000). The 2005 Camp 32 fire on the Rexford ranger district, KNF, burned with lethal crown fire behavior until it moved into an area that had previous fuel reduction treatment completed. The fire then dropped to the ground burning only surface fuels (Hvizdak, D1 FMO personal observation 2005).

Roads that are bare and not covered with vegetation serve to break the continuity of forest fuels, so act as barrier to low intensity surface fire spread and provide access to fire suppression personnel and equipment. Roads considered for storage and or decommissioning remove initial attack fire suppression access, become covered with vegetation and will increase the cost of suppression to taxpayers. Without ready access of fire equipment and personnel, fire size and difficulty of control can be expected to increase.

On-going ecological changes that result in dead fuel buildup will increase the fire potential over time so that the possibility of destructive wildland fires will increase.

The cumulative effect of all these past management activities is a resulting landscape comprised of a matrix of managed and unmanaged timber stands. Existing recent harvest areas where fuel treatment is complete and areas of past ecosystem burning would serve as potential suppression control areas. Proposed treatment areas with activity fuel treatment would function the same once activity fuels are treated.

Consistency of the Alternatives with Forest Plan Standards as well as Other Laws, Regulations and Initiatives

The fuels management plans developed for the action alternatives are consistent with Forest Plan direction and takes into account the requirements of the National Forest Management Act, and the guidance provided by the Regional Overview, the Living with Fire Strategy and “A Nation’s Natural Resource Agenda”.

AIR QUALITY

Introduction

This analysis discloses the potential effects to air quality from the action alternatives, and also includes the "no-action" alternative, to provide the decision maker with a means of comparing these alternatives. The analysis of both the "action" and "no-action" alternatives include the effects of wildland fire smoke, prescribed fire smoke and suspended road dust.

Wildland fires are a natural combustion process that consumes both living and dead vegetative material and produces smoke that can have adverse impacts on air quality. 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, occurrence and intensity of wildland fires depends directly on variables such as meteorological conditions, the type of vegetation present, the moisture content of both live and dead fuel, topography, and fuel loading or the total weight of consumable material available. Small fuel, such as dead grass and conifer needles, supports fire spread. Larger dead fuels are consumed to a variable extent depending on their moisture content. Under environmental conditions such as drought and extreme heat that reduce the moisture content of live fuels, these fuels become available and may also be consumed. Slope effects fire in much the same way wind does, the steeper the slope the greater the effect. The aspect of a slope influences the moisture content of fuels with north aspects being relatively damp and south slopes being relatively dry. Under the extreme condition of heavy fuel, seasonal 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, which varies with burning conditions and duration. Large amounts of smoke are produced under extreme burning conditions and for extended burning periods.

Smoke produced from the prescribed burning of timber harvest residue and natural fuels can have an adverse effect on air quality. The amount of smoke produced is influenced by the same factors that influence the amount of smoke produced by wildland fires. Increasing the utilization of sub-merchantable material can reduce the amount of fuel remaining after timber harvest and so reduce the amount of smoke produced. The type and timing of burning as well as weather conditions influences the amount of smoke produced. Other methods of slash treatment and site preparation are available (see Appendix 1, Air Quality project file). However, most of these alternatives require costly equipment, can cause excessive soil disturbance, do little to remove the slash problem, provide inadequate site preparation, and do not restore fire into the ecosystem.

Air quality is affected locally by suspended road dust produced by vehicular traffic, especially on native surface roads. The silt content of the road surface layer, the distance traveled, the weight and speed of the vehicle as well as weather conditions, influence the amount of dust produced. Paved roads produce a relatively smaller amount of dust than do native surface roads, especially during dry weather. Mitigation measures, that reduce the availability of fine silt particles, such as watering or dust suppressants, are effective. Reducing the speed of vehicles can reduce the localized impacts.

This analysis includes the direct effects (effects resulting from the implementation of the alternatives that occur at the same place and time), indirect effects (effects resulting from the implementation of the alternatives 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).

The Need for Prescribed Burning

There are situations in forest management where it is desirable, and required by law, to treat activity created fuels after a timber sale is completed. Prescribed fire is one of the most common techniques used to dispose of these fuels. Because it is a forest management adaptation of wildfire, it simulates natural processes better than other fuel treatment alternatives. Hall (1972) summarized the chemical and thermal processes involved with fire and concluded that the adverse effects of prescribed burning are compensated for by the reduction in wildfire hazard.

According to the Environmental Protection Agency's (EPA) 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 smaller quantity than that produced by wildfires. The EPA 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."

Prescribed burning is a land management treatment, used during specified conditions, to accomplish natural resource management objectives. Prescribed fires are conducted within limits of a fire plan and prescription that describes the conditions under which the burn can be conducted to meet these resource objectives. Its use reduces the potential for high intensity wildland fires and thus has the potential to maintain long-term air quality. Also, this practice removes logging residues, 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 to reduce the potential for unwanted wildland fires.
2. Prepare harvested sites for tree planting using the most appropriate method, including prescribed fire and mechanical means.
3. Prepare harvested sites for natural seeding using the most appropriate method, including prescribed fire and mechanical means.
4. Use prescribed fire to enhance wildlife habitat and forage production.
5. Use prescribed fire to maintain the natural succession of fire dependant plant communities.
6. Control insect and disease outbreaks through the use of prescribed fire.
7. Use prescribed fire, as well as mechanical treatment where appropriate, to reduce natural fuel buildup resulting from wildland fire suppression.
8. 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.
9. Reduce the amount of material that must be burned by removing unwanted fuel offsite for further utilization, storage, or disposal.
10. Reduce or eliminate unwanted fuel onsite. Methods to consider include manual, mechanical, biological, and prescribed fire treatments and their necessary associated activities.
11. Where appropriate, identify if and when fire program costs plus anticipated net value changes do not justify fuel treatment.

The selection of a fuel management technique depends on several factors including silvicultural system, timber harvest method, timber harvest type, treatment economics, wildlife habitat, soil, water, cultural resource protection, and air quality. The Interdisciplinary Team (IDT) selected fuel treatment options that best balance resource objectives and economic concerns. These options include burning both natural fuel and activity created fuel in place as well as concentrating activity and natural fuels using treatments such as whole tree yarding and piling followed by burning.

Ecosystem Burning: This fuel treatment method would be applied to accomplish wildlife habitat, fuel management and forest health objectives. These burns would be accomplished during spring weather, prior to the growing season. Sites where this burning would occur are usually large areas, generally steep, sparsely vegetated with light fuel loadings. Burning is the only feasible means of accomplishing these objectives. Well developed smoke columns would seldom be generated since the rate of ignition would generally not be rapid enough, especially when the retention of live overstory trees is an objective. If, as in the case of brush field creation burns, there is no live overstory component to protect, sufficient heat may be generated to develop a vigorous column.

Underburning: This fuel treatment method is used to accomplish silvicultural, natural and activity fuel hazard reduction, wildlife habitat and forest health objectives where one of the objectives is to retain a component of live over-story trees. Underburning is generally used where other treatment options are not feasible. In general, underburning on southerly aspects would be done during the spring burning season (March through June) and underburning on north aspects would be done during the fall burning season (September and October). The rate of ignition for underburning live trees is generally slow to control the intensity of the fire. As a result, vigorous convection is seldom achieved so smoke is not driven as high into the atmosphere.

Broadcast Burning: The objectives are similar to those of underburning except there is no residual overstory to protect from fire. Broadcast burns are ignited as rapidly as possible within the capabilities of the holding crews. High intensity fires are created that burn with greater efficiency than understory burns. A developed convection column is often obtained with the smoke being lifted into the free air mixing winds.

Whole Tree Yarding followed by Pile Burning: This fuel treatment method would be utilized for areas where fuel loading reduction is needed before underburning and in stands that would be commercial thinned. Specifically, this method would be used where the resulting stand density, species composition, tree size, economic feasibility, and visual resource concerns preclude the use of underburning or piling as options. Piles of yarded material are generally burned at the landing in late fall after receiving enough moisture to reduce the risk of fire spread and before the piled material is too wet to burn. Since pile burning occurs late in the fall season when smoke dispersion is often poor, it is possible that piles burned on a good ventilation day will smolder long enough to cause some impacts on air quality during any following poor ventilation days.

Excavator Piling followed by Pile Burning: This treatment method is used to accomplish a range of resource objectives in treatment areas where the resulting stand density is low, slopes are generally forty-five percent or less and site preparation objectives can be met. Piled slash would generally be burned in late fall after receiving enough moisture to reduce the risk of fire spread and before the piled material is too wet to burn. Since pile burning occurs late in the fall season when smoke dispersion is often poor, it is possible that piles burned on a good ventilation day will smolder long enough to cause some impacts on air quality during any following poor ventilation days. In some situations, specifically when clear cuts are piled, enough heat can be generated to develop a vigorous convection column. However, the usual situation is that smoke is more diffuse and does not raise into the upper transport winds.

Natural Abatement: This treatment would be applied when it is determined that the cost of fuel treatment would be excessive when considered in the context of the risk of loss. Specific examples where this treatment would be used include: pre-commercial thinning where the cost of fuel treatment would equal or exceed the cost of the thinning and the risk of loss to a wildland fire is low; and commercially thinned units where most unwanted fuel would be removed by whole tree yarding but incidental breakage would increase fuel loadings to the degree that underburning would result in the death of small diameter overstory trees.

A preliminary fuel management plan that focuses on the reintroduction of fire as a means of improving ecosystem health was developed for each of the action alternatives. The selected treatments represent the best balance of accomplishment of resource management objectives, minimized smoke production, and economic feasibility.

Location and Frequency of Burning

The proposed burning, associated with each action alternative, would occur throughout the project area. The proposed fuel treatment for each alternative is indicated on the alternative maps. For each of the action alternatives in this analysis, areas identified for burning would receive only one burn treatment.

After a timber sale is sold, it may be harvested over the course of several years. The sale may qualify for a contract extension that could extend sale completion well past the end of the original contract period. Due to the uncertainty about when harvest would occur, it is not possible to accurately predict the exact timing of burning, but generally one to five years after harvest.

Burning associated with this project would occur annually, during the spring or fall burning periods, until all burning is completed. All ecosystem burning is done in the early spring until green-up occurs. The spring burning period usually runs from late March through June. The fall burning period usually occurs in September through the end of November. Broadcast and underburning will occur during both the spring and fall burning period, but historically by October these types of burns have received moisture and do not dry out due to shorter days and cool nights. Pile burning would occur during the late fall burn period which would generally start in October and end by the end of 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.

Suspended Road Dust from Vehicle Traffic on Unpaved Roads

Suspended road dust is a result of motorized vehicle use when road surfaces are dry. When a motorized vehicle travels on an unpaved road, the force of the wheels moving across the road surface causes pulverization of surface material. Dust is lofted by the rolling wheels as well as by the turbulence caused by the vehicle itself. This air turbulence can persist for a period of time after the vehicle passes.

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Variables which influence the amount of dust produced include the average vehicle speed, the average vehicle weight, the average number of wheels per vehicle, the road surface texture, the fraction of road surface material which is classified as silt (particles less than 75 microns in diameter), and the moisture content of the road surface.

The moisture content of the road surface has the greatest influence on the amount of suspended dust produced. Within the project area, roads are generally closed during the winter months from snow or for wildlife habitat security. July, August and September are generally dry so most dust production would

occur during this period. Precipitation during these months is usually limited, so the moisture would only reduce dust production for short periods.

Mitigation measures that may be used to reduce suspended road dust emissions within the project area include: the application of chemicals that increase the moisture retention of road surfaces, specifically magnesium chloride; watering during high use periods or during road maintenance operations; and speed restrictions in sensitive areas. While some or all of these measures would likely be used, it is not possible, at this time, to quantify the actual mitigation measures which would be taken.

Mitigation Measures Taken to Reduce Prescribed Burning Emissions

The amount of smoke emissions resulting from prescribed burning of both natural fuels and logging slash, would be mitigated by four general methods: fuel loading reduction, fuel consumption reduction, flaming combustion optimization and impact avoidance.

***Fuel Loading Reduction*:** Purchasers may be required to pay for, and therefore encouraged to utilize, small round wood. The standard contract allows the purchaser to remove sub-merchantable material from regeneration harvests. Sub-merchantable material may also be removed from commercial thinning units with prior Forest Service agreement. All these measures help decrease the amount of woody fuel that must be burned.

***Reduction in the Amount of Fuel Consumed**:* The reduction of the amount of fuel consumed by prescribed burning would be accomplished through the use of spring burning. Harvested areas located on east, southeast, south, southwest and west aspects would be burned, to the extent possible, during the spring burn season. Typically, the season spans from late March through June. During this timeframe larger diameter fuels and the duff layer usually have relatively high moisture contents that reduces the amount of fuels consumed by prescribed burning, which reduces smoke emissions.

***Flaming Combustion Optimization**:* When prescribed burning is determined to be the most appropriate fuel treatment, methods which increase the flaming combustion phase would be used. Concentration of logging slash by whole tree yarding or excavator piling increases the amount of material consumed during flaming combustion and also allows material to be burned in the late fall during cloudy weather when smoke is less obvious and the risk of escape is low. Purchasers are required to construct piles so they are compact and free of excess soil.

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 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, balloon soundings, burn plans, and air quality conditions to determine, on a daily basis, the need for restrictions on prescribed burning. The Forest Service is issued an annual permit to burn by the Montana Air Quality Bureau. Issuance of this permit is based on participation and compliance with burning restrictions issued by the Montana Airshed Group. Prescribed burning for the project area is reported to the Airshed Coordinator on a daily basis. If ventilation problems are forecasted by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation conditions return. The Forest Service will cooperate with the State in meeting the requirements of the State Implementation Plan and the Smoke Management Plan (Forest Plan, II-26).

Large Woody Debris for Long-term Soil Development: Current research indicates it is desirable to leave large woody debris (4"+ in diameter) on site to facilitate long term nutrient recycling. The actual amount (tons per acre (TPA)) to be left is dependent on habitat type. Generally the drier habitat types require less (5-15 TPA) while the wetter habitat types require more (25-30 TPA). In order to meet these objectives less material is consumed in the fire with a corresponding reduction in the amount of smoke produced.

Trained and Qualified Prescribed Fire Practitioners: Individual burn bosses are trained in smoke management techniques prior to being qualified as a burn boss. A burn boss has a responsibility to evaluate smoke dispersion and halt burning operations in the event the actual smoke dispersion is not as was forecasted and will cause significant harmful impacts.

REGULATORY FRAMEWORK

The Clean Air Act regulates air pollution. The applicable standard in the project area regulates the amount of PM 10, or particulate matter less than 10 micrometers in diameter. The Clean Air Act requires the Environmental Protection Agency (EPA) to adopt National Ambient Air Quality Standards ("standards") that are protective of public health and provide an adequate margin of safety. Because recent studies indicate that particulate matter (PM) in ambient air has health effects at lower concentrations than previously thought, air quality standards changed in December 2006.

The revised 2006 standards addressed two categories of particle pollution: PM2.5 (also called "fine particulate"), which includes particulate matter that is 2.5 micrometers in diameter and smaller; and PM10 which is smaller than 10 micrometers. The average diameter of a human hair is 60-80 micrometers. The revised 24-hour fine particle standard for PM2.5 is 35 ug/m^3, and the annual fine particle standard for PM2.5 is 15 ug/m^3. EPA retained the 24-hour PM10 standard of 150 ug/m^3 and no longer has an annual PM10 standard.

The Miller West Fisher project area is south of the Libby designated PM 2.5 non-attainment area. See Table 3.76 for probability for impact analysis from project area to Libby.

As described above, 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.

AIRSHED CHARACTERISTICS AND EXISTING CONDITION

Montana is divided into ten airsheds by the Montana State Air Quality Bureau. The Miller West Fisher project area lies entirely within Airshed 1. Smoke produced within the analysis area would most likely be carried in an easterly direction by the predominantly westerly, synoptic scale, windflow pattern that influences western Montana.

Smoke dispersal is usually best during the spring and early summer because daytime heating and general windflows help smoke rise above ridge tops and into the free air winds where it is diluted and dispersed. Stable high pressure systems that often occur during late summer and fall hamper the vertical motion of air and reduce the smoke dispersion potential. Infrequent low pressure systems also move through the area during the summer and early fall period and improve smoke dispersal until high pressure re-establishes. As the heat of summer changes to milder daytime temperatures and night time temperatures begin to drop, air quality begins to deteriorate as night time inversions become more prevalent. Smoke is trapped in valley bottoms until adequate heating breaks the inversion later in the day. Weather patterns begin to change during the fall months with periodic cold front passages being interspersed with periods of stable high pressure. These cold fronts are often dry, but can bring substantial moisture. Winds associated with these cold fronts provide good ventilation, but also increase the risk that a prescribed

burn may escape control. The late fall often marks the return of wet, foggy and cloudy weather to the analysis area. During this time, periods of good ventilation occur during fontal passages but valley inversions often hamper the dispersion of smoke. Winter weather is very similar, with smoke dispersion being poor.

The mountainous topography of the analysis area also influences the dispersion of smoke. Smoke produced at higher elevations is nearer to the free air winds that occur at and above ridge tops, so dispersion is usually better than at lower elevation. Conversely, smoke produced at lower elevations is more likely to be effected by valley inversions and must rise farther to enter the free air wind. Burns on south exposures are more likely to be effected by local thermal winds than those on north slopes. Burns on slopes exposed to the prevailing wind would have better smoke dispersion than those located on the lee slope.

Smoke dispersal is best when the daytime heating is greatest. This usually coincides with the period of greatest atmospheric instability for the day. Free air winds penetrate into lower elevation at this time resulting in good vertical motion and smoke dilution. These conditions generally occur from 13:00 to 18:00. Smoke dispersal is usually poor for night-time burning due to the increase in atmospheric stability as cool air pools in valleys. This process also results in the development of valley inversions.

Quantitative air quality data is not available for the period prior to settlement of the analysis area late in the 19th century. However, it is known that fire played a major role in the development of vegetative patterns throughout western Montana. Journals from early day explorers and newspaper articles from the late 1800's often mention the smoky conditions from summer fires burning in western Montana and northern Idaho (Losensky 1992).

The annual amount of smoke generated from forest fires has generally decreased since the early 1900's, even with today's use of prescribed fire. Prior to the advent of effective fire suppression in the early 1900’s, fires that started in the area burned unchecked from the time of ignition until weather changes stopped their spread. Smoke production varied as environmental factors changed. Smoke could have been produced for just a few hours or for as long as several months. During severe fire seasons, especially when stagnant high pressure systems persisted, regional air quality was no doubt poor. The number of acres burned by wildland fires decreased as effective fire suppression became common and as a result, air quality improved. During the last two decades of the 20th century, natural fuels resulting from decades of fire suppression have reached a level where larger, more intense fires are becoming common. The degradation of air quality is a direct result of these wildland fires.

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 Eureka and Libby areas.

Source apportionment studies for Libby, a non-attainment area (Clean Air Act), have shown that slash burning contributes less than 3% of the total PM-10 load, with road dust and wood stove smoke originating within the city itself being the major contributors. PM-10 readings taken in Libby since 1988 have shown a trend in improving air quality during the months of September through November when most of the prescribed burning takes place. The potential impacts of smoke from prescribed burning have been minimized through successful airshed coordination. The months of March and November has been removed from management burning availability in Impact Zone L, which surrounds Libby.

Airshed 1 air quality is influenced predominantly by smoke and dust originating from areas located to the west, since the general wind flow direction for the area is from this direction. This includes grass burning on the Rathdrum and Palouse Prairies, located between Sandpoint and Lewiston, Idaho, as well as other agricultural areas in Washington and northern Oregon. Industrial emissions as well as those

from internal combustion engines add to the level of regional haze and air pollution load. Prescribed burning of logging residue by private and other government entities adds wood smoke to the air mass. Wildland fires burning as far west as the coastal range of Oregon and Washington also contribute to air quality degradation. Dust, originating from tilled farm land during dry windy weather, can add to local haze and reduce air quality.

Monitoring

The Forest Service is a member of the Montana Airshed Group, which monitors air quality on a daily basis during burning season. The Monitoring Unit is activated when prescribed fire activity begins in the spring and continues until the end of November when the open burn season closes. The amount of burning allowed for any given day is based on this monitoring as well as forecasted weather conditions. Air quality monitoring is done daily at several locations within the area covered by this group. The amount of burning allowed within each airshed is tied directly to the daily monitoring of ambient air quality. The process of monitoring and forecasting has been effective at achieving the Airshed Group's objectives, which are listed in the Montana/Idaho Smoke Management Agreement.

One objective is to minimize or prevent accumulation of smoke during the fall prescribed burning season when burning is necessary for conducting accepted forest management practices such as hazard reduction, site preparation and wildlife habitat improvement. This is done by prohibiting or restricting burning at times and places where stagnant weather conditions result in poor smoke dispersion, and by conducting prescribed burns when ventilation and air quality conditions are good. The developments of alternative methods are encouraged when such methods are practical.

A second objective is to develop a smoke management plan for reporting and coordinating burning operations on all forest and range lands within Montana and Idaho. Guidelines in the plan will be based upon technical information currently available on smoke dispersion and on State and Federal air quality regulations.

The third objective is to improve the smoke management program through regular review and evaluation. One or two general meetings of members are held annually to exchange ideas, review operations and offer suggestions for improving the program.

The cumulative effects on air quality, resulting from the implementation of one of the action alternatives and from other local and regional pollutant sources, will likely result in PM 10 loadings, on an average daily loading, equal to or less than the maximum annual arithmetic mean of 50 micrograms per cubic meter or a maximum daily concentration of PM 10 at or below 150 micrograms per cubic meter. There may be days when regional air quality does not meet these standards but, because of the Montana/Idaho Air Shed Group Monitoring Group's effectiveness, it is unlikely that any source associated with this project or any other present or reasonably foreseeable future burning project, would be a significant contributor.

Each burn plan includes the provision for a test fire. The purpose of this test fire is to allow the burn boss to determine if burn objectives would be met as well as determining if smoke dispersal would be adequate.

ENVIORNMENTAL CONSEQUENCES

Suspended Road Dust

Direct, Indirect, and Cumulative Effects:

The analysis considers the suspended road dust associated with post-decisional project activity by both Forest Service as well as the timber sale contractor. The actual amount produced would be influenced by dust mitigation measures taken directly by the Forest Service, by the timber sale contractor as contract requirements and by Lincoln County as general road maintenance, as well as actual precipitation, and timing of log hauling.

Prescribed Burning Smoke

Direct, Indirect, and Cumulative Effects:

The estimated amount of smoke emissions, produced by prescribed burning associated with an action alternative, is portrayed in the following table. Smoke from fuel treatment is related to fuel loadings. Fuel loadings in prescribed burn units after timber harvest will range from approximately 11 to 40 tons/acre. The average fuel loading will be approximately 30 tons/acre. To best meet all resource objectives about 7 tons/acre of 4"+ (diameter) material will be left on the site, approximately 3 tons/acre of various size fuels will not be consumed. The amount of fuel loading consumed during prescribed burning will average about 25 tons/acre for harvest underburn units and about 7 tons/acre for non-harvest underburn units. Fuels concentrated into piles equates to approximately 5 tons/acre. Smoke emission factors (fire average values), can be used to predict PM-10 emissions: 19 lbs/ton for pile burning and 23 lbs/ton for broadcast underburns of timber harvest slash (Hardy 1992). Federal and State ambient air quality standards use PM-10 emission values to regulate smoke impacts to air quality.

Table 3-60 - Fuel Treatment by Alternative

ALTERNATIVE	UNDERBURN HARVEST UNITS	UNDERBURN NON-HARVEST	GRAPPLE PILE BURNING
1	0	0	0
2	972 ac @ 575lb/pm10/ac = 558,900 lb pm10	3,175 ac@161lb/pm10/ac = 511,175 lb pm10	230 ac @ 95 lb/pm10/ac = 21,850 lb pm10
4/7	463 ac @ 575 lb/pm10/ac = 266,225 lb pm10	2,830 ac@161lb/pm10/ac = 455,630 lb pm10	127ac @ 95 lb/pm10/ac = 12,065 lb pm10
6	596 ac @ 575 lb/pm10/ac =342,700 lb pm10	2,830 ac@161lb/pm10/ac = 455,630 lb pm10	127 ac @ 95 lb/pm10/ac = 12,065 lb pm10

Fuel treatment by prescribed fire and the associated smoke emissions in the project area will occur over a period of time. PM 10 produced from each unit varies by the burn unit acreage size and environmental conditions at the time of implementation. For example; a forty acre underburn harvest unit would produce 23,000 lbs of PM 10 emissions, primarily during the day of ignition, and be significantly less each day until the burn goes out. Participation and coordination with the Idaho and Montana Air Quality Group is key to successful smoke dispersion and reduced smoke impacts.

The direct effects of prescribed burning smoke are: reduced visibility; and increased level of small diameter particulates, specifically PM 10, of concern for human health reasons.

The indirect effects of prescribed burning smoke produced as a result of the implementation of one of the action alternatives would be limited to the local and downwind airshed air quality degradation. PM 10 particulates have an effect of increased visual haze. PM 10 levels rapidly disperse from the source as they are mixed out and carried by local and general transport winds. Short periods of smoke concentration may occur in the local area during night and early morning inversions following the day of ignition. Diurnal heating and mixing will disperse smoke as the inversions break in the early morning and mixing continues throughout the afternoon hours. Residual smoke production from large logs, stumps, and piles can be expected for several days.

The cumulative effects on air quality of prescribed burning smoke, produced as a result of the implementation of one of the action alternatives, would result in an incremental decrease in air quality as PM 10 particles from this source combine with other particles produced both by the implementation of other aspects of this project, specifically suspended road dust, as well as other local and regional sources located upwind. Prescribed burning of logging slash, on other federal, state or private lands, would also contribute particulates, as would agricultural burning and suspended dust from tilled ground. Particulates from industrial and automotive sources also contribute to regional particulate loading. Other vehicle traffic, agricultural and industrial sources outside the analysis area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these other sources.

Wildland Fire Smoke

ALTERNATIVE 1 – No Action

Direct Effects

The direct effect of wildland fire 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 from the past ninety-two years show that, on average, 3 (<1) fires occur within the analysis area every year.

These fires are generally small, burning less than one acre each. However, there is an increasing probability that one of these fires will escape initial attack and grow to several hundred to several thousand acres, burning for several days to several weeks. Fires of this scale and duration would impact air quality to varying degrees during the time the fire would be active.

Indirect Effects

An indirect effect of wildland fire smoke, from implementing Alternative 1, would be the gradual change in the existing fuel complexes as dead woody fuels accumulate secondary to insect, disease and weather disturbance. Live fuels, especially ladder fuels, would also increase over time as understory shade tolerant species increase. As the fuel loadings increase, intensity of wildland fires and the smoke they produce would increase. The current non-lethal to mixed lethal fire regime would change over time to a mixed lethal to lethal fire regime.

ALTERNATIVES 2, 4, 7, and 6

Direct Effects

The comparison of relative impacts of implementing an action alternative versus a wildland fire indicates that, on an acre-to-acre basis, a high intensity wildland fire would produce 66% more of a smoke impact than an action alternative affecting the same area.

A direct effect of wildland fire smoke on air quality, resulting from implementing one of the action alternatives, would be an increased risk of high intensity wildfire and accompanying smoke production between the time timber is harvested and activity fuels are burned. After activity fuels are burned the risk would either return to near pre-harvest levels, or be reduced resulting from the additional treatment of natural fuels within the units.

Indirect Effects

The indirect effect of wildfire smoke on air quality, resulting from implementing one of the action alternatives, would be vegetation recovery in response to both the burning and the increase in available sunlight. The potential fire rate of spread on treated areas would increase from the immediate post-burn level as fine fuels, such as grass, grows in. However, the potential wildland fire intensity and smoke production would decrease.

ALTERNATIVES 1, 2, 4, 6, 7

Cumulative Effects

The cumulative effects of wildland fire smoke on air quality, for all alternatives, would include all pollution sources contributing particulates to the air mass in addition to the smoke produced by wildland fires within the analysis area. The greatest cumulative effect would occur when wildfires are burning outside and upwind of the analysis area along with wildland fires burning within the analysis area at the same time. The cumulative effects of these sources result in extended periods of poor air quality until the weather changes, but would not last more than a nine month period where conditions support fire. Cumulative effects on air quality are short term and would never extend more than one year in length.

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 1948 to December of 1989. The data selected for this analysis is for the 750-millibar level, which corresponds to 8,400 feet above sea level. It is felt that winds at this level represent the free-air wind direction and velocity that are likely to occur over the analysis area. Windroses and tables containing the source data are included in the project file.

The average wind speed at 8,400 feet above sea level, for the entire year, ranges from a low of 11 miles per hour (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 Miller West Fisher 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 windrose 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 air sheds, and other local communities.

Table 3-61 - % Probability of Air Pollutants from project Area Impacting an Area of Concern

AREA OF CONCERN AND REASON FOR CONCERN	TRANSPORT WIND DIRECTION TO LOCATION OF POTENTIAL IMPACT	DISTANCE TO AREA OF CONCERN (miles)	% PROBABILITY OF WIND DIRECTION OCCURRENCE: MAY (SPRING)	% PROBABILITY OF WIND DIRECTION OCCURRENCE: SEPT. (FALL)
Libby, MT, Non-attainment area	S	12	4.2 %	3.0 %
Whitefish, MT, Non-attainment area	W	60	13.1 %	14.6 %
Kalispell, MT, Non-attainment area	W	60	13.1 %	14.6 %
Thompson Falls, MT, Sensitive area	N	40	3.7 %	4.1 %
Eureka, MT, Sensitive area	S	65	4.2 %	3.0 %
Cabinet Mt. Wilderness, Class I Airshed	E	19	4.0 %	1.8 %
Glacier National Park, Class I Airshed	W	72	13.1 %	14.6 %
Bob Marshall Wilderness, Class I Airshed	NW	92	4.2 %	5.8 %

EFFECTS OF POTENTIAL IMPACTS TO CLASS I AIR SHEDS

Certain wilderness areas and National Parks established before August of 1977 were designated as Class 1 airshed areas. Class 1 designation allows only very small increments of new pollution above already 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 more polluted. The Bob Marshall Wilderness, Glacier National Park and the Cabinet Mountains Wilderness are all Class I areas.

It is important to note that currently, both the Bob Marshal Wilderness and Glacier National Park have fire management plans that allow naturally ignited wildland fires to burn within prescribed parameters over long periods to accomplish resource objectives. Smoke generated from wildland fires varies over the summer burning period from within these Class 1 airsheds.

The existing condition of the representative standard visual range for these Class I areas are as follows:

Table 3-62 – Standard Visual Range

	10TH PERCENTILE	50TH PERCENTILE	90TH PERCENTILE
Cabinet Mountains Wilderness	88 kilometers (55 miles)	160 kilometers (99 miles)	228 kilometers (141 miles)
Bob Marshal Wilderness and Glacier National Park	97 kilometers (60 miles)	178 kilometers (110 miles)	249 kilometers (154 miles)

The interpretation of these percentile figures is as follows: For the Cabinet Mountains Wilderness, on ten percent of the days monitored, visibility was fifty-five miles or less, which also means that on ninety percent of days monitored visibility was greater than fifty-five miles. On fifty percent of the days

monitored visibility was ninety-nine miles or less, which also means that on fifty percent of days monitored visibility was greater than ninety-nine miles. On ninety percent of days visibility was 141 miles or less, which also means that on 10% of the days monitored visibility was greater than 141 miles.

The degree of visual impairment and the amount of airborne pollutants, resulting from the burning of wildland fuels, is undoubtedly less than it was prior to the advent of effective fire suppression. Conversely, pollutants from other human related sources, has increased during the same timeframe. There is no historic data for comparing the existing situation to the historic situation.

Effects resulting from the implementation of one of the action alternatives would be considered indirect effects since none of these areas are within close proximity downwind to the project area.

The analysis presented in table above indicates that transport winds, from a direction that would carry smoke toward the Cabinet Mountains Wilderness Area, would occur less than four percent of days in the spring and 1.8% of days in the fall. If burning occurs on one of these days, smoke would impact visual quality and would also deliver airborne pollutants to this Class I airshed. The effects of visual impairment would be less noticed during spring weather because wilderness use is very limited then due to deep snow. The overall probability of impacting the air quality of Cabinet Mountains Wilderness is considered to be low.

The analysis shown in the table above indicates the probability that transport winds would carry smoke toward the Bob Marshal Wilderness Area is 4.2% (spring) and 5.8% (fall), and Glacier National Park 13.1% (spring) and 14.6% (fall) of days. If burning occurs on one of these days, smoke could impact visual quality and could also deliver airborne pollutants to these Class I airsheds. Smoke dilution would greatly reduce the level of pollutants reaching these points of interest. The effects of visual impairment would be less noticed during spring weather because wilderness use is very limited due to deep snow. The probability of impacting the Bob Marshal Wilderness and Glacier National Park is considered to be quite low due to the distance to these areas.

The cumulative effects on Class 1 airsheds from the implementation of the action alternatives and other present and reasonably foreseeable future actions are not known at this time. The production of air pollutants associated with the implementation of this project would vary over time and would not be continuous. Therefore impacts would be episodic in nature and the potential of occurrence would end when the implementation of this project is completed.

In the near future, “IMPROVE” Air Quality Monitoring Equipment will be installed on Green Mountain, near Noxon, Montana. The purpose of the equipment is to monitor air quality for the Cabinet Mountain Wilderness Area. This data would capture information and represent the cumulative effects on air quality from all sources.

SCENERY

INTRODUCTION

In 1998, Chief of the Forest Service Michael Dombeck re-affirmed the Agency's commitment to scenic resource management. At that time he displayed a "natural resource agenda" to chart future resource management (FS-630, A Nation's Natural Resource Legacy). Of the four resource areas emphasized in this publication, recreation had as its highest priority "Improving the settings for outdoor recreation and enhancing visitor experiences".

Effects analysis for scenic resources is performed using the Forest Service Scenery Management System (USDA Forest Service 1995). This system compares the visual appearance of a proposed action to the landscape character and existing condition of the surrounding area. As part of this analysis, Scenic Integrity Levels (SIL) are inventoried and mapped for the activity areas. The scenic integrity level defines the acceptable level of alteration of the landscape character. The degree of alteration is measured in terms of the noticeability of scenic contrast with the surrounding natural landscape.

This system of analysis is used to estimate the effects of human caused changes to the scenic resource; it is not used to estimate the effects of natural change (disease, fire, insects, wind, etc.). Natural change is considered an integral part of the natural landscape character of an area - neither good or bad, nor pretty or ugly.

Scenic Integrity Objectives (SIO) are developed in an interdisciplinary setting by a team during project planning. The SIO for an area does not change even though human-caused changes may alter the scenic integrity levels.

The Forest Plan prescribes VQO's for each Management Area. These VQO's may be more or less restrictive than what would be inventoried based on the Scenery Management System (SMS). This analysis describes what the effects to the scenic resource are and whether or not the alternatives meet Forest Plan VQO standards and Scenic Integrity Levels.

NATURAL LANDSCAPE CHARACTER

The Miller West Fisher analysis area consists of the entire Miller Creek drainage, the West Fisher Creek drainage, and the Silver Butte Creek/Silver Butte Fisher River drainage. Scenic analysis is focused on activity areas for this project, so the head end of the West Fisher and Silver Butte drainages will not be discussed. These drainages are deeply incised by their streams and the ridgelines have fairly gentle slopes. Side slopes between these two features are generally steep. Prominent features are Barren Peak (5,365 feet), Porcupine Summit (5,460 feet) and Teeters Peak (5,230 feet). Numerous spur ridges come off the main ridges and trend west to east at lower elevations. The south and west aspects of the project area have numerous small natural openings in a ponderosa pine and Douglas-fir canopy. The north and east aspects have a nearly continuous canopy of Douglas-fir, larch, and lodgepole pine. This tree canopy is broken sharply by drainages. Seasonal color variation is most pronounced in late September when cottonwoods in the creek bottoms turn a brilliant yellow and mid October when western larch on northerly aspects turn a brilliant gold. The Miller Creek drainage is favored by the public for its fall color displays due to the high percentage of western larch in the forest canopy. There are no major rock forms visible in this analysis area from on the ground views.

EXISTING SCENIC CONDITION

The sensitivity of the Miller West Fisher viewshed is determined by the high percentage/acres of Forest Service ownership and seen area as viewed from Sensitivity 1 or 2 travel routes. Sensitivity Level 1 travel routes are primary travel routes, use areas, or water bodies where at least ¼ of users have major concern for scenic qualities. Sensitivity level 2 travel routes are primary travel routes, use areas, or water bodies where less than ¼ of users have major concern for scenic qualities. Land management activities (road construction, tree harvest) through time have incorporated scenery mitigation techniques. Large geometric shaped tree harvest units (seed tree, clearcut) are found predominantly in the headwaters of the drainages on north/east aspects and are viewed mostly from local roads. These have uncharacteristic form/line and do not mimic the natural openings present. The Scenic Integrity Level for this area is moderate to low. Moderate levels of the analysis area are viewed from West Fisher Road 231 and Silver Butte Road 148 (Sensitivity Level 2) at a middle-ground distance. Middle-ground views are significant to the public because these are the most noticeable in their travels to/through the National Forest.

DESIRED FUTURE LANDSCAPE CHARACTER

Vegetative diversity is especially desirable to introduce on the north and east aspects of the watersheds where homogenous canopies currently dominate. Vegetation manipulations must avoid large geometric shapes that result in uncharacteristic form or harsh lines. Western larch should be a key species to retain or perpetuate for its fall color displays. On south and west aspects, vegetative manipulation should mimic the numerous small openings present. Mature ponderosa pine is the key species to retain, especially along roads and trails. No road cut/fill slopes should be visible from any Sensitivity Level 2 travel route.

Viewing Areas

West Fisher Road 231 and Silver Butte Road 148 are the major east - west travel routes near the valley floor through the heart of the analysis area. They are inventoried as sensitivity level 2 (moderate sensitivity) travel routes due to their yearlong access link between US Highway 2 and the recreation access afforded the public. All views of the analysis area in the vicinity of proposed actions from these travel routes are at foreground (0-1/2 mile) and middle-ground (1/2-4 miles) distances. Visibility of the analysis area is determined by landform without vegetation considered. West Fisher and Silver Butte Roads are positioned near the toe of the slope, thereby providing inferior viewer positions of the analysis area. Views of management activities during the snow cover months (November-April) are most sensitive as form (size/shape) and line are well defined. Views of significant portions of the analysis area are screened from the West Fisher and Silver Butte Road corridors by topography. Visual quality objectives (VQO's) for areas seen from these roads range from partial retention to modification. The Scenery Management System SIO for areas viewed from these roads range from moderate to low scenic integrity.

MODERATE Scenic Integrity equates to a PARTIAL RETENTION Visual Quality Objective. Moderate scenic integrity refers to landscapes where the valued landscape character "appears slightly altered". Noticeable deviations must remain visually subordinate to the landscape character being viewed.

LOW Scenic Integrity equates to a MODIFICATION Visual Quality Objective. Low scenic integrity refers to landscapes where the natural-appearing landscape character "appears moderately altered". Deviations from the natural-appearing character begin to dominate the viewing area, and they may

incorporate valued landscape character attributes from outside the viewing area such as size, shape, edge effect, and pattern of natural openings, or vegetative type changes. However, these deviations must also be compatible or complimentary to the natural landscape character within the viewing area.

VERY LOW Scenic Integrity equates to a MAXIMUM MODIFICATION Visual Quality Objective. Very Low scenic integrity refers to landscapes where the natural-appearing landscape character "appears heavily altered". Deviations from the natural-appearing character may strongly dominate the viewing area, and they may not incorporate valued landscape character attributes such as size, shape, edge effect, and pattern of natural openings, or vegetative type changes from within or outside the viewing area. However, these deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition.

UNACCEPTABLY LOW scenic integrity refers to landscapes where the natural-appearing landscape character appears extremely altered. Deviations are extremely dominant and incorporate little if any form, line, color, texture, or scale from the natural-appearing landscape character of the viewing area. Landscapes at this level of integrity need rehabilitation. This level should only be used to inventory existing integrity. It must not be used as a management objective.

Miller Creek Road 4724 - This road is the east-west access road open to public motorized use yearlong through the drainage. This road links US Highway 2 with other open roads beyond the Miller Creek headwaters, and is classified as a level 3 (low sensitivity) travel route. Views of proposed actions are at foreground, and middle-ground distances from these roads. Forest Plan VQO's for areas seen from these roads range from modification to maximum modification. Scenic integrity levels (SIL's) for areas seen from this road ranges from low to very low scenic integrity.

The remaining parts of the analysis area are difficult to view from these travel routes due to topographic screening. However, they may be viewed from Forest Service and Plum Creek Timber Company "local" roads at foreground and middle-ground distances. Such areas have a Forest Plan VQO of maximum modification. SIL's for areas seen from local roads range from low to very low scenic integrity.

Divide Trail South 6S, Jumbo Peak 110, Standard Creek 116, Miller Creek 118, Trapper Creek 297, Porcupine Creek 298, Teeters Peak 300, Olson Creek 415, North Fork Miller Creek 505, Miller Ridge 506, Porcupine Ridge 532, Libby Divide 716, – These trails traverse the main ridges throughout the analysis area. Views from these trails are generally screened by trees, except where the trails cross open grassy parks near prominent mountain summits. In this area, proposed treatment areas are viewed from a superior view angle. A notable exception to this narrative are several trails (Miller Creek, Jumbo Peak, Standard Creek, Porcupine Creek) which descend north through several proposed treatment areas to the valley floor.

EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

Direct and Indirect Effects

This alternative would leave the area in the same condition in the short term. The middle-ground/background views from the West Fisher, Silver Butte and Miller Creek Roads would change over time with the growth of trees in previously harvested areas. The views of management activities seen from these roads would be obscured as tree growth approached 15 feet high. This is estimated to take 15-20 years or more.

Cumulative Effects

This alternative is not envisioned to cumulatively affect the scenic resources of the analysis area.

Consistency with the Forest Plan - This alternative is consistent with the Forest Plan.

Alternative 2 - Proposed Action

The Proposed Action consists of 94 tree harvest treatment areas and several fuel treatment areas covering 3,191 acres. The purpose of these treatments is to reduce tree densities and fuel loadings to a more natural historic level, to capture mortality before product value is lost, to regenerate stands that have deteriorated, and to regenerate shrub species for big game forage.

Direct and Indirect Effects

Road construction is proposed for 1.2 miles with this alternative. This road would be obliterated after use. This road would expose exceptionally light colored subsoils for the short term. However, this road would be recontoured and revegetated following harvest activities. The following table displays by unit the scenic resource effects of this Alternative. Abbreviations used are as follows: MA = management area; VQO = visual quality objective; SIL = scenic integrity level; RX = timber harvest prescription; CC = clearcut; ST = seed tree; UB = underburn; MM = maximum modification; M = modification; L = low; VL = very low; UM = unacceptable modification; PR = partial retention; Imp = improvement harvest.

Table 3-63 – Alternative 2 VQO Effects by Unit

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
1	37	15	MM/VL	CC	UM - Proposed clearcut treatment area is located in the lower reaches of Miller Creek. It is positioned from the ridge top to mid slope on a steep north aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the open Miller Creek 385 road at a middle-ground distance. Due to unit size, harsh lines and steep terrain, **this treatment would not meet the Forest Plan VQO. There is the opportunity to leave western larch which would result in a ST/SW treatment.**
2	38	15	MM/VL	ST	MM - Proposed seed tree treatment area is located in the lower reaches of Miller Creek. It is positioned on the lower slopes on a steep north aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Miller Ridge trail and closed 4724A road at a foreground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave more western larch which would result in a ST/SW treatment.**
3	17	15	MM/VL	CC/ ST	MM - Proposed clearcut/seed tree treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep north aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Or treatments regenerate a stand by leaving 5 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Miller Ridge trail and closed 4726 road at a foreground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to shift this unit to the east where more leave trees exist.**
4	10	15	MM/VL	ST/ CC	MM - Proposed seed tree/clearcut treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Or treatments regenerate

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the Miller Ridge trail and closed 4726 road at a foreground distance. Due to unit size and remote location, this treatment would not attract viewer attention. **There is the opportunity to leave more western larch which would result in a ST/SW treatment.**
5	36	15	MM/VL	CC	UM - Proposed clearcut treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep north aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Due to unit size, harsh lines and steep terrain, **this treatment would not meet the Forest Plan VQO. There is the opportunity to leave western larch which would result in a ST/SW treatment.**
6	16	15	MM/VL	UB	PR - Proposed underburn treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep northeast aspect. Such treatments kill lodgepole pine, consume down fuels, and rejuvenate shrubs. Treatment would be viewed from the closed 4726 road at a foreground distance. Due to tree density/spacing and natural openings, this treatment would not attract viewer attention.
7	18	19	MM/VL	ST/ CC	MM - Proposed seed tree/clearcut treatment area is located in the middle reaches of Miller Creek. It is positioned at mid slope on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Or treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the open Miller Creek 385 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would not attract viewer attention. **There is the opportunity to leave large relic western larch.**
8A	38	15	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reaches of Miller Creek. It is positioned near the upper slopes on a steep north aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open Miller Creek 385 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave more western larch which would result in a ST/SW treatment.**
8B	40	19	MM/VL	CC	UM - Proposed clearcut treatment area is located in the middle reaches of Miller Creek. It is positioned at the top of the slope on a steep north aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to unit size, harsh lines and steep terrain, **this treatment would not meet the Forest Plan VQO. There is the opportunity to leave western larch which would result in a ST treatment.**
10	39	15	MM/VL	ST	MM – Proposed seed tree treatment area is located in the middle reaches of Miller Creek. It is positioned near the top of Teeters Peak on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave trees and remote location, this treatment would meet Forest Plan VQO. **There is the opportunity to leave more western larch which would result in a ST/SW treatment.**
11	23	15	MM/VL	CC	MM - Proposed clearcut treatment area is located in the middle reaches of Miller Creek. It is positioned near the toe of the slope on a steep north aspect. Such treatments regenerate a stand by removing all trees

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					except wildlife snags, and planting seedlings. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Due to unit position on the slope and steep terrain, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch reserve trees.**
12	40	15	MM/VL	CC/ ST	UM - Proposed clearcut/seed tree treatment area is located in the middle reaches of Miller Creek. It is positioned near the lower slopes on a steep northeast aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Or treatments regenerate a stand by leaving 5 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Due to unit size, harsh lines and visibility, **this treatment would not meet the Forest Plan VQO. There is the opportunity to leave more mixed conifer which would result in a ST/SW treatment.**
13	17	15	MM/VL	ST	MM – Proposed seed tree treatment area is located in the middle reaches of Miller Creek. It is positioned near the top of Teeters Peak on a steep northwest aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed at an oblique angle from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would not attract viewer attention.
15	34	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the bottom of a steep northwest aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Due to leave tree density, slash cleanup along the 4724 road and viewing distance, this treatment would not attract viewer attention.
16	34	12	MM/VL	ST/ CC	MM - Proposed seed tree/clearcut treatment area is located in the headwaters of the South Fork Miller Creek. It is positioned near the top of the slope on a steep northwest aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Or treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the open South Fork Miller Creek 4724 road and Teeters Peak Trail 300 at a foreground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch and Douglas-fir which would result in a ST/SW.**
17	20	15	MM/VL	ST/ CC	MM - Proposed seed tree/clearcut treatment area is located in the headwaters of the South Fork Miller Creek. It is positioned near the top of the slope on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Or treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the open South Fork Miller Creek 4724 road and Teeters Peak Trail 300 at a foreground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch which would result in a ST/SW.**
18	37	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the top of a steep east aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees.

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Due to leave tree density, slash cleanup along the 4724 road and viewing distance, this treatment would not attract viewer attention.
19	14	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the top of a steep east aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Due to leave tree density, slash cleanup along the 4724 road and viewing distance, this treatment would not attract viewer attention.
20	8	12	Mod/L	CC/ ST	Mod – Proposed clearcut/seed tree treatment area is located in the headwaters of the South Fork Miller Creek. It is positioned at the top of the slope on a gentle east aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Or treatments regenerate a stand by leaving 5 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to unit size, slope position and gentle terrain, this treatment would meet the Forest Plan VQO.
21	53	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the top of a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave tree density, slash cleanup along the 4724 road and viewing distance, this treatment would not attract viewer attention.
22	15	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the toe of a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave tree density and viewing distance, this treatment would not attract viewer attention.
23	7	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the toe of a steep east aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave tree density, slope position and viewing distance, this treatment would not attract viewer attention.
24	22	12	MM/VL	CC	MM - Proposed clearcut treatment area is located in the headwaters of Miller Creek. It is positioned at the toe of the slope on a steep north aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed at an oblique angle from the open 4724 road at a middle-ground distance. Due to slope position and oblique view angle, this treatment would meet the Forest Plan VQO.
25	87	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned at mid-slope on a steep north aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from closed local roads north of Miller Creek. Due to leave tree density and remote location, this treatment

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					would not attract viewer attention.
26	114	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned near the upper slope on a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road and the Miller Creek Trail 118 at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
27	7	12	Mod/L	CC	Mod – Proposed clearcut treatment area is located in the headwaters of Miller Creek. It is positioned at the toe of the slope on a gentle east aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from closed roads across Miller Creek at a middle-ground distance. Due to unit size and slope position, this treatment would meet the Forest Plan VQO.
28	17	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned near the toe of the slope on a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
29	11	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned at mid-slope on a steep south aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the Miller Creek Trail 118 at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
30	7	12	Mod/L	CC	Mod – Proposed clearcut treatment area is located in the headwaters of Miller Creek. It is positioned at the top of the slope on a gentle southeast aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from closed roads across the North Fork Miller Creek at a middle-ground distance. Due to unit size, gentle terrain and slope position, this treatment would meet the Forest Plan VQO.
31	38	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned at mid-slope on a steep south aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the Miller Creek Trail 118 at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
32	31	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the South Fork Miller Creek. It is positioned near the top of the slope on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch which would result in a ST/SW.**
33	13	18	MM/VL	Imp	PR - Proposed improvement treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned at mid-slope on a steep south aspect. Such treatments thin merchantable trees from a dense

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance and oblique view angle. Due to leave tree density, oblique view angle and remote location, this treatment would not attract viewer attention.
34	18	12	MM/VL	ST	Mod - Proposed seed tree treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned at mid-slope on a steep east aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch/Douglas fir which would result in a ST/SW.**
36	5	12	MM/VL	ST	PR - Proposed seed tree treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned at mid-slope on a steep southwest aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be difficult to view from any managed travel route. Due to leave trees, unit size and remote location, this treatment would meet the Forest Plan VQO.
37	9	12	MM/VL	Imp	PR - Proposed improvement treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned at mid-slope on a steep southwest aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be difficult to view from any managed travel route. Due to leave tree density and remote location, this treatment would not attract viewer attention.
38	12	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned at mid-slope on a steep southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the North Fork Miller Trail 505 at a foreground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO**. There is the opportunity to leave Douglas-fir which would result in a ST/SW.**
39	39	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned near the top of a spur ridge on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the North Fork Miller Trail 505 and the closed 4725 road at a foreground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO. Due to Douglas-fir mortality, there is little opportunity to leave a higher density seed trees.
40	2	11	MM/VL	Imp	PR - Proposed improvement treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned on a gentle ridge top. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the closed 4725 road at a foreground distance. Due to leave tree density, unit size and remote location, this treatment would not attract viewer attention.
43	17	18	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of the North Fork Miller Creek. It is positioned on a steep south aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees.

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					Treatment would be viewed from the closed 4725 road at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
44	15	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned at mid-slope on a steep southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO**. There is the opportunity to leave Douglas-fir which would result in a ST/SW.**
45	19	18	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of the North Fork Miller Creek. It is positioned on a steep southwest aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the closed 4725 road at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
46	22	18	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of the North Fork Miller Creek. It is positioned on a steep southwest aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the closed 4725 road at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
47	37	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of Miller Creek. It is positioned on a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
48	19	11	Mod/L	ST	Mod - Proposed seed tree treatment area is located in the middle reach of Miller Creek. It is positioned at mid-slope on a steep south aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave trees, this treatment would meet the Forest Plan VQO**. There is the opportunity to leave western larch/Douglas-fir which would result in a ST/SW.**
49	20	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the lower reach of the North Fork Miller Creek. It is positioned near the toe of the slope on a steep southwest aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the closed 4725 road at a foreground distance. Due to slope position, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave ponderosa pine/Douglas fir/western larch which would result in a ST/SW.**
50	17	11	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of the Miller Creek. It is positioned on a gentle east aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the North Fork Miller Trail 505 at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
51	12	11	MM/VL	CC	MM - Proposed clearcut treatment area is located in the middle reach of Miller Creek. It is positioned at mid-slope on a steep northeast aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the closed 4725 road at a foreground distance. Due to remote location, this treatment would meet the Forest Plan VQO. Due to stand stagnation and dwarf mistletoe in the western larch, this is a stand conversion treatment.
52	18	11	MM/VL	CC	MM - Proposed clearcut treatment area is located in the middle reach of Miller Creek. It is positioned near the toe of the slope on a steep northeast aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the closed 4725 road at a foreground distance. Due to remote location, this treatment would meet the Forest Plan VQO. Due to stand stagnation and some dwarf mistletoe in the western larch, this is a stand conversion treatment.
53	20	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of the Miller Creek. It is positioned on a gentle southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
54	18	11	Mod/L	ST	Mod - Proposed seed tree treatment area is located in the middle reach of Miller Creek. It is positioned near the toe of the slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open 385 road at a foreground distance. Due to slope position, leave trees and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch which would result in a SW/Imp harvest.**
55	2	11	MM/VL	ST	PR - Proposed seed tree treatment area is located in the middle reach of Miller Creek. It is positioned near the toe of the slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the closed 385 road at a foreground distance. Due to slope position, unit size, leave trees and remote location, this treatment would meet the Forest Plan VQO.
56	126	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of the Miller Creek. It is positioned on a steep south aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
57	16	18	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of the North Fork Miller Creek. It is positioned on a steep southwest aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be difficult to view from any managed route. Due to leave tree density and remote location, this treatment would not attract viewer attention.
58	39	12	MM/VL	CC	MM - Proposed clearcut treatment area is located in the middle reach of North Fork Miller Creek. It is positioned from mid-slope to near the toe of the slope on a steep northeast aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					seedlings. Treatment would be viewed from the closed 4725D road at a foreground distance and the open 4724 road at a middle-ground distance. Due to remote location and oblique view angle, this treatment would meet the Forest Plan VQO. **There is opportunity to reduce the large geometric shape/harsh lines through unit layout.**
101	27	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a gentle southwest aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
102	16	24	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a steep southwest aspect near the ridge top. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
103	13	10	MM/VL	Imp/ SW	PR - Proposed improvement/shelterwood treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a gentle southeast aspect near the ridge top. Such treatments thin merchantable trees from a dense stand and regenerate the area leaving an overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
104	9	10	MM/VL	Imp	PR - Proposed improvement treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a steep southeast aspect near the ridge top. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
105	11	10	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a steep south aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
106	12	10	MM/VL	SW	Mod - Proposed shelterwood treatment area is located in the lower reach of West Fisher Creek. It is positioned near mid slope on a steep east aspect. Such treatments regenerate a stand by leaving10-20 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to slope position, leave trees and remote location, this treatment would not attract viewer attention.
107	14	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a gentle southeast aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
108	8	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the lower reach of West Fisher Creek. It is positioned near the toe of the slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to slope position, unit size, leave trees and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to select quality ponderosa pine as leave trees.**
109	27	10	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a steep south aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
110	30	11	Mod/L	I/S W	PR - Proposed improvement/shelterwood treatment area is located in the lower reach of the West Fisher Creek. It is positioned on a gentle southeast aspect near mid slope. Such treatments thin merchantable trees from a dense stand and regenerate the area leaving an overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
111	40	11	Mod/L	SW	Mod - Proposed shelterwood treatment area is located in the middle reach of West Fisher Creek. It is positioned near mid slope on a steep east aspect. Such treatments regenerate a stand by leaving10-20 of the largest, best quality trees per acre for seed. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to slope position and leave trees, this treatment would not attract viewer attention.
112	33	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of West Fisher Creek. It is positioned on a steep south aspect near the ridge top. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
113	61	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of West Fisher Creek. It is positioned on a steep southwest aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
114a	25	11	Mod/L	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the toe of the slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to slope position, unit size, and leave trees, **this treatment would NOT meet the Forest Plan VQO**. **There is the opportunity to select quality western larch, ponderosa pine, Douglas-fir as leave trees in the southwest 5-10 acres resulting in a shelterwood. This coupled with the short view duration would meet the Forest Plan VQO.**
114b	8	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the toe of the slope on a gentle south aspect. Such treatments regenerate a stand by leaving 5-10 of the

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					largest, best quality trees per acre for seed. Treatment would be viewed from the closed Teeters Peak road at a foreground distance. Due to slope position, unit size, and leave trees, this treatment would meet the Forest Plan VQO.
115	20	12	MM/VL	SW	Mod - Proposed shelterwood treatment area is located in the middle reach of West Fisher Creek. It is positioned near mid slope on a steep southwest aspect. Such treatments regenerate a stand by leaving10-20 of the largest, best quality trees per acre for seed. Treatment would be viewed obliquely from the West Fisher 231 road at a middle-ground distance. Due to slope position, view angle and leave trees, this treatment would not attract viewer attention.
116	17	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the top of the slope on a steep south aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location and leave trees, this treatment would meet the Forest Plan VQO. **There are scattered bluffs that line the bottom of the proposed unit.**
117	27	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the top of the slope on a steep southwest aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location and leave trees, this treatment would meet the Forest Plan VQO. **There is the opportunity to move this proposed unit to the east to capture more decadent stand conditions.**
118a	35	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near mid slope on a gentle west aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to gentle terrain, remote location and leave trees, this treatment would meet the Forest Plan VQO. **There is the opportunity to designate more western larch leave trees which would result in a heavy shelterwood.**
118b	22	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near mid slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to gentle terrain, remote location and leave trees, this treatment would meet the Forest Plan VQO. **There is the opportunity to designate more western larch leave trees which would result in a shelterwood.**
119	19	12	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of West Fisher Creek. It is positioned on a gentle south aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location and leave tree density, this treatment would not attract viewer attention.
120	30	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a steep west aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					attract viewer attention.
121	85	12	MM/VL	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a steep southwest aspect near the top of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road and Teeters Peak Trail 300 at a foreground distance. Due to remote location and leave tree density, this treatment would not attract viewer attention.
122	28	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a gentle southeast aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be obliquely viewed from the West Fisher 231 road at a foreground distance. Due to view angle and leave tree density, this treatment would not attract viewer attention.
123	58	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a steep southwest aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
124	41	14	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a gentle south aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
125	27	14	Mod/L	CC	MM - Proposed clearcut treatment area is located in the lower reach of Standard Creek. It is positioned near mid-slope on a gentle east aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the West Fisher 231 at a foreground distance. Due to high visibility from a sensitive travel route, **this treatment would NOT meet the Forest Plan VQO. There is opportunity to designate western larch leave trees with low dwarf mistletoe ratings near the 231 road.**
127	33	14	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek straddling the Standard Creek Trail 116. It is positioned on a gentle east aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
128	11	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek immediately below a scenic turnout. It is positioned on a steep southwest aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
129	36	14	Mod/L	ST	MM - Proposed seed tree treatment area is located in the lower reach of Bramlet Creek. It is positioned near mid slope on a gentle northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					largest, best quality trees per acre for seed. Treatment would be viewed from the West Fisher 231 road at a scenic turnout at a middle-ground distance. Due to high visibility from a sensitive travel route and scenic turnout, **this treatment would NOT meet the Forest Plan VQO. There is the opportunity to designate more western larch leave trees which would result in a heavy shelterwood.**
130	27	14	Mod/L	ST	MM - Proposed seed tree treatment area is located in the lower reach of Bramlet Creek. It is positioned near mid slope on a gentle east aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the West Fisher 231 road at a scenic turnout at a middle-ground distance. Due to high visibility from a sensitive travel route and scenic turnout, **this treatment would NOT meet the Forest Plan VQO. There is the opportunity to designate more western larch leave trees around a mixed conifer island which would result in a heavy shelterwood.**
131	12	14	Mod/L	ST	MM - Proposed seed tree treatment area is located in the lower reach of Bramlet Creek. It is positioned near mid slope on a gentle east aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be obliquely viewed from the West Fisher 231 road at a scenic turnout at a middle-ground distance. Due to gentle terrain, view angle and leave trees, this treatment would meet the Forest Plan VQO. **There is the opportunity to designate more western larch leave trees which would result in a heavy shelterwood.**
132	26	14	MM/VL	ST	MM - Proposed seed tree treatment area is located in the upper reach of Trail Creek. It is positioned near the top of the slope on a gentle north aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the closed Trail Creek 2314 road at a middle-ground distance. Due to remote location and leave trees, this treatment would meet the Forest Plan VQO.
133	23	14	MM/VL	ST	MM - Proposed seed tree treatment area is located in the upper reach of Trail Creek. It is positioned near the top of the slope on a gentle north aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the closed Trail Creek 2314 road at a foreground distance. Due to remote location and leave trees, this treatment would meet the Forest Plan VQO.
201	15	11	MM/VL	CC	MM - Proposed clearcut treatment area is located in the lower reach of Silver Butte Creek. It is positioned near the toe of the slope on a gentle west aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be obliquely viewed from the West Fisher 231 at a foreground distance. Due to view angle, this treatment would meet the Forest Plan VQO. **There is opportunity to designate western larch leave trees which would result in a seed tree treatment.**
202	3	11	Mod/L	CC	Mod - Proposed clearcut treatment area is located in the lower reach of Silver Butte Creek. It is positioned near the toe of the slope on a gentle west aspect along the Jumbo Peak ranch access. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from the ranch access road at a foreground distance. Due to unit size and remote location, this treatment would meet the Forest Plan VQO.
203	23	11	Mod/L	ST	MM - Proposed seed tree treatment area is located in the lower reach of Silver Butte Creek. It is positioned near the toe of the slope on a gentle north aspect along the Jumbo Peak Trail 110. Such treatments

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
					regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Silver Butte 148 road and Jumbo Peak Trail at a foreground distance. Due to high visibility from sensitive travel routes, **this treatment would NOT meet the Forest Plan VQO. There is the opportunity to retain western larch and aspen which would result in a shelterwood appearance**.
208	57	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Silver Butte Creek. It is positioned on a steep south aspect near the toe of the slope straddling the Porcupine Creek Trail 298. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the Silver Butte 148 road and Porcupine Creek Trail 298 at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
210a	8	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Silver Butte Creek. It is positioned on a gentle east aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the Silver Butte 148 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
210b	10	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Silver Butte Creek. It is positioned on a gentle east aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the Silver Butte 148 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
214	27	11	Mod/L	ST	Mod - - Proposed seed tree treatment area is located in the middle reach of Silver Butte Creek. It is positioned near the toe of the slope on a gentle southeast aspect straddling the Olson Creek Trail 415. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Silver Butte 148 road and Olson Creek Trail at a foreground distance. Due to leave trees, this treatment would meet the Forest Plan VQO. **There is the opportunity to retain western larch and ponderosa pine which would result in a shelterwood**.
215	24	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of Silver Butte Creek. It is positioned on a gentle east aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the Silver Butte 148 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.

Other Activities –Alternative 2 proposes several other land management activities beyond tree harvest. Precommercial thinning of existing tree stands is used to maintain tree vigor and select species to carry to maturity. Where this is proposed along primary travel routes, resulting thinning slash can be a scenic detractor. Under these circumstances, slash should be hand piled for burning. Along secondary travel routes, reducing slash height by lopping is effective mitigation.

Road storage and decommissioning is used to protect water quality. It normally involves the removal of culverts and shaping of drainages followed by revegetation of disturbed areas. Rarely do these activities result in negative impacts to scenic resources. Access changes involve construction of new road to facilitate tree harvest and closure of existing roads to enhance wildlife habitat values. New road

construction is discussed by proposed units in the section above. Closure of existing roads by gate or earthen barrier has virtually no negative scenic resource impacts.

Trail tread reconstruction on existing trails has no negative scenic resource impacts. Fuels reduction and hazard tree removal is proposed at Lake Creek Campground. Fuels reduction would remove ladder fuels and windfall in and near the campground. Hazard tree removal targets Engelmann spruce due to its shallow root system and susceptibility to wind throw. Both of these proposed activities have minimal negative scenic resources impacts. Prescribed fire is a broad scale activity that utilizes aerial ignition and natural barriers to contain fire spread. This is a very natural appearing activity that mimics large fire events. Negative scenic resource impacts are normally minimal.

Cumulative Effects - Alternative 2 would change the visual condition of the Miller West Fisher area. Drier habitats found on south and west aspects of the analysis area would have subtle texture changes as tree canopy densities were reduced following harvest, hazard fuel reduction, or wildlife enhancement. Minimal new line and form would be introduced with the proposed improvement harvest treatments. Alternative 2 would regenerate (clearcut, seed tree, shelterwood) 1,104 acres in 51 harvest units. Most regeneration treatments would meet Forest Plan VQO's. This is due to leave tree densities, vegetative screening, blending with natural openings, and topographic positioning Within 15-20 years of the proposed regeneration treatments, intermediate/tall shrubs and tree regeneration would be noticeable in the treated areas. Scenic resource effects associated with temporary road construction (one segment totaling 1.2 miles) to access harvest areas would be short term. Temporary road segments will be pulled back to natural slope contours and revegetated.

Plum Creek Timber Company (PCTC) has limited ownership in the Miller-West Fisher analysis area. Past PCTC tree harvest has resulted in regeneration harvest that is large size, and blocky shape with harsh lines. Most of the logging PCTC will implement in the project area in the foreseeable future has already been implemented. See the Current and Foreseeable Actions section of Chapter 3 for more detail.

The Montanore Mine proposal would be powered by electricity delivered via a transmission line through the project area. Regardless of location, the transmission line would create harsh lines due to clearing of right of way for safety. The Forest Service proposed Miller –West Fisher alternatives would use the mitigation techniques described below to avoid similar negative scenic resource impacts.

Scenic Quality Mitigation – 87 of 96 treatment areas are forecasted to meet or positively exceed Forest Plan VQO's. Units would be positioned to take advantage of inferior viewer positions, oblique view angles, topographic/vegetative screening, natural openings, and revegetated tree harvest areas. Units would be marked to leave residual trees with the largest/best formed crowns. Unit layout would utilize small areas, irregular shapes/edges and gentle slope angles. The use of these techniques singularly or in combination would yield positive results related to Visual Quality Objectives/Scenic Integrity Objectives. Feathering and thinning the edge of units would be employed throughout the improvement harvest units proposed because it mimics historic tree stand densities.

Slash disposal adjacent to the West Fisher road 231, Silver Butte road 148, Miller Creek Trail 118, Standard Creek Trail 116, North Fork Miller Trail 505, Teeters Peak Trail 300, Olson Creek Trail 405, Porcupine Creek Trail 298, and Jumbo Peak Trail 110 will need to be complete to meet Forest Plan VQO's. Special care will be needed along the trails to avoid damaging the tread, blaze trees, and markers/signs.

Consistency with the Forest Plan - Alternative 2 proposes 50 treatments that will positively exceed Forest Plan VQO's (example: maximum modification prescribed and partial retention achieved). Another 37 treatments are proposed that would meet Forest Plan VQO's. There are nine units proposed that do not currently meet Forest Plan VQO's. Most have design opportunities to bring them into standard.

Alternative 4

Alternative 4 was designed to address concerns of Forest Plan consistency, related to big game summer range habitat, scenic resources, economic considerations, and public comment. This Alternative consists of 38 tree harvest treatment areas and 16 fuel treatment areas covering 1,364 acres and 2,830 acres respectively. Sixty proposed treatment areas included in Alternative 2 were dropped. Thirteen of the treatments are exactly the same are as Alternative 2 – Proposed Action. The purpose of these treatments is to reduce tree densities and fuel loadings to a more natural historic level, to capture mortality before product value is lost, to regenerate stands that have deteriorated, and to regenerate shrub species for big game forage.

Direct and Indirect Effects

Approximately 0.94 miles of temporary road construction in seven segments is proposed to access tree harvest areas on National Forest with this alternative. Road construction in the Miller West Fisher area would expose exceptionally light colored subsoils. However, all temporary road construction is proposed for recontouring and revegetation following tree harvest. The following chart displays by unit the scenic resource effects of Alternative 4 **only** where it differs from Alternative 2.

Table 3-64 – Alternative 4 VQO Effects by Unit

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
3	25	15	MM/VL	CC/ST	MM - Proposed clearcut/seed tree treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep north aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Or treatments regenerate a stand by leaving 5 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Miller Ridge trail and closed 4726 road at a foreground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO.
4	13	15	MM/VL	CC/ST	MM - Proposed clearcut/seed tree treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep northeast aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Or treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Miller Ridge trail and closed 4726 road at a foreground distance. Due to unit size and remote location, this treatment would not attract viewer attention. **There is the opportunity to leave more western larch which would result in a ST/SW treatment.**

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
12	40	15	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reaches of Miller Creek. It is positioned near the lower slopes on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Great care will be needed to avoid creating harsh lines. Due to leave trees, unit will meet the Forest Plan VQO. **There is the opportunity to leave more mixed conifer which would result in a ST/SW treatment.**
21	75	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the top of a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave tree density, slash cleanup along the 4724 road and viewing distance, this treatment would not attract viewer attention.
25	65	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned at mid-slope on a steep north aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from closed local roads north of Miller Creek. Due to leave tree density and remote location, this treatment would not attract viewer attention.
26	114	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned near the upper slope on a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road and the Miller Creek Trail 118 at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
26A	15	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned near the upper slope on a steep east aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from open Miller Creek road 4724 at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
32	40	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the South Fork Miller Creek. It is positioned near the top of the slope on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch which would result in a ST/SW.**
53	70	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of the Miller Creek. It is positioned on a gentle southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open Miller Creek 385 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
61	17	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the Miller Creek. It is positioned near mid-slope on a steep north aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the closed North Fork Miller Creek 4725 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO.
113	76	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of West Fisher Creek. It is positioned on a steep southwest aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
114a	25	11	Mod/L	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the toe of the slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the West Fisher 231 road at a foreground distance. **There is the opportunity to select quality western larch, ponderosa pine, Douglas-fir as leave trees in the southwest 5-10 acres resulting in a shelterwood. This coupled with the short view duration would meet the Forest Plan VQO.**

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
117	40	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the top of the slope on a steep southwest aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location and leave trees, this treatment would meet the Forest Plan VQO.
119	58	12	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of West Fisher Creek. It is positioned on a gentle south aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location and leave tree density, this treatment would not attract viewer attention.
120	54	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a steep west aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
122	59	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a gentle southeast aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be obliquely viewed from the West Fisher 231 road at a foreground distance. Due to view angle and leave tree density, this treatment would not attract viewer attention.
123	89	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a steep southwest aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
124	57	14	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a gentle south aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
125	27	14	Mod/L	CC	MM - Proposed clearcut treatment area is located in the lower reach of Standard Creek. It is positioned near mid-slope on a gentle east aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and plant seedlings. Treatment would be viewed from the West Fisher 231 at a foreground distance. Due to high visibility from a sensitive travel route, t**here is the need to designate western larch leave trees with low DM ratings near the 231 road in order to meet the Forest Plan VQO.**
128	27	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek immediately below a scenic turnout. It is positioned on a steep southwest aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.

Other Activities –Alternative 4 proposes several other land management activities beyond tree harvest. Precommercial thinning of existing tree stands is used to maintain tree vigor and select species to carry to maturity. Where this is proposed along primary travel routes, resulting thinning slash can be a scenic detractor. Under these circumstances, slash should be hand piled for burning. Along secondary travel routes, reducing slash height by lopping is effective mitigation. Road storage and decommissioning is used to protect water quality. It normally involves the removal of culverts and shaping of drainages followed by revegetation of disturbed areas. Rarely do these activities result in negative impacts to scenic resources.

Access changes involve construction of new road to facilitate tree harvest and closure of existing roads to enhance wildlife habitat values. New road construction is discussed by proposed units in the section above. Closure of existing roads by gate or earthen barrier has virtually no negative scenic resource impacts. Trail tread reconstruction on existing trails has no negative scenic resource impacts. Fuels reduction and hazard tree removal is proposed at Lake Creek Campground. Fuels reduction would removal ladder fuels and windfall in and near the campground. Hazard tree removal targets Engelmann spruce due to its shallow root system and susceptibility to wind throw. Both of these proposed activities have minimal negative scenic resources impacts.

Prescribed fire is a broad scale activity that utilizes aerial ignition and natural barriers to contain fire spread. This is a very natural appearing activity that mimics large fire events. Negative scenic resource impacts are normally minimal. Alternatives 4, 6, and 7 include proposed construction of horse holding corrals for campers near the Lake Creek Campground. Construction would use native materials (lodgepole pine rails) and would appear quite natural in the developed setting near the campground.

The current owner of the Irish Boy patented mine has requested motorized access to the property, which would involve reconstruction of an existing closed road to his property. Views of this road are very limited and negative scenic resource impacts would be minimal. The Forest Service proposes fish pool construction in Miller Creek, stream bank stabilization in West Fisher Creek, and restoration of Standard Lake. All three proposals may utilize heavy equipment and immediate revegetation of disturbed soils. Negative scenic resource impacts would be minimal.

Cumulative Effects

Alternative 4 would change the visual condition of the Miller - West Fisher area. Drier habitats found on south and west aspects of the analysis area would have subtle texture changes as tree canopy densities were reduced following harvest, hazard fuel reduction, or wildlife enhancement. Minimal new line and form would be introduced with the proposed improvement harvest treatments. Alternative 4 would regenerate (clearcut, seed tree, shelterwood) 514 acres in 21 harvest units. All regeneration treatments would meet Forest Plan VQO's. This is due to leave tree densities, vegetative screening, blending with natural openings, and topographic positioning Within 15-20 years of the proposed regeneration treatments, intermediate/tall shrubs and tree regeneration would be noticeable in the treated areas. Scenic resource effects associated with temporary road construction (seven segments totaling 0.94 miles) to access harvest areas would be minimal. These road segments would be recontoured and revegetated following harvest. Any road impacts to scenic resources should be short-term, i.e. confined to the activity period and five years after.

Plum Creek Timber Company (PCTC) has limited ownership in the Miller West Fisher project area. Past PCTC tree harvest has resulted in regeneration harvest that is large size, and blocky shape with harsh lines. The Montanore Mine proposal would be powered by electricity delivered via a transmission line through the project area. Regardless of location, the transmission line would create harsh lines due to clearing of right of way for safety. The Forest Service proposed Miller West Fisher alternatives would use the mitigation techniques described below to avoid similar negative scenic resource impacts.

Scenic Quality Mitigation

All treatment areas are forecasted to meet or positively exceed Forest Plan VQO's. Units would be positioned to take advantage of inferior viewer positions, oblique view angles, topographic/vegetative screening, natural openings, and revegetated tree harvest areas. Units would be marked to leave residual trees with the largest/best formed crowns. Unit layout would utilize small areas, irregular shapes/edges and gentle slope angles. The use of these techniques singularly or in combination would yield positive results related to Visual Quality Objectives/Scenic Integrity Objectives. Feathering and thinning the edge of units would be employed throughout the improvement harvest units proposed because it mimics historic tree stand densities.

Slash disposal adjacent to the West Fisher Road 231, Miller Creek Road 385, South Fork Miller Road 4724, Miller Creek Trail 118, North Fork Miller Trail 505 and Teeters Peak Trail 300 will need to be complete to meet Forest Plan VQO's. Special care will be needed along the trails to avoid damaging the tread, blaze trees, and markers/signs.

Consistency with the Forest Plan

Alternative 4 proposes 15 treatments that will positively exceed Forest Plan VQO's (example: maximum modification prescribed and partial retention achieved). Another 23 treatments are proposed that would meet Forest Plan VQO's.

Alternative 6

Alternative 6 was designed to consider an alternate route through the project area for the Montanore power line. This Alternative consists of 55 tree harvest treatment areas and 16 fuel treatment areas covering 1,898 acres and 2,830 acres respectively. Thirty-three proposed units from Alternative 2 were dropped. Twenty-four of the treatments are exactly the same are as Alternative 2 – Proposed Action. The purpose of these treatments is to reduce tree densities and fuel loadings to a more natural historic

level, to capture mortality before product value is lost, to regenerate stands that have deteriorated, and to regenerate shrub species for big game forage.

Direct and Indirect Effects

Approximately 3.29 miles of temporary road construction in 12 segments is proposed to access tree harvest areas on National Forest with this alternative. Road construction in the Miller –West Fisher area would expose exceptionally light colored subsoils, however the effects are judged to be short term as roads would be recontoured and revegetated following harvest. The following chart displays by unit the scenic resource effects of Alternative 6 **only** where it differs from Alternative 2 – Proposed Action.

Table 3-65 – Alternative 4 VQO Effects by Unit

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
3	25	15	MM/VL	CC/ST	MM - Proposed clearcut/seed tree treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep north aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Or treatments regenerate a stand by leaving 5 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Miller Ridge trail and closed 4726 road at a foreground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO.
4	13	15	MM/VL	CC/ST	MM - Proposed clearcut/seed tree treatment area is located in the lower reaches of Miller Creek. It is positioned at mid slope on a steep northeast aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Or treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the Miller Ridge trail and closed 4726 road at a foreground distance. Due to unit size and remote location, this treatment would not attract viewer attention. **There is the opportunity to leave more western larch which would result in a ST/SW treatment.**
12	40	15	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reaches of Miller Creek. It is positioned near the lower slopes on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a foreground distance. Great care will be needed to avoid creating harsh lines. Due to leave trees, unit will meet the Forest Plan VQO. **There is the opportunity to leave more mixed conifer which would result in a ST/SW treatment.**

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
21	75	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of South Fork Miller Creek. It is positioned near the top of a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave tree density, slash cleanup along the 4724 road and viewing distance, this treatment would not attract viewer attention.
25	65	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned at mid-slope on a steep north aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from closed local roads north of Miller Creek. Due to leave tree density and remote location, this treatment would not attract viewer attention.
26	114	12	Mod/L	Imp	PR – Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned near the upper slope on a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road and the Miller Creek Trail 118 at a foreground distance. Due to leave tree density and remote location, this treatment would not attract viewer attention.
26A	15	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the headwaters of Miller Creek. It is positioned near the upper slope on a steep east aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from open Miller Creek road 4724 at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
32	40	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the South Fork Miller Creek. It is positioned near the top of the slope on a steep northeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the open South Fork Miller Creek 4724 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to leave western larch which would result in a ST/SW.**

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
38	17	12	MM/VL	Imp	PR - Proposed improvement treatment area is located in the headwaters of the North Fork Miller Creek. It is positioned at mid-slope on a steep southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the North Fork Miller Trail 505 at a foreground distance. Due to leave trees and remote location, this treatment would meet the Forest Plan VQO**.**
48	16	11	Mod/L	Imp	PR - Proposed seed tree treatment area is located in the middle reach of Miller Creek. It is positioned at mid-slope on a steep south aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave trees, this treatment would meet the Forest Plan VQO**.**
53	70	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of the Miller Creek. It is positioned on a gentle southeast aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open Miller Creek 385 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
56	103	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of the Miller Creek. It is positioned on a steep south aspect. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the open 4724 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
61	17	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the headwaters of the Miller Creek. It is positioned near mid-slope on a steep north aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the closed North Fork Miller Creek 4725 road at a middle-ground distance. Due to leave trees, oblique view angle and remote location, this treatment would meet the Forest Plan VQO.
108	21	11	MM/VL	ST	MM - Proposed seed tree treatment area is located in the lower reach of West Fisher Creek. It is positioned near the toe of the slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to slope position, unit size, leave trees and remote location, this treatment would meet the Forest Plan VQO. **There is the opportunity to select quality ponderosa pine as leave trees.**

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
111	40	11	MM/VL	ST	MM- Proposed shelterwood treatment area is located in the middle reach of West Fisher Creek. It is positioned near mid slope on a steep east aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to remote location and leave trees, this treatment would not attract viewer attention.
113	119	11	Mod/L	Imp	PR - Proposed improvement treatment area is located in the middle reach of West Fisher Creek. It is positioned on a steep southwest aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a middle-ground distance. Due to leave tree density, this treatment would not attract viewer attention.
114a	25	11	Mod/L	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the toe of the slope on a gentle southeast aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from the West Fisher 231 road at a foreground distance. **There is the opportunity to select quality western larch, ponderosa pine, Douglas-fir as leave trees in the southwest 5-10 acres resulting in a shelterwood. This coupled with the short view duration would meet the Forest Plan VQO.**
116	17	11	MM/VL	ST	MM - Proposed clearcut treatment area is located in the middle reach of West Fisher Creek. It is positioned near the top of the slope on a steep south aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and planting seedlings. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location, this treatment would meet the Forest Plan VQO. **There are scattered bluffs that line the bottom of the proposed unit.**
117	40	12	MM/VL	ST	MM - Proposed seed tree treatment area is located in the middle reach of West Fisher Creek. It is positioned near the top of the slope on a steep southwest aspect. Such treatments regenerate a stand by leaving 5-10 of the largest, best quality trees per acre for seed. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location and leave trees, this treatment would meet the Forest Plan VQO.

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
119	58	12	MM/VL	Imp	PR - Proposed improvement treatment area is located in the middle reach of West Fisher Creek. It is positioned on a gentle south aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from a closed local road at a foreground distance. Due to remote location and leave tree density, this treatment would not attract viewer attention.
120	54	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a steep west aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
122	59	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a gentle southeast aspect near mid slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be obliquely viewed from the West Fisher 231 road at a foreground distance. Due to view angle and leave tree density, this treatment would not attract viewer attention.
123	89	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a steep southwest aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
124	57	14	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek. It is positioned on a gentle south aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.
125	27	14	Mod/L	CC	MM - Proposed clearcut treatment area is located in the lower reach of Standard Creek. It is positioned near mid-slope on a gentle east aspect. Such treatments regenerate a stand by removing all trees except wildlife snags, and plant seedlings. Treatment would be viewed from the West Fisher 231 at a foreground distance. Due to high visibility from a sensitive travel route, t**here is the need to designate western larch leave trees with low dwarf mistletoe ratings near the 231 road in order to meet the Forest Plan VQO.**

UNIT #	ACRES	MA	VQO/SIL	RX	VQO ACHIEVED - RATIONALE
128	27	12	Mod/L	Imp	PR - Proposed improvement treatment area is located in the lower reach of Standard Creek immediately below a scenic turnout. It is positioned on a steep southwest aspect near the toe of the slope. Such treatments thin merchantable trees from a dense stand leaving a manageable overstory canopy of the largest, best quality trees. Treatment would be viewed from the West Fisher 231 road at a foreground distance. Due to leave tree density, this treatment would not attract viewer attention.

Other Activities – Alternative 6 proposes several other land management activities beyond timber harvest. Precommercial thinning of existing tree stands is used to maintain tree vigor and select species to carry to maturity. Where this is proposed along primary travel routes, resulting thinning slash can be a scenic detractor. Under these circumstances, slash should be hand piled for burning. Along secondary travel routes, reducing slash height by lopping is effective mitigation.

Road storage and decommissioning is completed to protect water quality. It normally involves the removal of culverts and shaping of drainages followed by revegetation of disturbed areas. Rarely do these activities result in negative impacts to scenic resources. Access changes involve construction of new road to facilitate tree harvest and closure of existing roads to enhance wildlife habitat values. New road construction is discussed by proposed units in the section above. Closure of existing roads by gate or earthen barrier has virtually no negative scenic resource impacts.

Trail tread reconstruction on existing trails has no negative scenic resource impacts. Fuels reduction and hazard tree removal is proposed at Lake Creek Campground. Fuels reduction would removal ladder fuels and windfall in and near the campground. Hazard tree removal targets Engelmann spruce due to its shallow root system and susceptibility to wind throw. Both of these proposed activities have minimal negative scenic resources impacts. Prescribed fire is a broad scale activity that utilizes aerial ignition and natural barriers to contain fire spread. This is a very natural appearing activity that mimics large fire events. Negative scenic resource impacts are normally minimal.

This alternative includes construction of horse holding corrals for campers near the Lake Creek Campground. Construction would use native materials (lodgepole pine rails) and would appear quite natural in the developed setting near the campground.

The current owner of the Irish Boy patented mine has requested motorized access to the property, which requires reconstruction of an existing closed road to his property. Views of this road are very limited and negative scenic resource impacts would be minimal.

The Forest Service proposes fish pool construction in Miller Creek, stream bank stabilization in West Fisher Creek, and restoration of Standard Lake. All three proposals may utilize heavy equipment and immediate revegetation of disturbed soils. Negative scenic resource impacts would be minimal.

Cumulative Effects

Alternative 6 would change the visual condition of the Miller West Fisher project area. Drier habitats found on south and west aspects of the analysis area would have subtle texture changes as tree canopy densities were reduced following harvest, hazard fuel reduction, or wildlife enhancement. Minimal new line and form would be introduced with the proposed improvement harvest treatments. Alternative 6 would regenerate (clearcut, seed tree, shelterwood) 692 acres in 28 harvest units. All regeneration treatments would meet Forest Plan VQO's. This is due to leave tree densities, vegetative screening,

blending with natural openings, and topographic positioning Within 15-20 years of the proposed regeneration treatments, intermediate/tall shrubs and tree regeneration would be noticeable in the treated areas. Scenic resource effects associated with temporary road construction (12 segments totaling 3.29 miles) to access harvest areas would be short term. These road segments would be recontoured and revegetated following harvest.

Plum Creek Timber Company (PCTC) has limited ownership in the project area. Past PCTC tree harvest has resulted in regeneration harvest that is large size, and blocky shape with harsh lines. The Montanore Mine proposal would be powered by electricity delivered via a transmission line through the analysis area. Regardless of location, the transmission line would create harsh lines due to clearing of right of way for safety. The Forest Service proposed alternatives would use the mitigation techniques described below to avoid similar negative scenic resource impacts.

Alternative 7

Alternative 7 was designed to meet big game summer range and grizzly bear habitat standards. It proposes exactly the same tree harvest areas as Alternative 4. The only difference between Alternative 4 and Alternative 7 is winter logging in some of the harvest units in the Standard Creek drainage to meet open road density standards in MA 12. Effects to scenic resources would be exactly the same as described in Alternative 4.

Scenic Quality Mitigation

All treatment areas are forecasted to meet or positively exceed Forest Plan VQO's. Units would be positioned to take advantage of inferior viewer positions, oblique view angles, topographic/vegetative screening, natural openings, and revegetated tree harvest areas. Units would be marked to leave residual trees with the largest/best formed crowns. Unit layout would utilize small areas, irregular shapes/edges and gentle slope angles. The use of these techniques singularly or in combination would yield positive results related to Visual Quality Objectives/Scenic Integrity Objectives. Feathering and thinning the edge of units would be employed throughout the improvement harvest units proposed because it mimics historic tree stand densities.

Slash disposal adjacent to the West Fisher Road 231, Miller Creek Road 385, South Fork Miller Road 4724, Miller Creek Trail 118, North Fork Miller Trail 505 and Teeters Peak Trail 300 will need to be complete to meet Forest Plan VQO's. Special care will be needed along the trails to avoid damaging the tread, blaze trees, and markers/signs.

Consistency with the Forest Plan

Alternative 6 proposes 29 treatments that will positively exceed Forest Plan VQO's (example: maximum modification prescribed and partial retention achieved). Another 26 treatments are proposed that would meet Forest Plan VQO's.

RECREATION

Introduction

This section discusses the existing condition and the effects of the alternatives on the recreation resource.

Analysis Area

The analysis area is bounded on the east by US Highway 2. The Miller Creek divide forms the north boundary. The headwaters of West Fisher Creek and its tributaries bounded by high peaks within the Cabinet Mountains Wilderness form the west boundary. The south boundary is formed by the Silver Butte Creek divide and its tributaries. This analysis area is analogous with the Silverfish Planning Subunit.

Analysis Methods

The Recreation Opportunity Spectrum (ROS Primer and Field Guide, R-6-REC-021-90, USDA Forest Service, April 1990) provides the framework to understand how resource management affects settings, activities and ultimately the experience levels of recreationists. Experience levels are defined as highly probable outcomes of participating in recreation activities in specific recreation settings. The key to providing most experiences is the setting and how it is managed. As resource managers, the Forest Service can facilitate (or hamper) many desired experiences by the way setting indicators are managed. These indicators are:

1. Access - includes type and mode of travel.
2. Remoteness - refers to the extent to which individuals perceive themselves removed from the sights and sounds of human activity.
3. Social Encounters - refers to the number and type of other recreationists met along travelways and at destinations.
4. Visitor Management - includes the degree to which visitors are regulated and controlled, as well as the level of information and services provided.
5. Facilities and Site Management - refers to the level of site development.
6. Visitor Impacts - refers to the impacts of visitor use on the environment.
7. Naturalness - refers to the degree of naturalness of the setting, it affects the psychological outcomes associated with enjoying nature.

Setting Characterizations

Primitive Setting – Area is characterized by essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from the evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

Semi-Primitive Non-Motorized Setting – Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is not permitted.

Semi-Primitive Motorized Setting – Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions are present, but subtle. Motorized use is permitted.

Roaded Natural Setting – Area is characterized by predominantly natural appearing environment with moderate evidences of the sights and sounds of man. Such evidences harmonize with the natural environment. Interaction between users may be low to moderate, but with the evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

Rural Setting – Area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soils. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate densities are provided for away from developed sites. Facilities for intensified motorized use and parking are available.

Urban Setting – Area is characterized by a substantially urbanized environment, although the background may have natural appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, on site, are predominant. Large numbers of users can be expected, both on site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Impact Levels

Impacts would be **high** where proposed actions would preclude existing or planned recreational uses or permanently negatively affect recreation experiences.

Impacts would be **moderate** where proposed actions would temporarily preclude existing recreation uses during peak use periods or temporarily negatively affect recreation experiences.

Impacts would be **low** where proposed actions would temporarily preclude existing recreation uses during non-peak use periods or temporarily negatively affect recreation experiences.

AFFECTED ENVIRONMENT

1) Access – The Miller–West Fisher–Silver Butte area has a low density of roads (open and closed) that were constructed for a variety of purposes. Roads open to motorized vehicle travel year around serve public access to recreation sites and trails. Most spur roads are closed year around to achieve big game or grizzly bear habitat effectiveness. Snowmobile use is permitted on open and closed roads except where bear denning habitat values would be compromised. ORV trespass of closed roads is common. Closed roads are used extensively by walk-in hunters during the fall. Non-motorized hiking/horseback trails are located throughout the analysis area. All managed trails in the analysis area are closed to motorized travel yearlong by Forest Supervisor Order.
2) Remoteness - Due to the low density of roads and traffic levels, the perceived condition of remoteness is easily achieved in the Miller–West Fisher-Silver Butte area. Exceptions would be

high use road corridors, i.e. West Fisher Road 231, Miller Creek Roads 385 and 4724, and Silver Butte Road 148.

3) Social Encounters - Contact between recreationists is moderate to high along open roads. Contacts are highest during peak seasons, examples: summer hiking on trails, summer driving to view scenery/wildlife, and hunting during the fall. Contact on closed roads is low, as most recreationists respect another person's desire for space. Contact by visitors in the Wilderness at lake basins accessed by trails can be high. Encounters by season are often by people pursuing the same recreation activity.
4) Visitor Management - The most common control on recreationists in the Miller-West Fisher-Silver Butte area is road closures to motorized vehicle travel. Over half of the road mileage in the project area has been closed year around to benefit wildlife or watershed health. The information most commonly provided to visitors is related to vehicle travel, i.e. road numbers, mile markers, and traffic control signs.
5) Facilities and Site Management – There is one Forest Service developed recreation facility within the project area, and that is the Lake Creek Campground. Numerous hiking trails are managed within the analysis area. Trailhead development includes parking and information signing. Trails are maintained every 1-3 years.
6) Visitor Impacts - The most common impacts of visitors are littering and spread of noxious weeds. Vandalism to gates, once common is now declining. Cross-country ORV use has resulted in the creation of new travel ways, vegetation elimination, soil erosion and weed spread. Nearly all signs, regardless of message, have several to numerous bullet holes in them.
7) Naturalness - Visual quality objectives are used to quantify the degree of landscape naturalness. For more information, see the scenic resource section in Chapter 3.

The Miller-West Fisher-Silver Butte area provides important recreation settings, ranging from primitive to rural, for a wide spectrum of recreation activities. The area is important due to the ease of access year around from US Highway 2 and to its position south of the community of Libby. Important dispersed recreation activities are viewing/photographing scenery and wildlife, fishing, hiking, hunting, and picnicking. There are five outfitter/guides permitted in the project area for a variety of activities.

The Cabinet Face East Inventoried Roadless Area #671 is positioned in the headwaters of West Fisher Creek. The Barren Peak IRA #183 is on the divide between West Fisher and Silver Butte Creeks. The Allen Peak IRA #185 is on the south Silver Butte divide. Primitive recreation settings are abundant due to the high level of unroaded lands. The majority of the project area is inventoried as semi-primitive non-motorized.

Managed trails in the analysis area are: Divide Trail 6S, Divide Cutoff Trail 63, Jumbo Peak Trail 110, Iron Meadows Trail 113, Silver Dollar Trail 114, Fourth of July Trail 115, Standard Creek Trail 116, Great Northern Mountain Trail 117, Miller Creek Trail 118, Swamp Creek Trail 121, Bear Lakes Trail 178, Himes-Waloven Trail 293, Silver Butte Creek Trail 296, Trapper Creek Trail 297, Porcupine Creek Trail 298, Barren Peak Trail 299, Teeters Peak Trail 300, Gloria Mine Trail 301, Mill-Ozette Trail 302, Himes Spring Creek Trail 343, Cabinet Divide East Trail 360E, Cabinet Divide South Trail 360S, Olson Creek Trail 415, Allen Peak Trail 466, Baree Creek Trail 489, North Fork Miller Creek Trail 505, Miller Ridge Trail 506, Porcupine Ridge Trail 532, Blacktail Loop Trail 536, Lake Creek Trail 656, Bramlet Lake Trail 658, Libby Divide Trail 716, and Wayup Mine Trail 815. All or portions of these trails access remote roadless lands to provide a semi-primitive non-motorized recreation setting. There are vistas along these trails which offer panoramic views of the East Cabinet Range.

Currently, stock use of the project area is low. Favored riding areas are associated with the Cabinet Mountains Wilderness and Inventoried Roadless Areas. Loop riding opportunities are common.

ORV use within the analysis area is presently light. Four wheelers and motorcycles are the two major ORV types. ORV trespass use of roads which are closed to motor vehicles is common.

Snowmobile use is low with no concentrated use areas.

People participating in activities where a semi-primitive non-motorized experience is desired are, for the most part, dependant upon trail management and road closures. Trail management budgets within the Forest Service have been declining since 2003. Currently the yearlong and seasonal closures on spur roads are doing a marginal job of maintaining this setting. Violations of road closures by four wheelers and motorcycles are common.

The project area is used by recreationists at all seasons. Peak use periods are during the spring-summer for hiking and driving to view scenery/wildlife, and fall for hunting. Libby-Troy and Montana residents make up the highest percentage of visitors to the area. Recreation activities are dispersed over time and space.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects Common to All Action Alternatives

The action alternatives propose to harvest trees on from 1,364 to 2,492 acres, burn from 3,302 to 4,794 acres, and thin 351 acres on the National Forest.

1) Access - The action alternatives propose temporary road construction for tree harvest. See Chapter 2 for details. These roads would be re-claimed following tree harvest. The action alternatives will change settings for a variety of activities and ultimately the experience derived by recreationists. For example, a new road closure would make gathering forest products (berry picking, Christmas tree cutting) more difficult or impossible (firewood cutting). However, that same road closure would enhance walk-in hunting or horseback riding. Therefore, effects analysis often looks at access management to determine if a balance of recreation opportunity is available. In the Miller-West Fisher-Silver Butte area, a reasonable balance of open and closed road-related recreation settings would be available under the action alternatives.

Tree harvest access and traffic levels to support these proposals will impact experiences for recreationists driving to view scenery/wildlife on the project area. Visitors will need to be more cognizant of traffic for safety and may not see as much wildlife due to increased traffic. A short term low level negative impact is anticipated for public access.

Mitigation could include safety signing and advisories.

Within the project area, all Forest Service managed trails are closed to motorized travel. These closures provide additional big game summer range habitat. The project alternatives would not change the existing condition of these existing trails.

2) Remoteness – Public use of the analysis area will only be restricted for safety reasons during tree harvest and burning. Therefore, a low level short term negative impact is anticipated for the public's sense of remoteness. It is highly unlikely that noise from tree harvest will be heard by visitors to the Cabinet Mountains Wilderness due to prevailing winds and distance from proposed activities.

No mitigation is proposed to enhance remoteness.

3) Social Encounters - Public use of the analysis area would only be restricted during brief periods for safety reasons. Social encounters are anticipated to increase slightly due to the curiosity of travelers to the area. Social encounters may actually decrease as visitors are displaced to other locations for their activities. Under the above scenarios, short term low level negative impacts are anticipated.

Mitigation could include safety signing and travel advisories.

4) Visitor Management – Visitor regulation and control will be increased under the proposed actions. Some roads will be closed seasonally or yearlong to public motorized use to provide for public safety or to protect wildlife values. These roads will provide new non-motorized travel routes for a variety of activities; however, fall hunting will likely dominate use. Public perception of regulation and control is largely negative. Where new road closures are implemented, long term low level negative impacts are anticipated.

Mitigation could be biannual monitoring of road closure devices to assure effectiveness.

5) Facilities and Site Management – The Lake Creek Campground is the only developed recreation site is found within the project area. Scenic turnouts are located at milepost 8.8 and 10.1 on the West Fisher Road 231.

The following work is proposed to enhance existing facilities and site management. Fuels reduction and hazard tree removal is proposed for Lake Creek Campground. Fuels reduction would focus on ladder fuels and blowdown around the campground perimeter. These fuels would be hand piled for burning in the fall. Hazard tree removal would focus on Engelmann spruce removal due to its shallow rooting habit and high blowdown potential related to public safety.

Several trails in the analysis area are proposed for tread reconstruction (Silver Butte Creek Trail 196, Porcupine Creek Trail 298, Miller Ridge Trail 506, Libby Divide Trail 716), foot log stream crossing (Waloven Creek Trail 293), or horse ford stream crossing (Waloven Creek Trail 293). Nearly all trailheads in the analysis area require modification to accommodate stock use supported by truck and trailer. Modifications needed are space for parking and turning trucks with trailers. Such work largely relates to public safety for trail visitors. The effect would be to potentially increase certain types of use in the project area, such as trailer camping or horse back use.

No mitigation is proposed to enhance facilities and site management.

6) Visitor Impacts – Under the proposed action, five existing roads would be closed to public motorized travel to protect wildlife habitat values or cultural resources. An earthen barrier would be utilized to implement these proposals. Access management is a key public issue, particularly with OHV users in this analysis area. Visitors opposed to road closures will vandalize gates and signs. OHV users will circumvent gates/barriers and develop new routes from the roads where terrain is suitable. Such use will spread noxious weeds, eliminate vegetation and result in erosion. This is judged to be a low level long term negative impact.

Mitigation could include biannual monitoring to assure closure effectiveness and repair of structures and resource damages.

7) Naturalness - Recreation opportunities will continue to be varied and dispersed through the area. Trails located throughout the analysis area will be maintained at longer intervals as the Forest Service manages declining maintenance budgets. The need for public outfitter/guide services will remain low due to the area's high level of road/trail accessibility.

Increased traffic levels would be expected on roads during tree harvest. There would be short-term displacement of recreationists from activity areas due to noise, traffic, dust, and for safety reasons.

These would be low to moderate level short term negative impacts depending on activity during peak recreation seasons.

Other activities are proposed in the action alternatives, including construction of new and/or temporary roads, implementation of best management practices (BMP's) on roads, various levels of road storage and decommissioning, and various amounts of prescribed fire in areas not treated with timber harvest. Alternatives 4, 6, and 7 include pool creation in Miller Creek and stream bank stabilization in West Fisher Creek. These activities would not impact recreation users because they are short-term and of low magnitude in the project area.

Alternative 4 would permit motorized access to private property to the Irish Boy Mine in the Lake Creek drainage near the trailhead to Geiger Lakes Trail 656. An existing primitive road would be reconstructed to permit access. That road begins at the Lake Creek trailhead, a very popular public non-motorized trail access to the Cabinet Mountains Wilderness. Visitors using this trail may encounter the sights/sounds of motorized access to the Irish Boy located across the drainage below them. Such encounters would impact their sense naturalness. This is judge to be a low level, long term negative impact.

Cumulative Effects

Within the project area, the Forest Service is the major land owner followed by Plum Creek Timber Company, Montana Department of State Lands, and private property and mineral patent owners. FS initiated tree harvest in the area in the 1920s. Transportation development coincided with these dates and utilized railroad technology. This transportation system was unavailable to the general public, and hiking/pack trails were therefore used for recreation access. By the 1960s, road development for tree harvest had replaced rail lines. These roads were now available to the recreating public. From 1960 to 1990, the area of tree harvest on FS ownership was greatly expanded spatially. The public was afforded motorized access to the analysis area during this period. Since 1990, the FS has realized the benefit of road management to a variety of resources. Over 50% of all roads constructed in the area are currently closed to motorized travel. This brief history will provide the basis for cumulative effects analysis using the setting indicators of the Recreation Opportunity Spectrum.

1) Access – From early European settlement to 1950, recreationists used game trails and pack trails to access settings for recreation activities. From 1950 to 1990, motorized access on roads constructed for tree removal expanded rapidly. Pack trails during this period were often obliterated or abandoned. Few trails were maintained for recreation access. With the advent of road closures in 1990, the FS launched a program of trail restoration to facilitate recreation access. Currently the public enjoys a balance of motorized and non-motorized access to recreation settings.

2) Remoteness - Primitive and semi-primitive non-motorized settings dominated the Miller-West Fisher-Silver Butte area up to 1950. With greatly expanded tree harvest and road construction from 1950 to 1990, the sights and sound of human activity were common. The 1950s semi-primitive motorized settings associated with primitive roads and vehicles by 1990 had, with higher standard roads and improved technology in vehicles, evolved to roaded natural settings. From 1990 to present, recreation settings have shown a large movement to the more primitive side of the spectrum with road closures and revegetation of harvest areas.

3) Social Encounters – Up to 1950, social encounters were rare except at the most popular destinations (e.g. Cabinet Mountains Wilderness). Even with a low population of recreationists, encounters increased from 1950 to 1990 due to the ease of access afforded by road construction

and more available free time. With road closures starting in 1990, social encounters in some settings have been reduced. Overall, the recreation population has aged and with more available free time, encounters are not expected to decrease.

4) Visitor Management – Up to 1950, visitor management was virtually non-existent except for a few fire prevention posters. From 1950 to present, visitor management has steadily increased with the most visible being road closures. Since 1990, permits for a variety of activities (firewood gathering, Christmas tree cutting, etc) have been required by the Forest Service.
5) Facilities and Site Management – Prior to 1950, the Forest Service maintained a vast network of pack trails primarily for fire suppression. Recreationists used these trails as well. From 1950 to present, roads have become the major facility within the project area. Beyond restored pack trails and improved trailheads, very few recreation-specific facilities exist within the area. The analysis area contains one Forest Service developed recreation site, the Lake Creek Campground. The site contains four fully developed sites and two vault toilets. Dispersed campsites can be found throughout the analysis area. User created developments (e.g. fire rings) are common at campsites.
6) Visitor Impacts – Prior to 1950, few impacts from recreationists could be found on the environment. From 1950 to present, impacts are wide ranging (weeds, litter) and localized (vandalism to gates, signs). In the future, visitor created trails from ORV use is expected to accelerate in the project area.
7) Naturalness – Prior to 1950, the degree of setting naturalness was very high. From 1950 to 1990, naturalness declined with large geometric patterns of tree harvest and road construction to access harvest areas. From 1990 to present, tree harvest has been reduced and has utilized smaller unit sizes and irregular shapes. Few new roads have been constructed and other yarding systems (helicopter, skyline) have been employed. In the future, recreation setting naturalness is expected to increase as tree harvest areas and closed road surfaces revegetate.

In addition to the proposed tree harvest and road use, a number of proposed actions, in or close to the project area will impact public recreation settings, activities and experiences. These are:

1) The Rock Creek Mine located west of the Cabinet Mountains Wilderness proposes to impact 492 surface acres, of which 140 acres are on NFS lands.
2) The Montanore Mine located east of the Cabinet Mountains Wilderness proposes to impact 3,200 surface acres of which 3,000 acres are on NFS lands.
3) Numerous small scale placer mining operations are located in the analysis area and run the spectrum from panning to sluicing to portable dredging operations.

The effect of these activities combined with the Miller West Fisher project would be that visitors to the area would experience a large increase in activity in the project area. Increased logging activity in the project area would be over the short term, such as three to five years. Activity from the Rock Creek mine should not be detectable by most recreation users within the project area, with the exception of those that access the ridge between the project area and Rock Creek to the west. These users may experience mining activity, which would affect their sense of remoteness and naturalness.

The addition of activity from the Montanore project in the Miller West Fisher project area would largely be associated with the construction of the power line that would support the mill site and adit outside the project area. This activity would be intense and short-term in nature, followed by infrequent long-term

activity to maintain the line and keep vegetation from interfering with power transmission. Visitors may be displaced by this short-term increase in activity.

Forest Plan Consistency

The environmental consequences of the action alternatives on recreation settings, activities, and experiences would be consistent with goals, objectives, and standards of the Forest Plan.

PROPOSED, THREATENED, ENDANGERED, AND SENSITIVE PLANTS

Introduction

The activities proposed under the Miller West Fisher project; (tree removal, road storage, temporary and permanent road construction, road repair and BMPs, trail maintenance, and slashing and burning) have the potential to effect proposed, threatened, endangered and sensitive (PTES) plant populations.

The purpose of this analysis is to:

1. Determine if the alternatives will adversely affect any of the PTES plant species that either occur or have potential to occur in the analysis area, and if so, list design features to be implemented to reduce potential effects. The analysis area is the Miller West Fisher project area, See Map in appendix.
2. Insure that the alternatives do not contribute to the loss of viability of any sensitive plant species or cause a trend toward federal listing;
3. Comply with USDA Forest Service Region 1 policy to insure that sensitive plant species receive full consideration in the decision-making process;
4. Comply with the Endangered Species Act.

This analysis considers the short- and long-term effects of the proposed action on:

- Existing and potential habitat;
- The welfare of existing plants.

REGULATORY FRAMEWORK

Endangered Species Act

The Endangered Species Act (ESA) of 1973 declares, "…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 Interior whenever an action authorized by such agency is likely to affect a species listed as threatened or endangered.

Although no proposed, threatened, or endangered plant species are know to occur on the Kootenai National Forest two threatened plant species are suspected to occur.

National Forest Management Act

The National Forest Management Act (36 CFR 219.19) directs that the Forest Service must maintain viable populations of all native and desired non-native wildlife, fish and plant species in habitats distributed throughout their geographic range on National Forest System (NFS) Lands.

Agency Direction

In addition Forest Service Manual 2670.5 section 19 defines **sensitive** species as "those plants and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:

1. Significant current or predicted downward trends in population numbers or density; or
2. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Effects to these **sensitive** species must be analyzed.

The Kootenai Forest Plan (USDA 1987) addresses Sensitive species under its Forest-wide management direction. The Plan includes a goal to "determine the status of Sensitive species and provide for their environmental needs as necessary to prevent them from becoming Threatened and Endangered" (Forest Plan p. II-1). The Plan goes on to say that we will maintain diverse age classes of vegetation for viable populations of all existing native species. The Plan also supports the protection and maintenance of important riparian zone features, marshes, fens, and other water bodies where Sensitive plants often exist.

ANALYSIS METHODS

The following steps were taken to complete this analysis for PTES plants:

1. The assessment of sensitive plants and sensitive plant habitat followed the methods outlined for the Kootenai NF by Leavell and Triepke (1995). Suitable habitats for each sensitive species known or suspected of occurring on the Kootenai NF have been identified by consultation with sensitive plant field guides (USDA 1992) and published and unpublished literature on sensitive plants (Lesica and Shelly 1992; Vanderhorst 1996, 1997) as well as through extensive field experience. Probability of occurrence (Leavell and Triepke 1995) of sensitive species was estimated, including both historic and existing conditions. Rare plant inventories were conducted subsequent to these assessments (USDA 1998). The inventories took into consideration all rare plants and rare plant habitats in addition to sensitive species. They took place in addition to other past and concurrent surveys of sensitive plants in and around the analysis area (Vanderhorst 1996, 1997; R. Ferriel, pers. comm.). 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 the following factors:

- Past disturbance;
- Locations of known populations: District records, past surveys and the Montana Natural Heritage Program database were scanned to determine species already known to exist in the analysis area. These populations are included on the analysis map.
- Ecological requirements of the individual species (*e.g.*, elevation, potential vegetation, landtype, lithology, shade and moisture regimes).

Areas proposed for treatment were reviewed for places with moderate to high potential for providing habitat for PTES plant species.

2. Field surveys were completed for all proposed activity areas with emphasis on areas with moderate to high potential to provide habitat for PTES plants. In general, these areas are streams, wetlands, and riparian zones, mesic coniferous forest with a component of mature western redcedar, moist cliffs and talus slopes, dry meadows, park-like ponderosa pine forest, and dry south-facing rocky areas. Unique landscape features have more potential to provide habitat for PTES plants than more common landscape features. These features are emphasized during surveys.

3. This analysis was completed using the maps, surveys completed to date, literature, experts, and personal knowledge about the requirements of each suspected plant species of concern.

Assessment Area and Time Frame

The Miller West Fisher Project Area, which is defined by the Silverfish Planning Subunit, is the context for the present analysis (see map in project file).

Current conditions will be considered against an historical reference period. Reference conditions give resource managers an idea of the environments to which native plant species have adapted to (Morgan et al. 1994). As described by Federal Planning Regulations (CFR 219.20) and the Kootenai NF (USDA 1995), the reference period used with this analysis is based on the period extending back approximately 2,500 years before present, when climate and environmental conditions more or less stabilized (Chatters and Leavell 1994). Forest processes have been affected accordingly, contributing to characteristic patterns of forest structure, composition, and habitat abundance and spatial distribution.

Project implementation should occur over the next five to ten years (except in the case of the *no action* alternative).

AFFECTED ENVIRONMENT/EXISTING CONDITION

Most rare plant species are rare because of narrow ecologic amplitudes. This means habitat requirements for many sensitive plant species are often narrowly defined. When this is the case, decisions as to the probability of occurrence and the potential sites to survey are easily and confidently determined. Some sensitive plant species have wider ecological amplitudes and their potential extends through a variety of habitats.

The Miller West Fisher project area is within the Silverfish Planning Subunit. This subunit is approximately 69,419 acres. Of that area, 60,519 acres are NFS lands, 640 acres are State lands, 6,196 acres are Plum Creek Timber Company lands, and 2,064 acres are in other private ownership. Important watersheds in the project area include Miller, West Fisher and Silver Butte Creeks and their tributaries.

Overall Description of the Project Area

The majority of the proposed units for the Miller West Fisher Project are within the headwaters of Miller Creek, a stream that enters the Fisher River near US Highway 2 south of Libby. There are also proposed units in the adjacent West Fisher drainage primarily on the north side of the project area. There are scattered treatment areas in the Silver Butte drainage extending towards the Cabinet Mountains Wilderness boundary. Elevation of the project area is between 3,000 and 5,000 feet. Treatment units are located on all aspects. Douglas-fir, larch, and ponderosa pine are the dominant overstory species in the general area. But in stands with a north aspect, or areas near riparian zones, lodgepole pine, spruce, grand fir, and/or subalpine fir can be found in the overstory.

There are some saturated meadows in the project area but none will be affected by proposed activities.

There are two documented occurrences of a sensitive plant species within the project area. A population of *Botrychium crenulatum* occurs in the West Fisher area near Lake Creek Campground. There are no proposed activities that would affect this population. A population of *B. ascendens* is also found within the project area on a roadside in the West Fisher drainage. This population also would not be affected by project activities.

Habitat Descriptions of Proposed Activity Areas

Within the Miller West Fisher project area are five recognized habitats with the potential to support sensitive plant species:

Openings Along Ridges – These are generally dry sites with poor, rocky soils and are dominated by grasses, shrubs, and/or rocky outcrops. The sensitive plant species with a potential to occupy these sites are: *Clarkia rhomboidea*, *Heterocodon rariflorum*, and *Lomatium geyeri*. As of August 11, 2004, *C. rhomboidea* has not been found on the Libby District and *L. geyeri* appears restricted to the lower Kootenai River valley and to the Yaak Falls area. *H. rariflorum* was discovered in 2004 on the Libby District occupying dry openings just above the Kootenai River.

This habitat is common within the project area. Field surveys conducted did not reveal any populations of sensitive plants occupying this type of habitat in the project area.

Openings Within The Forest – Openings within the forest can be caused by a number of factors: fire, disease, poor soils, rock outcrop, or a high water table. The openings themselves and the zone surrounding the openings represent a dramatic change from the adjacent, predominant habitat. This change increases the potential for the establishment of sensitive plant species. Dry openings have the potential to support the following rare species: *Clarkia rhomboidea, Corydalis sempervirens, Heterocodon rariflorum, Lathyrus bijugatus*, and *Lomatium geyeri*. Moist openings have the potential to support: *Botrychium* spp, *Carex* spp, and *Ophioglossum pusillum*.

Field plant surveys did not locate any moist openings within the forest; however, a few dry openings were seen. Plant surveys did not reveal any new populations of sensitive plants occupying this type of habitat.

Riparian And Wetland Areas – These are sites dominated by water or strongly influenced by water. The water can be in pools or moving through stream channels. Most land management activities are restricted within riparian areas. None of the proposed activity areas for the Miller West Fisher Project are within a designated riparian habitat conservation area (RHCA) as defined by the Inland Native Fish Strategy (INFS). Riparian areas often support fragile ecosystems and are affected by changes to the timing and flow of the hydrologic system (regime). Because activities outside the riparian zone can affect the water regime within the riparian zone, this habitat is surveyed for the presence of sensitive plants. Riparian areas have the potential to support the following rare plant species: *Botrychium* spp, *Carex* spp, *Ophioglossum pusillum*, *Collema curtisporum*, and *Lycopodium dendroideum*.

Though no sensitive plant species were located in riparian areas, the potential remains for rare plants to exist in this habitat.

Forested Slopes – This is the dominant habitat in the Miller West Fisher project area. Douglas-fir, larch, and ponderosa pine are the primary overstory tree species. Lodgepole pine, grand fir, spruce, and subalpine fir were also found as minor components in the overstory.

This is reflected in the list of sensitive plants with the potential for existing within the forested slopes of the project area: *Lathyrus bijugatus*, *Lycopodium dendroideum*, *Collema curtisporum*, and *Corydalis sempervirens*. Overall potential for sensitive plant species to exist on these forested slopes is rather low.

No sensitive plant species were found resulting from surveys in the forested slopes.

Roadsides – Over the past several years, several sensitive plant species have been discovered growing along roadsides. Requiring disturbance to exist and reproduce, many species of the *Botrychium* genus, as well as *Clarkia rhomboidea* and *Lomatium geyeri*, have been found growing in roadsides on the Libby District and on other districts of the Kootenai Forest. The conditions required for these plant species vary by genus. *Botrychium* species seem to need shade and moisture in order to become established. *Clarkia* species needs exposed soil – as in the exposed soil of a road-cut. Sensitive plant species with a potential to exist on roadsides within the project area are: several *Botrychium* spp, *Clarkia rhomboidea*, *Lomatium geyeri*, and *Heterocodon rariflorum.*

A population of *Botrychium ascendens* is known to occur on a roadside within the project area.

The project area provides types of habitat that may be occupied by sensitive plant species. Other types of suitable habitat appear to be absent from the project area. Absent, but suitable habitats include habitats for species requiring calcareous soils, or soils derived from materials containing calcium. Soil inventories of the KNF, including the project area, are found in Kuennen and Nielsen-Gerhardt 1995. These inventories do not display any calcium-derived soils (soils in the 320 series) within the project area. Species that require calcareous soils include *Amerorchis rotundifolia, Cypripedium passerinum, Cypripedium parviflorum,* and *Grimmia brittoniae.*

POTENTIAL SPECIES

Threatened, Endangered, and Proposed Plant Species

Currently, two species in Montana, water howellia (*Howellia aquatilis*) and Spalding's catchfly *(Silene spaldingii*) are federally listed as threatened. These species are suspected to occur on the Kootenai NF, but have not been found on federal land within the KNF. The term 'threatened species' means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. There are no endangered species suspected to occur on the KNF. Endangered plant species will not be further discussed. Linearleaf moonwort (*Botrychium lineare*) was formerly listed as a candidate species by the USFWS. In 2007, the USFWS removed this species from the candidate list due to more populations being located by surveys and protection measures in place for a number of populations. Please see the botany project file for more information. Candidate species will not be further addressed.

Table 3-66 below summarizes findings for Threatened and Endangered plant species.

Table 3-66: Summary of Findings for Threatened Plant Species

SPECIES	HABITAT	CONCLUSION	JUSTIFICATION
Howellia aquatilis (Water howellia)	Ephemeral glacial ponds and abandoned river oxbows below 4,500 ft.	**No Effect**	*Not known in the PA or found during project surveys *Ephemeral glacial ponds or abandoned river oxbows below 4,500 feet are not known in the project area.
Silene spaldingii Spalding's catchfly	Remnant Palouse Prairie and canyon grassland habitat	**No Effect**	*Not known in the PA or found during project surveys. *Grassland habitat not known in the Miller West Fisher project area.

Table 3-67: Sensitive Plant Species of the Kootenai National Forest and Status in the Miller West Fisher Project Area

Common Name	Scientific Name	Status	Potential/Footnote
Round-leaved orchis	*Amerorchis rotundifolia*	Suspected	Low
Bog Birch	*Betula pumila*	Suspected	Low
Water marigold	*Bidens beckii*	Suspected	Low
Deer fern	*Blechnum spicant*	Suspected	Very Low
Upswept moonwort	*Botrychium ascendens*	**Known**	**Known**
Wavy moonwort	*Botrychium crenulatum*	**Known**	**Known**
Western moonwort	*Botrychium hesperium*	Suspected	Low

Common Name	Scientific Name	Status	Potential/Footnote
Peculiar moonwort	*Botrychium paradoxum*	Suspected	Low
Stalked moonwort	*Botrychium pedunculosum*	Suspected	Low
Watershield	*Brasenia schreberi*	Not suspected	NS2
Big-leaf sedge	*Carex amplifolia*	Suspected	Low
Creeping sedge	*Carex chordorrhiza*	Suspected	Low
Prairie sedge	*Carex prairea*	Suspected	Low
Beaked sedge	*Carex rostrata*	Not suspected	NS2
Sheathed sedge	*Carex vaginata*	Not suspected	NS5
Common clarkia	*Clarkia rhomboidea*	Suspected	Moderate
Sand Springbeauty	*Claytonia arenicola*	Suspected	Very Low
Lichen	*Collema curtisporum*	Suspected	Low
Pink corydalis	*Corydalis sempervirens*	Suspected	Low
Clustered lady's-slipper	*Cypripedium fasciculatum*	Suspected	Low
Small yellow lady's-slipper	*Cypripedium parviflorum*	Suspected	Low
Sparrow's egg lady's-slipper	*Cypripedium passerinum*	Suspected	Low
English sundew	*Drosera anglica*	Not suspected	NS2
Linear-leaved sundew	*Drosera linearis*	Not suspected	NS2
Crested shield fern	*Dryopteris cristata*	Not suspected	NS2
Giant helleborine	*Epipactis gigantea*	Not suspected	NS8
Slender cotton grass	*Eriophorum gracile*	Not Suspected	NS2
Green-keeled Cottongrass	*Eriophorum viridicarinatum***	Not suspected	NS2
Western boneset	*Eupatorium occidentale*	Not suspected	NS7
Hiker's gentian	*Gentianopsis simplex*	Not Suspected	NS2
Mouse moss	*Grimmia brittoniae*	Not Suspected	NS3
Howell's gumweed	*Grindelia howellii*	Not suspected	NS8
Western pearlflower	*Heterocodon rariflorum*	Suspected	Moderate
Latah tule pea	*Lathyrus bijugatus*	Suspected	Low
Geyer's biscuit root	*Lomatium geyeri*	Suspected	Low
Bog club moss	*Lycopodiella inundata*	Not suspected	NS2
Prickly tree club moss	*Lycopodium dendroideum*	Suspected	Low
Running Pine	*Lycopodium lagopus*	Not suspected	NS7
Moss	*Meesia triquetra*	Not suspected	NS2
Short-flowered Monkeyflower	*Mimulus breviflorus*	Suspected	Low
Lichen	*Nodobryoria subdivergens*	Not suspected	NS7
Northern adder's-tongue	*Ophioglossum pusillum*	Not suspected	NS2
Northern beechfern	*Phegopteris connectilis*	Suspected	Low
Dwarf wooly heads	*Psilocarphus brevissimus*	Not suspected	NS8
Pod grass	*Scheuchzeria palustris*	Not suspected	NS2
Tufted bulrush	*Scirpus cespitosus*	Not suspected	NS2
Water bulrush	*Scirpus subterminalis*	Not suspected	NS2
Moss	*Scorpidium scorpioides*	Not suspected	NS2
Flat leaved bladderwort	*Utricularia intermedia*	Not suspected	NS2
Great-spurred Violet	*Viola selkirkii*	Suspected	Low

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 with low or no probability of occurrence in the project impact area will not be considered further in this analysis. There is one species that is known to occur and three more with moderate potential to occur within the project impact area.

TABLE 3-68 – Known and Suspected Sensitive Plant Species in Miller West Fisher Project Area

COMMON NAME	SCIENTIFIC NAME	STATUS	POTENTIAL/FOOTNOTE
Upswept moonwort	*Botrychium ascendens*	Known	Known
Wavy moonwort	*Botrychium crenulatum*	Known	Known
Common clarkia	*Clarkia rhomboidea*	Suspected	Moderate
Western pearl-flower	*Heterocodon rariflorum*	Suspected	Moderate

MODERATE POTENTIAL

Populations of the Sensitive plant species ***Botrychium ascendens*** and ***B. crenulatum*** have been found growing in roadsides across a variety of habitats. However, a few factors seem to be constant among all known roadside locations. All sites are in wetter habitats, as compared with open hillsides. Western redcedar, hemlock, subalpine fir, and even spruce habitat types are very common at these sites. Also, shade is found consistently at all of these sites. Generally, there is shade in the mornings and early afternoons. This shade can be from vegetation growing along the roadside (alder, willow, etc.) or via the surrounding landforms. Plus, the slope of the road is never extreme; the actual location of the plants is generally in areas having slopes less than ten percent. And finally, the density of the ground cover is such that there are patches of exposed soil.

These conditions can be found whenever a stream channel or narrow ravine crosses a road. Other situations where these conditions can be found are at roadside seeps (created by the cut-slope) or on any gentle stretch of road where shade and moisture conditions accumulate. No new populations were found during project surveys.

Heterocodon rariflorum – The first known district population of western pearl-flower was located on the Libby District in June 2004. The site was in a dry, grassy-rocky opening located near Lake Koocanusa. The plants were found growing in small depressions that provide more shade and moisture than the surrounding vicinity. This type of micro-site can exist in many dry, grassy-rocky openings. None were found during project surveys.

Clarkia rhomboidea - This species has been found on the Cabinet and Three Rivers Districts of the Kootenai Forest. It also has been found on dry, open slopes on the Lolo Forest south of the project area. No populations of this species were found during project surveys.

ENVIRONMENTAL CONSEQUENCES

Design Features

The finding of any additional sensitive plant populations will result in additional mitigation needs.

PTES Plant Species Biological Assessment, Consultation Requirements for Threatened Species; Biological Evaluation for Sensitive 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; and is not required to request written concurrence from the USFWS with respect to the determination of "no effect".

Table 3-69 Summarizes the biological evaluation for the four plant species considered in this analysis.

Table 3-69—Summary of Effects to Known and Suspected Sensitive Species

Common Name	Scientific Name	Conclusion	Rationale
Upswept moonwort	*Botrychium ascendens*	May Impact**	MI 2
Wavy moonwort	*Botrychium crenulatum*	May Impact**	MI 2
Common clarkia	*Clarkia rhomboidea*	May Impact**	MI 2
Western pearl flower	*Heterocodon rariflorum*	May Impact**	MI 2

**May impact individuals or habitat, but will 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.

ALTERNATIVE 1 (NO ACTION)

Direct and Indirect Effects

This alternative proposes no ground disturbing activity. The no action alternative would have **no direct or indirect effects** to plants listed as known or **suspected** status in the preceding table, since no activities would occur.

Cumulative Effects

The response of each of the PTES plant species to management activity varies by species, and in some cases is not fully known. We do know that these rare plants and all the native vegetation of the Kootenai National Forest evolved with and are adapted to the climate, soils, and natural processes that took place prior to settlement of this area by Europeans. Any management or lack of management that causes these natural processes to be altered may have a negative impact on native vegetation, including rare plants. An example of altered natural processes would be the removal of fire from the ecosystem. If the No Action alternative is selected and fire is continuously excluded from the analysis area, there could be a negative impact on some PTES plant species due to an unnatural build up of fuels, increased canopy closure with a resulting decrease in light to the forest floor, and a decrease in naturally occurring open meadows.

ACTION ALTERNATIVES 2, 4, 6, and 7

Direct and Indirect Effects

The action alternatives include timber harvest with associated temporary and permanent road construction, slashing and prescribed burning for fuels reduction, planting, trail maintenance, trailhead expansion, fuels reduction and corral construction in the Lake Creek Campground, pool creation and

stream bank stabilization in Miller and West Fisher Creeks, restoration of Standard Lake, access to private property, and road improvement and decommissioning work. These activities have the potential to affect PTES plant species. There are no known populations of rare plants within any proposed treatment units so it is anticipated that there would no effects to PTES plant populations. The treatments vary by amount for each alternative so there could be some slight differences in potential effects.

Effects to Sensitive Plants Species Suspected in the Miller West Fisher Project Area

Sensitive Plants in Riparian and Wetland Areas

Implementation of the Proposed Action may impact individuals or habitat but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species for suspected species with moderate potential to occupy wetland, riparian or wet forest habitats (*Botrychium ascendens and Botrychium crenulatum).*

Direct Effects

No populations were discovered within riparian habitats. These systems are protected by INFISH (Inland Native Fish Strategy) and RHCA (Riparian Habitat Conservation Act) buffers. These required buffers are expected to protect potential sensitive plant habitat from direct effects of activities by restricting activities in riparian and wetland habitat. Direct effects from project activities are not expected to threaten the presence or viability of these species within the project area.

Road construction proposed on NFS lands in the Miller West Fisher project is minimal and not near riparian or wetland areas. This road construction is not expected to add to cumulative effects to these plants. Proposed road obliteration and storage may effect both the habitat in which these species occur and any potential habitat for these species by causing subtle hydrologic changes. These activities are intended to restore more historic habitat conditions to riparian and wetland systems, and are expected to help offset negative effects to riparian and wetland habitat caused by previous road building.

The known populations of *Botrychium crenulatum* and *B. ascendens* will not be affected by any proposed activities.

Indirect Effects

With respect to riparian habitat, possible indirect effects relate only to potential habitat for sensitive species, since these species are not known to occupy the activity areas. Therefore, the Miller West Fisher project activities are not expected to threaten the presence or viability of this species within the project area.

The buffers required by INFISH (RHCA's) are expected to mitigate and minimize effects of timber harvest and prescription burning to wetland and riparian habitat, though activities upslope of any wetland has potential to alter hydrologic regimes. Hydrology of riparian areas and wetlands are not expected to change to a measurable extent (see hydrology analysis). Subtle changes in hydrology resulting from road obliteration and/or storage activities may influence potential habitat for sensitive plants. Indirect effects resulting from these changes are expected to move wet habitat toward more historic habitat conditions.

Indirect effects from these project activities are not expected to threaten the presence or viability of any species within the project area.

Cumulative Effects

Considered in the cumulative effects analysis are all the activities listed at the beginning of Chapter 3, including the Montanore Mine power line and associated road construction. The Montanore proposed action power line, the North Miller Creek route, would construct 16.4 miles of power line right-of-way and 9.9 miles of new road needed for construction and maintenance of the power line. Surveys of the power line ROW were completed, and no sensitive plant species were found. No surveys have been completed along the proposed new road construction for the Montanore project and it is unknown what effect this road construction would have on PTES plants. It is likely that new access roads pass through similar habitats as the power line, which does not have PTES plant populations according to surveys completed. Any additional survey work required for the Montanore project would be completed in coordination with that project. The Miller West Fisher project would not contribute to any cumulative effect to PTES plants from the Montanore Mine.

The other projects listed for cumulative effects either occur outside the analysis area for PTES plants in this project (Rock Creek Mine, Green Mountain, etc.), or have been previously analyzed for effects to plants (Wayup Fourth of July, Bear Lakes Estate). The Miller West Fisher project will not combine with these past and proposed projects to create a cumulative effect to PTES plant species.

The INFISH and RHCA buffers applied to wetland and riparian areas in the Miller West Fisher project will greatly reduce the potential for proposed activities to contribute to cumulative effects to the above species or their habitat. These buffers are expected to help protect sensitive plant populations and potential habitat by minimizing direct and indirect effects to wetland and riparian habitat

Cumulative effects from project activities are not expected to threaten the presence or viability of riparian and wetland species within the project area.

Sensitive Plants in Dry Forests or Open Areas (Along Ridges and in the Forest)

The Proposed Action **may impact individuals or habitat but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species** for the sensitive plant listed in the table as suspected with moderate potential to occupy dry forested or open habitat, (*Heterocodon rariflorum*). This species is not known to occur in the Miller West Fisher project area, and was not observed during sensitive plant surveys.

Direct Effects

Since this sensitive plant species is not known to occur in the project area, it is assumed there will be no direct effects to this species. If some plants were undetected they could possibly be affected by activities in the dry habitats.

Indirect Effects

Indirect effects may influence potential habitat for sensitive species. Ground disturbance from harvest and road decommissioning and storage activities will remove vegetation and expose bare mineral soil. Several sensitive species are adapted to colonization of disturbed soil, but noxious weed species that now reside throughout the project area have the establishment and survival advantage. The possibility of weed migration into potential sensitive plant habitat will be increased, reducing opportunities and habitat suitability for sensitive species. Adherence to design features for noxious weeds in the Miller West Fisher area (see Chapter 2) will be helpful in reducing indirect effects of weed encroachment, though will not preclude weed encroachment.

The use of prescribed burning for fuels reduction or site preparation for reforestation will influence potential sensitive plant habitat. In general, the sensitive plants that inhabit dry forest types are adapted to fire, and low intensity fire will increase habitat suitability for these plants. There is also potential for increasing weed populations in sites where weeds are established.

These possible indirect effects relate only to **potential habitat** for sensitive species, since these species are not known to currently occupy the project area. Therefore, the Miller West Fisher project is not expected to threaten the presence or viability of these species within the project area.

Cumulative Effects

It is likely that timber harvest, reforestation, and/or road construction activities in the project area on lands of all ownership have affected some sensitive plants and potential habitat. In some cases, these activities may have created disturbances reflecting natural processes that provide opportunity for colonization by sensitive species. Disturbance from activities on lands of all ownership in the Miller West Fisher project area has caused many acres to become infested with noxious weeds, reducing opportunities for sensitive species to colonize disturbed areas. Weed spread is an expected result of Miller West Fisher activities, and of all foreseeable activities on lands of all ownership further compromising potential habitat for sensitive species. The amount of potential habitat that will be affected cannot be predicted. Weed design features (described in Chapter 2) are expected to reduce, though not eliminate, the effects of additional weed introduction. Although likely considerable, the extent of previous and future effects of weed invasion in the project area cannot be quantified. The degree to which the Miller West Fisher project will contribute to these effects is unknown.

Timber harvest and road construction is expected to continue to affect these plants and their habitat. Road construction proposed on FS lands in the Miller West Fisher project is minimal and not expected to contribute to cumulative effects to these plants. Road obliteration, proposed in all action alternatives, may also result in negative cumulative effects. In general, road obliteration is expected to improve habitat suitability by reducing weed migration into potential habitat. Tree basal area and fuels reduction in dry forest habitats will help to restore more historic overstory conditions in potential habitat for sensitive plants that occupy dry forest types.

The discussion of effects of the Montanore Mine and other projects under riparian and wetland species also applies to this habitat type. The Miller West Fisher project is not expected to threaten the presence or viability of these species within the project area nor to contribute to cumulative effects from past, present, and foreseeable projects.

Sensitive Plants in Moist Forest

The Proposed action **may impact individuals or habitat but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species** to plants known or **suspected** with **moderate potential** to occur in moist forest habitat (***Botrychium ascendens*** and ***Botrychium crenulatum)*.** Populations of *B. crenulatum* and *B. ascendens* are known to occur in the project area, though not within any activity area.

Direct Effects

Mechanical ground disturbance caused by harvest activities could kill or injure sensitive plant species. Populations of *B. crenulatum* and *B. ascendens* are known to occur within the project area, though not within any activity area. These populations will not be impacted by activities proposed in any of the

action alternatives. Impacts to either *Botrychium* species are not anticipated. It may be possible that undetected populations might be impacted, since suitable habitat is included within activity areas.

Indirect Effects

The removal of vegetation during project activities will alter potential habitat for sensitive species in forested habitat. This may make potential habitat less suitable for colonization by sensitive species that occupy forested habitat, and reduce the availability of potential habitat for these species in the project area. Indirect effects of the Miller West Fisher project are not expected to threaten the presence or viability of these species within the project area.

Cumulative Effects

It is likely that timber harvest, reforestation, and road construction activities in the project area on lands of all ownership have had effects to at least some of these plants and potential habitat. The extent of effect these activities have had is unknown. Disturbance from activities on lands of all ownerships in the Miller West Fisher project area has caused many acres to become infested with noxious weeds. Weed spread is an expected result of Miller West Fisher activities and of all foreseeable activities on lands of all ownership. Weed spread further compromises potential habitat for sensitive species. The amount of potential habitat that will be affected cannot be predicted. The degree to which the Miller West Fisher project will contribute to these effects is unknown.

Timber harvest and road construction is expected to continue to affect potential habitat for some of these species. Road construction proposed on FS lands in the Miller West Fisher project is minimal and not expected to add to cumulative effects to these species. Road obliteration is expected to improve habitat suitability by reducing weed migration into potential habitat. Since these species are not known to occur in the project area, cumulative effects of the Miller West Fisher project to potential habitat for these species is not expected to threaten their presence or viability within the project area.

The discussion of effects of the Montanore Mine and other projects to riparian and wetland species also applies to riparian and wetland habitat. The Miller West Fisher project is not expected to threaten the presence or viability of these species within the project area or contribute to a cumulative effect from past, present, and foreseeable projects.

Sensitive Plants in Roadside Habitat

The Proposed Action may impact individuals or habitat but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species for sensitive plants listed in the table as suspected with moderate potential to occupy roadside habitat: (*Botrychium ascendens, Botrychium crenulatum* and *Heterocodon rariflorum).* Populations of *B. crenulatum* and *B. ascendens* are known to occur in the project area, though not within any activity area. *H. rariflorum* was not detected in any plant surveys in the project area.

Direct Effects

Road maintenance and use may directly affect plants or potential habitat of these species. Mechanical disturbance during road obliteration activities may injure or kill sensitive plants and alter potential habitat. The known populations of *B. crenulatum* and *B. ascendens* do not occur on roadsides with any maintenance activities and will not be affected by any proposed activities.

Indirect Effects

Road maintenance and use during project activities may alter potential habitat of sensitive species occupying roadsides. Road decommissioning and storage may reduce the availability of potential habitat for some species. Indirect effects of the Miller West Fisher project on potential habitat for these species is not expected to threaten the presence or viability of these species within the project area

Cumulative Effects

Road building can mimic natural processes that provide opportunity (bare soil) for colonization by some sensitive species. Subsequent road maintenance activities can be beneficial or detrimental depending on the nature and degree of disturbance. Disturbance from road building, as well as maintenance and use on lands of all ownership in the Miller West Fisher project area has caused many acres to become infested with noxious weeds, reducing opportunity for sensitive species to colonize and inhabit roadsides.

Herbicide use for weed control could injure or kill roadside sensitive species, depending on the species and the herbicide used. Weed spread is an expected result of Miller West Fisher activities, and of all foreseeable activities on lands of all ownership, further compromising potential habitat for these species. The amount of potential habitat that will be affected cannot be predicted. Weed design features described in Chapter 2 are expected to reduce, though not eliminate, the effects of additional weed infestation. Road decommissioning and storage activities may reduce the availability of potential habitat for these species. The degree to which the activities of the Miller West Fisher project activities will contribute to cumulative effects of weeds on potential habitat cannot be quantified. Cumulative effects of the Miller West Fisher project to potential habitat for these species are not expected to threaten their presence or viability within the project area.

Native Plant Communities

Direct, Indirect and Cumulative Effects

Disturbance from harvest activities will have direct, indirect, and cumulative effects to native plant communities in the project area. Direct effects will result from mechanical injury to native plants in activity areas. The mychorrhizal fabric of the subsoil community may also be affected, particularly in areas of heavy disturbance. This may temporarily decrease the ability of associated plants to uptake nutrients and water, and may make the communities more susceptible to environmental stress and noxious weed establishment.

Indirect and cumulative effects to native plant communities would likely result from the introduction and spread of undesirable non-native species. Weed species are already abundant on many roads in the project area. Ground disturbing activities from timber harvest, as well as from road decommissioning and storage activities will remove vegetation and expose bare mineral soil. Though many native species are adapted to colonizing disturbed soil, noxious weed species now residing throughout the project area have the establishment and survival advantage. Weed infestations are adjacent to almost every proposed activity area. The seed bank in native communities may already contain weed seeds that will take hold when conditions such as soil disturbance permit. Machinery is likely to be a primary vector, bringing weed seeds from infested roads or portions of units into native communities. Even revegetation along roads and skid trails will have effects to the native community as nonnative, potentially invasive species can be introduced in seed mixes. Additional activities in the area are likely to exacerbate negative effects to the native plant communities caused by past activities. Even with design features, native plant communities are likely to be further compromised by non-native weeds.

The use of prescribed burning for fuels reduction or site preparation for reforestation will influence potential sensitive plant habitat. In general, native plants that inhabit dry forest types are adapted to fire. Low intensity fire will increase habitat suitability for these plants. There is potential for increasing weed populations in sites where weeds are established.

Consistency with the Forest Plan and other Management Direction

This project is in compliance with Forest Service policy on sensitive species (FSM 2670.32) and the Endangered Species Act relative to PTES plant species. The Forest Service is mandated to maintain viable populations of all native and desirable non-native species under the National Forest Management Act. Clause R1-C6.251#, Protection of Habitat of Endangered Species, will be used in the timber sale contract to modify the action as necessary to protect PTES plant populations in the event that they are missed by field surveys and found after the timber sale contract is awarded.

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 effect to the threatened water howellia and Spalding's catchfly and proposed linearleaf moonwort; and is not required to request written concurrence from USFWS with respect to the determination of "no effect".

Need for Re-Assessment Based on Changed Conditions

The findings of this report are based on the best data and scientific information available at the time of preparation. If new information reveals effects that may effect threatened, endangered, proposed or sensitive species, or their habitats, in a manner or to an extent not considered in this assessment; if the proposed actions are subsequently modified in a manner that causes an effect that was not considered in this assessment; if sensitive species are found to occupy activity areas, or if a new species is listed or habitat identified that may be affected by the actions, a revised biological assessment should be prepared.

NOXIOUS WEEDS

INTRODUCTION

The analysis within this report is tiered to reference and current conditions described in the Fisher Landscape Assessment (USDA 2003).

Purpose and Need

The identified purpose and need related to Weed Management for the Miller West Fisher Project are to:

- Maintain the vigor and long-term productivity of forest stands, and Maintain or improve grizzly bear and big game habitat in the Miller West Fisher analysis area.

Noxious weeds are: "Those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds 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 being native or new to or not common to the United States or parts thereof" (FSM 2080.5). Noxious weeds generally have the potential to adversely affect native flora and fauna and their habitats. The Lincoln County Weed Control Act (MCA 7-22-2101) defines a noxious weed as "any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities and that is designated:

I. As a statewide noxious weed by rule of the department; or
II. As a district noxious weed by a board, following public notice of intent and a public hearing."

ANALYSIS AREA

Analysis bounds for most noxious weed occurrence and impacts will be the Miller West Fisher project area and access routes. For risk of new invaders, the analysis bounds will include the Kootenai National Forest.

The Analysis Boundary for weed effects includes the Miller Creek, West Fisher, and Silver Butte drainages, which are located on the west side of the Fisher River and US Highway 2. The analysis area is 69,419 acres of which 87% are National Forest System (NFS) lands, 640 acres are Montana State Lands, 6,196 are Plum Creek Timber Company (PCTC) Lands, and 2,064 are in small private ownership.

General historical or reference condition, and the desired and existing condition information is described in the Fisher Landscape Assessment Vegetation Response Units (VRU's) and within the project area in this document. The VRU groups will be used to describe some of the reference and desired conditions.

ANALYSIS METHODS

Information from field weed surveys conducted in the summer or 2002, 2005, and field reconnaissance conducted in 2005-2007, are the basis for evaluation of current infestation levels, species presence and risk. The Libby Ranger District weed files contain the field form for the road weed surveys completed in the project area. Weed density and infestation size were mapped using the *Montana Noxious Weed Survey and Mapping System*. Refer to the project file for the weed surveys. The hawkweed and spotted

knapweed likely occurrence maps were developed using a mapping strategy that looked at travel and spread vectors, VRU's and spot reconnaissance to map areas where hawkweed or spotted knapweed are present or have a moderate to high probability of being present. This mapping exercise does not indicate density, just that it is likely the species is present on the site.

REGULATORY FRAMEWORK

Federal

The objectives of National Forest Management Act (NFMA), 1976 include maintaining the diversity of plants and animals existing in forest ecosystems.

> Sec. 6. "(B) provide for **diversity of plant** and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives, and within the multiple-use objectives of a land management plan adopted pursuant to this section, provide, where appropriate, to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan. (ii) there is assurance that such lands can be adequately restocked within five years after harvest.

US Forest Service

The Natural Resource Agenda, the Northern Region Overview, the Interior Columbia River Basin Ecosystem Management Project all highlighted noxious weeds as a serious ecological, environmental and economic threat. Invasive species have been identified by the Chief of USDA Forest Service as one of the four significant threats to our forest and rangeland ecosystems. The National Strategy and Implementation Plan for Invasive Species Management were developed to guide the Forest Service in invasive species management. The national strategy encompasses four program elements including (1) prevention; (2) early detection and rapid response; (3) control and management; and (4) rehabilitation and restoration (USDA 2004).

State of Montana

The Montana County Noxious Weed Control Law (MCA 7-2101 through -2153) was established in 1948 to protect Montana from destructive noxious weeds. This act, amended in 1991, has established a set of criteria for the control and management of noxious weeds in Montana. The noxious weed control law establishes weed management districts throughout the state. These management districts have the responsibility to enforce the law and are defined by the boundaries of the county.

County

The Lincoln County Weed Control Act (MCA 7-22-2116) states that "it is unlawful for any person to permit any noxious weed to propagate or go to seed on his land, except that any person who adheres to the noxious weed management program of his district or who has entered into and is in compliance with a noxious weed management agreement is considered to be in compliance with this section." On July 26, 1991 the Kootenai National Forest signed a memorandum of understanding with Lincoln County, Montana regarding noxious weed management standards. The Kootenai NF agreed to assist and cooperate with the Weed Board in fulfilling and enforcement of Montana State Weed Law (MCA 7-22).

AFFECTED ENVIRONMENT AND INVASIVE SPECIES

Exotic Vegetation

Prior to European settlement, exotic vegetation was non-existent in the project area and the Forest. Over the past 60-70 years, mixtures of non-native and native grasses and forbs have commonly been used to accomplish erosion control and re-vegetation of exposed areas. Non-native grass and forb species such as orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), several bromes, and various clovers (*Trifolium* spp., *Melilotus* spp.) have been used to re-vegetate log landings, road cuts and fills, stream crossings, and heavily used recreation sites. Non-native seed used for re-vegetation is grown commercially for agricultural purposes and is generally available in large quantities and are inexpensive compared to native seed mixtures. Generally, the location and extent of non-native plants relates to human development and use. Within the developed areas of the National Forest, non-native species are widespread. Due to the historic use of non-native seed to quickly stabilize road cuts, fill slopes, stream crossings, log landings and disturbed recreation areas, past disturbed sites in these areas often exhibit well established populations of non-native species.

Although non-native species are common on disturbed sites across the forest, displacement of native species is not known to be common. Many of the non-native plant species commonly used for re-vegetation are generally adapted to areas of disturbed soil and are not highly successful in competing with stable native plant communities. However, due to their aggressive competitiveness and adaptability, some non-native species have spread from disturbed areas into undisturbed areas. Non-native species such as white Dutch clover (*Trifolium repens*) and various varieties of blue grass are commonly found along stream channels, moist areas and often in grass/forb communities. The long term effect of these non-native plants on native plant communities is not known.

Noxious Weeds

Noxious weeds are exotic vegetation that by definition are non-native, unwanted and detrimental to desired conditions. Noxious weeds are a serious ecological and environmental threat to the natural resources. Noxious weeds can displace native plant communities (including endangered species), alter wildlife habitat, reduce forage for wildlife and livestock, and lower biodiversity. In some cases, noxious weeds increase soil surface runoff and sedimentation into streams (Lacey et al 1989).

Most noxious weeds and non-native plants arrive on site as stowaways. Seeds are inadvertently brought from one area to another on equipment, vehicles, off-highway vehicles (OHV's), livestock or by well-intending people for gardens or to help control erosion. Some non-native plants minimally impact the local ecosystem or do not thrive at all, while others take hold, prosper and change the local ecosystem forever. Once established, weeds have a competitive edge over native plants because their natural enemies that co-existed with these plants in their homeland did not migrate with the weeds or are not adapted to the sites where the weeds established.

Weeds infest about 100 million acres in North America; they conquer more than 3 million acres each year, invading an estimated 6 square miles of Forest Service and BLM lands every day (Westbrooks 1998). Spotted knapweed now occupies 4.5 million acres in Montana (Stalling 1999). Previous road building, harvesting, mining, and homesteading in the Miller West Fisher analysis area brought in weed seeds, which in some cases became established and flourished. Ongoing resource management activities such as timber harvest, and mining, forest fires and recreational and administrative traffic have exacerbated the situation and weeds are established on most roads, and some harvest units, mining sites, and home sites in the Miller West Fisher project area.

The potential for introduction and spread of noxious weed species has been identified as a concern for this project.

A number of noxious weed species have been introduced throughout the Libby Ranger District. The project area is accessed by yearlong open roads 385 and 4724 in Miller Creek, 231, 2232, 5323, 6745, 6746, 6748 and 6780 in West Fisher, and 148, and 2308 in Silver Butte. Road 231 in the West Fisher connects to road 385 in Miller Creek, making this a popular destination for recreational activities. West Fisher Road 231 and Silver Butte Road 148 provide access to trailheads for trails into the Cabinet Mountain Wilderness, as well as Lake Creek Campground and Howard Lake Campground, making the areas along these vectors at risk for spreading existing populations of noxious weeds, as well as introduction of new species. The exact number of noxious weed species present in the project area is unknown. Weed surveys and ground reconnaissance conducted in the project area showed the following species to be present in the project area.

Cheatgrass (*Bromus tectorum*)
Spotted knapweed (*Centaurea maculosa*)
Oxeye daisy (*Chrysanthemum leucanthemum*)
Canada thistle (*Cirsium arvense*)
Hound's-tongue (*Cynoglossum officinale*)
Orange hawkweed (*Hieracium aurantiacum*)
Yellow hawkweed (*Hieracium pratense*)
Meadow hawkweed (*Hieracium pratense)*
Common St. John's-wort (*Hypericum perforatum*)
Sulfur cinquefoil (*Potentilla recta*)
Common tansy (*Tanacetum vulgare*)

Other weed species likely to invade the project area include:

Yellow toadflax (*Linaria vulgaris*)
Absinth wormwood (*Artemisia absinthium)*
Dalmatian toadflax *(Linaria dalmatica)*
Leafy spurge (*Euphorbia esula*)
Musk thistle (*Carduus nutans*)
Whitetop (*Cardaria draba*)
Rush skeletonweed (*Chondrilla juncea*)
Blueweed *(Echium vulgare)*
Tansy ragwort (*Senecio jacobaea*)

Of the species likely to invade the project area, rush skeletonweed and Dalmatian toadflax have been found in the project area, but the sites have been treated, and are monitored several times each season.

Due to the extent of the infestations; spotted knapweed is the most potentially threatening noxious weeds in the dry VRU group (1, 2S, 2N, and 3), and the hawkweeds are potentially the most environmentally threatening noxious weeds in the moist VRU group (4, 5, 6, 7, and 9). Refer to the Vegetation Report, page 20-32, for a description of the VRU groups, and the project file for a VRU Map.

Category 1 – Established Weed Species

Spotted knapweed is a biennial or perennial forb that can produce up to 18,000 seeds per plant per year under favorable conditions (Lacey et al 1995). Spotted knapweed ranks as the number one weed problem on rangeland in western Montana. It is adapted to a wide range of environmental conditions.

Spotted knapweed is most aggressive in the forest-grassland interface on well-drained soils, and in drier sites (Sheley 1999, pg 350-351). Current distribution of plants is primarily along road sides, with limited expansion into the dry forested environment. Refer to the Potential Spotted Knapweed Occurrence Map in the project file. Recently, biological control agents, insects that feed exclusively on host weed species, have been released on the Kootenai National Forest to control spotted knapweed and other species. The result of the releases is not yet conclusive on the Forest but observations by weed managers suggests there is a declining density of spotted knapweed in many areas on the Forest and within Lincoln County.

Hawkweeds reproduce from seed and stolons, which are the same structures that strawberry plants use to spread. These extensive stolons allow hawkweeds to form a dense mat that crowds out all other vegetation. Areas of risk include tree plantations, general forest lands, pastures, meadows, wetlands, roadsides, dispersed and developed recreation areas. These plants are successful on all but the driest sites (USDA FS 2000), but are most successful on disturbed sites within VRU 4, 5, 6, 7 and 9. Hawkweeds are currently the most rapidly expanding noxious weed in Montana (Littlefield 2007). Bio-control agents are being pursued, but as of this date there are no approved bio-control agents for hawkweeds in the United States. The current distribution and infestation levels of hawkweed plants range from light to moderate along road sides. Within the forested environment, there are generally light infestations in harvest units, mining claims and recreation sites. Refer to the Potential Hawkweed Occurrence Map in the project file. Currently, the hawkweeds are considered to be the highest noxious weed threat to the ecological integrity of the Miller West Fisher ecosystem.

Common St. John's-wort is a perennial forb that reproduces from seed, rhizomes and runners. With this comprehensive reproduction scheme, spread can be rapid and intensive. In areas of high density, common St. John's-wort can successfully out-compete native vegetation. Common St. John's-wort can be successful on most sites within the Miller West Fisher analysis area. The distribution of plants varies from very light to none within the forested environment to light along road sides, and some winter range sites. The District has treated isolated patches of St. Johns-wort with herbicide on winter ranges in the head end of Miller Creek, and in and adjacent to the Porcupine Creek Drainage within Silver Butte with backpack spray crews. In addition, roadside herbicide treatments have targeted this species. In 2006 Klamath beetles were successfully feeding on this species, with almost complete defoliation of the plants. The Klamath beetle was released in California in 1946, causing the St. John's-wort to be removed from the noxious weed list in that state. The Klamath beetle tends to be cyclic in Montana but does appear to periodically reduce the infestation size of St. John's-wort.

Cheatgrass is a winter annual that reproduces by seeds. It is widely distributed and is common along roadsides within dry Douglas-fir habitats in VRU 1 and 2S. It competes well with the native grasses because of late winter and early spring growth habit and its successful competition for early moisture. It also cures early, and after maturity, is highly flammable and can contribute to rapid fire spread. Currently cheatgrass is not widespread within this analysis area.

Sulfur cinquefoil is a long-lived perennial that has become one of the most serious invaders of the Northern Rockies. The earliest records of sulfur cinquefoil in Montana were in 1947. By 1996, sulfur cinquefoil had spread to at least 30 counties in western Montana. This rapid spread over large geographic areas is similar to the exponential spread pattern of spotted knapweed. Cinquefoil has a wide ecological amplitude, and is commonly associated with spotted knapweed. It is successful in invading low-disturbance sites, and is common in natural grasslands, shrub areas, and open canopy forests (VRU 1 and 2). Establishment and expansion are limited by shading from dense overstory tree canopies (Sheley 1999, pg 282-285). Currently cinquefoil is not widespread within this analysis area.

Oxeye Daisy is a perennial herb that spreads by rhizomes, and is one of our most common roadside weeds. It frequently invades fields and meadows where it competes aggressively, to form dense and expansive populations. It is widespread in the Northern Rockies and Pacific Northwest states and continues to expand its range (Taylor 1990). Establishment and expansion are limited by shading, and it is more common on basic or neutral soils and less common on acid soils (Sheley 1999). It commonly occurs along roadsides, meadows, and recently opened forest lands within the project area and is frequently associated with the hawkweeds. Currently is not considered a serious threat to this ecosystem.

Canada thistle is an aggressive perennial weed that spreads from deep rhizomes to form dense and persistent populations. It invades fields, pastures, waste areas, and recently disturbed sites such as harvest units (Taylor 1990). It is commonly found in disturbed areas as part of the initial post-disturbance community (Duncan 2005). It is best adapted to open sunny sites, and does not persist long in the forested environment. In the project area it is generally limited to the first 1-5 years following disturbance, but does persist along roadsides, disturbed riparian areas, and private pasture lands. It is not considered a serious threat to this ecosystem.

Hound's-tongue is a biennial herb that is common along roadsides and in disturbed areas (Taylor 1990). Within the project area, it currently occurs along roads and private pasture lands, but is at risk for spread due to the burr-like seeds making long distance transport possible. It tolerates shade, but is more robust in full sun, and thrives in wetter grasslands. Hound's-tongue is a poor competitor with native plants, and requires disturbed or bare areas to establish (MSU 2003). Bio-control agents are not yet approved for use in the United States, but have been released in British Columbia and Alberta Canada in 1997 and 1998, and are expected to move across the borders into the United States. Hound's-tongue is not generally invasive in the forested landscape, and is not considered a serious threat to this ecosystem.

Common Tansy is a perennial herb that spreads from short rhizomes to form dense clumps. It is common along roadsides, pastures, and riparian areas. It needs moist, disturbed soil for seedling establishment, and prefers open sites for at least part of the growing seasons (USDA NRCS 2008). It is very aggressive and persistent once established. Tansy has formed dense monocultures along the Fisher River, and is moving up the West Fisher drainage and into West Fisher Creek. The majority of the infestation is within the first mile of West Fisher Creek, on Plum Creek Timber Company lands. Because it is spreading upstream and has the potential for substantial impacts to important riparian habitat, control options should be pursued, but are beyond the scope of this project.

New Invaders

Rush Skeletonweed has two known occurrence sites within the project area. One site is in Miller Creek, and the second site is on the existing power line corridor in the Silver Butte drainage. Both sites have been treated for several years, and are checked several times each growing season. Please refer to the Rush Skeleton Weed Map in the project file for locations of these two sites. There is one known occurrence of Dalmatian Toadflax near the junction of Roads 385 and 4724 in Miller Creek that was treated several years ago. The site is checked a couple times each growing season, and it has not returned.

DESIRED CONDTIONS

Management Goals

The goal of noxious weed management on the Kootenai National Forest is to manage weeds in order to protect forests, rangelands, wildlands, adjacent farmlands, and to cooperate with private individuals and county and state agencies concerned with managing noxious weeds (USFS 1997).

The Purpose and Need identified in the Kootenai National Forest Invasive Plant Management FEIS, is to prevent the introduction, establishment, and spread of new invader weed species, prevent or limit the spread of established weeds, restore native plant communities and improve forage on specific big game winter ranges, treat weeds on National Forest System lands where adjacent to private landowners that are currently managing weeds, and limit the spread of weeds into and within the wilderness areas. The overall theme to this purpose and need is to cooperate with and educate the public regarding weed prevention, treatment, and control (USDA FS 2007).

Preventing noxious weeds from invading new areas is the most economical and easiest way to control them (prevention). Spraying of herbicides is currently the most effective method of control for smaller populations once noxious weeds become established (early detection, rapid response, control, and management). Roads are a common vector for weed introduction, establishment and spread. Spraying roadsides and right-of-ways can be very effective in managing the spread of weeds. Other ground disturbing activities such as timber harvest, mining, and home sites are at risk for weed introduction and establishment. Biological control agents are a useful tool, when they are available, for weeds that have escaped control and have large populations.

Reducing the density and competition of noxious weeds before they have displaced the native vegetation is the most effective means to rehabilitate and restore affected areas.

The desired condition is to maintain the diversity of plants and animals within the forested ecosystem.

Management strategies should be applied to prevent introduction, establishment, and spread of noxious weeds, in conjunction with restoration of native plant communities to restore vegetative health and increase ecological resilience and resistance to potential climate change.

Recent and Planned Weed Control Measures

Past weed control measures in the project area include herbicide treatment along road systems, trailheads, campgrounds and trails. Refer to the project file for a summary of treatment within this area since 2002, and to Table 3-70 for a summary of herbicide treatment for the past three years. The District received a Centennial Grant in conjunction with the Cabinet Backcountry Horsemen in 2005, which allowed focus on trail inventory and herbicide treatment along the trails in 2005. The main yearlong open roads and accessible closed roads were treated in 2006 because of the potential for projects resulting from this analysis. Recreation sites, gravel pits, and rush skeletonweed sites were the focus for herbicide treatment in 2007. A survey conducted by the Wilderness Institute in 2007 found populations of knapweed, oxeye daisy, hawkweeds, and common St. John's-wort a the Geiger Lake Trailhead, and Bramlet Lake access and trail. The Bramlet Trail and access road # 2332, the Geiger/4th July trail and access road #4748, the Fisher Road 231, Lake Creek Campground, and spot treatment of sites located by the Wilderness Institute will be completed the summer of 2008 with funds from a Rural Community Development (RAC) Grant.

Table 3-70 – 2005-2007 Herbicide Treatment in Miller West Fisher Project Area

Drainage Location	Site	Acres	Spot or Broadcast
	2005		
Fisher River 402	Miller Creek Trail 716	0.06	SP
Fisher River 402	Miller Creek Trail 716	0.60	SP
Fisher River 402	Miller Creek Trail 716	1.50	SP
Silver Butte - Fisher	Bear Lakes 178, Iron Meadows 63, 113	0.01	SP
Silver Butte - Fisher	Trapper Creek Trail 297	0.27	SP
Silver Butte - Fisher	Porcupine Trail 298	0.17	SP
Silver Butte - Fisher	Barron Peak Trail 6, 532	0.12	SP
Silver Butte - Fisher	Baree Lake Trail 489	0.02	SP
Silver Butte - Fisher	Olsen Trail 415	0.10	SP
Silver Butte - Fisher	Silver Butte Power line	6.00	SP
Silver Butte - Fisher	Silver Butte Power line	6.00	SP
Silver Butte - Fisher	Silver Butte Rush skeletonweed site D5-31	2.00	BC
Silver Butte - Fisher	Silver Butte Rush skeletonweed site D5-31,32,34	2.00	BC
West Fisher Creek	Geiger/Lost Buck 656, Fourth July Trails 115	<0.01	SP
West Fisher Creek	Bramlet Lake Trail 658	0.05	SP
West Fisher Creek	Silver Dollar Trail 114	<0.01	SP
West Fisher Creek	Lake Cr. Camp Ground	0.10	SP
West Fisher Creek	Libby Creek 231 - Lake Creek	10.00	SP
West Fisher Creek	Rush skeletonweed site D5-3	0.50	BC
West Fisher Creek	Rush skeletonweed site D5-3	0.50	BC
West Fisher Creek	West Fisher Pit	2.50	SP
West Fisher Creek	West Fisher 231 0-6mm	3.00	SP
West Fisher Creek	Bramlet 2332	3.75	SP
		39.27	
Drainage Location	**Site**	**Acres**	**Spot or Broadcast**
	2006		
Silver Butte - Fisher River	Road 594	18.0	BC
Silver Butte - Fisher River	Road 594	8.0	BC
Silver Butte - Fisher River	Bear Lake trailhead	0.2	SP
Silver Butte - Fisher River	Rush skeletonweed site D5-31	2.0	BC
Silver Butte - Fisher River	Silver Butte Power line	12.0	SP
Silver Butte - Fisher River	Rush skeletonweed site D5-31	1.0	BC
Silver Butte - Fisher River	Porcupine Burn	0.5	SP
West Fisher Creek	Road 2314	2.3	SP
West Fisher Creek	Roads 6746, 2332	0.8	SP
West Fisher Creek	Road 2314	9.0	SP
West Fisher Creek	Road 231	6.0	SP

Drainage Location	Site	Acres	Spot or Broadcast
Miller Creek	Miller Creek Winter Range	0.1	SP
Miller Creek	Roads 385, 4724, 4726	6.0	SP
Miller Creek	Roads 385, 4724	12.8	SP
Miller Creek	Roads 385, 4725, 4724	15.0	SP
		93.7	
Drainage Location	**Site**	**Acres**	**Spot or Broadcast**
	2007		
Silver Butte Fisher R	Rush skeletonweed sites D5-31, 32	1.00	BC
Silver Butte Fisher R	Rush skeletonweed sites D5-31, 32	1.50	BC
Silver Butte - Fisher River	Baree, Bear Lake Trailheads	0.30	BC
West Fisher Creek	West Fisher Pit	2.00	BC
West Fisher Creek	Road 231	7.50	SP
West Fisher Creek	Rush skeletonweed site D5-3	0.25	BC
West Fisher Creek	Road 6745	1.50	SP
Miller Creek	Road 4724	5.00	SP
		18.75	

In addition to the Forest Service Roads, Lincoln County has treated the Silver Butte Road # 148.

Future weed activities in the Miller West Fisher project area include the following:

- Continued treatment of the yearlong open road systems by the Forest Service;
- Continued treatment of trailheads and campgrounds;
- Continued treatment of gravel pits and new invader sites;
- Requiring timber sale purchaser's to spray up to 15 feet of right of way of the proposed haul routes prior to sale closure under timber sale clause R1-C(T) 6.27# - Noxious Weed Treatment, and to adhere to Weed Best Management Practices;
- Requiring potential mining claimants to treat noxious weeds along access routes, power line corridors, milling sites, etc., and to adhere to weed best management practices.
- Continue to release biocontrol agents as they become available to control noxious weeds;
- Apply appropriate mitigation measures to all projects in the analysis area;
- Continue to monitor and treat the rush skeletonweed sites as necessary.

Recently, biological control agents have been released on the Kootenai National Forest to control spotted knapweed and other species (USDA Forest Service KNF Forest Plan Monitoring Report 2008). The result of the releases is not yet conclusive on the Kootenai but observations by weed managers suggests there is a declining density of spotted knapweed in many areas on the Kootenai National Forest and within Lincoln County. Populations of spotted knapweed have crashed near MSU/Western Agricultural Research Center at Corvallis, Montana, where spotted knapweed biocontrol agents were released as early as 1974 (Flaherty 2005). Forest Plan Monitoring on the Kootenai has shown that biological control agents require a number of years to increase their populations to a level that will noticeably impact their weed hosts. There have been no release sites established for biological control agents within the Miller West Fisher project area, however damage from knapweed seed head flies *Urophora* spp, and knapweed weevil *Cyphocleonus achates* have been observed within the project area, and throughout the Fisher River drainage outside of release sites. In 2006 Klamath beetle activity was noted on the common St. John's-wort in the project area.

Biocontrol is a viable strategy when conventional methods of weed control are not providing adequate solutions to the control of a specific noxious weed. Biological control agents generally impact their host weeds by reducing their vigor and/or seed production. Biological controls generally do not eliminate weeds, and they generally don't completely prevent their spread since some weed seeds are usually still produced. However, biological controls can reduce the rate and extent of the spread of their particular host. Biological controls have the greatest impact on their weed hosts when several different agents are attacking the same plant host and are best used on weed species that are already well established in an area, that have sizable populations, and that have little or no possibility of being eradicated. Herbicide use or hand pulling are best used on new invaders that still may be eradicated, or on small or satellite populations of other well established weeds.

Herbicide use along key spread vectors such as roads, recreation sites, and trails is one of the most effective strategies to control the spread and establishment of existing populations of species such as spotted knapweed, hawkweeds, common St. John's-wort, sulfur cinquefoil, common tansy, and oxeye daisy due to the widespread populations.

In order to identify appropriate levels of management toward the control of noxious weeds within Lincoln County, Montana, and the project area; noxious weed species have been grouped into categories. The categories are unique to Lincoln County, Montana and the Kootenai National Forest; and are not intended to replace the State of Montana Noxious Weed list. The table below lists the weed classification and management strategy for known noxious weeds within the project area.

Table 3-71
Kootenai national Forest Weed Classification and Management Strategy

WEED CATEGORY	WEED SPECIES	MANAGEMENT STRATEGY
Category 3 Potential Invaders	No known populations (not currently known to exist in Lincoln County)	Prevention, Eradication
Category 2 New Invaders	Rush skeletonweed Two populations have been located and are treated annually	Eradication
Category 2 New Invaders	Dalmatian toadflax One small population located in Miller Creek and has been treated Yellow toadflax	Contain main body, eradication of populations outside main body. None noted within the analysis area, but are present along the Fisher River Corridor 1 mile outside the analysis area
Category 1 Established Infestation	spotted knapweed sulfur cinquefoil oxeye daisy cheatgrass St. John's-wort common tansy Canada thistle meadow hawkweed orange hawkweed Hound's-tongue	Prioritize areas to be treated, Reduce size of plant populations. Reduce rate of spread.

ENVIRONMENTAL CONSEQUENCES

The direct, indirect, and cumulative effects of invasive plants are limited to the affected environment consisting of project area drainage and access routes. The potential effects described below represent the result of analysis and professional judgment, and are based on research, experience, and monitoring.

The direct and cumulative effects on noxious weed introduction and spread of past activities are primarily associated with disturbance from harvest, site preparation, mining, permanent land clearing, road construction and maintenance, road storage and decommissioning, and prescribed fire, and the concurrent opening of the tree canopy.

Foreseeable actions will include additional commercial harvest on private lands, mining activities and access, the proposed Montanore power line construction, road maintenance, road storage and decommissioning, prescribed burns as programmed through the Forest Wide Fuels EA, recreation activity, and weed management activities, as described in Chapter 3 of the Miller West Fisher EIS.

The direct and indirect effects of all action alternatives would result mainly from the vegetation management activities and associated site disturbance as described in the alternative descriptions for NFS lands harvest and fuel reduction activities, road access, trailhead parking improvement, trail improvement, and stock corral creation, as described in Chapter 2 of the Miller West Fisher EIS.

The cumulative effects would result from the past activities, the proposed activities as described in Chapter 2, and the foreseeable actions described in Chapter 3 of the Miller West Fisher EIS.

Effects associated with actions on NFS lands will be disclosed in terms of the Purpose and Need statements that are applicable to vegetation management and ecology: Maintenance of Ecosystem Function and Vegetation Health. Elements of ecological integrity applicable to noxious weeds include:

- Reduction of existing noxious weed infestations;
- Minimizing the risk of expansion or introduction of new invasive species.

ALTERNATIVE 1 (No Action)

Direct and Indirect Effects

With the “No Action” alternative there are no additional management action proposed through this project on NFS lands. Previously approved treatment units in the Forestwide Fuels EA that are planned for slashing and underburning, Bonneville Power Administration (BPA) power line maintenance, road maintenance, and recreational use would continue to occur. Ongoing weed management activities as approved through the Kootenai National Forest Invasive Plant Management FEIS would continue as funding allows, and management activities on private lands would proceed. Natural disturbance process such as wildfire, insect, disease, recreation, and big game use would also continue. Fires would be suppressed in accordance with Forest Plan direction.

The long term health of these ecosystems is linked to our ability to manage or control noxious weeds. Ongoing weed control measures across the area would continue, but without programmed activities, the focus of treatment would be limited to gravel pits, campgrounds, dispersed recreation sites, trailheads, secondary roads accessing the trailheads, BPA power line access roads, and on the main yearlong open roads such as Miller Creek Road 385, the West Fisher Road 231, and County weed treatment on the main Silver Butte Road 148. The priority areas for treatment are gravel pits, and areas that have high recreational use or provide access to trailheads to the Cabinet Mountain Wilderness. Even with treatment, the existing open roads may support low level weed populations with some potential for seed spread by road maintenance equipment, administrative, and recreational traffic.

Yearlong restricted roads would be a low priority for treatment of all but the potential invaders and new invader species. Weed management activities associated with fuel treatment, timber removal, road storage or decommissioning, trailhead parking development, trail improvement, wildlife habitat improvement or fisheries improvement activities would not be implemented. Closed roads would continue to support weed populations because they would not be treated, and they could contribute to spread of weeds off the road prism and into the forest, particularly with the species adapted to dry sites such as knapweed, and the shade tolerant hawkweeds. The No Action alternative would not increase vehicle traffic into the analysis area. It would not increase site disturbances, such as temporary road construction, road storage or decommissioning, recreation enhancement, timber harvest, and prescribed burning (above those planned through the Forestwide Fuel EA, and treatment on private lands), therefore weed spread would not be accelerated or slowed as a result of actions from this alternative.

Because current budgets only allow for treatment of the highest risk open roads and high use recreational sites, the No Action alternative is expected to allow existing weed populations outside these areas to increase. If budgets do not allow for continued treatment, and present weed populations are not managed, weed populations may continue to exceed KNF Forest Plan standards (Table IV-1, pg IV-10 KNF Forest Plan 1987). With the current trend for appropriated budgets for noxious weed management, existing weeds are expected to continue moving off closed roadways into previously disturbed areas, onto undisturbed dryland areas, and into new or existing burned areas.

With current weed management emphasis, no increase in funding, and no project support for weed control; most established noxious weed species may continue to maintain presence and spread along closed and seasonal restricted road systems, ATV trails, riparian areas, and sites that are disturbed in the future.

Spotted knapweed, St. John's-wort, sulfur cinquefoil and cheatgrass may continue to expand off the closed road systems in the dryland areas (VRU 1, 2 and 3). Orange hawkweed (*Hieracium aurantiacum*) and the meadow hawkweed complex (*Hieracium pratense, H. floribundum, H. piloselloides*) will continue to increase on all but the driest sites, common tansy (*Tanacetum vulgare),* will continue to expand within the riparian area along the West Fisher Creek, and Canada thistle (*Cirsium arvense*) will continue to be a common component in disturbed areas. New invaders will have the potential to establish and spread along open roads, and the power line corridor, but current weed management activities should minimize this risk.

With the exception of the hawkweeds, weed species of concern are not persistent in forested vegetation communities that have moderate to high canopy closure. As stands close and succession continues, the spread of noxious weeds should slow. Without disturbance many of the noxious weed species will not have a competitive advantage however, the driest sites with light forest canopy will be at risk for spread of spotted knapweed, St. John's-wort, sulfur cinquefoil, and cheatgrass even without management activities on NFS lands.

The hawkweeds will continue to spread along closed roads and trails on all but the driest sites, and will move into areas with heavier canopies, and riparian areas, particularly if they have experienced any past duff reduction activities such as mining, timber harvest, or fire.

Resource Impacts of Noxious Weeds

Impacts to Big Game Winter Range

Weeds impact native vegetation by competing for light, water and nutrients. Native vegetation provides forage, cover or nesting habitat for micro and macro fauna. In comparison, noxious weed species

generally do not provide valuable forage or habitat for native animals (Trammell and Butler 1995). As weeds invade the dry sites, the carrying capacity of big game winter range within the Miller West Fisher analysis area will continue to be compromised. By altering the structure of plant communities, noxious weeds alter the structure of animal communities (Sheley 1999). Warm and dry (mesic) forest types are most likely to be invaded by spotted knapweed, St John's-wort, Dalmatian toadflax, sulfur cinquefoil, rush skeletonweed, and cheatgrass. Of these species spotted knapweed is the most prevalent, followed by St. John's-wort, cheatgrass and sulfur cinquefoil. Dalmatian toadflax is currently present at only one site, which is being treated, within the analysis area, and the rush skeletonweed sites are being treated and monitored several times each year. There have been no new plants within those sites for a few years.

Watson and Renney (1974) found that spotted knapweed infestations decreased bluebunch wheatgrass forage yield by 88% (Sheley 1999). Associated elk use, was reduced by 98% on spotted knapweed-dominated range compared to bunchgrass-dominated sites (Sheley 1999). Established bio-control agents including seed head flies (*Urophora* spp) and the root weevil *Cyphocleonus achates* may help slow the spread of spotted knapweed on these important winter ranges.

St. John's-wort seedlings may require several years to reach reproductive maturity, and are not strong competitors with other vegetation until they mature. Once the plant is mature, the large crowns can produce up to 30 flowering stems and 15,000 to 33,000 seeds annually. Dense stands can displace native plans, and can greatly depreciate wildlife carrying capacities, and endanger the biological diversity of these lands (Sheley 1999, pg 374-376). The cyclic buildup of the Klamath beetle combined with ongoing emphasis to treat small infestations, may help keep reduce the potential spread of this species.

Cheatgrass can out compete native bunchgrasses due to it's rapid growth in the late winter or early spring which occurs approximately six weeks earlier that native bunchgrasses such as bluebunch wheatgrass . Soil water depletion by cheatgrass is one of the principal mechanisms for competing with perennial grasses (Sheley 1999, pg 180). In southern Idaho, cheatgrass dominates many of the grass/shrub ecosystems. Increasing fire frequency in cheatgrass systems have eliminated native, perennial species and encouraged invading annuals, and the associated decline in species richness (Whisenant 1994). Cheatgrass has little value as winter forage, therefore increasing density of cheatgrass results in a decrease in the carrying capacity of big game winter ranges.

Sulfur cinquefoil can establish and rapidly dominate range lands, dry land shrub communities, and open canopy dry lands. Disturbance can accelerate this dominance, but it is also successful in invading native plant communities with little to no disturbance. It is commonly associated with spotted knapweed. It is avoided by most grazing animals; therefore an increase in sulfur cinquefoil results in a decrease in big game forage.

Impacts to Big Game Summer Range

Because of their competitive nature, and the ability to expand in forested conditions, the hawkweeds pose the greatest risk to big game summer range habitat. Hawkweeds can choke out most herbs, grasses and forbs with almost complete dominance of the understory vegetation.

Soil Effects of Noxious Weeds

Increases in noxious weeds have been shown to affect the structure of ecosystems by altering soil properties. Soil in areas dominated by noxious weeds may have lower amounts of organic matter and available nitrogen than areas supporting native grasslands. Noxious weeds may increase soil erosion,

and chemical compounds may hinder soil macrofauna and microfauna (Lacey et al 1989). Weeds may deplete soil nutrient reserves, and alter soil temperatures (Sheley 1999). As weed populations increase, the associated soil effects will increase.

Watershed Effects of Noxious Weeds

Noxious weed populations can increase surface runoff and sediment yield by reducing native plant community diversity and increasing exposed soil (Lacey et al. 1989). Where noxious weed canopies are light but native plants are in decline, vegetative cover of soil may be reduced, thus exposing increased soil surface and increasing evaporation, reducing soil moisture. Where canopies are dense, high transpiration rates by noxious weeds may deplete soil water content. The effects of uncontained noxious weed expansion in the project area would vary by site and species, but could change the watershed characteristics.

Impacts to Native Plant Communities

Noxious weeds have been shown to affect the structure of ecosystems by altering the composition of plant communities. In general, noxious weeds have invasive characteristics that allow them to be competitive and often out compete and displace native plant species. This can affect the species diversity and species richness on a given site or area.

Impacts to Threatened, Endangered and Sensitive Species

While it is difficult to determine the effects of invasive plants to Threatened, Endangered, and Threatened Species; an estimated 400 of the 958 species that are listed as threatened or endangered under the Endangered Species Act are considered to be at risk primarily because of competition with or predation by non-indigenous species (Pimentel 2004). Please refer to the threatened, endangered, and sensitive plant section of this document for more information on these plants.

Impacts to Historic Fire Regimes

With ongoing expansion of invasive species such as spotted knapweed, sulfur cinquefoil, and St. John's-wort, in the dry land types (Vegetation Response Units 1, and 2), the fire frequency may decrease due to the reduced density of fine fuels from native species. In the case of cheatgrass dominance, the fire frequency could increase, resulting in accelerated decline in native shrubs and bunchgrasses.

With no hazard fuel reduction treatments, there is a potential for wildfires in timbered stands with heavy fuel loads to burn at higher intensities with a greater disturbance factor than they would with treatment. Fire disturbances, fire suppression activities, and fire line construction could enhance the introduction and spread of noxious weeds.

Cumulative Effects

Past Harvest Activity

Harvest over the past 50 years has created variable levels of disturbance across 8,820 acres of National Forest and private lands. The majority of the past harvest activities have been concentrated in the dry land VRU's (VRU 2S, and 3) and the warm and moist VRU's (primarily VRU 5). Spotted knapweed is the most common noxious weed species on the dry land VRU's, has a presence on almost all road systems, and has encroached onto disturbed areas within the dry land types and the BPA power line corridor. The hawkweeds have infested most roads and major skid trails within the moist VRU's and has light encroachment into most harvest units within the moist VRU's. Refer to the project file for

Predicted Knapweed and Hawkweed Occurrence Maps. Because these species are established within the Miller West Fisher analysis area, it is expected that hawkweeds will continue to increase without management, and that spotted knapweed will retain presence but may decrease in density as biological control agents become better established. Other species present in the area as a result of past harvest activity may decrease or remain stable as the native vegetation recovers and shade out these invasive species.

Past Slashing and Underburning

Past slashing and underburning has occurred on roughly 2,120 (although some portions of the 2,120 acres did not carry fire). The effects of these habitat improvement and fuel reduction burns have generally decreased the understory component of conifers, and increasing sunlight to the forest floor. The response of vegetation to fire is influenced by a variety of fire parameters including intensity, severity, soil heating, and season of burn. These variations can and will cause differences in the response of individual species and the community as a whole, but generally spring burns will initially decrease the density of the native bunchgrasses, and shrubs, and give noxious weeds a temporary advantage. The shrubs respond very quickly to pre-burn density, but the bunchgrasses may take several years to reach pre-burn coverage. Fire studies and unpublished data from western Montana generally support the observation that where propagules are available, spotted knapweed is likely to establish, persist, and/or spread following fire. (www.fs.fed.us/database/feis/plants/forb/cenmac/).

There were isolated populations of knapweed and common St. John's-wort within the Silver Butte and Porcupine burns prior to burning. These populations are continuing to persist and have been treated with backpack spray crews in 2003, 2004, and 2006. The common St. John's-wort appears to be decreasing, but the spotted knapweed continues to expand down the spur ridge within this burn area. Expansion is moving along game trails and appears to be carried by wildlife species. Knapweed was also present within the Miller Creek burn area, but the author has not noticed an increase related to the burns.

Past Road Construction, and Access

Past road construction has served as the primary vector for introduction and spread of noxious weeds in the Miller West Fisher project area. Severe site disturbance associated with construction, and the potential for seed movement on equipment has been instrumental in establishing noxious weeds within this area. Noxious weed management such as Weed Best Management Practices and pre-treatment with herbicide were not incorporated into most of these past activities. Noxious weeds are now concentrated along these linear road features.

Past Road Storage and Decommissioning

Past road storage and decommissioning in the Miller West Fisher project area have decreased access for noxious weed management, increase disturbance on the site, and generally increased density of noxious weeds following the disturbance. The areas where past road storage and decommissioning activities took place were not treated with herbicide prior to the ground disturbance; however they were seeded with a roadside seed mix to quickly establish a vegetative cover to compete with noxious weeds.

Past road storage on the upper segment of road 6743 near Teeters Peak created a substantial amount of disturbance on a system with heavy vegetation coverage. Spotted knapweed, common St. John's-wort, and hawkweeds were present on the road system prior to the road decommissioning. The upper 1.5 miles was recovered to the point that conifers were pole size and larger, requiring high levels of disturbance to remove this vegetation, remove culverts, and the road template. An increase in spotted

knapweed and common St. John's-wort has been noted along the majority of the road template, and an increase in hawkweeds has been noted in the moist areas associated with the draws.

Storage on the 4782A and 5326 roads reduced the native vegetation (particularly the shrub component), and created site disturbance that was receptive to noxious weed establishment and spread. These roads were seeded following storage activity. Hawkweeds and knapweed are present along these road segments.

Storage on the upper segment of the 6745 road in Standard Creek has not shown a major increase in noxious weeds. This is most likely a result of the light disturbance level and the generally light pre-treatment infestation of noxious weeds.

Past Road Closures

Road closures have reduced noxious weed introduction and spread by eliminating vehicle traffic; however they have also reduced accessibility for noxious weed management. Closures have generally reduced the spread rate of invasive plants, and as the road systems re-vegetate with native species (particularly shrubs), generally the density of all species except the hawkweeds have declined.

BPA Power Line Construction and Maintenance

BPA power line construction and maintenance served as a vector for introduction, establishment and spread of several noxious weed species. Knapweed, common St. John's-wort, Canada thistle, and the hawkweeds are common and persistent on this line. In addition, rush skeletonweed was introduced to the project area through maintenance equipment in 2002. Knapweed has moved to the Cabinet Divide via the power line activities and road 594, and common St. John's-wort and hawkweeds have been noted on road 594 just below the divide. BPA has provided funding for herbicide treatment along this the power line, their access roads, and for treatment of the rush skeletonweed site, which has helped contain these spot infestations and has prevented further spread.

Effects of Past Weed Management

Past weed control has consisted of herbicide treatment, education and prevention in this analysis area. Weed educational posters have been posted at trailheads and campgrounds, and weed seed free certified hay is required for all stock use on NFS lands. Refer to the project file for herbicide treatment since 2002. Herbicide treatment has been ongoing since the mid 1990's and has been effective in containing and controlling noxious weeds on the main yearlong open roads, at campgrounds, trailheads, and on trails within and adjacent to the Cabinet Mountain Wilderness. Areas that have been treated repeatedly over the past decade have low composition of noxious weeds. Weed density on closed road systems varies from moderate to high depending on the time since treatment and the recovery stage of the native vegetation.

Herbicide treatment generally has about a three year effect in reducing the density of noxious weeds, and can slow spread for many years if recovery of native vegetation occurs during this time. Herbicides used in this area have been Picloram, Clopyralid, Triclopyr, and 2,4-D.

Clopyralid, picloram, triclopyr and 2,4-D, are synthetic plant growth hormones and have some structural similarities to naturally occurring hormones called auxins. They disrupt plant growth by binding to molecules that are normally used as receptors for the natural growth hormones. The binding causes abnormal growth leading to plant death in a few days or weeks, depending on the species and the herbicide. The Environmental Protection Agency has approved these herbicides for controlling noxious weeds, and requires that any use restrictions be included in the product label. All of the herbicides,

except 2,4-D, are rated by the EPA as slightly toxic to humans. 2,4-D is rated as moderately toxic. 2,4-D is the most commonly used herbicide in the United States. It degrades quickly with a half-life of roughly one week. Clopyralid is a selective herbicide that affects members of only three plant families, making it useful for selectively killing knapweeds while protecting many native plant species. It has a soil half-life of 20 days. Picloram is a rate selective herbicide that has an average soil half-life of 90 days. Triclopyr has a half life in the soil of 30 days (USDA FS 2007).

Reasonably Foreseeable Actions

Planned Harvest Activity on Plum Creek Lands

Approximately 1,018 acres of harvest activity are proposed on Plum Creek Lands between 2006 and 2008. Harvest activity will create additional disturbance and a receptive seed bed for noxious weeds. The majority of the planned harvest activities are within the dry land VRU's (VRU 2S, and 3) and the warm and moist VRU's (primarily VRU 5). Because spotted knapweed and common St. Johns'-wort are generally well established on the road systems in the project area, it is highly likely the populations will continue to expand within the harvested dry land types. The hawkweeds are present on most roads within the moist sites in the project area, and it is likely the populations will continue to expand into the harvest units following harvest related disturbance. Canada thistle commonly expands following disturbance, and is persistent, but high density is relatively short lived in these forested environments. Timber harvest on Plum Creek Timber Company property may increase the existing weed populations in the Miller West Fisher project area. Plum Creek Timber Company does have an aggressive weed management program and do require many of the same weed best management practices that the federal and state agencies require. These activities will substantially reduce the risk of new introductions, but expansion of on site noxious weed species is a risk that is associated with these activities.

Planned Pre-commercial Thinning on Plum Creek Lands

Approximately 326 acres of pre-commercial thinning are proposed on Plum Creek Timber Company lands. Because this is not a ground disturbing activity, there should be no effects to noxious weeds through this activity.

Planned Montanore Power Line

The proposed Montanore power line will result in permanent clearing of forest vegetation on approximately 100 acres. In addition to the power line clearing, approximately 9.9 miles of road would be constructed to access the power line (Montanore Preliminary Draft EIS page 163). Of this 9.9 miles, approximately 3.7 miles are within the Silverfish Planning Subunit. Less than half of this new road construction would take place on private or industry lands, with the majority of this construction taking place on NFS lands. An additional 3.69 miles of roads closed with earthen barriers would be opened and gated to facilitate power line construction and maintenance. Construction and clearing activities will result in high site disturbance that will create a receptive seedbed for noxious weeds. Access roads and maintenance activities will provide a continuous vector for introduction and spread of noxious weeds. A specific mitigation and monitoring plan requires Montanore to pre-treat any existing noxious weed infestations, to re-vegetate the disturbed sites, to monitor and treat any future noxious weed infestations, and to install road closure devices on all access routes. With the associated mitigation, the net increase to noxious weed infestation levels should be low to none. Infestation levels could decrease as Montanore would be treating populations that are not currently being treated. In addition, funding for bio-control releases could be provided by Montanore.

Bear Lakes Estates

This project authorizes livestock access and 1,300 feet of new trail construction to a private in-holding and may provide the opportunity for introduction of noxious weeds. Mitigation requires the use of weed free certified forage, and monitoring for noxious weeds. Any infestation of noxious weeds will be controlled as soon as possible after discovery. This should reduce the potential for introduction of noxious weeds, but will not eliminate the risk.

Wayup/Fourth of July Mines

This project authorizes access to two mining claims near the Cabinet Mountain Wilderness and construction of 2.68 miles of new road in Lake Creek, and authorizes reconstruction and motorized use on 1.3 miles of non-system road at the head end of the West Fisher drainage. These activities have the potential to introduce and spread noxious weeds in an area that is essentially weed free. Any infestation of noxious weeds will be controlled as soon as possible after discovery. This should reduce the potential for introduction of noxious weeds, but will not completely eliminate the risk.

Planned Road Storage Associated with the Libby Adit and Montanore Mining Projects

The road storage mitigation requirements for grizzly bear are not finalized for all mining activity associated with the Montanore Mine and Libby Adit, but it is highly likely that additional road storage will be required. The impacts of road storage will be proportionate to the amount of area treated, the disturbance levels, and the associated weed mitigation. All equipment used to store roads will be required to come to the job clean of all mud and plant materials. Use of weed free certified seed and mulch, and seeding and fertilizing on disturbed areas will be required mitigation. Weed populations on these roads will be treated with herbicide prior to storage to reduce the risk for spread of noxious weeds. Because knapweed, hawkweeds, and common St. John's-wort are generally well established, the risk of spreading these weeds through storage activities is high.

In the short term, road storage may increase spread of on-site weed seed, and increase the risk for transport off site seed into the area on equipment. Disturbance associated with these activities can create a seedbed that allows noxious weeds to re-establish and flourish. Monitoring has shown that herbicide treatments prior to storage work helps reduce weed densities and population size, and that the long-term benefits of road storage are a reduced rate of noxious weed spread, particularly for new invaders. There is a small risk of introducing weed seeds on equipment associated with the storage even with the required equipment washing. The greatest risk is posed when equipment from outside the area is utilized for these activities, since they may bring new invaders onto these sites.

Once re-vegetated, roads that are stored will be fairly resistant to spread of all but the species that continue to flourish under a shaded environment, such as hawkweeds. The spread of hawkweeds may be higher through storage than the current conditions due to the difficulty in treating these roads once storage activities have occurred.

Road Maintenance

Routine road maintenance is likely to occur on roads that are currently open to the public. These are on a periodic herbicide treatment schedule, so while the increased disturbance will provide a receptive seed bed for noxious weeds, the herbicide treatment should serve to maintain a low density of noxious weeds.

Forest-wide Fuels Projects

Planned spring underburning may increase the competitive advantage of some noxious weeds. Cheatgrass is an example, as it is a cool season grass and is often past its major growth cycle by the time the burns are implemented. Generally the native bunchgrasses are actively growing and the prescribed fire in the spring will set these species back and it may take several years for them to recover their pre-burn density. Most studies show that fire initially reduces frequency and basal area of Idaho fescue, bluebunch wheatgrass and rough fescue (www.fs.fed.us/database/feis/plants/graminoid/). Current mitigation for these projects includes a pre-treatment survey for noxious weeds. If infestations are located off the roads within the forested environment, they will either be treated before or following the burn to eliminate seed and reduce the potential for spread. These projects may also provide funding for biological control release if the infestations are large enough.

If funding remains consistent with the past few years or greater, current monitoring and treatment completed as authorized under the Kootenai National Forest Invasive Plant Management FEIS, combined with bio-control agents, should prevent significant spread of these invasive species on big game winter range sites within NFS lands in the project area.

Planned Weed Control

Future weed control will consist of herbicide treatment, education and prevention in this analysis area. Weed educational posters will continue to be posted at trailheads and campgrounds, and weed seed free certified hay is required for all stock use on NFS lands. Acres treated with herbicide will vary depending on funding and the ability to acquire grants. Acres treated over the past six years vary from a low of 5 acres in 2002 with a high of 93 acres in 2006 in preparation for a potential project in this area. The overall average not including the project funded activity in 2006 is roughly 20 acres per year. Potential sources of funding such as RAC and the Centennial Grant have been critical in treating noxious weeds in this high use area. If those funds are not available it is estimated that an average of about 10 acres per year would be treated with herbicide. BPA power line access treatment would be in addition to these acres. Refer to the project file for herbicide treatment since 2002.

As long as the Forest can continue treating the main spread vectors such as roads, the treatment should be effective at containing and controlling noxious weeds in gravel pits, on the main yearlong open roads, at campgrounds, trailheads, and on trails within and adjacent to the Cabinet Mountains Wilderness. Weed density on closed roads will decline for species that are not tolerant of shade, but will continue to increase for species that are tolerant of shade such as the hawkweeds.

The effects of herbicides on humans and the environment are displayed in the USDA Forest Service Kootenai National Forest Invasive Plant Management FEIS, 2007.

Effects of Off-road-vehicles

Off-highway-vehicles (OHV's) would continue to use existing trails in the analysis area. Weed seeds are expected to keep moving into un-infested areas as OHV use continues.

Effects of Potential Climate Change

Predictions for potential climate change within northwest Montana vary from warmer and drier to warmer and moister, and most predict a longer growing season. Global warming and other climate changes will affect the growth, phenology, and geographical distribution of weeds. Weed species currently restricted to the southern united states may expand northward (Patterson 1995). Fire risk is strongly associated with increased spring and summer temperatures and an earlier spring snowmelt

(Westerling 2006). A summary of literature searched indicates that noxious weeds on the whole have a larger than expected growth increase to both recent and projected increases in atmospheric carbon relative to other plant species. There is also evidence that rising carbon dioxide may preferentially select for invasive, noxious species within plant communities (Ziska 2004).

Most of the dry land noxious weeds on the Kootenai appear to respond favorably to drought, so potential climate change to a warmer environment with a longer growing season, the associated soil moisture depletion, and increased CO^2 could cumulatively favor these species and could result in decreased plant diversity and decreased big game forage. In the case of the cool season cheatgrass, earlier soil moisture depletion, would strongly favor the cheatgrass over native bunchgrass, which could start a cycle similar to the south and intermountain west where the fire frequency has increased, giving cheatgrass an additional competitive edge.

Resources managers will be challenged to integrate adaptation strategies in a time of potential climate change. Adaptive strategies should include resistance options (forestall impacts and protect highly valued resources), resilience options (improve the capacity of ecosystems to return to desired conditions after disturbance), and response options (facilitate transition of ecosystems from current to new conditions) (Millar 2007). Successful management of invasive weeds will require active inventory and management to prevent new introductions, and persistent efforts to reduce existing infestations. While the no action alternative allows for current weed management programs, it does not promote an integrated and active weed management strategy due to the lack of management emphasis in the project area and the lack of weed management that would be provided through a timber sale contract and purchaser haul route spraying.

ACTION ALTERNATIVES 2, 4, 6 and 7

Direct and Indirect Effects

Alternatives 2, 4, 6 and 7 include timber harvest, natural and activity fuel reduction, site preparation, re-introduction of fire, and big game forage enhancement treatments, tree planting, pre-commercial thinning, construction of temporary roads, road maintenance, access changes, long-term road storage, road decommissioning, trailhead parking development, trail maintenance, and stock corrals.

The potential to spread noxious weeds is strongly correlated with site disturbance and seed introduction. Proposed activities are ranked in order of potential to spread weeds below. Mitigation measures to reduce weed spread during these activities are listed below in the mitigation section of the weed report.

- Road Construction
- Road Reconstruction
- Trailhead Parking Construction
- Road storage or decommissioning
- Road maintenance and BMP Work
- Harvest utilizing ground based equipment
- Site preparation and fuel reduction utilizing grapple piling
- Site preparation on regeneration harvest units through prescribed fire
- Harvest utilizing a skyline system
- Winter harvest utilizing ground based equipment
- Stock corral construction
- Access management changes without road storage
- Underburning for hazard reduction in intermediate treatments

- Underburning for natural fuel reduction, and/or forage enhancement
- Harvest utilizing helicopter yarding,
- Stream bank stabilization on the West Fisher Road # 231 adjacent to West Fisher Creek
- Trail maintenance
- Standard Lake restoration (without machinery)
- Tree planting
- Pre-commercial thinning
- Weed control activities.

Road construction, reconstruction, storage or decommissioning, and maintenance and trailhead turnarounds and parking construction have a high potential to introduce and spread noxious weeds, due the amount of site disturbance combined with the existing infestations on associated existing road systems, and the potential for seed introduction on machinery.

Harvest utilizing tractor or forwarder systems, ground based site preparation and fuel reduction, site preparation through prescribed fire, harvest utilizing skyline systems, and winter harvest utilizing ground based equipment have a moderate potential to spread noxious weeds. The potential is proportional to the amount of disturbance and duff reduction.

Underburning for hazard reduction in intermediate treatments, prescribed fire for natural fuel reduction and wildlife enhancement, harvest utilizing helicopter yarding, and winter harvest utilizing ground based equipment, stock corral construction, and stream bank stabilization have a moderate to low potential to spread noxious weeds depending on the amount of disturbance and the amount of duff reduction.

Trail maintenance, tree planting, precommercial thinning, and weed control activities have a very low potential to introduce and spread noxious weeds.

Activities with a low potential to spread noxious weeds may have a potential to spread noxious weeds through access vehicles, and from foot access into the area. For all activities, contractors and administrative vehicles may accidentally spread weed seeds in the area.

Existing Roads and Associated Effects

With the exception of the main access roads up each of the three drainages, the majority of the access routes to NFS lands in the project area are currently closed yearlong, so there is limited additional opportunity to close roads to reduce weed spread. Options to reduce the current rate of spread include herbicide treatments, bio-control, and road storage.

The following activities have the highest risk of spreading or introducing noxious weeds:

Road Construction

Road construction has a high potential to spread noxious weeds through severe disturbance that creates a receptive seedbed and allows noxious weeds to establish and flourish. This site disturbance can last several years on dry land sites. Once established, travel along the new road can continue to spread weeds. Alternative 2 includes 1.2 miles (3.6 acres) of new road construction on an old road template that was previously decommissioned; Alternative 4 and 7 would have no new road construction; and Alternative 6 would have approximately 0.8 miles (2.4 acres) of temporary road construction on this same road template as Alternative 2. Private access to the Irish Boy Property is proposed in Alternative 4 with an additional 0.2 miles (0.6 acres) of road reconstruction. All proposed construction is in the warm moist VRU 5.

Proposed new road construction on NFS lands in Alternative 2 is also proposed for decommissioning immediately following harvest activities. Seeding of disturbed soils will be required on the road immediately following construction and again immediately following decommissioning. An accessible tread will be retained for foot or stock travel to treat potential noxious weed infestations in the future. The 0.2 miles of road reconstruction to access the Irish Boy Mine included in Alternative 4 will require continued monitoring and herbicide treatment as necessary to control any noxious weed infestations. This will be the private land owner's responsibility.

Road Reconstruction and Best Management Practices (BMP) work

Road reconstruction can spread noxious weeds through disturbance that creates a receptive seedbed and allows noxious weeds to re-establish and flourish. Once established, administrative and recreational travel along the new road can spread weeds. Reconstruction work may include minor earthwork, motor grading, seeding, brushing, ditch cleaning, ditch construction, ditch relief drainage, installing surface water drainage structures, culvert replacement and new culvert installations, surface rock replacement, dust abatement and subgrade reinforcement.

All of the action alternatives would haul volume down the Miller, West Fisher and Silver Butte Roads and secondary roads off these main collector roads. The project proposes approximately 42.72 miles of re-construction, BMP work and/or blading and shaping for Alternative 2, 30.45 miles for Alternative 4 and 7, and 38.99 miles for Alternative 6. In addition, Alternative 4 proposes 0.2 miles of reconstruction to provide access to the Irish Boy Mine.

Temporary Road Construction

Temporary road construction can spread noxious weeds through disturbance that creates a receptive seedbed and allows noxious weeds to re-establish and flourish. Temporary road construction is generally not proposed where a major amount of earthwork would be required so this work may include minor earthwork, temporary culvert installations, installing surface water drainage structures, and after use, removing all drainage structures and restoring the slope template. Seeding and fertilizing will be required following restoration activity.

Trailhead Parking Expansion

Trailhead parking expansion has the potential to spread noxious weeds through disturbance that creates a receptive seedbed and allows noxious weeds to establish and flourish. Once established, use of this area can contribute to weed spread both along access roads and up trails. Alternative 2 does not include trailhead expansion. Alternative 4, 6 and 7 improve parking on 15 sites, for an estimated impact of 1-2 acres of disturbance. The risk of weed introduction at expanded trailheads is mitigated because these sites are accessible to spray trucks and have high priority for treatment because of the high recreational use and agency focus on treatment of recreational sites. For analysis the impact is equivalent to approximately 0.5 miles of new road construction.

Road storage and decommissioning

In the short term, road storage may increase spread of on-site weed seed, and transport off-site seed into the area on equipment. Disturbance associated with these activities can create a seedbed that allows noxious weeds to re-establish and flourish. Mitigation measures include equipment washing, herbicide treatments prior to storage activities, use of weed free certified seed and straw, seeding and fertilizing on disturbed areas, and post treatment monitoring and herbicide treatment. Monitoring has shown that herbicide treatments prior to storage work helps reduce weed densities and population size, and that the

long term benefits of road storage are a reduced rate of noxious weed spread, particularly for new invaders. There is a small risk of introducing weed seeds on equipment associated with the storage even with the required equipment washing. The greatest risk is posed when equipment from outside the area is utilized for these activities, since they may bring new invaders onto these sites. The long-term effects of road storage are a reduced rate of weed spread due to these areas not being accessible to vehicle use. Once re-vegetated, roads that are stored will be fairly resistant to spread of all but the species that continue to flourish under a shaded environment, such as hawkweeds. The spread of hawkweeds may be higher through storage than the yearlong closures due to the difficulty in treating these roads once storage activities have occurred.

Alternative 2 proposes 12.1 miles (24 acres) of road storage, Alternative 4 and 7 propose 6.6 miles (13 acres) and Alternative 6 proposes 16.4 miles (33 acres). Because the majority of these roads have current infestations of hawkweeds, knapweed, common St. John's-wort, daisy, and Canada thistle, mitigation will require brushing and herbicide treatment a minimum of one season prior to the storage activities. Most of these roads are on the moist sites, or have moist areas within the road template, and therefore have a high risk of spreading hawkweeds during and following storage activities. Alternative 4 and 7 have the lowest risk of contributing to long term spread of hawkweeds due to the lower disturbance and less future access reduction to treat roads. Alternative 6 has the highest risk. For other species, the risk is the opposite with Alternative 4 and 7 having the highest risk of future introductions and expansion, and Alternative 6 having the lowest risk due to the lack off access and the decline in these species once the native vegetation has reoccupied the sites.

Alternative 2 propose no road decommissioning. Alternative 4, 6, and 7 propose 1.43 miles (4.29 acres) of decommissioning on road 6744. This road is currently re-vegetated and has a low infestation of noxious weeds; however it is frequently trespassed by OHV's. The road is not currently accessible for brushing or herbicide treatment other than spot spraying, so herbicide treatment will only occur if new invaders are found.

The following table shows the access management changes and the positive degree for weed management for all alternatives including the "no action". In general, the higher the miles of restricted road access, and in the long term, the higher the miles in storage, the lower the rate of noxious weed spread. The exception to this rule is the hawkweeds that will continue to spread on stored roads due to the difficulty in treating these vectors once the storage activities have taken place.

Table 3-72
Activities with Heavy Disturbance and High Risk of Noxious Weed Invasion and Spread by Alternative

ACTIVITY	ALT 1	ALT 2 (Miles)	ALT 4 and 7 (Miles)	ALT6 (Miles)	Other Cumulative (Miles)	Other Cumulative (Miles) Alt 6 Only
Permanent Road Construction*	0	1.20	0	0	6.70	6.40
Temporary Road Construction*	0	0	0.94	3.29	0	0
Road Reconstruction and BMP Work	0	42.72	30.45	38.99	4.10+	4.10+
Trailhead Parking Construction	0	0	15 sites 0.5 miles	15 sites 0.5 miles	0	0
Road Storage Miles	0	11.36	5.17	15.00	0	0
Road Decommissioning	0	0	1.43	1.43	0	0
Total Miles	0	55.28	38.49	59.21	10.80	10.50

*All proposed new roads and temporary roads to be constructed will be obliterated after use.

The following activities have moderate risk for weed invasion and spread:

- Harvest utilizing ground based equipment
- Site preparation on regeneration harvest units through grapple piling and scarification
- Fuel reduction through grapple piling and burning

Timber Harvest Utilizing Ground Based Yarding without Required Winter Harvest

Timber harvest activities can spread noxious weeds by transporting seeds on personal vehicles and harvest equipment. Ground disturbance associated with timber harvest creates a receptive seedbed on landings and skid trails. Harvest activities can spread noxious weed seeds by transporting seeds from the decking, landing and servicing areas to un-infested sites in harvest units. The risk of noxious weed spread is related to the amount of disturbance. Table 3-72 displays the amount of acres harvested by system on National Forest and Plum Creek lands, and the relative risk of noxious weed spread.

Montanore Power Line Clearing

Montanore power line clearing will have impacts similar to that of ground based timber harvest due to the intensity of the clearing and fuel reduction.

Site Preparation and Fuel Reduction through Grapple Piling and Scarification

In the regeneration units that have grapple piling and scarification planned, up to 25% of the unit may have the majority of the duff removed, and up to 50% of the unit may be disturbed through the grapple piling and scarification activity. In units with grapple piling for fuel reduction, scarification is not an objective, but up to 25% of the unit may have duff removal and up to 50% of the ground could be disturbed through this activity. The impacts would be lower with spot grapple piling, and if the piling were accomplished over frozen ground conditions. This ground disturbance creates a receptive seedbed within the harvest unit. In addition equipment may transport some noxious weed seed into the unit even with the required equipment washing.

Table 3-73
Activities with Moderate Disturbance and Moderate Risk of Noxious Weed Invasion and Spread by Alternative

ACTIVITY	ALT 1	ALT 2 Acres	ALT 4 Acres	ALT 7 Acres	ALT 6 Acres	Other Cumulative Acres	Other Cumulative Acres Alt 6 only
Non-winter Ground Based Yarding	0	539	556	365	592	400	400
Grapple Piling	0	257	146	146	146	0	0
Montanore Power line Clearing	0	0	0	0	0	99	214
Total Acres	0	796	702	511	146	499	614

The following have a moderate to low risk of noxious weed invasion and spread:

- Site preparation on regeneration harvest units through prescribed fire
- Harvest utilizing a skyline system
- Winter harvest utilizing ground based equipment
- Stock corral construction

Site Preparation on Regeneration Harvest Units through Prescribed Fire

Site preparation through prescribed fire will have a moderate to low potential to spread noxious weeds depending on the severity of the burn, and the amount of duff reduction.

Harvest Utilizing a Skyline System or Winter Ground Based Harvest

Ground disturbance associated with timber harvest creates a receptive seedbed on landings and skid trails. Winter logging reduces the chance of spreading existing weeds by generally reducing soil disturbance. Cable logging systems similarly reduce soil disturbance and potential weed spread as compared to tractor logging. All systems can spread noxious weed seeds by transporting seeds from the decking, landing and servicing areas to un-infested sites in harvest units. The risk of noxious weed spread is related to the amount of disturbance.

Stock Corral Construction

Stock Corral Construction would have very little disturbance during the construction activity, but use of the stock corrals has the potential to maintain the area in a disturbed condition and introduce weeds onto that receptive site. This is a moderate risk of introduction, but a low risk of spread because recreation sites are a high priority for monitoring and treatment to control noxious weeds. In addition, it will concentrate use and could reduce the potential for introduction and spread from stock.

Table 3-74
Activities with Moderate to Low Disturbance and Moderate to Low Risk of Noxious Weed Invasion and Spread by Alternative

ACTIVITY	ALT 1	ALT 2 Acres	ALT 4 Acres	ALT 7 Acres	ALT6 Acres	Cumulative Acres	Cumulative Acres Alt 6 only
Site Preparation through Prescribed Fire	0	955	328	328	536	0	0
Skyline Yarding	0	735	555	555	759	618	618
Winter Ground Based Yarding	0	139	25	216	150	0	0

ACTIVITY	ALT 1	ALT 2 Acres	ALT 4 Acres	ALT 7 Acres	ALT6 Acres	Cumulative Acres	Cumulative Acres Alt 6 only
Stock Corrals	0	0	0.1	0.1	0.1	0	0
Total Acres	0	1,829	908	1,099	1,373	618	618

The following activities have low disturbance levels and low risk of introduction and spread of noxious weeds:

- Access management changes without road storage;
- Underburning for fuel reduction in intermediate treatments;
- Underburning for natural fuel reduction, and/or forage enhancement;
- Harvest utilizing helicopter yarding;
- Stream bank stabilization in West Fisher Creek.

Access Management changes without Road Storage

Access management changes without concurrent road storage have low disturbance levels, and low risk of introduction of noxious weeds. Because most of these systems will still be accessible for weed management, there will be no increased risk in the short term due to lack of public access.

Prescribed Fire

Prescribed fire can increase the rate of spread of noxious weeds by creating a receptive seedbed that allows noxious weeds to establish and flourish. The potential is dependent on the severity of the burn. The dry land areas will have spring burns and the moist areas will generally have fall burns. While the severity and amount of disturbance may be higher from fall burning, the dry land burns may be more susceptible to noxious weed increase due to the more open conditions and lower existing duff levels. Burns that have adjacent road access will be pre-treated a minimum of one year prior to burning.

Harvest using Helicopter Yarding

Helicopter yarding has a low disturbance level, and a low risk of spreading noxious weeds. All systems can spread noxious weed seeds by transporting seeds from the decking, landing and servicing areas to un-infested sites in harvest units.

Stream Bank Stabilization in West Fisher Creek

Stream bank stabilization can spread noxious weeds by transporting seeds on equipment. Ground disturbance associated with the restoration work is very low for this project.

Table 3-75
Activities with Low Disturbance and Low Risk of Noxious Weed Invasion and Spread by Alternative

ACTIVITY	ALT 1 Acres	ALT 2 Acres	ALT 4 and 7 Acres	ALT6 Acres	Cumulative Acres	Cumulative Acres Alt 6 only
Road Closures	0	5.09 (10 ac)	1.92 (4 ac)	1.92 (4 ac)	0	0
Prescribed Fire	0	3,839	2,974	3,343	993	993
Helicopter Yarding	0	1,079	228	417	0	0
Stream bank Stabilization Acres	0	0.1	0.1	0.1	0	0
Total Acres	0	4,928	3,206	3,764	993	993

Activities that have very low risk of noxious weed introduction and spread:

Because risk is generally associated with disturbance and equipment, the following activities have very low risk. The affected acreage will not be summarized because of this low risk. Having these activities occurring may increase the probability of locating and mapping noxious weed infestation by having personnel on the ground. Mitigation measures include monitoring and treatment of any new invaders.

- Trail maintenance
- Standard Lake restoration
- Tree planting
- Pre-commercial thinning
- Weed control activities

Table 3-76
Comparison of Disturbance Levels and Risk by Alternative

ACTIVITY	Disturbance and Risk	ALT 1	ALT 2	ALT 4	ALT 6	ALT 7	Other Cumulative Effects	Other Cumulative Effects, Alt 6 only
Permanent Road Construction	High	0	0	0	0	0	6.7	6.4
Road Construction and Post Activity Decommissioning (miles)	High	0	1.2	0	0.83	0	0	0
Trailhead Parking (miles)	High	0	0	.5	.5	.5	0	0
Road Storage (miles)	High	0	12.1	6.6	16.4	6.6	0	0
Road Decommissioning (miles)	High	0	0.87	0.51	0.51	0.51	0	0
Road Reconstruction and BMP Work (miles)	High	0	42.27	30.45	38.99	30.45	4.1+	4.1+
Non-Winter Ground Based Harvest Systems (acres)	Mod	0	539	556	592	365	400	400
Grapple Piling (acres)	Mod	0	257	146	146	146	0	0
Montanore Powerline Clearing	Mod	0	0	0	0	0	99	214
Site Prep Prescribed Fire (acres)	Mod to Low	0	955	328	536	328	0	0
Skyline Systems (acres)	Mod to low	0	735	555	759	555	618	618
Winter Harvest Ground Based (acres)	Mod to low	0	139	25	150	216	0	0
Stock Corrals (acres)	Mod to low	0	0	0.1	0.1	0.1	0	0
Access Mgt without Storage (miles)	Low	0	5.09	1.92	1.92	1.92	0	0
Prescribed Fire (acres)	Low	63	3,839	2,974	3,343	2,974	993	993
Helicopter Yarding (acres)	Low	0	1,079	228	417	228	0	0
Stream bank Stabilization (acres)	Low	0	0.1	0.1	0.1	0.1	0	0
Total Miles High Risk								
Total Acres High Risk (3 ac/mile)		0						
Total Acres Moderate Risk		0	796	702	146	511	499	614
Total Acres Moderate to Low Risk		0	1,829	908	1,099	1,373	618	618

Note that risk level above considers design features and mitigation measures.

Table 3-77
Potential Herbicide Treatment Miles and Acres by Alternative

ACTIVITY	ALT 1	ALT 2	ALT 4 and 7	ALT6	Cumulative	Cumulative Alt 6 Only
Herbicide Treatment for haul routes on Roads Currently Closed (miles)	0	21	10	10		
Herbicide Treatment For Storage and Decommissioning (miles)	0	13	7	17		
Herbicide Treatment on Yearlong Open Roads (acres)	0				36.5	36.5
Herbicide Treatment on BPA Power line Access (miles)	0				5.5	5.5
Total Miles	0	34	17	27	42	42
Total Acres	0	68	34	54	84	84

Management actions proposed in Alternative 2, 4, 6 and 7 have the potential to increase total infested area of noxious weeds in the project due to the additional disturbance. Mitigation measures and design features will reduce but will not completely eliminate the risk of noxious weed spread.

The amount of acres with moderate and high levels of disturbance and the associated moderate and high risk of having a receptive seedbed for noxious weeds can be used to compare the alternatives and the relative risk for noxious weed introduction and spread. To compare the relative reduction in potential weed spread between the alternatives the analysis considered the miles of road treated with herbicide and the monitoring associated with all treatment activities.

Overall, Alternative 2 has the highest potential to create conditions favorable to spreading weeds because of the highest number of acres treated, the associated road construction and reconstruction and the road storage and decommissioning work. It also has the highest amount of roads treated with herbicide, and the highest amount of monitoring associated with activity. Alternatives 4 and 7 treat less harvest acres than Alternative 6 and have less road storage. Alternative 4 and 7 also treat the lowest amount of roads with herbicide, and have the lowest amount of monitoring associated with activity. Alternative 7 has slightly less disturbance due to the required winter ground based logging in Management Area 12.

The total number of acres treated does not indicate that all of these acres would be infested with noxious weeds if the treatment were implemented; however, disturbance translates to higher risk of increased noxious weed infestation. In contrast, planned activities are associated with the highest amount of herbicide treatment and monitoring for noxious weed infestation and spread. All herbicide application would be completed as analyzed in the Kootenai National Forest Invasive Plant Management Project (USDA FS 2007).

The no action alternative also has a probability of noxious weed spread along travel routes such as roads and trails. Even without management related disturbance, species that are tolerant of shade such as the hawkweeds can continue to spread in the moister VRU's. Species such as spotted knapweed, common St. John's-wort, and sulfur cinquefoil can spread in the open VRU 1 and 2S, common tansy can continue to spread within lower West Fisher Creek, and hound's-tongue and Canada thistle can persist and spread along the natural disturbed riparian areas and game trails.

The mitigation measures listed below and prescribed in Chapter 2, and the noxious weed treatment planned for the Miller West Fisher project area as approved in the KNF Invasive Plant Management FIES and ROD will help reduce the rate of spread and the risk of new infestation in harvested and burned areas, and areas with new road construction, reconstruction, BMP work, and road storage.

Cumulative Effects

Past soil-disturbing activity such as road construction, harvest, mining and vehicle traffic have helped introduce and spread noxious weeds into the project area. Much of this past activity did not have concurrent weed treatment and mitigation measures.

Contrasting Effects of Proposed Actions with Past Actions: As compared with most past activities that had no associated weed education, mitigation, and control treatments, the Miller West Fisher project objectives address concerns for forest health, vigor and productivity, ecosystem integrity, and sustainability through an integrated and active weed management strategy that includes education, mitigation and concurrent weed control treatment associated with all proposed actions in this analysis. Refer to section VIII for a comprehensive weed mitigation package that is common to all action alternatives. Similar mitigation measures have been, or will be identified for all foreseeable management actions on National Forest System Lands.

Refer to the resource impacts of noxious weeds and the past management activities section on page 3-11 through 3-14 of this report, for a discussion on cumulative effects of weeds and past management.

Because roads are a primary spread vector, spraying of yearlong open roads in the project area is expected to continue to be a priority for the district and the county due the amount of recreation use in the area. Herbicide treatment is also required for all activities that have been recently approved through other analysis processes such as the Montanore Mine. It is estimated that approximately 42 miles would be treated every three years for an average of 14 miles per year that is associated with the District's and County's current program and treatments of the existing BPA power line. An additional 17 to 34 miles of road treatment is proposed within the range of alternatives. Because roads are such a key introduction and spread vector, this amount of treatment would be highly effective in reducing noxious weed introduction and spread in the project area.

Roads will be treated primarily with Tordon (active ingredient is Picloram) where appropriate under label restrictions at a rate of 16 oz per acre because it has a residual effect, for a total area treated of between 118 and 152 acres. This treatment should have a three to four year effect in reducing the density of noxious weeds, primarily spotted knapweed, St. John's-wort, sulfur cinquefoil, and hawkweeds. This treatment in conjunction with other vegetation establishment could have a much longer affect.

Herbicide treatment of roads in the project area would be completed in accordance with the KNF 2007 Invasive Plant Management FEIS and ROD. Effects analysis for this work is displayed in the analysis for this project. Refer to the 2007 Kootenai National Forest Invasive Plant Management for further information.

In addition to the road associated activities, other management actions proposed in this project in conjunction with past and reasonably foreseeable actions have the potential to increase noxious weed infestation in the project area due to the additional disturbance. This disturbance would be mitigated through herbicide treatments along the haul routes associated with harvest activities, along roads to be stored or decommissioned, on harvest landings, on access routes for other activities such as mining, power lines, on access to and within recreational sites, and along trails. In addition, spot treatments for isolated populations of noxious weeds that are located through monitoring may be treated. Follow up monitoring surveys and treatment are proposed for all activities as described in on in this report,

disturbance level and risk by management activity, in the design criteria and mitigation measures, and in Chapter 2. It should be noted that the existing infestation of noxious weeds in the project area is strongly correlated with past management actions such as roads, mining and harvest activities, that until recently, did not have weed mitigation measures associated with them. The District has noted a reduction in noxious weed introduction and spread during such activities as a result of the current weed management programs and weed best management practices.

In the case of species that do well in shaded and forested environments such as the hawkweeds, periodic herbicide treatment that is funded through project activities is critical to management of this species and keeping it out of special areas such as the Cabinet Mountain Wilderness and MA 2 lands. Because dry land species such as knapweed and common St. John's-wort are already established, monitoring and treatment through proposed activities such as harvest and burns may be critical to helping curb the spread of these species in high value big game ranges. Past prescribed fire and the associated weed survey and treatments that were funded through the Rocky Mountain Elk Foundation and Forest Wide Fuels projects have been instrumental to the location and treatment of small isolated knapweed and common St. John's-wort populations. While bio-control agents have not been released in this area, the Klamath Beetle was noted on the isolated common St. John's-wort populations in Miller Creek in 2006, and the *Cyphocleonus* root weevil has been noted in knapweed. *Cyphocleonus* combined with the seed head flies appear to be reducing density and plant vigor in spotted knapweed in other areas on the Forest. Management activities may help fund release of these bio-control agents in the Miller West Fisher project area.

Resources managers will be challenged to integrate adaptation strategies in a time of potential climate change. Successful management of invasive weeds will require active inventory and management to prevent new introductions, and persistent efforts to reduce existing infestations. While the action alternatives contribute to site disturbance and provide a favorable seed bed for noxious weeds, they also promote an active management strategy associated with proposed activities.

While the no action alternative allows for current weed management programs, it does not promote and integrated and active weed management strategy. The no action alternative has the potential to contribute to an overall increase in noxious weed infested area some unknown time in the future, because only open roads that are currently on a treatment schedule and roads associated with power lines would be treated. It is unlikely that roads that are not open to the public would be treated with current budgets and programs. Survey and monitoring that is associated with management activities would only occur on approved projects such as the Forest Wide Fuels project.

Noxious Weed Mitigation Measures Common to All Action Alternatives

The mitigation measures identified in this document and incorporated in Chapter 2 of this document, and the specific weed control measures to be implemented in accordance with the 2007 KNF Invasive Plant Management EIS, were designed to help reduce the spread of weeds in the Miller West Fisher project area and minimize the chance of introducing new species.

The recommended mitigation is focused on prevention as the most effective and least expensive weed management strategy, and early detection and eradication as the best alternative once a new species has been introduced. For established invaders, treating spread vectors and keeping these species out of new locations is the main objective. It is well documented that roads are often the first place to have weed infestations due to the efficiency of vehicles in seed transport and the receptive seed bed available for seed germination and establishment. It is also well documented that roads serve as sources for weed seed to be transported to other locations. Once the roadsides are colonized, the invasive species move into adjacent vulnerable habitat. Because roads serve as a primary spread vector, much of the recommended

mitigation is road related. Specific project mitigation will include all weed BMP's identified in FSM 2080 Noxious Weed Management Handbook. This document highlights the key mitigation measures that will apply to the Miller West Fisher project.

1. Implement Forest Service manual (FSM) 2080 Noxious Weed Management Prevention and control measures.
2. Certified weed-free forage is required for use on all National Forest System lands in Montana (USDA Forest Service 1997).
3. Treat existing noxious weeds on roads to be reconstructed or stored prior to that activity. If possible schedule spraying two or more seasons before activities are expected to occur to reduce the amount of viable weed seed stored in the soil.
4. If roads to be stored or decommissioned are not accessible for herbicide treatment because of vegetation density, brush the roads at least one year ahead of the scheduled activity so the herbicide treatment can occur prior to that activity.
5. Treat existing noxious weeds in gravel/rock pits, inspect these sources for weeds and treat before material is transported. All materials must come from weed free sources.
6. Survey for noxious weeds. If located, treat existing noxious weeds on proposed trailhead construction sites, and access sites for in-stream work.
7. Require weed free certified straw or mulch for all construction, reconstruction and restoration activities.
8. Seed and fertilize stored roads with certified weed free seed immediately following restoration activities.
9. Pressure wash logging equipment, road maintenance, and restoration equipment before entering the project area. Inspect equipment to ensure no dirt or plant parts are transported.
10. Spray open access routes within the project area prior to activities with appropriated funds.
11. Require treatment of existing noxious weeds along haul routes the first operational season for weed spraying (spring or early summer). Treat helicopter landings and service areas prior to yarding activities.
12. Seed and fertilize newly constructed roads, landings, major skid trails, trailheads, before and after use with certified weed free seed.
13. Prevent road maintenance machinery from blading or brushing through known populations of new invaders. In areas where weeds are established and activities are opening and blading restricted or closed roads with significantly lesser infestations, brush and blade road systems from un-infested segments of road systems to infested areas. Where hawkweed is present, brush as much of the road corridor as feasible to increase the areas where herbicide can effectively get to the ground. On dry sites where hawkweed is not present, and other species such as spotted knapweed have high density, limit brushing and mowing to the minimum distance and height necessary to meet safety objectives.
14. Minimize soil disturbance and mineral soil exposure during activities. Soil disturbance should be no more than needed to meet project objectives. This includes not exceeding recommended mineral soil exposure for site preparation in regeneration harvest units, utilizing timing, and designated skid trails to minimize mineral soil exposure in harvest units.
15. Survey proposed burn units for noxious weeds. Determine the risk of spread from prescribed fire. If there is risk of spread beyond the road corridor, defer burning until weeds can be treated, or schedule weed treatment after weed seed germination following the burn. If there is a road adjacent to the burn unit, treat noxious weeds along the road system at a least a year prior to the burn.

16. Continue to monitor/survey the project area for new invader weed species. Monitor weed population levels in treated areas, with particular emphasis on haul routes, stored roads, and landings. Retreat as needed and as funding allows.
17. Treat and sign sites if new invaders are located. Defer ground disturbing activities within those sites until the weed specialist determines the site is no longer a threat, and approves those activities.
18. Site-specific guidelines will be followed for weed treatments within or adjacent to known sensitive plant populations. All future treatment sites would be evaluated for sensitive plant habitat suitability. Suitable habitats would be surveyed as necessary prior to treatment.
19. All noxious weed control activities would comply with state and local laws and agency guidelines, and the Kootenai National Forest Invasive Plant Management FEIS.
20. All herbicides used in the project area would be applied according to the labeled rates and recommendations to ensure the protection of surface water, ecological integrity and public health and safety. Herbicide selection will be based on target species on the site, site factors (such as soil types, distance to water, etc), and with the objective to minimize impacts to non-target species.

Desired mitigation strategies to reduce the chance of noxious weed introduction and spread include:

1. Keep administrative traffic on closed roads to a minimum. Whenever possible, time activities prior to seed set of the primary weed species or emphasis weeds on a given road.
2. Consider winter logging to reduce mineral soil exposure and the chance of spreading existing noxious weeds.
3. Approved bio-control agents will be released on suitable sites, as funding allows. New bio-control agents will be released as they become available.
4. Plan follow up noxious weed treatment the spring or early summer, following final purchaser blading of all haul roads if funds allow (this will be funded with appropriated or KV dollars).
5. Design road storage to allow passage of a 4-wheeler to continue treatment of hawkweeds in the future. Hawkweed populations will continue to expand even after the template has re-vegetated.
6. Coordinate with Lincoln County and Plum Creek Timber Company on noxious weed management strategies in the Miller West Fisher project area.

Consistency with the Forest Plan and Other Management Direction

Forest Service Manual (FSM) 2080.1 directs the National Forests to conform to the Federal Noxious Weed Act of 1974, as amended.

The Lincoln County Weed Control Act (MCA 7-22-2116) indicates that "it is unlawful for any person to permit any noxious weed to propagate or go to seed on his land, except that any person who adheres to the noxious weed management program of his district or who has entered into and is in compliance with a noxious weed management agreement is considered to be in compliance with this section."

The Kootenai National Forest has entered into a weed Memorandum of Understanding (MOU) with Lincoln County, which is a management agreement under this law. Because the mitigation measures identified above, and described in **Chapter 2** will be followed, this project is in compliance with the MOU and the Federal Noxious Weed Act.

These actions will also help to meet the goal for noxious weed management as stated in the Forest Plan.

It is recommended that post harvest weed management treatments be a high priority for any available KV funding.

WILDLIFE

INTRODUCTION

The Kootenai National Forest provides habitat for approximately 280 different species of wildlife (Kootenai Forest Plan, Appendix 12, pg. A12-1), many of which occur on the Libby Ranger District and within the Silverfish Planning Subunit. 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 Fish, Wildlife and 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 and 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 Environmental Impact Statement, 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 2004b).

The cumulative effects analysis considered the projects/activities within the Silverfish planning subunit (hereafter referred to as Silverfish PSU) as described earlier in Chapter 3. All projects listed were considered for each species evaluated, however, it is possible for a particular species that there were no cumulative effects from one or more of these 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 2005), Pfister et al. (2000), Kootenai Supplement No. 85 to FSM 2432.22 (1991), and Castaneda (2004). 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. Data sources to identify old growth stands include District files and surveys and the KNF old growth GIS layer.

Field verification of old growth has occurred by several methods. Some stands were inventoried using one of the procedures developed for use on the Libby Ranger District (see Old Fisher River Old Growth Process Paper, USDA 2003a). This survey procedure, developed by Gary Altman (Altman 1990) and used from 1990 to 2000, rates the structural features of old growth forests as defined in the Kootenai National Forest Plan (see Appendix 17 Kootenai NF Integrated Plan 1987). Some stands were inventoried using the Old Libby Ranger District Old Growth Process Paper (USDA 2003b), while some more recent surveys use the KNF old growth protocol surveys. A number of stands originally inventoried by walk through surveys or photo-interpretation still need to be surveyed, with surveys dependant upon funding and personnel.

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 associated wildlife species, refer to the pileated woodpecker analysis in the Management Indicator Species (MIS) section of this document.

Criteria used to compare the alternatives for this project by their impacts on old growth include:

1) Acres of vertical structure removed. These are the acres of direct harvest of designated old growth. This includes both effective (OG) and replacement (ROG) old growth.
2) Acres of harvest in undesignated effective OG.
3) Acres of harvest in undesignated replacement old growth.
4) Road length built adjacent or through designated old growth (in feet).
5) Number of proposed units adjacent to old growth.
6) Acres of edge effect in old growth.
7) Acres of interior habitat remaining in old growth.
8) Acres of additional old growth designated**.**
9) Acres treated to maintain old growth characteristics or trend toward old growth.
10) Percent of designated old growth (OG/ROG) in the PSU.

Current edge effects were determined by buffering existing regeneration harvest units (TSMRS activity codes 4100-4134) that are ≤ 30 years old and bordering old growth stands by 300 feet (three tree heights- Russell et al. 2000: 134; Harris 1984: 110-111; Morrison et al 1992: 84; Province of BC 1995: App. 1, and Ripple et al. 1991: 79). On the Kootenai the average old growth tree height across old growth types is 100 feet (KNF TSMRS). Effects of Alternatives were determined by using the same buffer on proposed regeneration units that border old growth stands.

The analysis boundary for project impacts and cumulative effects to old growth is the Silverfish PSU, 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. Timber harvest and fire history are discussed in the Fisher NFMA assessment (USDA 2003), and the vegetation section of the EIS. Existing old growth surveys within the Silverfish PSU have identified (either plot, walk through, or photo-interpretation inventory method) approximately 6,900 acres of designated and undesignated old growth (Out of this 6,986 designated acres, 266 acres are located over 5,500 feet in elevation in the Silverfish PSU). Please see the old growth map at the back of this document for location of old growth stands within the PSU. Of this 6,986 acres, approximately 6,720 acres are located below <5,500 feet in elevation. Of these 6,720 acres, designated old growth totals 5,296 acres, and designated and undesignated replacement old growth totals 1,361 acres. Replacement old growth stands have many old growth characteristics, but not enough to be considered old growth currently. These stands have the

potential to become old growth in time. Table 3-1 summarizes the designated and undesignated status of the OG and ROG acres within the Silverfish PSU and the Kootenai National Forest-wide situation.

Table 3-78 also shows the minimum acres required to be designated to meet forest plan standards. Designated old growth stands in the project area generally support the habitat conditions described in "Old Growth Forest Types of the Northern Region" (Green et al. 1992, errata corrected 02/2005).

Table 3-78 - Forest Service and old growth acres under <5,500 feet elevation in the Silverfish PSU and Forest-wide

	SILVERFISH PLANNING SUBUNIT		KOOTENAI NATIONAL FOREST	
	Acres	Percent (%)	Acres	Percent (%)
Total NFS lands	60,515			
Total NFS lands below 5,500 feet elevation	52,078		1,869,222	
Minimum acreage designation required by Forest Plan	5,200		186,922	10
DESIGNATED OG (MA13, or OG MA)				
Designated effective OG	5,296	10.2	138,902	7.4
Designated ROG	1,361	2.6	62,605	3.3
Designated unknown (UNK) (KNF Forest Plan)	63	<1	19,558	1.1
Total designated OG, ROG and UNK	6,720	12.9	221,065	11.8
UNDESIGNATED EFFECTIVE OG AND ROG				
Undesignated effective OG	0	0	61,192	3.3
Undesignated ROG	<10	<1	36,229	1.9
DESIGNATED AND UNDESIGNATED OG, ROG, UNK TOTALS				
Total designated and undesignated effective OG	5,296	10.2	200,094	10.7
Total designated and undesignated ROG	1,361	2.6	98,834	5.3
Designated unknown (UNK) (KNF Forest Plan)	63	<1	19,558	1.0
All old growth acres below 5,500 feet	6,720	12.9	298,699	16.0

*Acres were updated in May 2006 for the Silverfish PSU. Inventory of old growth completed in 2006 and 2007. Final acreages may be different. Forest-wide acres are of April 2008. Above 5,500 feet, an additional 266 acres are designated old growth.

The 2007 Forest Plan Monitoring Report (FY2007, April 2008) indicates the KNF has 1,869,222 acres below 5,500 feet elevation (minus lakes and highways). Using the stand-level data, there are currently 199,865 acres or 10.69% of KNF acres below 5,500 feet that are old growth (designated or undesignated). An additional 98,834 acres are replacement old growth (designated and undesignated). Forest-wide, old growth or replacement old growth on the KNF totals 298,699 acres or 16.0% 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 9.0% of the Forest, with a 90% confidence interval of 7.2% to 10.9%. 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 5,500 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 FY 2007 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.

The Silverfish PSU totals 69,415 acres, with 60,775 acres below 5,500 feet (52,078 acres of NFS and 8,697 acres of other state or private lands). Old growth stands on Corporate timber land and State lands have been harvested, and the 6,720 acres of old growth remaining on NFS lands<5,500 feet is approximately 11% of all lands <5,500 feet within the Silverfish PSU, regardless of ownership. As shown in Table 3-78, across the Kootenai National Forest, the percent of NFS acres designated as an old-growth MA is 11.8%. The present allocations within the Silverfish PSU of 12.6 percent are above Forest Plan direction as clarified in FSM 2432.22. Over 5,500 feet within the Silverfish PSU, 266 acres have been designated as old growth (designated effective, replacement, and unknown).

Old growth stands in the analysis area are mainly composed of old larch, ponderosa pine and Douglas-fir, and other conifers. There are several areas of large contiguous old growth blocks in the PSU, as well as some isolated and fragmented old growth stands. Field verification of all stands identified as MA13 within the Silverfish PSU is completed (fall 2008).

Stands with old growth character and least fragmentation in the analysis area have been allocated to MA 13 or other old growth MAs. Replacement old growth stands were designated to provide old growth in the future within the PSU. Replacement old growth above the forest plan standard was identified to provide connectivity between effective old growth stands, or to conserve areas with a component of old growth micro-sites and evidence of ecological continuity. Those inventoried stands best meeting old growth definitions were allocated to old growth MAs. Old growth management area designations within the PSU have been delineated to conserve the best old growth attributes available; and to provide the best distribution, size, habitat type, and quality of what is available. These old growth areas are composed of old growth stands that are physically connected to other old growth stands where possible, or are interconnected to adjacent old growth stands with connector stands composed of 100+ year old age classes where possible.

Block Size

When undesignated old growth and replacement old growth stands are considered in conjunction with designated stands, there are approximately 51 blocks of 17 to 500 acres in size. Of these 51 blocks, 29, or 57%, are greater than 50 acres in size. These larger blocks for wildlife species that utilize old growth provide adequate interior habitat and connectivity within the areas of National Forest System (NFS) lands. Also, additional stands smaller than 50 acres in size have been designated to protect additional attributes unique to old growth where they exist in the subunit 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

Of the stands designated in old growth management areas, (including both effective and replacement) the distribution (percentage) within vegetation response units (VRU's) reflects the availability of old growth that remains rather than reflecting similar distribution of VRU's found within the PSU. Though the project area is above the minimum standard for old growth with a total of 16 %, it lies outside the historic range of variability for old growth per VRU. Table 3-79 shows the distribution of old growth (<5,500' elevation) by VRU.

Table 3-79 - VRU acres of all lands, VRU acres by NFS Lands, and old growth (OG, both effective and replacement) acres by NFS lands only within the project area

VRU	HRV OG (%)	VRU ALL LANDS		VRU NFS LANDS		VRU NFS LANDS <5,500 FEET ELEV.		TOTAL DESIGNATED OG/ROG/DUNK ACRES (AND PERCENT) OF VRU ON NFS LANDS <5,500 FEET ELEVATION	
		Acres	%	Acres	%	Acres	%	Acres	%
1	40-70	1,706	3	1,211	2	1,211	2	12	<1
2	20-50	8,341	12	6,668	11	6,668	13	627	9
3	15-40	4,227	6	3,841	6	3,841	7	620	16
4	10-40	8,690	13	7,783	13	7,783	15	1,082	14
5	25-55	20,760	30	17,469	29	17,470	33	2,120	12
6		94	1	94	1	94	1	63	67
7	15-45	14,819	21	12,894	21	11,250	22	2,026	18
9	5-10	9,897	14	9,649	16	3,750	7	169	4
10		914	1	909	1	14	0	0	
Total		69,418		60,518		52,081		6,720	

*There is no undesignated OG or ROG stands. There are 84 acres of VRU7 and 182 acres of VRU9 designated old growth located above 5,500 feet

These designated and undesignated 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 9/04). That information is incorporated by reference. In summary Green 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, white pine) 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 (ibid).

Before timber harvest became prevalent in the northwest, wildfire was the dominant disturbance that shaped old growth stands. Understanding fire ecology is crucial to interpreting the effects fire has on the landscape and landscape processes. Relative to wildfire, the habitats that influence the development of old growth within the project area can be categorized into 3 broad groups: Dry site/fire maintained old growth habitats low severity; moist/mesic transitional old growth habitat mixed severity; and fire refugia. This are discussed by Green et al (1992, errata corrected 9/04), Habeck (1988) Camp et al. 1995), Zack and Morgan 1994) and these references are incorporated by reference

Disturbance

Historically, landscape patterns were created and maintained by natural disturbance regimes. Disturbances that kill some or all vegetation in a particular location are an intrinsic part of ecosystem development. Ecosystems and landscapes change over time as a function of vegetation characteristics and disturbance regimes (Camp et al 1997).

Within existing designated old growth (both designated effective and designated replacement) there are 3.91 miles of road. Of this, 1.64 miles are restricted year round to motorized vehicles including over snow, 0.19 miles are restricted year round with over snow allowed, 0.48 have no restriction order issued, 0.04 are previously decommissioned, and 1.56 miles are open year-round. Road construction and maintenance has removed standing snags, and open roads allow for potential access by firewood cutters to remove standing snags.

There are approximately 35 old growth stands with one or more edge adjacent to regeneration units (stands <30 years old). The impacts of harvest units by alternative are displayed in Table 3-80. These units create an edge influence on about 434 acres of old growth. The impacts of cumulative activities listed in Chapter 2 are displayed under Alternative 1, the no action, as well as in combination with the action alternatives.

Environmental Consequences

The following table displays a comparison of effects to old growth habitat by alternative. These criteria are discussed under each alternative.

Table 3-80 - Summary of measurement criteria to evaluate effects to old growth

MEASUREMENT CRITERIA	EXISTING CONDITION	ALT 1 CUM1 AND CUM2	ALT 2	ALT 4 AND ALT 7	ALT 6, INCLUDING SUBDIVISION A (6A)
Acres of vertical structure removed in designated OG/ROG	0	0	0	0	0
Acres of vertical structure removed in undesignated OG	0	0	0	0	0
Acres of vertical structure removed in undesignated ROG	0	0	0	0	0
Road length built adjacent or through designated OG (in feet)	0	0	0	0	
Number of proposed units adjacent to old growth (harvest/burn)	0	0	2	1/7	1/6
Acres of edge effect in old growth (total)	434	403	689	661	661
Acres of interior habitat remaining in old growth	6,607	6,579	6,357	6,382	6,382
Acres of additional effective old growth designated	0	0	0	0	0
Acres treated to maintain old growth characteristics or trend toward old growth with prescribed burning only	0	+-211	105	86	84
Percent of designated old growth in the planning sub-unit	%	13	13	13	13

[1] *Alternative 1 (CUM1 or CUM2 or Alt. CUM2) has no direct effects as no activities, including harvest, burning or road building are proposed. The activities displayed under Alternative 1 are the cumulative effects from other planned or reasonably foreseeable activities. Where applicable, they can be added to the acres in the action alternatives to see cumulative effect acres.

Management activities (including timber harvest, road construction, mining etc.) have the potential to impact the effectiveness of existing old growth habitat or specific components of old growth. These specific components include interior habitat and vertical structure.

Timber harvesting can affect adjacent old growth stands by altering six microclimatic factors: solar radiation, soil temperature and moisture, air temperature, relative humidity and wind speed (Chen et al. 1995). Microclimatic changes lead to vegetative changes (e.g. species richness, diversity, structure, composition) (Russell and Jones 2001). Changes in vegetative conditions may lead to effects such as changes in wildlife species using the area; species abundance and higher predation (Askins 2000: 120) (see pileated woodpecker analysis). All these effects extend varying distances into the uncut stands depending on a number of variables (e.g. aspect, slope, elevation, wind speed and direction, etc.). While there is no single answer to how wide the area influenced by edge is (Chen et al. 1995), research (Harris 1984, Russell et al. 2000, Morrison et al. 1992, Ripple et al. 1991; Province of BC 1995) has identified a three tree height general rule as the distance effects occur. On the Kootenai National Forest, average tree heights across old growth types is 100 feet, and edge effects are considered to occur for 300 feet (Johnson, W. pers. Communication 2/16/05, Johnson 2006a). Table 3-80 (above) displays the acres of old growth influenced by edge effects. The depth of influence is also related to time since harvest, with effects dissipating within 20 to 50 years, depending on the factor (Russell and Jones 2001, Ripple et al. 1991, Russell et al 2000). In the Silverfish PSU, average tree growth in regeneration units result in tree heights (20-50 feet) and densities (fully stocked stands) that reduce the depth of influence from edge effects after thirty years.

While changes in vegetation and wildlife use may occur on the acres influenced by edge, those acres remain functional old growth for some species. The old growth acres not impacted by edge effects provide interior habitat.

Alternative 1 (with CUM1 or CUM2)

Direct, and Indirect Effects

The no action alternative would have no direct or indirect effect on designated old growth or associated plant and wildlife species (see also pileated woodpecker discussion). The conditions for all measurement criteria (see Table 3-80) 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 habitat over a long term.

Existing conditions include the effects of edge from adjacent existing regeneration units, and roads opened for firewood cutting during previous years. Roads opened for firewood cutting may result in some continuing level of snag removed from the old growth stands. See Table 3-80 (above) for acres impacted.

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 accrue until a natural disturbance occurs. Over a longer time period, this could disrupt the dry-site old growth structure and function, but in the next 10 years, these stands would still provide the habitat required for dry-site old growth species. 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.

Cumulative effects

Past road construction projects, tree harvest, fire suppression, and natural events have created the existing habitat conditions for old growth dependent species. Cumulative effects of past projects on wildlife on the Kootenai National Forest has been summarized in Johnson (2006a). Effects on old growth resulting from existing and reasonably foreseeable regeneration harvest units or power line construction (please see Chapter 3) are displayed in Table 3-80 under Alternative 1 (CUM1 or CUM2). The cumulative activities considered are the same except for the location of the proposed MMI power line. Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alt. 1 CUM2 considers the power line location in the West Fisher (Modified West Fisher 2 in the Montanore EIS). Cumulatively, the harvest units located on private land create an edge influence on about 403 acres of old growth. The power line locations considered for cumulative effects do not impact any old growth stand in the project area.

The Cumulative Effects Worksheet, located in the Wildlife Project File, considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed in Chapter 3. Those activities that cumulatively contribute indiscernible effects on old growth habitat or associated species, as well as those activities that cumulatively affect old growth habitat or associated species, such as firewood gathering and private land development are discussed. (Please see project file.)

Effects of the Action Alternatives 2, 4, 6, and 7

Direct and Indirect Effects Common to all action alternatives

No new roads or temporary roads would be constructed through designated or undesignated old growth stands in any action alternative.

All action alternatives would store portions of two roads, Rds. 99803 and 99803A adjacent to old growth. These roads are currently undrivable, but in the long term, the availability of snag habitat would be maintained and improved in these areas.

Portions of roads to be opened for the action alternatives may pass through designated old growth stands. Road 4726 impacts two designated effective stands. Road 2314 would be open to store road 2314M, but public access would not occur. These stands will have an increased risk for indirect removal of large diameter snags due to public *firewood gathering* when the roads are open for management activities. As mitigation, all old growth stands located on these roads would be signed to prevent firewood cutting.

A number of design criteria and/or monitoring items would be implemented to maintain and improve snag habitat. Identified tasks include: the retention of snags and dead merchantable trees; retention of live cull and dead-top trees; retention of fire-killed trees; retention of reserve trees; inoculating live trees with heart-rot pathogens to create live snags over the long term; provide for large woody material; and monitoring snag levels

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

A. Block Size

None of the action alternatives propose to harvest within designated MA 13 old growth habitat. Consequently, all action alternatives would maintain the existing number of blocks and block size for designated old growth. All action alternatives would also maintain the existing block size of undesignated old growth habitat.

B. Distribution

None of the action alternatives change the distribution and percentage of old growth by VRU type.

C. Stand Structure

All alternatives maintain the existing stand structure of 12.6 percent designated old growth within the Silverfish PSU. No additional old growth acres are added.

D. Disturbance

No harvest would occur in existing designated old growth stands under any action alternative. No timber harvest is proposed or designed to improve or preserve attributes that could develop old growth character in the future.

All alternatives propose prescribed fire that overlaps two designated old growth stands. Underburn Unit B8 would treat 44 acres of MA 13, B11 would treat 16 acres of MA 13, B12 would treat 2 acres of MA 13 and 1 acre of MA 18 OG, while B13 would treat 2 acres of MA 2OG. This treatment complies with forest plan direction and would maintain and enhance the old growth characteristics of the drier ponderosa pine stands. B8, B11, and B12 are considered low severity fire regimes and are located on the ridge top with grass and shrubby brush fields, and some inclusions of ponderosa pine, lodgepole and Douglas-fir. B13 is comprised of grass and brush fields on the ridge but extends down into open timber, and is a mix of low to mixed fire severity. (Please refer to the vegetation section for a discussion on fire severity regimes.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to old growth because they do not occur in or adjacent to old growth.

Effects by Action Alternative

Direct and Indirect Effects

Disturbance

No harvest treatment is proposed in any designated old growth or replacement old growth stand, or any undesignated old growth or replacement old growth stand. Within old growth, underburning would occur under each alternative.

Fire exclusion in these VRUs tends to create a greater uniformity in ages and composition/structure – with a declining diversity of undergrowth species (Arno et al. 1993 and Keane et al. 1996). Basal area and trees per acre increase dramatically. This results in increased physiological stress and opportunity for higher than endemic increases in insect- and disease-caused mortality (Arno et al. 1997, Fellin 1980, Biondi 1996). Fire exclusion also results in increased loadings of dead and living (ladder) fuels across the landscape that can increase the likelihood of severe and extensive wildfires (Barrett et al. 1991, Barbouletos et al. 1998, Quigley et al. 1996, Morgan et al. 1998).

Alternative 2 proposes 7 units (B8, B10, B11, B12, B13, B18, B19, and B20), Alternatives 4, and 7 propose 7 units (B8A, B8b, B10, B11, B13, B19A, and B20), and Alternative 6 proposes 6 units (B8a, B8b, B11, B13, B19A, and B20). The purpose of the underburning is to reduce fuel loading and ladder fuels that have grown in due to fire suppression. The outcome would be the maintenance of old growth structure and function in the treated areas.

All action alternatives propose *precommercial thinning* on approximately 351 acres. This would occur in existing regeneration units and would have no direct, indirect, or cumulative effect on old growth. As roads opened for thinning would not be opened to the public, incidental removal of snags for firewood cutting should not result from precommercial thinning activities.

All action alternatives propose prescribed fire that is not associated with commercial timber harvest. These burns are proposed mostly for fall burning, but some for spring or fall. Many of these areas fall within inventoried roadless areas and do not have opportunities for commercial timber harvest prior to burning.

Cumulative Effects of Action Alternatives

Past road construction projects, tree harvest, fire suppression, and natural events have created the existing habitat conditions for old growth dependent species. Cumulative effects of past projects on wildlife on the Kootenai National Forest have been summarized in Johnson (2006a).

The Cumulative Effects Worksheet, located in the Wildlife Project File, considers and describes proposed activities, in addition to the past, current, and reasonably foreseeable activities listed in Chapter 3. These include activities such as firewood gathering and private land development that cumulatively affect old growth habitat or associated species.

All action alternatives propose harvest treatment units that are adjacent to old growth and replacement old growth blocks (a portion of the proposed unit is adjacent to one or more edge of the old growth stand). The proposed harvest may result in an additional edge influence on the existing blocks of old growth. Those proposed units with the objective to restore ponderosa pine and historic stand density in the drier open stands are not expected to increase edge effect in the existing dry ponderosa pine/Douglas-fir MA13. Seed tree harvest adjacent to just one edge of the old growth stands will subject the edge to drying and invasion by early successional plant species (Morrison et al 1992). Some impact on snags in the adjacent old growth stand may also occur due to OSHA safety concerns in the harvest unit. Alternative 2 increases edge influence by 255 acres (to 689 acres total), and Alternatives 4, 7, and 6 increase edge influence by 227 acres (to 661 acres total) over the existing condition (please see Table 3-80).

The **action alternatives**, in combination with other proposed and reasonable foreseeable activities proposed by the Forest Service and other private corporations would maintain the amount and suitability of old growth and old growth habitat needed by such species as the pileated woodpecker.

Regulatory Consistency

All alternatives are 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 26th, 2004 direction (Castaneda 2004), old growth is analyzed on the PSU scale. There is approximately 12.9% of designated old growth <5,500'in the Silverfish PSU. A recent Forest-wide assessment (USDA Forest Service 2008) shows that the Kootenai National Forest has 16% MA 13 designated (please refer to Table 3-78). 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 in the project area.
- *MA13 Timber standards*: All alternatives comply with standards 1 and 3. . Firewood cutting could impact snags located in old growth habitat, and this effects 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 recent sites specific post harvest snag surveys in the Silverfish PSU, although the old growth surveys do record snags. These surveys recorded snags in diameter classes based on wildlife habitat needs. Additional dead tree information from TSMRS was not available. See old growth project file for details.

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). The analysis process was based on the field data and applied as a worst case scenario. Old growth stands provide 100% snag level (SL) as do untreated forest stands (Tincher 1998). Partial cut stands provide at least 60% snag level (Johnson and Lamb 1999). 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 1999). Post 1987 Forest Plan, (1993-2002) 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% snag level 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 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 and live culls provided a majority of the cavity habitat, with fire resistant ponderosa pine providing most of the large (>19" DBH) snags and live culls. VRU 3 has a higher component of larch snags and culls, 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, live cull 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 3-81 summarizes the existing population potential on National Forest System (NFS) lands in the Silverfish PSU.

Table 3-81: Existing population potential on NFS lands in the Silverfish PSU

HABITAT COMPONENT	ACRES	PERCENT OF SUB-UNIT	TOTAL SNAGS PER ACRE \1	SNAG LEVEL PERCENT	HABITAT POTENTIAL \2
OLD GROWTH	6,986	11.5%	(2.25)	100 \3, \4	11.5%
UNTREATED FOREST	41,081	68%	(2.25)	100 \3, \4	68%
PARTIAL CUT FOREST \6	3,408	6%	(1.35)	60 \3, \5	3%
PAST REGEN. HARVEST (1993-PRESENT) \7	225	.4%	(0.9)	40 \3, \5	.4%
PAST REGEN. HARVEST (THRU 1992) \7	1,408	2%	0	0 \5	0
ROADS AND BUFFER (53 ACRES PER MILE)	7,407	12%	0	0	0
TOTAL SUB-UNIT	60,515				83%

\1 Value in parenthesis is based on Thomas 1979 Table 18 (pg. 72) and includes all snags ≥ 10" DBH.
\2 Percent of sub-unit times snag level percent = proportionate habitat potential for each component. Sum of proportionate habitat potentials from all components equals the Sub-unit potential. (Thomas 1979: 72-73)
\3 Managed snag level percent
\4 Based on Tincher (1998)
\5 Based on Johnson and Lamb (1999)
\6 Partial cut forest includes TSMRS activity codes: 4150 thru 4241
\7 Regeneration harvest includes TSMRS activity codes: 4100 thru 4149

The existing PPL on NFS lands is calculated at 83% percent of maximum (see Table 3-81 above). This meets current Forest Plan direction. Considered in the existing condition are the effects of all past activities. 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 is being met. Forest riparian standards, as amended by INFS, assure the 60% level is being met in those areas.

Snag data for corporate, state and small private lands was not available but district reconnaissance has indicated limited snags. Of the 8,697 acres of non-USFS lands, regeneration harvest has occurred on 2,796 acres, partial cut treatments on 1,508 acres, and roads impact 4,385 acres (with 82.75 miles of road and using the 53 acres of impact per mile).

Environmental Consequences

Table 3-82 summarizes the potential population levels by alternative. No activities are proposed under Alternative 1. Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion) Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Table 3-82: Cavity Excavator potential population level (%) on NFS lands by Alternative based on Forest Plan Standards

	EXISTING CONDITION	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2	ALT. 4 AND ALT. 7	ALT. 6 AND 6A
PPL (%) In PSU	83%	82% (-1)	82% (-1)	80% (-3)	80% (-3)	80% (-3)
Acres treated that reduce snag level	12,448	104	220	2,446	1,364	1,835

* Value in parenthesis is percent change (+/-) due to Alternative.

The acres displayed under Alternative 1 are the cumulative effects from other reasonably foreseeable projects. Alt. 1 CUM1 acres due to power line construction in North Fork Miller Creek and miscellaneous harvest on NFS lands; Alternative CUM2 acres due to power line construction in West Fisher, and miscellaneous harvest on NFS lands. These acres can be added to the action alternative acres for cumulative acres impacted.

Alternative 1 (with CUM1 or CUM2)

Direct and Indirect Effects

Under the no action alternative, no activities would be proposed, so **no direct** effect to snags would be expected with this alternative. 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 can not be calculated due to the high uncertainty in predicting occurrence and intensity levels.

Cumulative Effects

Alternative 1 would not authorize any cumulative snag-reducing activities. Suitable habitat would still occur on NFS lands. Any change in snag potential is a result of other reasonably proposed or existing cumulative activities as described in Chapter 3. Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same except for the location of the proposed MMI power line (please see Chapter 3 Current and Foreseeable Actions section for a full discussion) Alternative 1 with CUM1 considers the MMI power line in Miller Creek while Alternative 1 with CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Cumulatively, the Forestwide Fuels Reduction and Wildlife Habitat Enhancement EA (FFRWHE) program will treat approximately 1,056 acres in the project area with *slash and/or burning*. As a **direct** result of prescribed fire, some, but not all snags are generally lost in treated areas. The direct loss of snags due to burning would directly reduce both feeding a nesting habitat for snag dependent species. However, the burning would also result of the creation of snags, which would **indirectly** provide both feeding and nesting habitat. On those areas not treated under the FFRWHE program, indirect effects in the drier type old-growth areas would continue with Douglas-fir regeneration and encroachment. This stress may kill some of the larger ponderosa pine overstory trees in the stands, resulting in a higher percentage of snags in the short-term. Over time this could result in a higher percentage of Douglas-fir trees throughout all canopy layers over the next several decades.

Cumulative effects of past projects on wildlife on the Kootenai National Forest have been summarized in Johnson (2006a).

PPL is not calculated for private lands. Based on records of timber harvest, estimate of road impact acres, and district field reports, snags are not readily available on harvested private lands. Planned harvest on private lands would impact approximately 1,864 acres, and it is expected that snag availability on these lands would be reduced.

Sufficient nesting and foraging habitat would remain in the Silverfish PSU. On NFS lands, all existing old growth habitat, along with corridor links composed of multi-aged stands would be maintained. Any slashing and burning conducted under the FFRWHE would encourage the retention of old growth ponderosa pine habitat within VRU's 1, 2, 3 and 4. Other *annual activities,* including firewood gathering would continue to remove remaining snags from the open road corridors.

The no action alternative, 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 availability of snag habitat because Alternative 1 would not directly authorize any snag-reducing activities. Suitable cavity habitat would still occur on NFS lands. The NFS lands, with an 82% PPL, are expected to provide for a population level above 40%. Cumulatively, other timber harvest activities could reduce potential foraging sites.

Direct, Indirect, and Cumulative Effects Common to All Action Alternatives

Management activities that could reduce snags in riparian areas are restricted by Riparian Habitat Conservation Area (RHCA) standards and guidelines (USDA Forest Service 1995) on NFS lands. For the proposed activities, this would result in 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.

Proposed *precommercial thinning* on approximately 351 acres would occur in existing regeneration units which would have no direct, indirect or cumulative effect on existing snags. As roads opened for thinning would not be opened to the public, incidental removal of snags for firewood gathering should not occur.

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 Alternatives 2, 4, 7, and 6 (Alt 6 includes subdivision A)

Direct and Indirect Effects

Implementation of the action alternatives would have *direct* effects on snag habitat. Table 3-83 summarizes those project activities that would reduce potential population levels.

Table 3-83 - Project Activities Impacting Snag Habitat on NFS lands

ACTIVITY	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2	ALT. 4 AND ALT. 7	ALT. 6
Regeneration Harvest (acres)	159	275	1,185	514	859
Partial Cutting (Improvement) (acres)	0	0	1,261	850	976
TOTAL timber harvest acres	159	275	2,446	1,364	1,835
Temporary Road Construction (miles)	3.99	3.69	1.2	<.5	1.89
Prescribed Fire Only (acres)	1,056	1,056	3,175	2,830	2,830

Acres displayed in the no-action alternative are the cumulative effects from other planned or reasonably foreseeable activities on NFS land as described. Difference between Alt 1 CUM1 and Alt 1 CUM2 is the location and road building considered for the MMI power line on NFS lands. These acres can be added to the acres in the action alternatives to see cumulative effect acres. Acres of timber harvest in the no action alternatives are largely related to the construction of a power line and associated roads.

Management activities that could reduce snags in riparian areas are restricted by Riparian Habitat Conservation Area (RHCA) standards and guidelines (USDA Forest Service 1995) on NFS lands. Any harvest activities included in the action alternatives would result in meeting the riparian standard for snag levels (60%). For the Miller West Fisher action alternatives, no harvest would occur in RHCA's. Any previous harvest was considered in the existing condition.

Loss of snags would occur within the identified treatment areas due to OSHA regulations. Specifically, OSHA requires that snags in harvest units be felled to ensure the safety of forest workers. The Libby Ranger District is no longer marking snags to leave within helicopter and skyline units. This may also occur on tractor/skidder units, depending on snag condition, location, and size in relation to skid trails and falling personnel. For **all alternatives**, any un-marked snags felled for safety reasons may be removed for timber volume or firewood use by the contractor.

Regeneration harvest in the action 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.

Timber harvest is proposed in MA 10. **Alternative 2** would helicopter log on a total of 49 acres of MA 10 (improvement harvest in units 103, 104, and 109), and helicopter log units 105 and 106 (22 acres of a mix of MA 10 and MA 11). **Alternative 2** would include a project-specific amendment which would suspend the requirement that existing cavity habitat be retained in MA 10. **Alternatives 4, 7 and 6** drop all timber unit acreage on MA 10 in order to meet Forest Plan standards.

In the long term, the proposed *improvement* harvests identified in the action alternatives are expected to provide for the continuity of large diameter overstory ponderosa pine and Douglas-fir. This in turn provides a long-term benefit to cavity-dependent species by retaining the large diameter trees in the overstory, 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 overstory 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 understory, which will likely be removed or toppled during logging operations. Depending on the logging method used, OSHA safety standards may result in the loss of standing existing snags. Adequate replacement trees of larger sizes however, would be retained to provide habitat features needed by snag dependent wildlife in the future. *Regeneration* harvest can potentially impact long-term cavity habitat, since fewer trees are left on site to be recruited as snags or snag replacements. Table 3-83 displays the acres of regeneration harvest by alternative. Table 3-83 included the mixed treatment units of

improvement/regeneration under the regeneration harvest. The actual impact on existing snags would be between the effects described above.

The subsequent proposed prescribed underburning 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 or prescribed fire on non-harvest units may result in some fire killed trees and subsequent feeding/nesting sites.

A potential KV project if funded, would create snags in existing harvest units utilizing either girdling or inoculation. Inoculation is preferred due to the natural process and longevity of the created snag, but where mistletoe is a concern, girdling may occur. Where no existing snags are retained, or where marked existing snags are cut for safety, creation of snags would help mitigate for this loss.

The proposed improvement and reconstruction or rerouting of trail tread may impact some snags. Construction of stock corrals in Lake Creek Campground, pool creation and stream bank stabilization, activities to restore Standard Lake, spring development, and implementation of BMP's will not have an effect on snags because they will not change access to snags or cause snags to be felled. Removal of fuels and hazard trees in Lake Creek Campground also will likely not impact snags because campers have most likely used any dead trees already for camp fires.

Cumulative Effects

Cumulatively, when other activities including the harvest on both private and federal lands discussed under the no action alternative, and all past, present, and reasonably foreseeable activities on both private and federal lands are considered, habitat on federal lands is considered sufficient to provide cavity habitat to cavity dependent species. The primary excavator potential population level on NFS lands is estimated to drop from 83% to 80% after implementation of any of the action alternatives. This level of snag habitat 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) on NFS lands.

Cumulatively, across the Silverfish PSU, the cavity habitat potential is expected to be lower due to the limited snag availability on private lands. As discussed under Alternative 1, private timber harvest is expected to occur on approximately 1,864 acres. The cumulative effects on NFS lands include the impacts from potential harvest and the construction of roads, and a power line (Alt 1 CUM1 approximately 60 acres of timber removal for road construction and 99 acres for power line construction in Miller Creek, and Alt. 1 CUM2, approximately 60 acres of timber removal for road construction and 215 acres for power line construction in West Fisher Creek). The 60 acres is based on an estimate of road construction and potential timber removal.

Cumulatively, when other activities including the harvest on private land discussed under Alternative 1, and all past, present, and reasonably foreseeable activities on federal lands are considered, a 80% cavity habitat level would be sufficient based on standards established for NFS lands. National Forests can only manage habitat on NFS lands; the case for viable populations must be made on NFS lands. In the case of a post fire snag specialist like the black-backed woodpecker, Sampson's (2006) conservation assessment determines that the critical habitat threshold needed for maintaining viable populations of black-backed woodpeckers is far exceeded on NFS lands across the Northern Region and on all of the individual forests including the Kootenai. This assessment covered the period of 2000-2003. An updated

assessment of critical habitat available on the Kootenai over the last seven years is detailed in the black-backed woodpecker section.

The 2007 Forest Plan monitoring report (USDA, US Forest Service 2008) documents results for the past 16 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

The current Management Area (MA) 10 Wildlife and Fish Standard #3 (Forest Plan, Volume I, III-39) states "Existing cavity habitat will be retained". Kootenai Forest Plan cavity habitat standard in MA 10 is met. **Alternative 2** includes a project-specific amendment to suspend the requirement to retain all existing cavity habitat in MA 10. The amendment is for the Silverfish PSU, only for the duration of this specific project. However, all units will still meet the 40% minimum level with replacement and seed trees for future snags. As mitigation, a potential KV project if funded, would create snags in existing harvest units utilizing either girdling or inoculation.

All proposed units that mark and retain snags are designed to maintain at least 40% snag levels. Those units that do not mark snags would not maintain a current 40% existing snag level. Green replacement trees would be left for future recruitment as snags in these proposed unit areas. No alternative causes the Silverfish PSU overall PPL to drop below the general forest 40% or riparian 60% primary cavity excavator potential population level standards (or as amended).

DOWNED WOODY DEBRIS HABITAT

Data Sources, Methods, Assumptions, Bounds of Analysis

Down woody debris is woody material derived from tree limbs, boles, and roots in various stages of decay (Graham et al 1994), and performs many physical, chemical and biological functions in forest ecosystems. Coarse woody debris is generally defined as any woody residue larger than 3 inches in diameter. The minimum piece size to qualify as a down "log" is 8 feet long with a large-end diameter of six inches or more (Bull et al. 1997). The ecological processes and functions of downed woody debris are discussed in many research papers (e.g. Bull et al. 1997; Graham et al. 1994; Maser and Trappe 1984; Maser it al 1988). These are incorporated by reference.

Data sources for downed woody debris include District surveys for old growth and surveys of existing regeneration units. The survey procedure for old growth, which includes the downed woody survey, is discussed in Altman (1990). Survey procedure used for existing harvest units is located in the project file. Data was collected on coarse woody debris over 10 inches in diameter. The analysis boundary for project direct effects is the treatment units. Cumulative effects are analyzed at the planning sub-unit scale.

Affected Environment/Existing Condition

The Forest Plan directs that sufficient amounts of large down wood material be retained on site for wildlife habitat needs, nutrient release back into the soil, and site protection for timber stands regeneration. The current Forest Plan direction (USDA Forest Service 1987: A16-6) is to meet timber/silviculture guideline #9, which is to leave logs greater than 12" diameter scattered through out harvest units (a few pieces per acre). Five to 15 tons per acre is recommended.

The project is designed to meet guideline #9. Reserve trees are provided to assure future down wood habitat.

Environmental Consequences

Alternative 1 (with CUM1 or CUM2)

Direct and Indirect Effects

No activities would be authorized under Alternative 1 and there would be no direct effects from implementation of Alternative 1. In the short-term, Alternative 1 would not change the current condition or availability of coarse woody debris within the PSU. Historical timber harvest has resulted in a decrease in the amount of coarse woody debris available in some existing regeneration units.

Cumulative Effects

Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion) Alternative 1 CUM1 considers the MMI power line in the North Fork of Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Ongoing and reasonably foreseeable activities on federal lands are not expected to significantly change existing coarse woody debris. The building of road for the Wayup Fourth of July Project, and the power line for MMI would not retain down woody in the impact corridor.

The FFRWHE program of slash and/or burning on approximately 1,056 acres would retain an adequate amount of down woody by re-introducing fire. Some existing down woody would be consumed by fire, while future recruitment would occur due to the creation of snags. Other annual activities, including firewood gathering, may reduce the amount of down woody in the road corridor.

On Plum Creek Timber Company land the timber harvest would impact availability of downed wood in the long-term due to the removal of large overstory trees.

Effects common to all action alternatives - Direct, Indirect, and Cumulative Effects

The proposed fuel treatment/wildlife habitat enhancement units would retain adequate down woody debris. Spring burning prescription and conditions should allow for the maintenance of larger pieces of organic matter on the forest floor. Fall burning may increase the risk of large woody debris consumption by fire, but fire-killed snags would be recruited over time.

In proposed timber harvest units, other than regeneration units (seed tree, clearcut), implementing recommended coarse woody debris guidelines under all alternatives is expected to ensure the maintenance of adequate habitat. Implementation of Forest Plan snag guidelines would maintain some cavity habitat and subsequent woody debris recruitment to the forest floor over the next several decades. Application of these guidelines within all harvest units would help to provide woody debris distributed across the landscape. Any marked snag felled due to OSHA standards would be required to remain on site. Unmarked snags would be available for removal as timber volume or firewood by the purchaser.

Site preparation methods are similar between the action alternatives (please see Chapter 2 for the differences in acres between alternatives). Grapple piling of logging slash more easily separates fine fuels from coarse woody debris. Charred coarse woody debris with checks and cracks does not substantially interfere with the decomposition or function of this material.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to downed wood because they do not involve vegetation management except within the campground, where downed wood has been removed over time already.

Regulatory Consistency

There are no specific goals or standards for downed woody debris 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)." The Kootenai Forest Plan does provide guidelines in Appendix 16, Cavity Habitat Management (FP, Vol. 2, App. 16:6). Guideline #9 states "leave logs >12" diameter scattered throughout dozer-piled units (a few pieces per acre) to provide cover and feeding sites for birds and small mammals. Five to 15 tons per acre is recommended and is generally compatible with silvicultural needs." All alternatives are consistent with the Kootenai Forest plan, as a wide range of successional habitats, and associated amounts of downed woody debris would be available.

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 is an inhabitant of old growth habitat and a 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 multiple-use objectives.

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). 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 white-tailed 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. As a general rule, the following process was used to determine the featured species. As documented in the Kootenai Conservation Plan (2004), Appendix H, Attachment B, page H-12 and 2600 letter of 5-16-1997, the KNF and MFWP Elk Task Force established management

emphasis designations for elk by planning subunit (PSU). In PSU's with high emphasis for elk, elk will be the emphasis MIS. For PSU's in which elk are a low emphasis, white-tailed deer will be the emphasis MIS. For PSU's in which elk are moderate emphasis, the project biologist will designate the MIS, based on site specific information about elk and deer use in the PSU. The Silverfish PSU has high emphasis for elk; therefore elk will be the general forest indicator in this analysis. **Those species raised in public comment, such as the northern goshawk, are covered under the analysis conducted for old growth and the pileated woodpecker.**

Table 3-84: Management Indicator Species

SPECIES	SCIENTIFIC NAME	HABITAT REPRESENTED	COMMENTS
Grizzly Bear	*Ursus arctos*	General Forest	See T and E Section
Gray Wolf	*Canis lupus*	General Forest	See T and E Section
Bald Eagle	*Haliaeetus leucocephalus*	Rivers And Lakes	See Sensitive Species Section
Peregrine Falcon	*Falco peregrinus*	Cliffs	See Sensitive Species Section
Elk	*Cervus elaphus*	General Forest	MIS Section
Mountain Goat	*Oreamnos americanus*	Alpine	MIS Section
Pileated Woodpecker	*Dryocopus pileatus*	Snags, Old Growth	MIS Section

Elk

Data Sources, Methods, Assumptions, Bounds of Analysis

Elk are one of the indicator species for general forest habitat condition. The Silverfish PSU is identified as an area where elk are emphasized over whitetail 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. Data sources used in the elk analysis for cover/forage, openings sizes, open road densities, movement areas, and key habitat components include Montana Fish, Wildlife and Parks data, forest historical data, District vegetation layers, INFRA roads layers, and field surveys by District biologists and data collection crews.

The analysis boundary for project impacts to individuals and their habitat is the Silverfish PSU to evaluate Forest Plan standards. The majority of the Silverfish PSU is located in Hunting District 104 and within the Clark Fork MFWP elk management unit (EMU), as identified by MFWP (Youmans 1993). The boundary for cumulative effects is the Silverfish PSU and to determine trend is hunting district 104. The boundary for determining viability is the Kootenai National Forest.

The effects analysis is based on direction provided in the Kootenai National Forest Plan (1987) as amended and Coordinating Elk and Timber Management - Results of the Montana Elk Logging Studies (Lyon et al 1985). Additional guidance is provided by Defining Elk Security: The Hillis Paradigm (Hillis et al 1991). Potential effects to elk and deer 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 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). Road impact acres are the percentage of the analysis area that provides neither cover nor forage based on the existing road network, and this value was removed from the C/F total.

Cover/forage ratios for summer range in the PSU, C/F ratio for winter range in the PSU, cover % for combined MAs 15, 16, 17 acres 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 measurement criteria for effects.

Opening size/movement corridor: An opening is any stand, which does not provide hiding or thermal cover. Opening size and distance to cover determines how ungulate big game use an opening for foraging. Research indicates elk will forage up to approximately 500 feet from cover (Thomas and Toweill 1982:443-456). In western Montana, Lyon (1976) found that openings 10 to 30 acres in size are used more by elk than larger openings, providing slash disposal is adequate. The opening size standard recommended for elk is described as an area having no point within the opening greater than 600 feet from cover. This standard distance to cover also allows for movement corridors that break up openings across a landscape, along with providing secure areas for bedding, feeding, and hiding. Movement corridors of at least two site distances in width (600 feet) should be maintained between existing openings, and also between proposed new units

Forest Plan direction for MA 10, 11 and 12 lands is that maximum opening size for elk should generally not exceed 40 acres. For MA 15, 16, and 17, there is not a biological standard for openings. The Forest Plan specifies that existing non-regenerated cutting units greater than 40 acres in size will not be enlarged until they are certified as regenerated within MA's 15, 16, and 17. On MA 12 the Forest Plan specifies that new units will not be harvested until adjacent units provide suitable hiding cover, and that movement corridors of at least two sight distances will be maintained between openings.

The number of regeneration harvest units greater than 20 acres and 40 acres will be the measure for effects. Table 3-85 displays the opening sizes.

ORD and 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).

The Kootenai Forest Plan (1987) calls for an open road density in MA 12 (Big Game Summer Range and Timber) of 0.75 miles per square mile. This translates into a habitat effectiveness value of 68%

(Lyon 1984). On MAs 15, 16, 17 and 18 the Forest Plan ORD standard is ≤ 3.0 miles per square mile, which equates to 38% habitat effectiveness. ORD's calculated for the fall period are based on the mitigation that no restricted roads would be opened from October 15th to December 1st.

The percent HE on MA 12 lands for the PSU, ORD for MA 12, and ORD for the combined MA 15, 16, 17 and 18 lands in the PSU are the measurement criteria 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 and 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 subunit a well as definitions for security levels (H-B-13). The Montana State Elk Plan habitat objectives for the Lower Clark Fork EMU include maintaining or enhancing elk security and secure travel corridors, particularly in remaining roadless areas (Youmans 1993:57). The percent security in the PSU will be the measurement criteria for effects.

Key Habitat Components: Wallows, wet meadows, and bogs will be avoided when constructing roads (Kootenai Forest Plan, 1987; III-44, and 49). When these areas are located they will be mapped and managed as riparian areas. The number of features potentially impacted by the project will be the measure for effects.

Affected Environment/Existing Condition

The Silverfish PSU is located in hunting district 104. Due to budget constraints, recent cow/calf surveys have not been conducted in Hunting District 104, however the overall trend for elk, within HD 104, and MFWP Region 1 which includes the Lower Clark Fork EMU, is upward (Sterling 2005). Currently, the cover/forage ratio is 96/4%, habitat effectiveness on MA 12 lands 56% (for the entire PSU HE is 69%), and 57% of the Silverfish PSU is secure habitat (includes roaded security) (Table 3-85). The PSU is managed with a high emphasis for elk (Johnson 2004: App. H-B: p. H-12). It is expected that there are wallows in the PSU, as well as calving areas.

Cover/forage: Table 3-85 displays the existing cover/forage ratios. Existing cover/forage ratio's for MA 10/11, MA 12 and MA 15, 17, and 18 lands meet the recommended guidelines for elk in the Silverfish PSU. Cumulatively, on private lands, timber harvest within the last 25 years has occurred on approximately 4,183 acres, or 44% of the private lands. These lands have been harvested with a combination of regeneration harvest and partial harvest (liberation, thinning, and sanitation salvage).

Opening size/movement corridor: On NFS lands, approximately 6 managed openings >20 acres ranging in size from 43 to 95 acres exist. As a result of harvest, only one opening on winter ranges used by mule deer, white-tailed deer, and elk exists and it is approximately 47 acres. On winter ranges, openings should generally have an upper limit of 20 acres on white-tailed deer winter ranges.

On Forest Plan designated big game summer range MA 12 and MA 14, openings occur up to 95 acres in size, and combined with adjacent unit acres on private land, reach up to 181 acres. On private lands,

openings resulting from timber harvest range over 311 acres in size. The Forest Plan states movement corridors of at least two sight distances will be maintained between openings. This has largely occurred as few openings exist on NFS lands (six total regeneration units existing), and most provide a mosaic of hiding cover and openings. Cumulatively, on private lands, large openings have been created by timber harvest; however patches of regeneration exist and function as hiding cover due to the lack of prescription burning.

Open road density (ORD's) and Habitat Effectiveness:

MA 10 and MA 11: Within the Silverfish PSU about 4,093 acres or 7% of the NFS lands have been allocated to big range winter range (MA 10 and 11). These designated winter ranges comprise 6% when all lands are considered. On MA 10 and MA 11 lands, no snowmobile monitoring is currently being done, but the snow level on the south facing slopes is generally limited and is expected to help limit the amount of snowmobile use. Open road density on MA 10/11 lands during the wintering period (12/1 to 4/30) within the Silverfish PSU it is 0.99 mi/mi^2. This open road density is an average across the PSU and indicates non-compliance with the Forest Plan Direction which states motorized access is generally not permitted during important wintering periods (December 1 through April 30th). Actual ORD on MA 11 lands may be higher if winter logging occurs under any cumulative activities proposed.

MA 12: About 5,093 acres, or 8% of the NFS lands within the Silverfish PSU, have been allocated to big game summer range (MA 12), where elk spring/summer/fall habitat is the primary management emphasis. When all lands are considered, this equates to 7%. During the summer period (6/30 to 10/15), the open road density of MA 12 lands within the Silverfish PSU is 1.3 mi/mi^2. This is displayed in Table 3-86, under the existing condition column. The Silverfish PSU contributes to elk summer range due to the more than 50% HE on MA 12 lands.

MA 15, 16, 17, and 18: Approximately 4,037 acres, or 7% of the National Forest Service (NFS) lands within the Silverfish PSU, are allocated to MA 15, 16, 17 and 18. When all lands are considered, this is about 6%. On MA 15, 16, 17, and 18 lands the summer period ORD within the Silverfish PSU is 0.86 mi/mi^2.

Private lands:

All lands: The open road density **on all lands** during the summer months (6/30 to 10/15) is 0.73 mi/mi^2, with no change during the fall months (10/15 to 12/1). Overall, the Silverfish PSU has a total road density of 1.97 mi/mi^2.

Hunting season security: The Silverfish PSU is 69,421 acres in size, with an existing 57 percent (39,570 acres) qualifying as security habitat during the fall hunting season. These fall season security areas, range from 1,517 acres to 24,300 acres in size, and are calculated based on what is known about federal and private activities and associated opening of roads.

Any federal activity would not open restricted roads for harvest or associated activity during the fall period of October 15th to December 1st. These fall security areas also provide some level of displacement habitat during the summer months. However many decrease in size, and the percentage of the area available for summer displacement may drop, if private harvest or other reasonably foreseeable activities occur as described in Chapter 3. Large portions of these security areas on private lands do not provide hiding cover due to timber harvest, and a decrease in effectiveness of the security area is expected.

Key habitat components: Wallows, bogs, or wet meadows have not been specifically identified in the areas where proposed units are located but they may occur. These components also exist within the Silverfish PSU.

Environmental Consequences

The following tables display changes in major habitat components that would occur with implementation of alternatives. For Alternatives 2, 4, 7, and 6, mitigation requires that *all restricted roads opened for harvest be restricted during hunting season (10/15 to 12/1).* Forest Plan ORD standards apply only to the PSU level.

Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion) Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, the CUM1 activities were considered with Alternatives 2 and 4, while CUM2 activities were considered with Alternative 6.

Table 3-85 - Changes in big game habitat components during or following implementation of Alternatives in the Silverfish PSU

HABITAT COMPONENT	EXIST	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2 DIRECT	ALT 4 DIRECT	ALT. 6 DIRECT	ALT. 7
Cover/forage							
MA 10/11 in PSU C/F Guide for elk 60/40 Thermal Cover guide for elk is ≥40%	85/15	71/29	72/28	66/34	72/28	65/35	72/28
MA 12 in PSU Guide for elk is 60/40	92/8	No Δ	No Δ	74/26	78/22	74/26	78/22
MA 15, 16, 17, 18 in PSU Guide for elk >15%	93/7	No Δ	No Δ	75/25	74/26	74/26	74/26
PSU NFS land summer range (guide 60/40)	96/4	93/7	93/7	92/8	94/6	93/7	94/6
Openings ≥ 40 acres							
PSU	6	14	14	7	0	0	0
MA12 lands Habitat Effectiveness, expressed in % for the summer period, During and/ Post project*							
Silverfish PSU	56	56/56	No Δ	51/61	51/57	56/56	56/57
Security ** During fall period, During activity and / Post-activity							
PSU (69,421 acres)	57	46/59	48/59	56/60	56/59	53/59	56/59

Alternative 1 – openings greater than 40 acres are the cumulative effects from other ongoing or reasonably foreseeable actions. Unit acres can be added to the action alternatives to see cumulative effects for opening size. These units are a result of harvest on corporate timber land. **Alternative 2**- Openings would result from improvement harvests on both summer and winter range (Units 21, 25, 26, 113, 121, 123). **All action alternatives**: Access changes under the action alternatives may occur at any time during the life of the project so the post ORD's displayed may not occur until the project is completed.

Tables 3-86, 3-87, and 3-88 display the direct effects of the alternatives, and the cumulative effects of Alternative 1 CUM1 with Alternative 2, 4, and 7, and CUM2 with Alternative 6.

Table 3-86: Summary of DIRECT EFFECTS to habitat conditions during and post alternative

HABITAT COMPONENT	EXIST COND.	ALT 2 DURING	ALT 2 POST	ALT 4 DURING	ALT 7 DURING	ALT 4 AND ALT 7 POST	ALT 6 DURING	ALT 6A DURING	ALT 6 POST
MA 10/11 (ORD during Winter 12/1 to 4/30)	0.99	1.90	0.95	1.80	1.60	0.95	1.90	1.60	0.95
MA 12 ORD (standard >0.75)	1.30	1.80	0.97	1.80	1.30	1.18	2.13	1.30	1.30
MA 14 ORD 6/30 to 10/15	1.00	1.10	0.96	0.98	0.98	0.98	0.98	0.98	0.98
MA 12 and MA 14 ORD	1.20	1.50	0.96	1.40	1.20	1.10	1.56	1.15	1.14
MA 13 / MA 13 and OG ORD	0.35/0.14	0.34/0.15	0.33/0.13	0.37/0.15	0.37/0.15	0.33/0.13	0.37/0.15	0.35/0.14	0.33/0.13
MA 15, 16, 17, 18 ORD (standard <3.0)	0.86	1.00	0.73	1.00	1.00	0.73	1.10	0.75	0.73
FS lands only	0.62	0.75	0.55	0.72	0.67	0.58	0.76	0.65	0.59
PVT lands only	1.50	1.40	1.28	1.40	1.40	1.4	1.40	1.40	1.40
All lands (federal, private)	0.73	0.84	0.65	0.80	0.74	0.68	0.84	0.74	0.69
Total Road Density	1.97	1.95	1.90	1.95	1.95	1.95	1.90	1.90	2.00

*ORD displayed for summer period from 6/30 to 10/15 and during the fall period from 10/15 to 12/1, except as noted for the wintering period 12/1 to 4/30; ** Security is displayed during the fall hunting season (10/15 to 12/1), during and post-activity.

Table 3-87: Summary of CUMULATIVE EFFECTS during and post Alternative 1 CUM1 with Alternatives 2, 4 and 7

HABITAT COMPONENT	EXISTING CONDITION	ALT 1 CUM1 DURING	ALT 1 CUM1 POST	ALT 2 DURING	ALT 2 POST	ALT 4 DURING	ALT 7 DURING	ALT 4 AND 7 POST
MA 10/11 (ORD during winter 12/1 to 4/30)	0.99	1.96	0.99	2.10	0.95	2.10	2.00	0.95
MA 12 (standard >0.75)	1.30	1.33	1.30	1.55	0.87	1.80	1.30	1.10
MA 14 6/30 to 10/15	1.00	1.40	0.94	1.40	0.92	1.40	1.40	0.94
MA 12 and MA 14	1.20	1.40	1.10	1.50	0.90	1.60	1.40	1.00
MA 13 / MA 13 and OG	0.35/0.14	0.59/0.23	0.35/0.14	0.61/0.24	0.13	0.61/0.24	0.61/0.24	0.33/0.33
MA 15, 16, 17, 18 (standard <3.0)	0.86	0.98	0.86	1.20	0.75	1.10	1.10	0.75
FS lands only	0.62	0.73	0.49	0.79	0.51	0.79	0.75	0.53
PVT lands only	1.50	2.90	1.50	2.90	1.30	2.88	2.88	1.40
All lands (federal, private)	0.73	1.00	0.68	1.10	0.60	1.10	1.00	0.64
Total Road Density	1.97	2.00	1.99	2.00	2.00	2.00	2.00	2.00

Table 3-88: Summary of CUMULATIVE EFFECTS during and post Alternative 1 CUM2 with Alternative 6

HABITAT COMPONENT	EXISTING CONDITION	ALT. 1 CUM2 DURING	ALT. 1 CUM2 POST	ALT 6 DURING	ALT 6, SUBDIVISION A DURING	ALT 6 POST
MA 10/11 (ORD 12/1 to 4/30)	0.99	1.60	0.95	2.30	2.10	1.03
MA 12 ORD (standard >0.75)	1.30	1.80	1.30	1.97 to 2.20	1.80	0.87 to 1.10
MA 14 ORD 6/30 to 10/15	1.00	1.40	0.94	1.40	1.40	0.94
MA 12 and MA 14 ORD	1.20	1.50	1.00	1.70 to 1.80	1.50 to 1.60	0.91 to 1.00
MA 13 / MA 13 and OG ORD	0.35/0.14	0.59 / 0.23	0.35/0.14	0.59/0.23	0.59 /0.23	0.33/0.13
MA 15, 16, 17, 18 ORD (standard <3.0)	0.86	0.27 to 0.88	0.24 to 0.86	0.21 to 0.83	0.27 to 0.88	0.11
FS lands only	0.62	0.67 to 0.74	0.49 to 0.55	0.75 to 0.82	0.72 to 0.78	0.47 to 0.53
PVT lands only	1.50	3.30	1.50	3.10	3.26	1.40
All lands (federal, private)	0.73	1.10	0.62	1.10 to 1.12	1.00 to 1.10	0.59 to 0.64
Total Road Density	1.97	1.99	1.99	2.00	1.99	1.93

Alternative 1 – No action

Direct and Indirect effects

Cover/forage ratios: Under the no action alternative, no activities are proposed. **No direct** effect to elk would occur in the short-term. In the short-term, the no-action alternative would not directly affect the potential of any summer ranger or winter/spring range to provide habitat for elk. **Indirectly**, plant succession would continue on some of the sites, resulting in an increasing canopy closure and increasing density of understory conifers. Indirectly, on NFS lands in the Silverfish PSU, the late seral forest condition, which has become fragmented with timber harvest, would continue to become re-established. The connectivity of the late seral forest condition will require several decades to become fully re-established, as harvest units gradually become re-forested. Overtime, as an **indirect** result of plant succession, thermal cover would be maintained and increase on summer and winter ranges. On winter/spring ranges the quantity and quality of forage available would decrease due to shading, competition, and lack of fire.

On those areas not treated under the FFRWHE program, indirect effects on winter ranges would be continued maintenance of thermal cover and Douglas-fir regeneration and encroachment throughout the winter range that would provide hiding cover. This vegetative condition is favorable to whitetail deer since they prefer a higher proportion of cover to forage than mule deer or elk.

The natural fire regime of periodic, low intensity underburns would have maintained open understory stand conditions with occasional dense pockets of sapling Douglas-fir and ponderosa pine. These conditions provided for a balance of cover to forage that historically was probably more favorable for mule deer than for whitetail deer.

Routine *annual activities* such as firewood gathering and road BMP work would not result in any direct effect to cover/forage ratios.

***Opening size/movement corridor*:** Alternative 1 would have **no direct** effect to the size of current openings in the short-term. **Indirectly**, plant succession would continue, and on NFS lands in the Silverfish PSU the late seral forest condition, which has become fragmented with timber harvest units,

would continue to become reestablished. The connectivity of the later seral forest condition will require several decades to become fully reestablished as harvest units gradually become reforested. Over time, the quantity of cover would increase, providing hiding cover and decreasing the size of existing openings.

Open road density (ORD's) and Habitat effectiveness: Alternative 1 would have **no direct or indirect** effect on current open road densities.

Hunting season security: Under this alternative, no activities would occur. No **direct** or **indirect** activities would occur behind roads restricted to motorized traffic so no change to existing displacement and security conditions would occur.

Cumulative Effects

Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same *except* for the location of the proposed MMI power line (please see Chapter 3 Current and Foreseeable Actions section for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with the action Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Past timber harvest and road construction projects and natural events have created much of the existing habitat conditions found within the analysis area. The Cumulative Effects Worksheet, located in the sensitive wildlife species project file, considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed in Chapter 3. This worksheet considers those activities that cumulatively contribute indiscernible effects on addressed species or their habitat, as well as those activities that cumulatively affect the species or habitat. These include routine road maintenance, recreational activities, vegetation management, private land development, and range management.

***Cover/Forage*:** Reasonably foreseeable activities (described in Chapter 3) will reduce cover on Forest Plan designated big game summer range and winter range, and these effects are displayed for Alternative 1 (Table 3-85). On the Silverfish PSU scale, cumulatively cover/forage ratio's on MA 10/11 lands after implementation of all proposed and reasonably foreseeable actions are compatible with the recommended 70/30 percent ratio. Cumulatively, the Forest Plan guideline for cover on MA 12, 15, 16, 17 and 18 lands is met.

The 1,056 acres of slash and/or burning under the FFRWHE program is expected to have a beneficial impact to ungulate species due to increased productivity on bunchgrass and shrub field habitat (FFRWHE EA, USDA 2001, Chapter 3:140-143).

Routine *annual activities* such as firewood gathering and road maintenance would not result in any direct effect to cover/forage ratios. The reasonably foreseeable mining activities (Montanore) and Plum Creek Timber Company activities will reduce the amount of cover available on federal and private lands.

Alternative 1, with either cumulative effects scenario, when considered in association with the planned activities on both public and private lands, is **not expected to have adverse cumulative** effects. No activities are proposed and current availability of suitable summer and winter range habitat would not change.

Opening sizes/movement corridors: Reasonably foreseeable activities (described in Chapter 3) would create openings, and remove movement corridors and these effects are displayed under Alternative 1 and

Alternative 6 CUM2 in Table 3-85. The FFRWHE program treatment units will slash and burn a total of 1,056 acres of winter/spring range. As a result of these treatments Douglas-fir encroachment would be reduced and shrubs would be top-killed. No large openings would be created, but natural openings would be maintained, restored, or enhanced. The slashing and burning will enhance the production, quality, and diversity of both shrub and herbaceous forage favored by deer, elk, and moose (Arno and Harrington 1995). The treatments are expected to have a beneficial impact to big game (FFRWHE EA, USDA, 2001, Chapter 3:141-143).

The PCTC activities have the potential to directly and indirectly affect ungulates and their habitat, such as reducing the suitability of portions of the winter or summer range. The proposed harvest in the Silverfish PSU would result in additional large openings for ungulate species.

Alternative 1, when considered in association with the planned activities on both public and private lands, is expected to have **no cumulative** effects on opening sizes or movement corridors. The cumulative impacts associated with planned private harvest are likely to increase opening sizes on private lands. The Forest Service has no regulatory authority over private/corporate lands.

Open Road Densities and Habitat Effectiveness: *Annual activities* such as road maintenance would not increase the open road densities. Cumulatively, activities proposed on federal land and described in Chapter 3, such as Montanore power line construction and access, would increase ORD's. During summer activity periods ORD on MA 12 lands stay at 1.3 mi/mi^2, and continue to exceed the Forest Plan standard. Cumulatively, as displayed in Table 3-86, no decrease in ORD (due to no access changes occurring on MA 12 lands under cumulative activities) occurs and no corresponding increase in habitat effectiveness occurs on the Silverfish PSU scale. As discussed in the existing condition section, for areas where elk are a primary resource consideration, the HE should be 50% or greater (Christensen et al. 1993).

Plum Creek Timber Company activities have the potential to directly and indirectly affect ungulates and their habitat by opening currently restricted roads, and this is displayed in the during activity column.

Alternative 1, when considered in association with the planned activities on both public and private lands, is expected to have **no cumulative** effects on open road density. The cumulative impacts associated with planned private harvest and federally approved activities would increase open road density. The Forest Service has no regulatory authority over private/corporate lands.

Cumulatively no change to MA 12 ORD's would occur due to reasonably foreseeable actions, as described in Chapter 2.

The 1,056 acres of slash and burning or underburning which will occur under the FFRWHE program are expected to have a beneficial impact to ungulate species (FFRWHE EA, USDA 2001, Chapter 3:140-143). Roads opened for burning would be for administrative use only and would occur for one to three days.

Hunting Season Security Habitat: Cumulatively reasonably foreseeable activities such as private harvest and proposed mining access (please see Chapter 3 for a list of these activities) on federal lands could impact security. Management activities associated with lands administered by PCTC would continue as described in Chapter 3. It is not known what season Plum Creek will harvest. If harvest occurred in the fall, Plum Creek activities would decrease security habitat and this scenario is displayed in Table 3-85 for the Silverfish PSU. Displacement effects to big game during hunting season would occur if activity occurs during hunting season. During the summer, these activities would also decrease summer displacement habitat in those drainages.

Effects of the Action Alternatives 2, 4, 7, and 6 (includes Alternative 6, subdivision 6A)

Security acres during the fall (October 15 to November 30) for **Alternatives 2, 4 and 6** reflect the assumption that there would be no motorized access behind restricted roads during hunting season on federal lands.

Key habitat components: No wallows, wet meadows, or bogs would be affected by any of the alternatives. Mitigation for all action alternatives includes the following; 1) if any key habitat features are found during layout, such as wallows and wet meadows, a minimum of 300 feet of cover would be maintained around it. A cover buffer of at least two sight distances would be maintained if conditions permit.

Direct and Indirect effects

Cover/forage ratios:

Implementation of the action alternatives would have **direct** effects on cover and forage habitat. Most of the units provide a mosaic of hiding, thermal, and no cover in the existing condition. Hiding cover is provided by overstory tree stem density, topography, shrubs, or sapling regeneration. Hiding cover is expected to be lost in the regeneration harvest treatments but some would likely remain in the improvement harvest units. On NFS lands, the *improvement* type harvests mostly located on VRU 2 and 3 are located on moderately dry Douglas-fir types. These units are considered outside of the range of historic density due (please see Forest Vegetation section) to the exclusion of fire and are expected to have more cover available now that historically. Thinning of the overstory and understory trees would reduce thermal and hiding cover. These more open winter ranges are expected to be more suitable for elk based on historic conditions.

As a **direct** result of the action alternatives, on NFS lands, the amount and availability of thermal cover on big game summer ranges and winter ranges would decrease. Please refer to Table 3-85 for acreages. These reductions in cover are based on all cover being removed in the proposed harvest treatment units and a portion of the slash/and or burn units, but it is likely that some level of hiding cover would remain in a mosaic pattern.

Summer range cover/forage ratio could become 82/18% (Table 3-85) under Alternatives 2 and 6, which is the largest change in this ratio. Only Alternative 2 includes units that would result in openings greater than 40 acres. This could result in openings that may not be fully utilized by elk as foraging areas. However, stringers and groups of trees would be left within the units to provide screening and minimize the effect of the openings. 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.

As displayed in Table 3-85, **Alternative 4 and 7** impact the least amount cover on MA 10/11 lands, followed by **Alternative 6 and 2** with similar effects. On the Silverfish PSU scale, cover/forage ratio's on MA 10/11 lands after implementation of all **action alternatives** is compatible with the recommended 70/30 percent ratio. **Alternatives 2 and 6** impact the most cover on MA 12 lands, followed by **Alternatives 4 and 7**. All action alternatives are compatible with the recommended 60/40 percent ratio for cover/forage. **All action alternatives** meet the Forest Plan guideline for cover on MA 15, 16, 17 and 18 lands.

The use of ground-based logging systems could result in the spread of noxious weeds such as goatweed and knapweed on naturally open bunchgrass habitat types. The use of ground-based logging systems

would occur on MA 11 lands under all action alternatives and would not improve the habitat for big game.

Precommercial thinning is also planned in existing regeneration units on a total of approximately 351 acres scattered in the Silverfish PSU. The proposed thinning would reduce the quality of big game cover, but would not create openings or eliminate hiding cover values in treated stands.

***Opening size/movement corridor*:** Implementation of the action alternatives would have **direct** effects on opening sizes and movement corridors with the activities proposed. The overall ability of big game to move through the landscape would not be adversely affected by the **action alternatives**. Individual animals may have to adjust their localized movement patterns, but no movement barriers would result. **Alternatives 2 and 6** impact the most ridgeline and riparian corridors while **Alternatives 4 and 7** impact the least.

On MA 11, the proposed improvement harvest and the proposed improvement/shelterwood units are considered to be consistent with Forest Plan MA 11 direction on opening sizes because no large regeneration (i.e. clearcuts or seed tree) openings would occur within them. It must be noted however, that biologically these units would essentially be openings for big game due to the reduction in basal area and regeneration. The reduction in cover expected due to the basal area reduction of the overstory trees is not expected to improve the winter range for white-tailed deer. However, patches of thermal cover would be retained and distributed throughout the winter range on NFS lands. Long-term treatment objectives to return these areas to the historic, open ponderosa pine/Douglas-fir habitat are expected to result in a winter range with habitat characteristics more suitable elk. On MA 10 and 11 lands, **Alternatives 2 and 6 treat the most acres, followed by Alternatives 4 and 7.**

Alternative 2 proposes regeneration unit openings greater than 40 acres in size. All alternatives have several proposed regeneration units are adjacent to existing regeneration units that do not provide hiding cover in all or most of the unit. These large openings may be broken up by topography, elevation, and regeneration, however in general they would not benefit big game.

Open road density (ORD's) and Habitat effectiveness:

Please refer to **Table 3-86**, for **direct effects** to ORD by alternative, **Table 3-87 for cumulative effects** to ORD for Alternative 1 CUM1 and Alternatives 2 and 4, and **Table 3-88 for cumulative effects to ORD** for the Alternative 1 CUM2 and Alternative 6. Open road densities are displayed for the summer activity period and during the fall security season. During fall, ORD's reflect no activity occurring behind restricted roads **for Alternatives 2, 4, 7, and 6. Alternative 2** is the only action alternative that proposes new road construction. **Alternatives 4, 7, and 6** propose temporary road construction however. Please see Chapter 2 for mileages by alternatives.

Alternative 2 proposes the most road maintenance and BMP work followed by **Alternative 4 and 7**, and then **Alternative 6** (please see Chapter 2 and descriptions of the alternatives for specific mileages). Motorized access changes would also occur on approximately 8.72 miles of road. Please refer to Chapter 2 for details. These closures would improve both fall and winter range security, and would slightly decrease open road densities. Road storage and decommissioning would also occur depending upon funding, with 12.92 miles affected. Both storage and decommissioning of roads would improve habitat security for big game. Total road density decreases slightly with the proposed road decommissioning.

The existing condition for MA 12 ORD exceeds the Forest Plan standard. During activity periods, **Alternatives 2 and 4** would increase that to 1.8 mimi^2. **Alternative 6** would increase the ORD's on MA 12 from the existing 1.3 mimi^2 to 2.0 mimi^2. Post project, **Alternatives 2 and 4** decrease the ORD on MA 12, to 0.97 and 1.20 mi/mi^2 respectively. Post project, **Alternative 6** maintains the current existing

ORD at 1.3 mi/mi^2. **Alternative 7** does not increase the MA 12 ORD during activity over the existing condition.

During the summer activity period ORD's would increase. Effects of opening restricted roads on the impacted summer ranges include the increased potential for displacement within a potential cow elk home range. Across the Silverfish PSU during the summer activity period, ORD on MA 15-18 lands reaches 1 mi/mi^2 under all the action alternatives.

Roads restricted year-round to motorized traffic would also be opened for the proposed *precommercial thinning*. On roads restricted to motorized traffic, thinning activities are restricted to 14 days or less, therefore these roads will still be considered closed and ORD's will not change. Thinning activities behind restricted roads will not occur during critical periods (October 15 to June 30).

Hunting season security: Security acres (please refer to Table 3-85) during the fall hunting season (10/15 to 12/1) are a result of required mitigation, including no access behind restricted roads during hunting season for all the proposed action alternatives.

The miles of road storage/decommission proposed under the action alternatives would result in the restricted roads being unsuitable for motorized traffic, and this helps to improve wildlife security although this is not enough to change the percentage of fall security habitat available. All alternatives maintain security habitat during and post activity above the recommended 30% (Hillis et al 1991:40).

Precommercial thinning activities would open restricted roads for the thinning, but due to the short duration of the activity (less than 14 days), and that thinning activities would not occur during critical periods (October 15 to June 30), no change to fall security habitat is expected. It is expected that individual thinning operations will cause direct, short-term disturbances to big game using the immediate area. However, thinning in itself is considered a minor activity, and is not likely to cause big game to move far from active thinning sites.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to elk because they do not impact elk habitat parameters as measured in the analysis above.

Cumulative effects

Cover/Forage: **Cumulatively**, the planned activities on both corporate and federal lands along with the action alternatives would decrease the percentage of cover in the Silverfish PSU. Please refer to Table 3-85 for the differences by alternative. The Forestwide Fuel Reduction and Wildlife Habitat Enhancement EA units are not expected to change the cover/forage ratios. Cover on MA 10/11 lands would remain above 75% across all NFS lands within the Silverfish PSU (please see Table 3-85).

Opening size/movement corridor: Cumulative effects of all past, ongoing, and reasonably foreseeable activities, on opening sizes and movement corridors are the same as discussed under Alternative 1.

ORD and Habitat Effectiveness: Cumulatively, private activities are planned within the Silverfish PSU, and any open roads are considered in the ORD calculations displayed in the three ORD tables. Table 3-86 displays direct effects for Alternatives 2, 4, 7, and 6, and Table **3-87** displays cumulative

effects for Alternative1 CUM1, with Alternatives 2, 4, and 7. Table **3-88** displays cumulative effects for alternative 1 CUM2 and Alternative 6.

***Hunting season security*:** Cumulative effects of all past, ongoing, and reasonably foreseeable activities that may affect security habitat are the same as discussed under Alternative 1. Cumulatively, security habitat could decrease during activity periods due to potential activity, and this is displayed in Table 3-85. During fall activity periods under all action alternatives, no federal activity would occur behind restricted gates during the hunting season.

Post-project, all alternatives result in security habitat on the Silverfish PSU scale above the recommended 30% (Hillis et al 1991:40). Remaining cumulative effects are as described for Alternative 1.

Regulatory Consistency

- Kootenai National Forest Plan: Volume 1, Chapter III: 38-47. Management Area direction for MA 10, MA 11, and MA 12.
- Summerfield, B. 1991. Big-game standards. This paper is a result of Forest Supervisor Bob Schrenk requesting that a Biologist Working Group be formed to coordinate big game standards with the grizzly bear standards. The working group consisted of KNF biologists and a MFWP area biologist. The working group provided clarification for big game standards, which are supported by current research and professional judgment of local managers.
- Montana Fish, Wildlife and Parks manage mule deer and white-tailed deer as a game species in Montana.

All alternatives meet Forest Plan direction and subsequent direction in Summerfield (1991) regarding cover/forage levels in summer and winter range habitat within the Silverfish PSU. **Alternative 2** creates forested openings larger than 40 acres, but does not exceed Forest Plan MA standards.

Action **Alternatives 2, 4, and 6** need a Forest Plan amendment for MA 12 ORD during activity periods as the existing condition ORD of 1.3 mi/mi^2 is increased during activity periods. **Alternative 7** during activity periods does not increase MA 12 ORD and would not need a Forest Plan Amendment.

Ungulate populations are managed by Montana Fish, Wildlife, and Parks. Proposed actions would not prevent the State from continuing to manage these species as harvestable populations.

Statement of Findings

Based on the analysis of elk, the emphasis species for management indicators of general forest habitat, effects to summer range habitat would result in maintenance of cover/forage ratios and decreased open road densities. Movement corridors would be maintained, however larger opening sizes may result in some changes in localized movement patterns of individual animals.

The current trend for big game populations in HD 104, which includes the Silverfish PSU, is upward. This increase has occurred with the existing high open road densities and private timber harvest. Environmental factors such as mild winters also contribute to increase in populations. Based on current population trends, the **proposed action alternatives** should maintain ungulate populations.

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 habitat is available, the populations of species using that habitat should remain viable.

Mountain Goat

Data Sources, Methods, Assumptions, Bounds of Analysis

Mountain goat ecology, biology, habitat use, status and conservation are described and summarized in Joslin (1980), and Brandborg (1955). That information is incorporated by reference. Mountain goat occurrence data comes from District wildlife observation records and Forest historical data and other agencies (MFWP).

Effects to management situation (MS) 1 habitat in the southern Cabinet Mountains is the primary evaluation criteria to analyze project effects, since MS 1 habitat is defined as critical mountain goat habitat and most sensitive to human activity (Joslin 1980). The MS 1 area analyzed extends from Elephant Peak south to Baree Mountain, and represents the year-round area occupied by mountain goats in this portion of the southern Cabinet Mountains.

The analysis boundary for project impacts to individuals and their habitat is the Silverfish PSU. The boundary for cumulative effects and determining trend or viability is the MFWP Mountain Goat hunting district (# 100).

Affected Environment/Existing Condition

Alpine habitat is found in the Silverfish PSU. Wildlife observation records show mountain goats are known to use the suitable habitat in this PSU. The 1997 KNF monitoring and 10 year Evaluation report indicated that the population trend was static or decreasing. Montana Fish, Wildlife and Parks records show that the Cabinet Mountains goat population has been increasing slightly over the past decade (Trendsetters, Montana Outdoors Magazine, Montana Fish Wildlife and Parks, December 2005).

Mountain goats are the indicator species for alpine habitat (USFS 1987). They are a unique species, highly specialized for rugged alpine habitats. Goats annually use the same summer and winter ranges, travel corridors, kidding areas and mineral licks, and rarely explore new territory (Joslin 1980; USFS 1995). Habitat use information and traditional use patterns are learned behaviors passed down through the generations. They use steep rock outcrops and escarpments for escape from predators and security during the kidding period. Mountain goats eat a wide variety of foods, including vegetation found in rock crevices, but in the Cabinet Mountains, shrubs are the major component of their diet year-round (Joslin 1980).

Highly traditional behavior restricts goats to regular seasonal use patterns which make them vulnerable to human activities or habitat changes in their range (Joslin 1980). If traditional use patterns are altered and seasonal home range knowledge is not transferred to offspring, then suitable ranges may not be recolonized (Ibid). Although winter range appears to be the limiting factor to goat densities in the Cabinet Mountains, quality summer range is also of paramount importance in providing highly nutritious forage which fortifies the body for winter and sustains the population from year to year (Ibid). Road access into critical goat habitat is the single biggest threat to goats in the Cabinet Mountains (Ibid.).

Goats in the east Cabinets occur in three general concentrations, one of which is centered in the upper Libby Creek, West Fisher Creek, Rock Creek, and Geiger Lakes areas (Joslin 1980; J. Brown pers. com., A. Bratkovich, 2007). West Fisher Creek and the Geiger Lakes areas are located within the Silverfish PSU.

The closest documented wintering area on the east side of the Cabinet Mountains was on the south-facing slope of Shaw Mountain in Libby Creek. Two goats were seen in this area in February 1989 (Thompson 1989). This area is approximately 2 miles north of the Silverfish PSU.

Environmental Consequences

Direct and Indirect Effects

Alternative 1 (with CUM1 or CUM2)

No activities are proposed under Alternative 1, and no direct or indirect effects would result from implementation of Alternative 1.

All Action Alternatives

There are no project activities located near breeding areas. No timing restrictions on activities that could occur near kidding areas during breeding season (5/15 thru 6/30) are necessary. None of the proposed action alternatives would impact suitable mountain goat habitat, and no adverse impact on the mountain goat is expected.

Cumulative Effects

Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same *except* for the location of the proposed MMI power line (please see Chapter 3 for a full discussion) Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Non-motorized access from hikers and horseback riders will continue along the Bear Lakes Trail (#178) and Divide Cut-off Trail (#63), with minimal impacts to mountain goats. The ridge complex in the wilderness should continue to provide for a high level of habitat effectiveness, with no additional impacts to Management Situation 1 habitat.

Since there are no direct or indirect impacts to mountain goats, the proposed Miller West Fisher project will not contribute any additional cumulative impacts.

Potential negative impacts to mountain goats are expected as a result of three other projects currently approved in MS 1 habitat in the southern Cabinet Mountains. These effects are associated with the Rock Creek Project, the Fourth of July Access (Skranak-Harpole) Project, the Wayup Mine Access Project, and the Bear Lakes Access.

As a result of activities associated with road construction and reconstruction, mineral exploration, and potential development of the Fourth of July Access Project, about 559 acres of MS 1 habitat will be influenced (USFS 2000). This activity is scheduled to occur about 2 miles north of the Bear Lakes property. Another 946 acres will be influenced as a result of the Way-up Mine Access Project, scheduled to occur about 6 miles north of Bear Lakes (Ibid.). As a result of both projects, goats may be displaced from traditional use areas, and may be exposed to additional stress (Ibid.). The actual start up date for both projects is uncertain at this time.

In addition, the Rock Creek Project is expected to influence about 1,892 acres of MS 1 habitat during the 20-year construction and operation period, along with the disruption of possible travel corridors leading to Government Mountain (USFS 2004). The ultimate effect could be a decline in goat numbers and loss of goat occurrence or abundance in some areas (Ibid.).

The Bear Lakes Access proposed action involves trail building within the wilderness and includes blasting to enable rock movement and rock placement in the corridor where the new trail construction will occur. Effects to MS 1 habitat were calculated by delineating an influence zone (1.0 mile or ridgeline) around blasting activities proposed for trail construction. Assigning an influence zone to the proposed blasting activity would affect about 1,165 acres (1.8 square miles) of mountain goat MS 1 habitat when blasting was occurring. Mountain goats within the blasting influence zone may be displaced when blasting was occurring. This would result in some goat habitat becoming less effective. However, potential displacement would be short-term, since blasting is projected to be completed within a one week period.

Other human activity associated with the proposed action is not expected to result in any increased stress levels for mountain goats. However, if mountain goat hunting occurs from the cabin site by the permittees, then a slight increase in mortality risk would occur due to greater hunter accessibility of the area made possible by stock use.

The southern Cabinet Mountains goat concentration area contains about 34,110 acres of MS 1 goat habitat (USFS 2000). All three currently approved projects will influence about 3,397 acres, or about 10% of all MS 1 habitat. Disturbance associated with the Bear Lakes Access Project is short-term (one week or less), and thus is not projected to cumulatively add to the long-term displacement or influence associated with the Fourth of July Access, Wayup Mine Access, or Rock Creek Projects.

Other reasonable foreseeable projects not yet approved, include the proposed Montanore mine. Any potential impacts, including direct and cumulative to mountain goats would be disclosed in that analysis.

Regulatory Consistency

The project is consistent with Forest-wide Plan direction on management indicator species (FP pg. II-1 # 3 and 7) and big game species (FP pg. II-2 #12). The project does not conflict with other Plan direction that provides habitat conditions for mountain goats (Johnson 2004: Appendix D).

SUMMARY ALPINE FOREST MIS STATEMENT

Based on the analysis for mountain goat and the KNF Conservation Plan (Johnson 2004), habitat for alpine forest species should provide sufficient quality and quantity of the diverse age classes of vegetation needed for viable populations. Since sufficient alpine 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 and McClelland (1999), Warren (1990), McClelland (1979, 1977), and McClelland et al. (1979). That information is incorporated by reference.

Research conducted in the Pacific and Inland Northwest is described in Bull and Jackson (1995), Bull and Holthausen (1993), Bull et al. (1992b), Bull (1987, 1980, 1975), Bull and Meslow (1977), Mellen et al. (1992), Mellen (1987), Thomas (1979), Mannan (1977), and Jackman (1974).

Pileated woodpecker occurrence data comes from recent District wildlife observation records, the Region One Landbird Monitoring Program (Avian Science Center, University of Montana), and Forest historical data (NRIS FAUNA). The pileated woodpecker is the indicator species for old growth 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 pileated woodpeckers 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) definition of old growth, or the definition found in Green et al. (1992, errata corrected 2005).

Effective old growth habitat was modeled as supporting one nesting pair per 600 acres, with replacement old growth habitat supporting one nesting pair per 1,000 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 from 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 Silverfish PSU. The boundary for cumulative effects and determining trend or 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 2003). 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 Silverfish PSU is displayed in the Old Growth Section of this document. This summary indicates that approximately 5,296 acres of effective old growth habitat, and about 1,361 acres of replacement habitat, 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 modeled minimum PPI for the pileated woodpecker in the Silverfish PSU is approximately 10 nesting or breeding pairs.

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 bird species heard or sighted are recorded during the survey. The rate of detection can vary 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. The pileated woodpecker was tallied 204 times at the 2,638 individual points surveyed (USFS 2003).

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (with CUM1 or CUM2)

Direct and indirect effects

No activities are proposed with Alternative 1 and no direct or indirect effects would result as implementation of this alternative. 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 pileated woodpecker nesting pairs that find suitable feeding and breeding conditions provided by the structural features and overall environment within these stands.

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 1977, McClelland and McClelland 1999) and in the Pacific and Inland Northwest (Bull and Jackson 1995; Bull 1987, 1975; Bull et al. 1980).

Under the no action alternative, 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 for pileated woodpeckers. Over the next several decades, this successional trend may result in a reduction in quality pileated woodpecker 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 and McClelland 1999, McClelland 1977; Weydemeyer and Weydemeyer 1928), in northeast Oregon (Bull 1987, 1975; Thomas 1979), or in British Columbia (Harestad and Keisker 1989).

Under the no action 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 snag and cavity habitat. The effects of edge on pileated woodpecker habitat from adjacent regeneration units will also remain as described under the old growth analysis. The no action alternative, and associated cumulative effects is not expected to change (either increase or decrease) the PPI (potential population index) for pileated woodpeckers on the Kootenai National Forest as a result of impacts to old growth habitat.

Effects of the Action Alternatives

Direct and Indirect Effects

Impacts to old growth habitat are disclosed in the old growth section. These effects translate to potential impacts to the pileated woodpecker as loss of nesting and foraging habitat or reduced habitat quality. No harvest treatment is proposed in any designated old growth or replacement old growth stand. Burning within old growth would occur under each alternative. Snags would likely be created as a result of the underburning. All action alternatives proposed harvest treatment units that are adjacent to old growth and replacement old growth blocks, resulting in an increased edge effect (please see Table 3-80 in the old growth section)

The removal of forested habitat with high canopy closure within a potential nesting territory will reduce interior habitat and potential feeding sites. Table 3-80 (please see Old Growth section) displays the acres of treatment methods by alternative. **Alternative 2** results in the largest loss of forested habitat followed by **Alternative 6, and then Alternatives 4 and 7.**

This reduction will occur in stands not currently mapped as old growth or replacement habitat. The loss of general forested habitat will contribute toward fragmentation of potential pileated territories within the drainage. Ongoing proposed federal activities will result in loss of interior habitat and this was considered under Alternative 1.

Based on the expected impacts to old growth acres (see Table 3-80 in the old growth section) the PPI is not expected to change as seen in Table 3-89 below. Any changes shown under Alternative 1, the no action alternative, are due to reasonably foreseeable actions. All alternatives do not change the PPI for pileated woodpeckers due to the fact that no old growth is harvested.

Table 3-89 - Potential Population Index by Alternative

ANALYSIS AREA	EXISTING PPI	ALT. 1 CUM1	ALT 1 CUM2	ALT 2	ALT 4 AND ALT 7	ALT 6
Silverfish PSU	10	10	10	10	10	10
Forest-wide	425	425	425	425	425	425

Project activities, such as falling and yarding are likely to cause pileated woodpeckers to, at least temporarily, move away from the disturbed areas.

Cumulative Effects:

No other federal activities are proposed. Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, the CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6. Reasonably foreseeable federal permitted activities included the MMI power line corridor, Bear Creek Lakes Access, and the Wayup/Fourth of July mine access. The harvested portion of any stands will not maintain preferred habitat conditions for basal area or canopy closure for pileated woodpeckers. These impacts were considered and disclosed under Alternative 1.

The proposed action alternatives and associated cumulative effects is not expected to change (either increase or decrease) the potential population index for pileated woodpeckers on the Kootenai National Forest as a result of impacts to old growth habitat. However, several hundred acres of general forested habitat (younger age classes) currently lie within potential nesting territories. Continued fragmentation of this habitat will reduce secure foraging habitat, and may reduce habitat effectiveness for several decades. Although adverse effects to some attributes of old growth habitat is expected within the Silverfish PSU, potential nesting territories of individual birds are not expected to be rendered ineffective for nesting as a result of management activities on federal land.

Regulatory Consistency

Old Growth Habitat – All alternatives are consistent with Forest Plan direction for old growth (see old growth section of this document)**.**

Cavity habitat and down wood - All proposed units are designed to maintain at least 40% snag levels in proposed harvest areas, and 60% snag levels in riparian areas. **Alternative 2** would include a project-specific amendment which would suspend the requirement that existing cavity habitat be retained in MA 10. However, all units will still meet the 40% minimum level with replacement and seed trees (future snags). No alternative would result in an overall snag level in the Silverfish PSU that is less than the Forest Plan snag standards, as amended. **Alternatives 2, 4, 6, and 7** would meet Forest Plan Snag standards in MA 10 lands.

There are no specific goals or standards for downed woody debris 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..." (Kootenai Forest Plan, Vol. 1, II-1, goal #7). However, the Forest Plan does provide guidelines in Appendix 16, Cavity Habitat Management (FP, Vol. 2, App. 16:6).

Guideline #9 states “leave logs >12” diameter scattered throughout dozer-piled units (a few pieces per acre) to provide cover and feeding sites for birds and small mammals. Five to 15 tons per acre is recommended and is generally compatible with silvicultural needs.” **All alternatives** are consistent with

the Kootenai Forest plan, as a wide range of successional habitats, and associated amounts of downed woody material would be available.

Summary Old Growth, Snag and Down Wood Habitat MIS Statement

Based on the analysis for pileated woodpecker, old growth, 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. These species include, but are not limited to, the northern goshawk and the pine marten which were brought up in public comment.

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 3-90: Sensitive Wildlife Species on the Kootenai National Forest (Kimbell 2004, 2005, and McAllister 2007)

SENSITIVE SPECIES	SCIENTIFIC NAME	STATUS IN SILVERFISH PLANNING SUBUNIT	COMMENTS**
Bald Eagle	*Haliaeetus leucocephalus*	K	
Black-backed woodpecker	*Picoides articus*	S	
Coeur d'Alene Salamander	*Plethodon idahoensis*	NS	1, 2
Columbian Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	NS	1, 3
Common loon	*Gavia immer*	K	4
Fisher	*Martes pennanti*	S	
Flammulated Owl	*Otus flammeolus*	K	
Harlequin Duck	*Histrionicus histrionicus*	NS	1, 5
Northern Bog Lemming	*Synaptomys borealis*	NS	1
Northern Leopard Frog	*Rana pipiens*	NS	1, 6
Peregrine Falcon	*Falco peregrinus anatum*	S	

SENSITIVE SPECIES	SCIENTIFIC NAME	STATUS IN SILVERFISH PLANNING SUBUNIT	COMMENTS**
Townsend's Big-eared Bat	*Corynorhinus townsendii*	K	
Western Toad	*Bufo boreas*	K	
Wolverine	*Gulo gulo*	K	

*Status Key:

K = This species is known to occur within the Silverfish planning subunit (PSU).
S = Species is suspected to occur within the PSU.
NS = Species is not suspected to occur within the PSU, and is dropped from further evaluation.
1 = Suitable habitat does not occur in the PSU
2 = No preferred seeps in fractured belt rock, waterfall spray zones, and rocky riparian substrates occur. Surveys have only documented the long-toed salamander (*Ambystoma macrodactylum)* in the PSU.
3 = No perennial grasslands occur within the Silverfish PSU. Species only known from Rexford R.D.
4 =. In the Silverfish PSU, Lower Geiger Lake has had documented detections in 1984, 2003 and 2006. None of the detections were of a successful breeding pair.
5 = No suitable streams occur in the Silverfish PSU
6 = The species is only known from the Clark, Koocanusa and Tobacco Planning Units.

Bald Eagle

Data Sources, Methods, Assumptions, Bounds of Analysis

Eagle population ecology, biology, habitat description and relationships identified by research are described in USDI 1995, USDI 1999, MBEWG 1991, MBEWG 1994. That information is incorporated by reference. Eagle occurrence data comes from recent District wildlife observation records, Forest historical data, and other agencies (USFWS, MFWP).

The National Bald Eagle Management Guidelines (USDI, USFWS 2007a) provide the recommendations for avoiding disturbance to bald eagles. The Montana Bald Eagle Management Plan (MBEMP) (MBEWG 1994) states that the Plan "*will also serve as the conservation and management plan when bald eagles are delisted*." The guidelines provided in the MBEMP meet the recommendations from the National guidelines; therefore the management guidelines from the MBEMP serve as the measure for bald eagle habitat management and disturbance impacts on the Kootenai National Forest. The effect of any proposed activity on potential eagle habitat and any known eagle nests located within the bald eagle habitat area agreed to by the USFWS (USDI 2001) will be discussed in relation to the MBEMP.

The analysis boundary for project impacts to individuals and their habitat is all lands within the Silverfish PSU that fall within the bald eagle habitat area boundaries agreed to by the FWS (USDI 2001). The boundary for cumulative effects and making the effects determination is the consultation area agreed to by the FWS (ibid) for bald eagles on the Kootenai National Forest.

Affected Environment/Existing Condition

The bald eagle was officially removed from the threatened species list on August 8, 2007. It was then placed on the Forest Service Northern Region's sensitive species list for a period of five years, after which a status review will be made to determine the need to remain on or be removed from the list.

Bald eagles occur as both seasonal migrants and year-round residents within the boundaries of the Kootenai National Forest. Nesting has increased significantly over the last two decades within the boundaries of the Kootenai National Forest. Only one active nest was known to occur in 1978, whereas 35 nests (18 on NFS and 17 on private land) were known and monitored in 2004. Nest success for active nests over the last twenty year period is about 83%, with an average of 1.3 fledglings per active nest (KNF bald eagle monitoring records).

Wintering bald eagle numbers have fluctuated over the years depending on food sources (fish from open waters and dead animals along roads and railroad tracks) and winter conditions (open verses frozen water for foraging habitat). Mid-winter bald eagle counts have averaged 96 bald eagles over the past 20 years (KNF bald eagle monitoring records).

Forest-wide potential bald eagle habitat covers about 564,558 acres (242,965 NFS; 275,470 private; and 46,123 water) (based on USDI 2001).

The National Bald Eagle Management Guidelines provide the following recommendations for avoiding disturbance to bald eagles at nest sites: 1) keeping a distance between the activity and nest, 2) maintaining preferable forested (or natural) areas between the activity and around nest trees (landscape buffers), and 3) avoiding certain activities during the breeding season.

The National Bald Eagle Management Guidelines (NBEMG) provide the following recommendations for avoiding disturbance to bald eagles at foraging areas and communal roost sites: 1) minimize potentially disruptive activities and development in the eagles direct flight path between their nest and roost sites and important foraging areas; 2) locate long-term and permanent water-dependent facilities, such as boat ramps and marinas, away from important eagle foraging areas; 3) avoid recreational and commercial boating and fishing near critical eagle foraging areas during peak feeding times (usually early to mid-morning and late afternoon), except where eagles have demonstrated tolerance to such activity; 4) do not use explosives within ½ mile (or within 1 mile in open areas) of communal roosts when eagles are congregating, without prior coordination with USFWS and MFWP; 5) locate aircraft corridors no closer than 1,000 feet vertical or horizontal distance from communal roost sites.

Additional NBEMG recommendations to benefit bald eagles include: 1) protect and preserve potential roost and nest sites by retaining mature trees and old growth stands, particularly within ½ mile from water; 2) where nests are blown from trees during storms or are otherwise destroyed by the elements, continue to protect the site in the absence of the nest for up to three complete breeding seasons; 3) to avoid collisions, site wind turbines, communication towers, and high voltage transmission power lines away from nests, foraging areas, and communal roost sites; 4) employ industry-accepted best management practices to prevent birds from colliding with or being electrocuted by utility lines, towers and poles. If possible, bury utility lines in important eagle areas; 5) where bald eagles are likely to nest in human-made structures and such use could impede operation or eminence of the structures or jeopardize the safety of the eagles, equip the structures with devices or nesting platforms that will safely accommodate bald eagle nests without interfering with structure performance; 6) immediately cover carcasses of euthanized animals to protect eagles from being poisoned; 7) do not feed eagles; 8) use pesticides, herbicides, fertilizers, and other chemicals only in accordance with Federal and state laws; 9) monitor and minimize dispersal of contaminants associated with hazardous waste sites.

MBEMP (MBEWG 1994) guidelines identify four general habitat categories and management concerns for bald eagles. They are: nesting habitat, foraging habitat (including perch sites), winter habitat (including roost sites), and mortality risks.

Nesting habitat is typically associated with mature forest stands in close proximity (less than 1 mile) to large bodies of water, including lakes and fourth order streams, which provide an adequate prey base. Nesting habitat includes 3 management zones: 1 – Nest site area, 2 – Primary use area, and 3 – Home Range. A description of each zone and associated management objectives and guidelines are found in the MPEMP (MBEWG 1994) and are included by reference. A portion of the Silverfish PSU is located within 1 mile of the Fisher River. This area is in a portion of the Kootenai National Forest that is documented to receive use by eagles and is considered in suitable eagle habitat based on the maps

agreed to by FWS (USDI, USFWS 2001). There is an active bald eagle nest site along US Highway 2, adjacent to the Silverfish PSU. Monitoring in 2007 indicated production of one eaglet.

Foraging habitat consists of lakes, rivers, wetlands and meadows which provide open flight paths, perches, and adequate prey. It also includes highway and railroad corridors (especially in the winter) due to dead animals found in these areas. Eagles likely feed along the West Fisher stream corridor.

Winter habitat is generally dictated by the presence and abundance of food, open water, and secure night roost sites (MBEWG 1994). Eagles may forage along the West Fisher, or for carrion along Highway 2.

The MBEMP (1994) identifies bald eagle mortality risks as shooting, accidental trapping, poisoning, diseases, and electrocution. On the Kootenai NF bald eagles have also died from collisions with motor vehicles and trains. In the Silverfish PSU most of these risks are likely present.

Environmental Consequences

Direct and Indirect Effects of all alternatives

None of the alternatives (1, 2, 4, 6, and 7) impact nesting habitat. A nest is located along US Highway 2, just to the east of the PSU. The acres treated and timing of activities would not result in displacement or disturbance of nesting eagles.

None of the action alternatives (2, 4, 7, and 6) propose harvest activity within 1 mile of the Fisher River, which is considered foraging habitat. No harvest activity is proposed in a nest site area (zone 1), a primary use area (zone 2), or a known home range foraging area (zone 3).

All of the action alternatives propose the burn unit B10, which has a portion located just within the 1 mile zone. The proposed burn would occur during the fall and would have no impact during the nesting season.

The timber sale contract will contain the contract clause CT 6.251 Protection of Endangered Species (4/90) as amended, which allows the government to cancel or unilaterally modify the timber sale in the event a new eagle territory would be found within the impact zone of the timber sale.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute an effect to bald eagle because they do not occur within bald eagle use areas as defined above.

Cumulative Effects for All Alternatives

Cumulatively, private permitted activities on federal lands, and harvest on corporate timber lands would continue to occur. The removal of large overstory trees may affect the availability of eagle nesting or roosting habitat in a specific stand. Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1

activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

No cumulative changes beyond those connected to private or corporate harvest are expected. Under all alternatives, suitable habitat within the bald eagle consultation area remains on both NFS and private lands distributed across the Silverfish PSU and across the Kootenai N.F.

A bald eagle mortality risk is present along the Highway 2 corridor. Deer carcasses lying within the road right-of-way can attract eagles, and increase the risk of vehicle-eagle collisions. This mortality risk is expected to continue under **all alternatives**.

Regulatory Consistency

- All Alternatives meet Forest Plan direction for sensitive species (FP Vol. 1, II-1 #6).
- The project is consistent with the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668C 1978).
- The project is consistent with the Migratory Bird Treaty Act (17 U.S.C. 703-712).

Statement of Findings

Alternative 1, when considered in association with planned activities on both public and private lands, **is expected to have no cumulative effects** that affect the bald eagle because no activities are authorized, and all past activities located within eagle habitat obtained concurrence with the USFWS if any impact to the bald eagle was suspected.

The action alternatives are not likely to impact individuals or their habitat and would not contribute to a trend toward federal listing or loss of species viability. This determination is based on 1) small potential for displacement from prescribed burning activities of unit B10 in the fall, and 2) a slight increase in mortality risk from hauling logs on Highway 2 (located within the consultation zone, USDI 2001).

Black-backed Woodpecker

Data Sources, Methods, Assumptions, Bounds of Analysis

Black-backed woodpecker population ecology, biology, habitat description and relationships identified by research are described in USDA Forest Service 2007, Russel et al. 2007, Saab et al 2007, Dixon and Saab 2000, Powell 2000, Cherry 1997, Hutto 1995, and O'Connor and Hillis 2001. That information is incorporated by reference. Black-backed woodpecker occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA). Black-backed woodpecker habitat was modeled using cumulative effects model (CEM) data (Heinz 1996, unpublished; see project file). The potential population index (PPI) (number of potential territories) was calculated for a breeding pair by dividing general forest habitat acres by 800 acres (approximate largest home range) and by dividing high quality habitat acres by 175 acres (approximate smallest home range) (Johnson et al. 2004: Appendix G). The difference in territory size used in the two habitat components is based on the assumption that higher quality habitat can support a breeding pair with fewer acres. High quality habitat is defined as mixed-lethal or stand-replacement fire areas where an abundance of snags are available. Black-backed woodpeckers have been found to be almost restricted to early post-fire forests (Hutto 1995). Territory sizes are from the summary paper by Cherry (1998). The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Silverfish Planning Subunit (PSU). The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

Habitat for black-backed woodpeckers consists of boreal and montane forest where beetle outbreaks are occurring as a result of disturbances caused by fire, wind, and disease. In the Silverfish PSU black-backed woodpecker habitat consists mainly of lower quality general forest habitat with small scattered patches of snags produced by insect and disease. Black-backed woodpecker observation and monitoring data indicate that historic and current sightings are concentrated in the northwest quarter of the district. No surveys or sightings are documented within the Crazy or Silverfish PSU's.

Lower quality habitat supports low populations of resident black-backed woodpeckers. The Kootenai CEM black-backed woodpecker habitat model (Heinz 1996) identified 36,505 acres of general forest habitat on NFS lands located within the Silverfish PSU. No high quality habitat in the form of recent (in the last 10 years) mixed lethal and stand-replacing wildfire or prescribed fire consists in the PSU. The available general forest would produce a PPI of 46 pairs.

On private lands, 3,432 acres of black-backed woodpecker habitat was modeled. Of that, an estimated 1,000 acres have been harvested since the layer was created. The remaining 2,432 acres would produce a PPI of 3 pairs.

On a Forest-wide level, modeled black-backed woodpecker habitat is abundant, broadly distributed and amounts to 1,317,790 acres of general forest habitat (Johnson 1999). Forest-wide, general forest habitat would produce a PPI of 1,647 pairs.

As a primary cavity-nester, black-backed woodpeckers require dead or live trees with heartwood rot and show a preference for Douglas-fir, ponderosa pine, lodgepole pine, and western larch. According to Thomas (1979, p. 74), a snag level of 40 percent or more should maintain viable populations of birds dependent on cavities for nest sites. The existing potential population level on NFS lands is calculated at 83%. Please refer to the Snag Habitat section in this document for a detailed summary of snag habitat.

Forest-wide, high quality habitat from recent (since 2000) mixed lethal and stand replacing wildfires covers about 32,000 acres (KNF FP Monitoring files FY07 item C6, Johnson 2008). Of those about 5,200 acres have been harvested (ibid), leaving around 26,800 acres of high quality BBWP habitat, enough to support a potential population index of 153 breeding pairs.

No population data is available for black-backed woodpeckers within the Kootenai National Forest. Breeding bird point count surveys have been conducted on the Kootenai National Forest since 1994. This survey technique is not specifically designed to census woodpecker species, although all bird species heard or sighted are recorded during the survey. The black-backed woodpecker was tallied 18 times at the 1,257 individual points surveyed from 1994-2004 (Al Bratkovich, Libby R.D. biologist, personal communication to J. Holifield, Libby R.D. biologist, 2005).

Across the Forest Service Northern Region, the black-backed woodpecker is considered secure in terms of persistence (Samson 2006, 2006a). The Northern Region BBWP Overview (Bonn et al. 2007) shows this species population is increasing and preferred habitat is also on the rise, due to recent (since 2000) large wildfire activity.

Environmental Consequences

Direct and Indirect Effects Common to All Action Alternatives

All action alternatives maintain snag and old growth forest levels throughout the Silverfish PSU that exceed the minimum levels necessary to support viable populations of snag dependent and old growth associated species (refer to snag habitat and old growth forest sections of this document). None of the

action alternatives propose to harvest within designated MA 13. There is proposed ecosystem burning that would occur under all of the action alternatives (a total of 61 acres in Alternative 2, and a total of 71 acres under Alternatives 4, and 6). Burning may consume some snags, but would create others and may also create feeding habitat for woodpeckers.

All action alternatives would change yearlong open roads to yearlong restricted roads, and decommission and/or store roads, but the mileage varies by alternative (please see Chapter 2 for details). Portions of these roads are within or adjacent to old growth habitat, or stands that support snags. Consequently, the availability of snag habitat would be maintained and improved over the long term in these associated stands.

A number of Design Criteria listed in Table 2-20 would be implemented to maintain and improve snag habitat. To mitigate for the loss of snags, dead merchantable trees, and dead-top trees within the harvest units due to OSHA safety standards, retention of live cull, fire killed trees, and reserve trees, signing old growth areas to prevent firewood harvest in these areas, and inoculating live trees with heart-rot pathogens to create snags over the long term (when money is available), and monitoring snag levels are prescribed.

During harvest operations and associated activity, there may be short-term site specific displacement of black-backed woodpeckers inhabiting the PSU.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to black-backed woodpecker because they do not impact habitat.

Effects by Alternative

Table 3-91 - Change in Black-backed Woodpecker Habitat and PPI, Displayed for NFS Lands and Other Lands by Alternative (NFS lands/Other lands)

SILVERFISH PLANNING SUBUNIT	EXISTING CONDITION	ALT. 1 CUM1	ALT. 1 CUM2	ALT 2	ALT. 4 AND ALT. 7	ALT. 6
Habitat Acres and % change from existing condition due to timber harvest (NFS/other lands)	36,505/ 3,433	No Δ/-873 0/25	No Δ/-873 0/25	-2,482/no Δ 7/0	-1,247/ no Δ 4/ 0	-1,878/ no Δ 5/0
PPI – (# pair territories)	46/3	46/3	46/3	42/no Δ	44/ no Δ	43/ no Δ
Acres of habitat due to prescribed fire and % change due to prescribed fire	0 0%	+1,056/0 3/0	+1,056/0 3/0	+2,567/0 7/0	+2,567/0 7/0	+2,567/0 7/0
Acres high quality habitat – and % change due to wildfires or stand replacing prescribed fire	0 0	0 0	0 0	+581/0 1/0	+581/0 1/0	+581/0 1/0
Forest-wide						
Habitat acres – Forest-wide And % change in general forest habitat due to harvest	1,317,130 0	1,317,130 0	1,317,130 0	1,314,648 <1	1,315,883 <1	1,315,252 <1
PPI – (# pair territories)	1,646	1,646	1,646	1,646	1,646	1,646

Acres in Alternative 1 (either CUM1 or CUM2) are the result of cumulative effects from other planned or reasonably foreseeable activities, including those on non-NFS lands. Acres displayed under the action alternatives are **direct effects** of the proposed activities, and *these can be added or subtracted from Alternative 1 acres to see cumulative effect acres***.** *No activities are directly proposed on non-NFS lands under the action alternatives which is why no change would occur on those lands, as shown under alt 2, 4, 7, and 6. The cumulative effects of other activities are displayed under alt 1 CUM1 or CUM2***.**

Direct and Indirect Effects

Under **Alternative 1,** no activities would occur so no black-backed woodpeckers would have the potential to be disturbed by timber harvest, slashing and/or underburning. No ***direct*** effect to black-backed woodpeckers would be expected with this alternative. Based on historical stand conditions (see vegetation and ecological discussion), both nesting and foraging habitat was altered by past timber harvest and fire suppression. Plant succession would continue, resulting in an increasing canopy closure and increasing density of understory conifers. The increasing density of the understory may stress and kill the larger overstory trees, ***indirectly*** resulting in an increase of nesting and foraging habitat. Should a wildland fire occur, some displacement of the species can occur in the short-term during the actual fire. However, high-quality habitat and a beneficial impact to nesting and foraging habitat would be expected for 2-3 years due to the number of snags created. If a wildfire were to occur, prime black-backed woodpecker habitat would be created, and conditions would benefit this species. Local populations would experience an immediate increase as bark beetles increased, lasting about six years, until beetle populations declined. The availability of dead and dying trees would also continue to be limited near motorized access routes due to firewood cutters. Removal of dead standing and down material would reduce the amount of feeding habitat.

Action Alternatives 2, 4, 6, and 7 proposed activities have the potential to remove or reduce general forest foraging opportunities, and at the same time, create foraging habitat during post-harvest burning activities. Regeneration harvest removes general foraging opportunities, as District implementation of OSHA requires the removal of all standing snags. Regeneration harvest almost always includes underburning, and with heavier slash, the potential to kill trees left on site. Potentially, a larger amount of low quality habitat would be replaced with a smaller amount of higher-quality habitat. Intermediate harvest would leave a number of trees on site for general foraging opportunities, however standing snags or dead top trees would be removed for safety. Underburning intermediate harvest units would create more potential for black-backed woodpecker foraging habitat than regeneration harvest units, however, due to more standing trees being retained. The proposed burn only units are a mix of fall underburning, mixed severity, and stand replacing burn prescriptions. The burns most similar to historical conditions created by mixed severity fires and stand replacing fires could provide high quality habitat for 2-3 years, then decline and rarely providing insect food sources beyond 5-7 years (Caton 1996, Murphy and Lehnhausen 1998). No commercial thinning is proposed under any of the alternatives.

Alternatives 2, 4, 6, and 7 would create forest openings with a combination of regeneration and intermediate harvest on 4 to 7% (See Table 3-91 for acres impacted by alternative) of black-backed woodpecker habitat in the Silverfish PSU, which would reduce general use but would also create some good forage trees following underburning. Habitat reductions in high quality habitat would not result following implementation of any of these alternatives because there is no existing high quality habitat within the PSU. Of the 36,505 acres of general forest habitat identified, a minimum of 93% would remain following implementation of all action alternatives. All alternatives would provide additional foraging trees on harvest units with underburning for site preparation. In addition prescribed burning would occur on 3,148 acres, or about 9% of the black-backed woodpecker habitat identified in the PSU. On a Forest-wide level, the reduction in general foraging habitat would amount to less than 1% for all action alternatives. Minor effects on the distribution of habitat needed for viable populations of black-

backed woodpeckers in the PSU or Forest would occur because proposed activities would result in a small net loss of low quality habitat scattered throughout the PSU. There would be no loss in high quality habitat. High quality habitat is expected to be created as a result of the proposed burn-only units. Within the Silverfish PSU, a minimum of 80% cavity excavator potential population level would remain on NFS lands following any implementation of any action alternative. Please refer to the Snag Habitat section of this document for a more detailed discussion.

As concluded the Northern Region BBWP Overview (Bonn et al 2007:23), if a project is not going to impact post-fire or bark beetle-outbreak areas, there should be no impact to black-backed woodpeckers.

Within the PSU, **Alternative 2** reduces the potential PPI the most, **followed by Alternative 6, and then 4 and 7.** All action alternatives maintain the existing PPI on the Forest-wide scale.

Cumulative Effects

The cumulative decreases in habitat and PPI changes are displayed in Table 3-91. Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same ***except*** for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considered the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Acres displayed for the no action alternative account for the cumulative effects from other reasonably foreseeable or planned projects. Acres displayed under the action alternatives are direct effects of the proposed activities, and these can be added or subtracted from the **no action alternative** acres to see cumulative effect acres.

Past road construction projects, tree harvest, fire suppression, and natural events have created the existing habitat conditions for the black-backed woodpecker. Wildfires that created large numbers of snags burned almost 100,000 acres on the Kootenai National Forest in 1994 and 2000, but none occurred within the Silverfish PSU. Only a minor portion of those areas, or about 10% of the 53,000 acres that burned on the KNF in 1994) were harvested. This left large areas where all fire-created snags were retained (USDA Forest Service 2003). Forest-wide, high quality habitat from recent (since 2000) mixed lethal and stand replacing wildfires covers about 32,000 acres (KNF FP Monitoring files FY07 item C6, Johnson 2008). Of those about 5,200 acres have been harvested (ibid), leaving around 26,800 acres of high quality BBWP habitat, enough to support a potential population index of 153 breeding pairs.

The Cumulative Effects Worksheet, located in the wildlife section of the project file, considers and describes proposed activities in addition to the past, current and reasonably foreseeable activities listed in Chapter 3. Those activities that cumulatively contribute indiscernible effects on addressed species or their habitat are not included in this section. These include activities such as normal road and trail maintenance activities and have the potential to remove nesting and foraging trees if they are close to a road or trail and present a safety hazard. Effects would include removing site-specific, individual trees, and would not be expected to adversely affect black-backed woodpeckers.

Those activities that cumulatively affect the species or habitat will be summarized below (refer to the Cumulative Effects Worksheet in project file for more complete description). These are firewood gathering, private land development, and vegetation management.

Firewood cutting on National Forest land is a permitted use that occurs along all open roads except with MA 13 old growth areas. As many old growth associated species also use other adjacent habitat, loss of

snags in these areas can affect habitat suitability. Outside of designated old growth habitat, the availability of snags and down woody material is reduced along the road influence zone. This loss of snag habitat was accounted for in the analysis of available snag habitat (please see snag habitat section). Firewood gathering can also cause minor short-term localized displacement to species using the area. Ongoing and reasonably foreseeable firewood gathering activities within the Silverfish PSU would cumulatively result in localized and minor effects on snag habitat and other habitat parameters required by the black-backed woodpecker.

Firewood gathering on State and Corporate lands is also expected to occur, and it was assumed that the same level of activity occurs on these lands, so potential effects to snags would be minor and associated with open road corridors. All activities on these lands may result in the loss of foraging opportunities for the black-backed woodpecker. However, given the amount of foraging habitat on NFS lands, this should not be a limiting factor for the species within the PSU. The level of firewood gathering is expected to remain fairly stable over the next 5 years.

Private land development and timber harvest on private land: Development of private land, including the construction of roads, clearing of vegetation, construction of private residences, and installation of improvements, as well as timber harvest, can create a variety of changes to the landscape. Depending on the size, type and location of the developments and the amount of private land on the landscape, these activities can have varied effects, including habitat loss, increased fragmentation, and localized disturbances on snag dependent species.

Approximately 13% of the Silverfish PSU is in private or state lands, and these activities could take place in a spatially dispersed manner across the PSU. Development of these lands for subdivision within the PSU could potentially reduce the amount of foraging habitat for black-backed woodpeckers.

Timber harvest on corporate timber lands is ongoing. Ongoing timber harvest includes both regeneration and selective silvicultural prescriptions. Road construction may also occur.

All activities on non-federal lands may result in the loss of foraging habitat for black-backed woodpeckers. However, on NFS lands, given the amount of old growth as well as other stands that provide foraging habitat, this should not be a limiting factor for this species within the PSU.

Vegetation management and other activities on NFS lands: past timber sales (identified in Chapter 3) have modified the old growth and snag habitat within the Silverfish PSU. Other ongoing activities that may impact black-backed woodpecker foraging habitat are the construction of a power line and associated access roads for the proposed Montanore Mine. Direct and indirect effects from ongoing activities were discussed in their associated BA's and BE's.

There is a potential for additional small salvage timber sales to occur over the next 10 years under the Forest-wide Blowdown Salvage DN. Salvage activities would follow Forest Plan direction. Treatment activities would follow the DN direction.

Other agency and public actions identified in Chapter 3 (description of ongoing and foreseeable actions) would have little to no effect on black-backed woodpeckers or their habitat because no change in this woodpecker's habitat would result from ongoing and foreseeable actions. No adverse cumulative effects from these types of activities would be expected.

Alternative 1, 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 black-backed woodpecker. This determination is based on: 1) Alternative 1 as proposed would not change the current availability of nesting and foraging habitat in the short-term; 2) the estimated PPI for both Silverfish PSU and Forest-wide on NFS lands would not change as a result of Alternative 1.

The action alternatives, in combination with other proposed and reasonably foreseeable Forest Service, State and private activities would contribute minor effects to black-backed woodpeckers and their habitat. The action **alternatives,** when considered in association with the planned activities on both public and private lands are expected to have no adverse cumulative effects that impact the black-backed woodpecker. Less than 0.5% of the Forest-wide habitat would be affected by any of the action alternatives. The action alternatives and other cumulative activities reduce the Silverfish PSU and forest-wide PPI by 1 with timber harvest and/or burning, and would lower the quality of foraging and remove potential nesting habitat. Post-activity, any territory in the areas influenced by the proposed Miller West Fisher harvest units may be less suitable due to timber harvest.

Cumulatively, when other activities on NFS lands discussed under Alternative 1, and all past, present, and reasonably foreseeable activities on federal lands are considered, approximately 80% cavity habitat would be sufficient based on standards established for NFS lands. National Forests can only manage habitat on NFS lands, therefore the case for viable populations must be made on NFS lands. In the case of a post fire snag specialist like the black-backed woodpecker, Sampson's (2006) conservation assessment determines that the critical habitat threshold needed for maintaining viable populations of black-backed woodpeckers is far exceeded on NFS lands across the Northern Region and on all of the individual forests including the Kootenai. This assessment covered the period of 2000-2003. An updated assessment of post fire habitat on the Kootenai National Forest, conducted for the Brush Creek Fire EA (2008) determined that 37,248 acres have been created over the past 7 years. Approximately 5,212 acres, or 14%, have been salvaged. The remaining habitat exceeds the critical habitat threshold for maintaining viable populations of black-backed woodpeckers.

After implementation of the action alternatives and the no action alternative, no other reasonably foreseeable FS projects would result in a change in cavity excavator PPL on NFS lands. The expected minimum of 80% level of snag habitat on NFS lands is still expected to provide for an associated species population level above 40% which is thought to be the minimum needed to maintain self-sustaining populations of snag-dependent wildlife (Thomas 1979:72).

Statement of Findings

Implementation of **Alternative 1** would have **no impact** (direct, indirect, or cumulative) on the black-backed woodpecker as no activities are proposed. Cumulatively, other reasonably foreseeable activities on federal land would occur and may affect individuals or their habitat.

Alternatives 2, 4, 6, and 7 may impact individuals and/or their habitat, but would not contribute to a trend toward federal listing or loss of species viability for the black-backed woodpecker. This determination is based on: 1) Snags would be lost due to timber harvest, but some snags would be created by prescribed burning, and suitable cavity habitat for the black-backed woodpecker is found forest-wide as documented in Johnson 1999a and USDA Forest Service, 2003b; 2) during logging operations, there may be short-term disturbance to black-backed woodpeckers utilizing the areas; 3) no high quality habitat would be reduced, small percentages of low quality habitat would be reduced, and small areas of low quality habitat would be improved, which would partly compensate for the reduction in habitat; 4) the decrease in forest-wide general foraging habitat would result in less than 1% change and habitat is broad, abundant and well distributed across the Northern Region and by the forest, and the short-term viability of the black-backed woodpecker in the Northern Region is not an issue as documented in Samson, 2005; and 5) the PPI forest-wide does not change.

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. Fisher occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA) and other agencies (MFWP). Fisher habitat was modeled using TSRMS vegetation data and running the Libby Ranger District TSMRS fisher habitat model (Fields 1999, see project file). The potential population index (PPI) (habitat acres divided by average home range acres) was calculated using 10,000 acres as the average male and 3,700 acres as the average female fisher home range (Powell and Zielinski 1994). The index shows both male and female fisher because their home ranges overlap extensively (ibid). The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Silverfish PSU. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

Fisher observation and monitoring data indicates no records of the species within the Silverfish PSU. Montana Fish, Wildlife and Parks performs winter track surveys about 3 times per year, every year. Data on FWP track sightings are not readily available. In the Silverfish PSU, the trail to Baree Lake, which is about 2.8 miles long, is surveyed every year. During 1994 and 1995, there were 19.6 and 28.6 additional miles of track surveys. No fisher tracks were documented. There were no USFS surveys done in during 1988 and 1989 in the Silverfish PSU. Johnson (1999) shows fisher presence confirmed in five of the eight planning units on the Kootenai. The Silverfish PSU is located within the Fisher planning unit, where no fisher presence has been documented.

Ruediger (1994) shows the Kootenai National Forest as a primary habitat area for fisher. Modeled habitat meets parameters of canopy closure, decadence, forest type, habitat group, and age structure (model definitions in project file). This modeled habitat was then clipped to only include land less than 650 meters distance to perennial streams (Heinemeyer 1993:54). Fisher habitat within this zone totals 18,885 acres on NFS lands, and no habitat was identified on private, State, or corporate land. Following the identification process outlined in Ruediger (ibid), the Fisher planning unit (major drainage) is assigned as a secondary fisher conservation area (Johnson 2004b). The Silverfish PSU (sub-drainage) is determined to be high quality fisher habitat area (ibid). Based on the average male and female fisher home range sizes and the modeled habitat acres within the fisher habitat zone, the potential population index for the Silverfish PSU is about 2 males and 5 females. The modeled forest-wide habitat, using the yearlong (modeled) habitat acres from Johnson (1999), provides the minimum PPI for the Kootenai National Forest of 29 male and 80 female fishers. The Silverfish PSU is fragmented by both existing timber harvest units and roads. Total road densities are about 1.9 mi/mi^2. This total road density would make fisher populations vulnerable to trapping in the roaded portions of the PSU.

Environmental Consequences

Direct and Indirect Effects common to all action alternatives

All action alternatives would continue to provide travel habitat for fisher traveling through the PSU. All action alternatives would maintain the potential population index (PPI) for fisher in the PSU and across the forest.

All action alternatives meet Forest Plan standards for retaining at least 40% available snag habitat (at least one snag per acre). Snags and down woody material are important to fisher as denning and resting sites. All alternatives maintain existing stands of old growth.

A number of Design Criteria listed in Table 2-20 would be implemented to maintain and improve snag habitat. To mitigate for the loss of snags, dead merchantable trees, and dead-top trees within the harvest units due to OSHA safety standards, retention of live cull, retention of fire killed trees, retention of reserve trees, signing old growth areas to prevent firewood harvest in these areas, and inoculating live trees with heart-rot pathogens to create snags over the long term (when money is available), and monitoring snag levels.

All action alternatives would maintain existing riparian vegetation and riparian travel corridors by following INFS direction. All action alternatives apply BMP's to all proposed harvest activities and establish RHCA's for stream and wetland protection (See Design Criteria, Table 2-20).

During harvest operations and associated activity, there may be short-term site specific displacement of fishers traveling through the PSU.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to fisher because they do not impact habitat.

Effects by Alternative

Table 3-92 summarizes the changes in habitat acres and PPI due to each alternative. **Acres displayed in the no action alternative** are the result of cumulative effects from other planned or reasonably foreseeable activities. Cumulatively, the reasonable and foreseeable activities considered in the no action alternative are the same *except* for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6. **Acres displayed under the action alternatives are the effects** of that alternative on fisher habitat, and these acres can be added or subtracted from Alternative 1 acres to see cumulative effect acres**.**

Table 3-92: Habitat and PPI Changes on NFS lands by Existing Condition and Alternative

	EXISTING CONDITION	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2 DIRECT EFFECTS	ALT. 4/7 DIRECT EFFECTS	ALT. 6 DIRECT EFFECTS
Habitat Acres within fisher habitat zone – Silverfish PSU (% change from existing)	18,885	-357 18,528 (-2%)	-407 18,478 (-2%)	-1,265 17,620 (-7%)	-732 18,153 (-4%)	-772 18,113 (-4%)
PPI – Silverfish PSU (#Males/Females)	2/5	2/5	2/5	2/5	2/5	2/5
Habitat Acres – Forest-wide (% Change from existing)	294,377	294,020 (<-1%)	293,970 (<1%)	292,805 (<-1%)	293,338 (<-1%)	293,298 (<-1%)

PPI – Forest-wide #(Males/Females)	29/80	29/80	29/80	29/80	29/80	29/80

Alternative 1 – CUM1 considers 307 acres prescribed burning, and estimate 50 acres of power line construction, with CUM2 considering 307 acres prescribed burning and estimate 100 acres of power line construction.

Direct and Indirect Effects

No activities would be proposed under **Alternative 1**, so no fishers would be disturbed by timber harvest, slashing, or underburning. No **direct** effect to fishers is expected with this alternative. Historical timber harvest decreased the amount of old growth and available down woody component available. Continued plant succession on drier sites would have few **indirect** effects on fishers, while on wetter sites habitat value may increase. All existing old growth habitat on NFS lands would be maintained. No changes in road access would occur under **Alternative 1**.

All action Alternatives propose vegetation management activities that would reduce the amount of fisher habitat (see Table 3-92 for acres by alternative). While research does not show the fisher to be highly sensitive to human activity, the presence of people and machines during project implementation may still 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. Heinemeyer and Jones (1994) show the most sensitive time for fisher is the breeding, denning and rearing period (Feb.15-June 30). Impacts within 200 meters (656 feet) of perennial streams are especially important to avoid (ibid). All action alternatives have units located within this zone. Within this zone, each alternative harvests fisher habitat as displayed in Table 3-92, as well as other timbered habitat as follows:

Alternative 2, within the fisher habitat zone impacts a total of 1,265 acres of modeled habitat (806 acres of timber harvest and associated activities, and 459 acres of prescribed fire). Additionally within this zone, other timbered habitat is impacted by 341 acres of harvest and 277 acres of burning. This alternative proposes the most regeneration harvest and therefore reduces travel habitat the most. **Alternative 4 and 7,** within the fisher habitat zone impact a total of 732 acres of modeled habitat (543 acres of timber harvest and associated activities, and 189 acres of prescribed fire). Additionally within this zone, other timbered habitat is impacted by 50 acres of harvest and 314 acres of burning. **Alternative 6,** within the fisher habitat zone impacts a total of 772 acres of modeled habitat (573 acres of timber harvest and associated activities, and 199 acres of prescribed fire). Additionally within this zone, other timbered habitat is impacted by 177 acres of harvest and 306 acres of burning.

All action alternatives have similar impacts to fisher habitat. Potentially fishers could occur. Risk for displacement impacts during the most sensitive time for fisher could occur, but no fishers are known to occur within the PSU. Riparian area buffers (RHCA's) included in all action alternatives, and which exclude timber harvest, would maintain some level of connectivity along riparian areas.

Under all action alternatives, if winter logging occurred, an increase in trapping pressure could result due to the easier access during the activity period. *Precommercial thinning* would occur on 351 acres under all **action alternatives**. Precommercial thinning could impact habitat to primary prey species such as snowshoe hare by decreasing foraging habitat.

Cumulative Effects

The cumulative decreases in habitat and PPI changes are displayed in Table 3-92. Acres displayed in **Alternative 1** account for the cumulative effects from other reasonably foreseeable or planned projects whose activities impact modeled habitat within the fisher habitat zone. Acres displayed are the acres of habitat remaining after implementation of these projects.

Alternative 1, when considered in association with the planned activities on both federal and private lands, would have **no cumulative** effects that would impact the fisher because it would not change the current availability of suitable habitat and access for trapping would not change. Suitable habitat would still occur on federal lands. Cumulatively, private and federal timber harvest, and burning activities and the creation of additional openings could affect potential fisher movement within certain areas. Within the fisher habitat zone, federal activities would prescribe burn on 307 acres of fisher habitat, and proposed power line construction could range from an estimated 50 to 100 acres (as displayed in the above table). The proposed power line construction in Miller Creek is estimated to impact less fisher habitat than the power line construction in the West Fisher. In addition, another 495 acres of timbered habitat on NFS lands would be harvested within the modeled fisher zone. Plum Creek Timber Company would harvest 966 acres within this zone, but harvest would not occur in modeled habitat. Cumulatively, roads could be built on PCTC lands if those lands are sold for subdivision. If this occurred, total road density would increase. However, habitat for fishers would remain on federal lands.

The **action alternatives**, when considered in association with the planned activities on both federal and private lands as described under Alternative 1, are expected to have no negative cumulative effects that impact the fisher. **Cumulatively**, habitat acres in Silverfish PSU remaining after implementation of the action alternatives are displayed in Table 3-92 above. **Alternative 2** impacts the most fisher habitat, followed by **Alternatives 6, 4 and 7**. Cumulatively the PPI for the Silverfish PSU is maintained at 2 males and 5 females, and the Forest-wide PPI is also maintained. The action alternatives would treat less than 1% of the potential fisher habitat available in the PSU or forest-wide. This amount of habitat loss is not likely to result in a declining population trend for this species.

Regulatory Consistency

The action alternatives meet Forest Plan goals for sensitive species. The proposed action meets FP riparian area standards and guidelines as amended by INFS.

Statement of Findings

Implementation of the **no action alternatives** would have **no impact** to the fisher as no activities are proposed. Cumulatively changes could occur due to effects of reasonable foreseeable activities.

The action alternatives **may impact individuals or habitat but would not contribute to a trend toward federal listing or loss of species viability** for fishers or their habitat. This finding is based the above analysis, and includes the following: 1) minimal potential for disturbance or displacement from proposed activities in suitable habitat; 2) proposed access changes may reduce susceptibility to trapping; 3) sufficient habitat would remain distributed across the forest to maintain populations; and 4) low potential for any displacement or impact to the fisher.

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. Flammulated owl occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS

FAUNA). Flammulated owl habitat was modeled using TSMRS vegetation data and running the Libby Ranger District TSMRS flammulated owl habitat model (Hanvey 1996) (see project file).

Estimation of mean home ranges reported in the literature vary from 5.5 ha (13.6 acres) in Oregon (Goggans 1985) and 24 ha (59 acres) in Colorado (Linkhart et al. 1998). 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 effects to habitat and resulting potential population index will help demonstrate potential changes to population index.

The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Silverfish PSU. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

District flammulated owl observation and monitoring data indicates that the species occurs within the Silverfish PSU. A Kootenai National Forest status summary of the flammulated owl was documented by Johnson (1999). The summary shows that potential habitat occurs across all eight planning units. Forest-wide, there are 237,098 acres of potential habitat (Ibid 1999). Field surveys have confirmed flammulated owl presence in five of eight planning units, but the population size on the Kootenai National Forest is unknown (Ibid 1999). The flammulated owl has been documented to occur within the Fisher Geographic Area (GA). Acreage of potential flammulated owl habitat was modeled on both NFS lands and PCTC lands using the District TSMRS model (Hanvey 1996). Forest-wide acreage is from Johnson (1999). Based on the average flammulated owl pair territory and the modeled habitat acres, the potential population index for the NFS lands within the Silverfish PSU is 65 flammulated owl pairs, and on private land it is 58. 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 multiple times on two sections of road within the Silverfish PSU over the last decade. North Fork Miller Creek road (Rd. 4725) was surveyed each summer, transects being about 4.5 linear miles, consisting of about 10 points and constituting about 1.3 mile^2 covered by broadcast calling. A section of road near Teeters Peak (Rd. 4782) was surveyed summers 1995 – 1997, transects being about 2.5 linear miles, consisting of 5 points and constituting about 0.8 mile^2 covered by broadcast calling. An additional 4.4 linear miles, consisting of 8 points and constituting about 1.3 mile^2, were covered by broadcast calling surveys in the Silverfish PSU. Flammulated owls were detected only on Rd. 4725, and were detected every year surveys were conducted, yielding 17 sightings total.

As part of the Northern Region Landbird Monitoring program, forest-wide flammulated owl surveys have been conducted in 2005 (Cilimburg 2006) and 2007 (Smucker and Cilimburg, summary October 2008) on the Kootenai National Forest. These surveys have included the Teeters Peak area (on Rd. 231) and Miller Creek (Rds. 4725 and 4724, South Fork Miller Creek Road).

Table 3-93: Results of Flammulated Owl Surveys in the Project Area

KOOTENAI NF	NUMBER OF TRANSECTS	NUMBER OF POINTS	YES – FLAMS (POINT)	% OF POINTS YES FLAMS
2005	38	376	26	6.9%
2007	21	159	31	19.5%

These 2005 and 2007 surveys documented flammulated owls off of the North and South Fork Miller Creek Roads (#4725 and 4724).

Environmental Consequences

Direct and Indirect Effects common to all action alternatives

All action alternatives maintain snag and old growth forest levels throughout the Silverfish PSU that exceed the minimum levels necessary to support viable populations of snag dependent and old growth associated species (refer to snag habitat and old growth forest sections of this document). None of the action alternatives propose to harvest within designated MA 13. There is proposed ecosystem burning. Burning may consume some snags, but would create others and may also create feeding habitat for woodpeckers, which in turn creates cavities used by flammulated owls.

All action alternatives would change yearlong open roads to yearlong restricted roads, and decommission and/or store roads, but the mileage varies by alternative (please see Chapter 2 for miles). Portions of these roads are within or adjacent to old growth habitat, or stands that support snags. Consequently, the availability of snag habitat would be maintained and improved over the long term in these associated stands.

A number of Design Criteria listed in Table 2-20 would be implemented to maintain and improve snag habitat. To mitigate for the loss of snags, dead merchantable trees, and dead-top trees within the harvest units due to OSHA safety standards, the following measures are included: retention of live cull, retention of fire killed trees, retention of reserve trees, signing old growth areas to prevent firewood harvest in these areas, and inoculating live trees with heart-rot pathogens to create snags over the long term (when money is available), and monitoring snag levels.

During harvest operations and associated activity, there may be short-term site specific displacement of flammulated owls inhabiting the PSU.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to flammulated owl because they do not impact habitat.

Effects by Alternative

Table 3-94 below compares the effects of the alternatives on flammulated owl habitat. A discussion on those effects follows.

Table 3-94: Existing condition, and changes in habitat and PPI, displayed by NFS/Private lands within the PSU (% Change is from existing condition).

	EXISTING CONDITION	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2	ALT. 4 AND ALT. 7	ALT. 6
Habitat Acres -Silverfish PSU NFS/Private (% change)	2614 / 2074 0	-50/-215 (-2/-10)	-100/-298 (-4/-14)	-260/ 0 (-10/ 0)	-138/ 0 (-5/0)	-107/0 (-4/0)
PPI – Silverfish PSU # potential territories NFS/private	65/58	64 / 46	63 / 44	59 / 46	62/46	63/46
Habitat Acres – Forest-wide NFS lands (% Change)	237,098	237,080 (<1)	237,080 (<1)	236,838 (<1)	236,960 (<1)	236,991 (<1)
PPI – Forest-wide NFS lands (# potential territories)	5,922	5,927	5,927	5,921	5924	5925
Acres unsuitable due to proposed regeneration harvest	0	18/212	18/212	88/0	103/0	61/0
Potential acres changed due to proposed improvement harvest	0	0	0	147/0	35/0	46/0
Habitat acres improved by proposed underburning only	0	+423	+423	+286/0	+286/0	+286/0

Acres in the no action alternatives are the result of cumulative effects from other planned or reasonably foreseeable activities. Acres displayed under the action **Alternatives 2, 4, 7, and 6** can be added or subtracted from the two no action alternative acres to see cumulative effect acres**.**

Direct and Indirect Effects by Alternative

Suitable habitat decreases and PPI decreases on NFS and Private lands are displayed in Table 3-94. This table is based on those harvest activities occurring in mapped habitat and removing suitable habitat characteristics. Decreases in habitat quality may be less than displayed as not all harvest acres are regeneration. However, this table displays a worst-case scenario if all suitable snags, large diameter trees, and other characteristics of suitable flammulated owl habitat were removed due to that marking of existing snags will not occur on skyline, helicopter, and potentially tractor units.

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 1992:77). Snag removal during timber harvest for OSHA safety standards also removes suitable habitat for flammulated owls. Measures to maintain and improve snag habitat in all action alternatives are listed above (Effects common to all action alternatives).

No activities are proposed under **Alternative 1**, 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).

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 understory and mid-story canopies develop. By alternative, regeneration units in flammulated owl habitat and greater than 8 acre blocks are as follows:

Alternative 2 (4 units), **Alternative 4 and 7 (**2 units); and **Alternative 6** (2 units). Overall, Alternative 2 impacts the largest amount of modeled flammulated owl habitat.

The improvement harvests will follow a basal area reduction prescription. Intermediate harvest is designed to leave the larger growing threes while thinning the understory. The stand remaining after this prescription would more closely resemble the stands found historically with the frequent understory burns typical of the drier VRU types. Understory burns and or slashing that results from the intermediate harvest 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 invigorated shrub/forb layer what would indirectly result from fire. These activities would benefit flammulated owls (Illg and Illg 1995).

Action Alternatives 2, 4, 7 and 6 propose vegetation management activities that would reduce or impact the amount of flammulated of owl habitat in the Silverfish PSU (see Table 3-94 for acres by alternative). The improvement harvests will follow a basal area reduction prescription. Please see Table 3-94 for acreages of improvement harvest 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 overstory while exhibiting a more open understory. Retaining large trees and snags in the overstory would preserve abandoned flicker and pileated woodpecker cavities, which are the primary nesting sites for flammulated owls. However, no upper diameter size limit has been incorporated into the silviculture prescriptions and larger diameter trees may be removed. On those improvement harvests logged with skyline or helicopter, no existing snags are expected to remain due to OSHA safety standards.

Existing snags may also be removed from tractor units where the sale administrator determines it is necessary. Unmarked snags may be removed as volume. When both regeneration and improvement harvests are considered, as displayed in Table 3-94 above, **Alternative 2** impacts the most flammulated owl habitat, followed by **Alternatives 4 and 7, and then 6.**

The proposed *precommercial thinning* for all alternatives would not impact existing flammulated owl habitat as it occurs in existing regeneration units.

Cumulative Effects

The cumulative decreases in habitat and PPI changes are also displayed in Table 3-94 above. Reasonable and foreseeable activities considered for **Alternative 1** are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considered the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6. This power line associated with the Montanore mine on federal lands would impact an estimated 50 to 100 acres of model-identified habitat, depending on the location of the power line and associated road building.

On PCTC land, 215 acres of model-identified suitable habitat will be harvested. In the CUM2 scenario, approximately 83 acres of flammulated owl habitat on PCTC land would be impacted.

Cumulatively, potential habitat could be reduced by these activities. Acres displayed under the action **Alternatives 2, 4, 7, and 6** can be added or subtracted from **Alternative 1** acres for cumulative effect acres**.**

Prescribed fire and/or slashing would occur under the Forestwide Fuels Reduction and Wildlife Habitat Enhancement EA (FFRWHE). These treatments, which include slashing and burning in drier Douglas-

fir/ponderosa pine forests are expected to have a **beneficial impact** to flammulated owl habitat (FFRWHE EA USDA, 2001, Chap 3:114-115). Approximately 423 acres of flammulated owl habitat in the Silverfish PSU would be burned under this reasonable and foreseeable activity. Any prescribed burning implemented under the proposed action alternatives is expected to have similar effects on flammulated owl habitat.

Alternative 1, 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 on NFS lands. Suitable nesting and foraging habitat would still occur on NFS lands, and sufficient habitat would remain within the Silverfish 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 overstory trees could reduce potential nesting and foraging sites.

The **action alternatives**, when considered in association with the planned activities on both federal and private lands as described under Alternative 1, are expected to have no negative cumulative effects that impact the flammulated owl. The action alternatives would treat less than 1% of the potential flammulated habitat available in the PSU or forest-wide. This amount of habitat loss is not likely to result in a declining population trend for this species.

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 nesting territories. 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 3-94 displays, sufficient habitat within the Silverfish PSU and across the Kootenai National Forest would remain.

Statement of Findings

Implementation of **Alternative 1** would have **no impact** (direct, indirect, or cumulative) on the flammulated owl as no activities are proposed. Cumulatively other reasonably foreseeable activities on federal land would occur and may affect individuals or their habitat.

Implementation of **Alternatives 2, 4, 7 or 6** is **likely to impact individuals and/or their habitat, but would not contribute to a trend toward federal listing or loss of species viability for the flammulated owl**. This determination is based on: 1) displacement could occur during implementation; 2) both model identified foraging and nesting habitat would be impacted; 3) habitat change at the Forest scale is less than 1%; 4) the potential decrease in PPI may not occur as surveys indicate occupancy level is less than the densities estimated by the PPI, and potential to impact or displace an owl is low; 5) the prescribed burning and improvement harvest may improve potential habitat; 6) Forest Plan standards related to flammulated owl habitat (old growth) are met; 7) Suitable, well-distributed habitat for the flammulated owl is found forest-wide (Johnson 1999a, and USDA Forest Service (2003b); 8) Based on a region-wide conservation assessment, habitat for the flammulated is abundant and well distributed in the Northern Region (Samson 2006).

Peregrine falcon

Data Sources, Methods, Assumptions, Bounds of Analysis

Peregrine falcon population ecology, biology, habitat description and relationships identified by research are described in Snow (1972) and Herman and Willard (1978), and USDI (1999). A monitoring Plan for the peregrine falcon is in place (USFWS 2003). That information is incorporated by reference. Peregrine occurrence data comes from recent District wildlife observation and Sumner and Rogers (2002, 2003).

The peregrine falcon was removed from the Federal list of Endangered and Threatened Wildlife on August 25, 1999. The KNF Forest Plan (Vol. 2, App. 12-1) also listed the peregrine falcon as a management indicator species dependent on cliffs. On the KNF the peregrine falcon is now considered a sensitive species.

The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Silverfish PSU. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

The Peregrine Fund inventoried the Kootenai N.F. in 1989 for suitable nest sites, and identified the cliffs west of Bull Lake (the spires of Mount Vernon), and the cliffs south of Noxon Reservoir (near Tuscor Hill) as potential nesting habitat. In 2003, a peregrine pair successfully fledged two young in the rocky cliffs above Bull Lake (Sumner and Rogers 2003:21). As of 2007, there are three known peregrine falcon nest sites on the KNF. The Silverfish PSU is approximately 30 miles southwest of where the peregrine falcon has been documented, and contains no steep rock cliffs suitable for nesting. The peregrine falcon likely uses the Kootenai River as a seasonal migration corridor during the spring and fall period. Peregrine use is probably limited to pursuing prey during migration.

Environmental Consequences

Impacts from any activity within one mile of known peregrine falcon nest sites can be mitigated by include a timing constraint on those activities to avoid disturbance during the breeding period (Feb. 1 thru Aug. 31). No known peregrine nest sites occur within the Silverfish PSU.

Direct and Indirect Effects

Existing or potential nesting habitat is not available in the project area, and undisturbed perching/roosting habitat is freely available for migrating birds. Management activities in the Silverfish PSU during the migration period should not cause falcons to alter their flight path, since peregrines migrate at relatively high altitudes and have extremely skillful flying abilities. Existing potential feeding habitat would not be affected. The implementation of any alternative would have **no impact** on the peregrine falcon.

Cumulative Effects

Management activities in the Silverfish PSU during the migration period should not cause falcons to alter their flight path, since peregrines migrate at relatively high altitudes and have extremely skillful flying abilities.

Statement of Findings

Existing or potential nesting habitat is not available in the project area, and undisturbed perching/roosting habitat is freely available for migrating birds. Management activities in the Silverfish PSU during the migration period should not cause falcons to alter their flight path, since peregrines migrate at relatively high altitudes and have extremely skillful flying abilities. Existing potential feeding habitat would not be affected. The implementation of any alternative would have **no impact** on the peregrine falcon.

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 bat occurrence data comes from recent District wildlife survey records and Forest historical data and other agencies (MNHP).

All known caves, mines or tunnels, lakes, and old growth were located within the Silverfish PSU. 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 and cumulative effects to individuals and their habitat is the Silverfish PSU. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

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. (1996) have located the species 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.

Currently, the major source of bat data is from surveys performed by the Montana Natural Heritage Program along bodies of water. Within the Silverfish PSU, MNHP has surveyed in the West Fisher Creek area: three surveys during 1994, where Townsend's big-eared bats were detected, and three surveys during 2005, where no detection was made. Another survey was done in 1997 by the USFS at the American Kootenai Mine, which did not document any detection. A survey in September 2007 documented a Townsend big-eared bat using a mine adit located within the Silverfish PSU for a hibernaculum.

Big-eared bats are known to feed along forest edges, and can be associated with either dry or wet type coniferous forests. The species shows 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 1995). As the Townsend's big-eared bat has 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 Silverfish PSU has 12.9% old growth 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 Silverfish PSU determined that the cavity

excavator potential population level on NFS lands was 83%. Please see the Snag Habitat section of this document for more detailed discussion.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects Common to All Action Alternatives

All action alternatives maintain snag and old growth forest levels throughout the Silverfish PSU that exceed the minimum levels necessary to support viable populations of snag-dependent and old growth associated species (See Snag and Old Growth Sections). Prescribed burning that may occur in old growth habitat is designed to maintain or enhance old growth characteristics by re-introducing fire. Many of the largest snags occur within the old growth stands, which are well-distributed across the landscape. Proposed regeneration units are also well-distributed.

All action alternatives would change yearlong open roads to yearlong restricted roads, and decommission and/or store roads, but the mileage varies by alternative (please see Chapter 2 for miles). Portions of these roads are within or adjacent to old growth habitat, or stands that support snags. Consequently, the availability of snag habitat would be maintained and improved over the long term in these associated stands.

A number of Design Criteria listed in Table 2-20 would be implemented to maintain and improve snag habitat. To mitigate for the loss of snags, dead merchantable trees, and dead-top trees within the harvest units due to OSHA safety standards, the following measures are included: retention of live cull, retention of fire killed trees, retention of reserve trees, signing old growth areas to prevent firewood harvest in these areas, and inoculating live trees with heart-rot pathogens to create snags over the long term (when money is available), and monitoring snag levels.

Direct and Indirect Effects

Under **Alternative 1**, no activities are proposed, so no Townsend's big-eared bats would be directly disturbed by any timber harvest or associated slashing and/or underburning. **No direct** effects to Townsend's big eared bats would be expected. Plant succession would continue on many of the sites, resulting in an increasing canopy closure and increasing density of understory conifers. This plant succession may have an **indirect** effect on Townsend's big eared-bats since they forage in open areas within forests and the increasing density of understory conifers may decrease the available habitat for prey species may also impede flight maneuvers needed for foraging. If a wildland fire was to occur it is not expected that potential key roosting habitat such as caves or mines would be impacted and there would be no expected change in the existing condition with implementation of the no action alternative. On NFS lands, no direct effect to existing snag habitat would occur with implementation of **Alternative 1**.

The proposed regeneration and improvement harvest activities have the potential to disturb or reduce roosting habitat as trees and snags with cavities or thick bark are removed from the landscape. Improvement harvest that opened up suitable habitat, or edge habitat created, may improve foraging opportunities for bats that use the area. Under **Alternatives 2, 4, 7, and 6**, regeneration and intermediate harvest activities have the potential to disturb or reduce day roosting habitat (trees and snags with cavities or thick bark). Intermediate harvest that opened up suitable habitat, or edge habitat created, may improve foraging opportunities for bats that use the area. While all alternatives meet Forest Plan standards for retaining snag habitat, Alternative 2 harvests a total of 2,446 acres, followed by Alternative 6 at 1,835 acres, and Alternatives 4 and 7 at 1,364 acres. Alternatives 4 and 7, with the least amount of timber harvest would maintain the highest level of snag habitat.

Underburning would both reduce and create snag habitat. All action alternatives propose underburning for fuel treatment and site preparation after harvest. **Alternative 2** proposes the highest number of acres to be burned (3,175 acres) followed by **Alternatives 4, 7, and 6** (2,830 acres). Please see the old growth section for a discussion of proposed underburning and impact to old growth stands. Underburning may burn up snags but would create others.

Snags would not be surveyed for bat use prior to implementation of the action alternatives. Disturbance or mortality of bats could occur if bats were using a snag cut down for safety. Displacement could occur during prescribed burning. Effects would be site-specific, affecting individuals rather than colonies, and would not affect the viability of Townsend's big-eared bats.

Designated old growth would be maintained with implementation of all alternatives. This maintenance of old growth habitat would provide large-diameter tree and snag habitat through time, and snag levels would be maintained at a minimum of 40% through time to provide cavity habitat.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to bats because they do not impact habitat.

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.

Reasonable and foreseeable activities considered for Alternative 1 are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considered the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Cumulatively, any burning associated with the Forest-wide Fuel Reduction and Wildlife Habitat Enhancement EA will 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 with in the Silverfish PSU. Those acres burned would result in a mosaic burn pattern with rejuvenated shrubs over time. The cumulative activities that would occur on federal land (including the construction of the MMI power line) and private timber harvest would also remove potential roosting habitat by the removal of snags and large trees in harvest units. **Alternative 1**, 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. Cumulative effects of implementation of **Alternative 1** and the proposed federal activities result in the existing cavity excavator potential population level of 83% on NFS lands.

Cumulatively, the adit where the Townsend's big-eared bat was documented will be protected as a hibernaculum due to a bat-compatible gate being installed.

Implementation of **the action alternatives**, and other reasonably foreseeable activities described for federal lands under Alternative 1, would drop the estimated potential population level from 83% to a minimum of 80%. Cumulatively, when other activities including the harvest on both private and federal lands discussed under the no action alternatives, and all past, present, and reasonably foreseeable

activities on both private and federal lands are considered, habitat on federal lands is considered sufficient to provide cavity habitat to cavity dependant species. The NFS lands potential population level of 80% 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).

Statement of Findings

Alternative 1, with either cumulative effects scenario, would have **no impact** to Townsend's big-eared bats or their habitat. This determination is based on: 1) no direct change in the current availability of roosting and hibernacular habitat would occur; and 2) foraging habitat and potential roosting habitat would remain distributed across the Silverfish PSU and across the Kootenai National Forest.

The action alternatives are **not likely to impact individuals or their habitat and would not contribute to a trend toward federal listing or loss of species viability** for Townsend's big-eared bat. This determination is based on: 1) The action alternatives would not affect key roosting or hibernation habitat associated with caves and mines, or any buildings and no impact to the species natality or mortality rates is expected; 2) Suitable cavity habitat for the big-eared bat is found forest-wide as documented in Johnson, 1999a and USDA Forest Service, 2003b; and 3) a forested environment suitable for foraging would remain distributed across the Silverfish PSU and Forest-wide.

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). That information is incorporated by reference. Western toad occurrence data comes from District wildlife observation records and Forest historical data and other agencies (MNHP). The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Silverfish PSU. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

Western toads require over-wintering, breeding/rearing, and foraging habitat, and may also be dependant 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 caverns 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 documented in seven of the eight planning units on the Forest. 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 al. 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).

Potential aquatic breeding habitat is present within the Silverfish PSU and the species is known to occur (Johnson 1999). Surveys have been carried out by the Montana Natural Heritage Program and the USFS. Surveys in the Silverfish PSU by the MNHP along major drainages in 1994 and the USFS on the Silver Butte Fisher River during various years and in small wetlands during 2006 yielded no detections. Amphibian monitoring has occurred within the PSU. The Silver Butte Fisher River oxbow was monitored yearly from 1995 to 2002, but the western toad does not occur at this site.

Breeding habitat is likely to occur within temporal ponds and road ditches across the Silverfish PSU. The remaining terrestrial habitat within the Silverfish 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 impacted (prescribed burned only).

Upland habitat has also been impacted with timber harvest and road building. As shown in Table 3-95, existing harvest on NFS lands is about 2,328 acres. Cumulatively, on private lands, approximately 4,200 acres have also been harvested.

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 (The Nature Conservancy 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).

Direct, Indirect and Cumulative Effects

Table 3-95 summarizes the direct, indirect and cumulative changes in habitat acres due to each alternative, as compared to the existing condition.

Table 3-95 - Toad habitat impacted by Alternative on NFS lands in the Silverfish PSU

	EXISTING CONDITION	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2	ALT. 4 AND ALT. 7	ALT. 6
Known breeding/rearing habitat impacted	0	0	0	0	0	0
Acres upland foraging habitat harvested	2,328	159*	275*	2,446	1,364	1,835
Acres upland foraging habitat prescribed burn only	820	1,056**	1,056*	3,175	2,830	2,830
Miles of proposed road construction		3.99	3.69	1.20***	<0.50***	2.47***

***Acres shown for Alternative 1** are cumulative effects from other existing, planned and reasonably foreseeable activities on NFS lands, including construction of MMI power line in Miller Creek with an estimated 60 acres impacted by road building and 99 acres impacted by power line construction (CUM1) or in West Fisher (CUM2) where 60 acres were estimated that could be impacted by road building and 215 acres impacted by power line construction. These acres can be added to the acres in the action alternatives to see cumulative effect acres.
**planned underburning on NFS lands
***proposed temporary road construction

Direct and Indirect Effects Common to All Action Alternatives

All alternatives would maintain existing breeding and rearing habitat by following INFS direction. All activities associated with timber harvest 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.

Existing large down woody material would be left within the harvest units through skid trail design and avoidance when possible.

All action alternatives meet Forest Plan standards for retaining snag habitat. This ensures that future down woody material would be available.

Prescribed burns would not be initiated within riparian systems. Occasionally, fire may creep down into riparian habitat from areas ignited higher on the slope. Because of the higher moisture levels within riparian zones, it is expected that very little of the riparian vegetation would burn.

This project identified watershed and aquatic habitat enhancement projects including culvert removals and stream bank stabilization. These opportunities are dependent upon funding, but are expected to enhance habitat for the western toad when completed. During the completion of these projects (short term), activities may displace or harm individuals; however, the benefits to the population upon completion (long term) out weigh the risk to a few individuals.

During the non-breeding period, western toads may inhabit upland areas. Proposed harvest activities within the upland habitat may harm or displace individuals that are in the area. Prescribed fire may also harm some individual western toads.

All action alternatives would change yearlong open roads to yearlong restricted roads, and decommission and/or store roads, but the mileage varies by alternative (please see Chapter 2 for miles). Portions of these roads may occur near riparian areas. Restricting motorized access on these roads would reduce potential for road kill of toads.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction

of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to western toad because they impact only a small amount of habitat.

Effects by Alternative

Direct and Indirect

Under **Alternative 1**, no Forest Service harvest or prescribed burning is proposed. **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 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, personal observation).

Timber Harvest and Road Building

A review of literature by 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, increased 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).

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

Alternative 2 has the greatest potential for impacting toads or their habitat with timber harvest followed by **Alternative 4, 6, and 7.** Please see Table 3-95 above for acreage comparisons. The proposed construction of temporary roads would occur under each alternative. This temporary road construction does not occur near known breeding sites.

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).

Alternatives 4, 7, and 6 propose the same amount of understory burning without harvest activities (See Table 3-95 above). **Alternative 2** proposes the most acres of burning. Site preparation burning in timber harvest units is also proposed under all alternatives. **Alternative 2** would treat the most acreage (955) followed by **Alternative 6** (571 acres), and **Alternatives 4 and 7** (683).

Funding for burning under the action alternatives is not secure. 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 geology of the watershed, past timber harvest, road construction projects, and natural events has created much of the existing habitat conditions for western toads found within the PSU. Other reasonable and foreseeable activities proposed by the Forest Service and other agencies and private landowners would occur as described in Chapter 3. Reasonable and foreseeable activities considered for Alternative 1 are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considered the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

Planned harvest on PCTC lands between 2000 and 2009 would occur on approximately 1,864 acres.

The Cumulative Effects Worksheet, located in the sensitive wildlife species project file, considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed in Chapter 3. Those activities that cumulatively contribute indiscernible effects on addressed species or their habitat are discussed as well as those activities that cumulatively affect the species or habitat. These activities, summarized briefly below include private land development, vegetation management, and resource enhancement projects.

Under **Alternative 1**, plant succession would continue on the sites. Any increase in canopy closure and density of understory conifers would have no cumulative effect on breeding habitat. As displayed in

Table 3-95 above, timber harvest has already occurred within the PSU. Many of these units are considered to have enough regeneration and cover now for toad movement. Prescribed fire on NFS lands has also occurred in the last 10 years. Table 3-95 displays acres of both cumulative timber harvest, harvest associated with proposed power line construction, and prescribed burning.

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). These cumulative increase in activities is not expected to cause additional in-channel sediment production or cause changes in channel morphology due to stable stream types, so the proposed actions would not have a measurable effect on aquatic habitat with respect to toads (please refer to the Watershed section of this document). Upland terrestrial habitat would be impacted by the removal of travel corridors between existing regeneration units.

Alternative 1, with either cumulative effects scenario**,** when considered in association with the planned activities on both public and private lands, are 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 NFS lands. **Cumulatively**, private timber harvest and federal timber harvest activities and road construction, construction of proposed power lines, and the creation of openings could affect upland toad habitat.

The **action alternatives** when considered in association with the planned activities on both public and private lands 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. 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 (CUM1 or CUM2).

Statement of Findings

Implementation of Alternative 1 would have no direct or indirect impact on the western toad. **Cumulatively however, changes in habitat may occur**. **Implementation of the action alternatives** may impact individuals or habitat, but would not likely contribute to a trend towards federal listing for the western toad**. This finding is based on:**

1. All alternatives meet Forest Plan direction for the western toad under the sensitive species classification. All alternatives would meet Forest Plan standards for snag retention, thus providing for future down woody habitat. All alternatives would also follow INFS direction.
2. The assessment of habitat parameters for the western toad at the PSU level determined that all action alternatives would maintain suitable habitat within the PSU. Proposed activities would not alter existing potential western toad habitat within the riparian areas, pond, wetlands, and stream sides. During the non-breeding period, western toads may inhabit upland areas. Proposed harvest activities within the upland habitat may harm individuals in the area. Prescribed fire and resource habitat enhancement projects may also harm some individual western toads (as discussed earlier); however, the small number of individuals potentially affected within a small portion of their range is not likely to cause a trend toward federal listing or loss of population viability.
3. Suitable habitat for the western toad would remain in the PSU and is distributed Forest-wide as documented in Johnson (1999a, 2005) and USDA Forest Service (2003b).

Wolverine

Data Sources, Methods, Assumptions, Bounds of Analysis

Wolverine population ecology, biology, habitat description and relationships identified by research are described in Banci (1994) and Butts (1992). That information is incorporated by reference. Wolverine occurrence data comes from recent District wildlife observation records and Forest historical data and other agencies (MFWP). Because wolverine are habitat generalist, except for denning habitat, only wolverine denning habitat was modeled using cumulative effects model (CEM) vegetation data and running the Kootenai CEM wolverine denning habitat model (Heinz 1996) (see project file). The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Silverfish PSU. The boundary for determining trend or viability is the Kootenai National Forest.

Wolverine habitat was analyzed using the Draft Hierarchical Habitat Guidelines for the wolverine (Ruediger 1994). Other management strategy guidelines used are discussed in the Region 1 Interim Direction for the Management of TES Species (1992). On a more local level, the Draft Wolverine and Fisher Hierarchical Approach to Conservation on the Kootenai National Forest (Johnson 2004) were also used.

Affected Environment/Existing Condition

Wolverine observation and monitoring data indicate that the Cabinet Mountains are a major source of sightings. Four historic casual track observations have been documented in the Miller, Fourth of July, Lake and Silver Bow Creek drainages within the Silverfish PSU. Two historic casual visual sightings were also made within the Silverfish PSU, in the Porcupine and Baree drainages.

Formal winter track surveys by the USFS in the proposed Montanore Mine area were documented during 1988, 1989, 1994 and 1995. Many of the survey routes were repeated in full or in part for those periods. Montana Fish, Wildlife, and Parks also performs winter track surveys about three times per year, every year, in the same area. Data on FWP track sightings is not readily available. In the Silverfish PSU, the trail to Baree Lake, about 2.8 mi long, is surveyed every year. Tracks are frequently sighted, with 11 of these documented, and one den has been identified within the drainage. During 1994 and 1995, there were 19.6 and 28.6 additional miles of track surveys. No wolverine tracks associated with those surveys were documented, although an unofficial survey noted wolverine tracks in Bramlet Creek drainage. There were no USFS surveys done in during 1988 and 1989 in the Silverfish PSU.

These are expected to be dispersing animals from the Cabinet Mountain Wilderness. Johnson (1999) shows wolverine presence confirmed in seven of the eight planning units on the Kootenai.

Applying the Draft Hierarchical Habitat Guidelines (USDA Forest Service 1993, Ruediger 1994), the Kootenai National Forest was designated as a Primary Wolverine Conservation Area. This designation was based on sightings and the inherent quality of wolverine habitat that occurs on portions of the Kootenai National Forest. A team of biologists from the Kootenai further defined wolverine habitat on a Forest-wide basis using vegetation classification from satellite imagery (Heinz 1996, Johnson 2004b), wolverine sightings, availability of suitable cover types, and the proximity to habitat where wolverine have been observed. The Silverfish PSU was assigned a secondary wolverine conservation area providing high quality wolverine habitat (Johnson 2004b). Johnson (1999) modeled (Heinz 1996) about 12,000 acres of wolverine denning habitat on the Forest. Using CEM, within the Silverfish PSU 13,902 acres of travel habitat and 754 acres of denning habitat were identified. Because of their ability to disperse long distances, it is important that high-quality habitat be connected with suitable travel habitat.

Travel habitat will be addressed through the analysis of open road densities and the amount and distribution of cover.

Larger portions of the PSU provide hiding cover as much of the western portion is located in the Cabinet Mountain Wilderness. There are both natural and artificial openings within the PSU that are greater than 40 acres in size. Wolverine are expected to avoid these larger openings. Many of these openings have young conifers established and should provide hiding cover within the next 15 years. Connectivity of cover patches is generally good. The lower elevation summer and winter range on Plum Creek lands is not optimum for species such as the white-tailed deer due to the removal of overstory thermal cover.

Within the PSU, the total open road density (ORD) for all lands is 0.73 miles/square mile, and the ORD on public land within the PSU is 0.62 miles/square mile. The open road density within MA 15, 16, 17 and 18 is 0.86 miles/square mile and meets Forest Plan standards. The Forest Plan states that most roads in MA 11 should be closed in the winter, and within the PSU, there are 0.99 miles/miles square of road open in winter.

The majority of the Forest Service roads open in the winter access private homes. Traffic levels on most roads are generally moderate during the summer. There are no seasonally restricted roads within the PSU. The relatively low miles of open road should help decrease the mortality risk to wolverine traveling through the area during this time frame. In consideration of the open road density and the amount and distribution of cover, and use levels expected by the wolverine, secure wolverine travel habitat is provided throughout the PSU.

ENVIRONMENTAL CONSEQUENCES

Denning habitat for wolverines has been identified in the Silverfish PSU, but no denning habitat would be impacted by any alternative.

Direct and Indirect Effects

Alternative 1 (CUM1 or CUM2)

Alternative 1 maintains the present condition and allows the natural decay/regeneration processes to occur within the project area. **No direct or indirect** effects would alter this condition in the project area. Forest stands would continue along their successional pathways and access would remain unchanged. No direct impacts on wolverine would occur under this alternative. No changes in the level of motorized access would occur, and the current level of road-use related disturbance/less effective habitat use by wolverine would continue. The ability of animals to move through the landscape would not change in the short-term because no removal of forested cover would result from this alternative. A number of young regenerated timber stands will develop hiding cover values over time which would increase the hiding cover percentage. Road closures proposed in the action alternatives would not be implemented in this alternative. The closures could result in a higher level of habitat security for animals moving through the area. Stand treatment/burning that would increase plant vigor and composition would not take place, and in turn may increase the risk for stand replacement fires. The No-Action Alternative would not measurably change the existing habitat conditions for the wolverine as described in Chapter 3 during the next ten years. Alternative 1 would have no direct or indirect effect on the wolverine or its habitat**.**

Effects Common to All Action Alternatives

All **action** alternatives would improve the vigor and availability of grasses, forbs, and shrubs which provide forage for species on which the wolverine may feed. Existing riparian vegetation and riparian

travel corridors would be maintained by following INFS direction. During logging operations, there may be short-term disturbance to wolverines traveling through the analysis area. All action alternatives decommission, restrict, or put into storage varying amounts of road within the analysis area. **Alternative 2** proposes the construction of 1.2 miles of new road to harvest units, while the remaining action alternatives propose temporary roads (please see Chapter 2 for miles of road by alternative). A number of Design Criteria listed in Table 2-20, would be implemented which would maintain or improve habitat for the wolverine. Identified tasks include: provide wildlife habitat security and protect riparian habitat.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to wolverine because they are short-term in nature or of small size.

Effects by Alternative

Direct and Indirect

None of the alternatives would result in a reduction of wolverine denning habitat. Many papers (Joslin and Youmans 1999, Witmer et al. 1998, Copeland 1996, Weaver et al. 1996, Thomas 1995, and Butts 1992) show that the wolverine is sensitive to human presence, which indicates that it is highly likely they would be displaced during project activities. Displacement distances due to human activity vary but in general the biggest impact for most species is shown to occur out to ¼ to 1/3 mile or nearest ridgeline (Christensen and Madel 1982, Schirato 1989, Frederick 1991, Grant et al. 1998, Austin 1998). Distances can be further depending on type of disturbance (e.g. helicopter flying and use of explosives; USFS 1988, IGBC 1990; or OHV in open country – Bury 1983, may displace animals up to one mile). Displacement distance for the action alternatives are up to 1 mile, or the nearest ridgeline providing a sound barrier. The most critical period for wolverine is denning (12/1 to 4/30). No project activities occur in denning habitat.

The proposed harvest in **the action alternatives** has been thoroughly discussed in terms of effects to big game (wolverine prey) and general habitat security (See MIS Section).

Movement Corridors: Movement corridors within MA 11 winter range are affected by all prescriptions that are part of this project. The regeneration and intermediate harvest prescriptions do not result in conditions that meet the hiding cover definition of hiding 90% of an animal at 200 feet. **Alternatives 4 and 7,** designed to be a lower complexity alternatives, results in fewer acres of harvest and leave more unharvested areas for movement.

Outside of the winter range area in MA 12, 14, and 15, the overall ability of big game to move through the landscape would be marginally affected by the action alternatives. There are some large openings not providing hiding cover that would increase in size with adjacent proposed regeneration harvest in all alternatives. **Alternative 2** does this in more areas than the other action alternatives. It is expected that these areas would continue to grow trees and would provide hiding cover within the next 10-20 years. **Alternatives 4 and 7** would maintain the existing movement corridors the best of any action alternative. Overall, ridgeline and riparian corridors remain largely intact and although individual animals may have to adjust their localized movement patterns, no movement barriers would result.

The number of acres of prescribed fire planned is highest in **Alternative 2** (3,175 acres), while **Alternatives 4, 7 and 6 propose** 2,830 acres of prescribed burning only. As a result, more forage would be created in Alternative 2.

Road Analysis: All action alternatives would decommission and /or store varying amounts of road, and additional miles of road would be restricted yearlong. These roads, which would be restricted to motorized travel, including over the snow vehicles, would result in more secure travel habitat.

All action alternatives build temporary road, with **Alternative 2** building (1.2 miles), **Alternatives 4 and 7** (0.94) **and Alternative 6** (3.29). The roads would be built to the minimum standards necessary; and be removed upon completion of harvest activities. Displacement of wolverines may occur during logging operations, but adequate displacement habitat exists in the remainder of the Silverfish PSU.

Winter range: Wolverines depend fairly heavily on ungulates as prey during the winter. **Alternative 2** impacts the most big game winter range (MA 10, 11 lands) with harvest of 40 acres on MA 10 and 686 acres on MA 11, followed by **Alternative 6** (harvest 642 acres and burn 165 acres of MA 11) and then **Alternatives 4 and 7** (burn 0.86 acres of MA 10, and 237 acres of MA 11, and harvest 269 acres of MA 11). Montana Fish, Wildlife, and Parks consider the Silverfish PSU as providing both summer and winter range (MFWP 2000), regardless of Management Area designation under the Forest Plan.

Harvest activities may displace a limited number of animals from harvest areas, causing greater energy expenditures by deer and elk. This could lead to higher levels of big game mortality. Displacement caused mortality would, in the short term, benefit wolverine by increasing their available winter forage.

For the wolverine, applicable strategies and guidance found in the Interim Management Recommendations (USDA 1992) were also considered. These management strategies include a) maintaining lower road densities < 1 mile per square mile; b) consider MS 1 grizzly bear habitat guidelines in addressing clearcut size and road density; and c) maintain and enhance wintering ungulate populations in remote locations. When these management strategies are compared to the existing condition it must be noted that the Silverfish PSU has a high open road density in portions, but is located within two BMU's, and is adjacent to the Cabinet Mountain Wilderness. The proposed action would result in several large openings being created, high open road densities during activity, but several road access changes are proposed which would improve security for big game. The proposed burning would improve forage on ungulate winter ranges.

Cumulative Effects

Past timber harvest and road construction projects and natural events have created much of the existing habitat conditions found within the analysis area. The cumulative effects of past and present land uses and natural random events have been incorporated into the analysis of current habitat within the project area.

Cumulatively, reasonable and foreseeable activities considered for Alternative 1 are the same except for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considered the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2 and 4, while CUM2 activities were considered with Alternative 6.

The Cumulative Effects Worksheet, located in the sensitive wildlife species project file, considers and describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed in Chapter 3. Those activities that cumulatively contribute indiscernible effects on addressed species or their habitat are discussed as well as those activities that cumulatively affect the species or habitat are

discussed in detail in the Cumulative Effects Worksheet. These activities, summarized briefly below include private land development and vegetation management.

No cumulative adverse effects to wolverine from implementation of any of the proposed actions have been identified during this analysis.

Concurrent activities will occur on federal lands (please see Chapter 3), and on Plum Creek Timber Company lands in the Silverfish PSU. Travel corridors may be impacted, but travel corridors would remain on other NFS lands between the Cabinet Mountain Wilderness and big game winter ranges located in the PSU would be maintained. The presence of winter logging activities may create an unknown level of disturbance on areas seasonally visited by wolverine. The effects of this disturbance are unpredictable but could be expected if they occur, to have some additional energetic cost to wolverine. This need may be offset by additional carrion if ungulates or other prey are also negatively affected by winter harvest actions. Potential effects of the action alternatives on wolverines are considered to be possible due to the likelihood of the species occurring in the PSU.

Cumulatively, other projects such as the Forestwide Fuels Reduction and Wildlife Habitat Enhancement EA would prescribe slash and/or burn activities. These activities would improve forage on ungulate winter range. The Forestwide Fuels program is designed to retain the larger, overstory trees which would result in no direct, indirect or cumulative increase in fragmentation. Some small openings would occur where there are heavy fuel accumulations, but these openings would not create any barriers to wolverine movement. Other annual activities described in Chapter 3 are not expected to have any impact on wolverine.

Reasonably foreseeable actions that would take place within the analysis area include routine road maintenance, firewood gathering, recreational activities, and hunting/trapping etc. These activities would result in some level of local disturbance, but are not anticipated to cause adverse effects to the wolverine or its habitat. The **action alternatives,** when considered in association with the planned activities on both public and private lands are expected to have no adverse cumulative effects that impact the wolverine.

Statement of Findings

Alternative 1 would have **no direct, indirect**, or **cumulative** impact on the wolverine or its habitat. This determination is based on: 1) no harvest or management activity would occur as a result of this project. Cumulatively other reasonably foreseeable activities on federal land would occur and may displace individuals or impact wolverine habitat.

The **action alternatives may impact individuals and/or their habitat, but would not contribute to a trend toward federal listing or loss of species viability** for the wolverine. This determination is based on:

1) The timber harvest and other activities would impact winter ranges, important carrion sources, but ungulate use would continue;
2) The assessment of habitat parameters for wolverine at the PSU level determined that all action alternatives would maintain suitable travel habitat within the analysis area. These alternatives maintain an adequate distribution of travel cover, would not create barriers to wolverine movement, and would not increase mortality risk to the wolverine. The only expected effect on individual animals is temporary displacement.
3) All alternatives follow the goals and strategies for evaluating potential habitat and effects to wolverine that are outlined in the Draft Hierarchical Habitat Guidelines (Ruediger 1994).

4) Suitable habitat for the wolverine would be maintained in the Silverfish PSU, and suitable habitat would remain distributed forest-wide as documented in Johnson (1999a:35) and USDA Forest Service, 2004a, 2004b.

Sensitive Species Regulatory Framework and consistency

Forest Plan: The Kootenai National Forest is directed to "identify, protect, and manage" habitat for sensitive species in order to assist in maintaining viable populations. The KNF Forest Plan contains the following goals and direction for sensitive species: "determine the status of sensitive species and provide for their environmental needs as necessary to prevent them from becoming threatened or endangered" (Vol. I, II-1 #6). **All alternatives** meet Forest plan direction for the eagle, black-backed woodpecker, fisher, flammulated owl, northern bog lemming, northern goshawk, Townsend's big-eared bat, western toad, and wolverine under the sensitive species classification

All alternatives are consistent with Forest Plan direction for old growth below 5,500' (FP Vol. 1 II-1, #7; II-7; II-22 and 23; Appendix 17, and Kootenai Supplement No. 85; supplement to FSM 2432.22). See the old growth section and species analysis for fisher, flammulated owl, northern goshawk, Townsend's big-eared bat, and the pileated woodpecker.

All alternatives are consistent with Forest Plan direction that states "cavity habitat will be perpetuated by managing for snags and snag replacement trees" (USDA Forest Service, 1987a, II-1 #8; II-7; and Appendix 16). Alternative 2 would require a site-specific amendment for cavity habitat on MA 10 lands. Alternatives 4, 6, and 7 would not harvest on MA 10 lands and no amendment would be required. See the Snag and Down Wood section, and the species analysis for black-backed woodpecker, flammulated owl, Townsend's big-eared bat, western toad, and the pileated woodpecker.

All alternatives are consistent with Forest Plan direction (Vol. 1 III-56) that states planned ignitions are acceptable to maintain old growth characteristics (e.g. old growth ponderosa pine). The ongoing Forest-wide Fuels Reduction and Wildlife Habitat Enhancement EA would continue treatments as described in Chapter 3, some of which treats old growth within the Silverfish PSU.

All alternatives are consistent with Forest Plan riparian standards and guidelines (FP Vol. I II-28 thru 33) as amended by INFS. See the species write-ups for fisher, northern bog lemming, and western toad, as well as the aquatics section.

National Forest Management Act: Forest Plan direction is to "Maintain diverse age classes of vegetation for viable populations of all existing native, vertebrate, wildlife species, including old growth timber, in sufficient quality and quantity to maintain viable populations of old growth dependent species and to maintain habitat diversity representative of existing conditions" (Vol. I, p.II-1 #7). The diversity requirement of NFMA is met by **all alternatives** as documented in the individual sensitive species analyses and supported by the statement of findings for each sensitive species

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 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.

The Kootenai National Forest Plan directs the Forest to manage habitat to maintain viable populations of existing native and desired non-native vertebrate species (Forest Plan page II-1). A viable population is defined as one that has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area, the Kootenai National Forest.

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 07/21/08. The FWS concurred with potential listed species distribution maps and resulting consultation areas for the KNF in 2001 (Wilson, 2001). Species status in the influence area of the proposed project and in the Silverfish PSU is shown in Table 3-96.

Table 3-96: Threatened, Endangered, and Proposed Wildlife Species: Silverfish PSU Status

SPECIES	ESA STATUS	STATUS IN PSU	COMMENTS**
Grizzly Bear	Threatened	K	1
Canada Lynx	Threatened	K	
Gray wolf	Endangered	K	

*Status Key:
K = This species is known to occur within the project area.
S = Suitable habitat exists and species is suspected to occur within project area.
NS = No Suitable habitat, species is not suspected to occur within the project area. No further analysis required.
** Select All That Apply
1 = The Silverfish PSU has portions located in Bear Management Units (BMU) 6 and 7, and a small portion located in one grizzly bear outside the recovery zone reoccurring use polygon (here after BORZ polygon), the Cabinet Face BORZ.

GRIZZLY BEAR

The biological assessment for threatened and endangered species, which includes the grizzly bear, is hereby incorporated by reference into this document.

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 1989-2007) 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, and other agencies (USFWS, MFWP).

The Silverfish PSU contains portions of both BMU 6 (Wanless) and BMU 7 (Silver Butte) with the northern boundary of the PSU adjacent to BMU 5. The recovery zone for grizzly bears in the Cabinet-Yaak Ecosystem is approximately 2,600 square miles. The current distribution of resident grizzly bears includes areas outside of the Recovery Zones identified in the Grizzly Bear Recovery Plan (USDI 1992). An analysis of potential for incidental take of grizzly bear outside the recovery zones on the Kootenai National Forest was completed by Johnson (2003). That information is incorporated by reference. Current grizzly bear distribution outside of the Cabinet-Yaak Recovery Zone has been delineated into eight individual polygons or analysis areas (Johnson 2003:3-4). The analysis boundary for project impacts to individuals and their habitat is the bear management unit (BMU) in the recovery zone and the grizzly bear outside the recovery zone reoccurring use polygon (here after BORZ polygon) (Wittinger et al. 2002).

District Court (Molloy) ruled on 12/13/2006 to set aside the Forest Plan Access Amendment decision (2004). That ruling removed the habitat parameter standards established in that decision. This means that the standards and analyses in place prior to the Access Amendment become the levels for effects analysis. They will remain in place until a new final access amendment EIS and ROD are completed. This document follows those analysis requirements. These requirements come from the 1987 KNF Forest Plan, the 1995 Amended Biological Opinion and Incidental Take Statement on the 1987 KNF Forest Plan, and the Selkirk/Cabinet-Yaak Grizzly Bear Interim Access Management Rule Set (12/1/1998). The analysis also considers available best science documents. According to the USFWS (2004) 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. Johnson (2007) supports this position.

AFFECTED ENVIRONMENT/EXISTING CONDITION

Inside Recovery Zone

The action alternatives propose activities within the Cabinet-Yaak grizzly bear recovery zone (USFWS 1993). Proposed activities would occur in BMU's 6 and 7 (please see map section of the document).

The recovery zone for grizzly bears in the Cabinet-Yaak Ecosystem (CYE) is approximately 2,600 square miles. The minimum viable population level of 100 bears is the recovery goal for this ecosystem (USFWS 1993). The current grizzly bear population in the Cabinet Mountains portion is thought to be less than 15 bears, based on five years of intensive research (Kasworm 1988), with an 89% probability of a downward population trend (Wakkinen and Kasworm 2004, Kasworm et al. 2005). A population estimate of 30 to 40 bears was made for the entire Cabinet-Yaak recovery zone in 2004 based on current and previous captures and sightings of unique individuals (Kasworm et al 2005). Kasworm et al. (2007) showed that at the end of 2005 the population trend had a 94% probability of decline. See Kasworm et al 2005 and 2007 for detailed current discussions on the CYE grizzly bear population status. 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).

Bear activity in the Cabinet-Yaak ecosystem, summarized in Kasworm et al (2007), includes: numbers of females with cubs in the Cabinet-Yaak recovery zone varied from 0-4 per year and averaged 1.7 per year from 2001 to 2006. Human caused mortality averaged 1.7 total bears per year and 1.3 females per year during 2001-06. Ten known human caused mortalities of grizzly bears have occurred in the recovery zone or within 10 miles since 2001. These include 8 females and 2 males. No bears are known to have died by human causes during 2006. Twelve of 22 bear management units had sightings of

females with young during 2001-06. A minimum population estimate of 40 bears was made for the Cabinet-Yaak recovery zone in 2006 based on current and previous captures and sightings of unique individuals.

Grizzly bear observation and monitoring data indicate that casual observations and formal detections are prevalent in the Cabinet Mountains. The US Fish and Wildlife Service sightings database reveals that the Silverfish PSU contains high concentrations of casual observations reported by the public.

Formal winter track surveys by the USFS in the proposed Montanore Mine area were documented during 1988, 1989, 1994 and 1995, and some of these overlap with the Silverfish PSU. Many of the survey routes were repeated in full or in part for those periods. Montana Fish, Wildlife, and Parks also perform winter track surveys about 3 times per year, every year, in the same area. Data on FWP track sightings are not readily available. In the Silverfish PSU, the trail to Baree Lake, about 2.8 mi long, is surveyed every year. During 1994 and 1995, there were 19.6 and 28.6 additional miles of track surveys. No grizzly tracks were documented. There were no USFS surveys done in during 1988 and 1989 in the Silverfish PSU.

In addition to sighting and winter track survey data, home range estimations of USFWS radio-collared bears are available. These data establish that the Silverfish PSU provides habitat for bear use. In the Crazy PSU, just north of the Silverfish PSU, an area where all home range estimates overlap is situated around the upper portions of Bear, Cable, Poorman and Ramsey Creeks. Home ranges extend laterally from that area over the entire Crazy PSU and the western half of the Silverfish PSU.

Table 3-97 shows BMU 6 and 7 baseline habitat conditions that have been identified by the U.S. Fish and Wildlife Service and grizzly bear researchers as important for grizzly bear recovery and potentially affecting mortality risk and associated incidental take.

Table 3-97 - Grizzly Bear Habitat Conditions Considered for the Baseline Condition by BMU

BMU	PERCENT CORE	OMRD % OF BMU > 1 MI/SQ. MI.	TMRD % OF BMU > 2 MI/SQ. MI.	% HABITAT EFFECTIVENESS	BMU LINEAR ORD (MI/SQ. MI.).
6	53	30	32	66	0.44
7	67	21	18	79	0.31

Outside Recovery Zone

The eastern edge of the Silverfish PSU is located within the Cabinet Face BORZ polygon. Grizzly bear reoccurring use areas outside the recovery zones (BORZ polygons) have been identified (Wittinger et al. 2002). The FWS has identified three factors falling under Forest Service jurisdiction that contribute to "taking" (ESA Section 9) of grizzly bears that apply in these areas. They are: 1) access management; 2) food attractants (human and livestock food storage and garbage); and 3) livestock presence. The proposed project is in the Cabinet Face BORZ polygon (Figure 1 in Johnson 2003). The current estimate of the grizzly bear population in the Cabinet Face BORZ polygon is 1 (Johnson 2003:3), including known recovery zone bear use.

Johnson (2003) established access management conditions for areas outside the recovery zone, with reoccurring grizzly bear use. The access management baseline conditions on National Forest System lands only for the Cabinet Face BORZ polygon are 2.2 miles/square mile of linear open road density and 3.9 miles/square mile of linear total road density (Johnson 2003). These existing condition road density values indicate that incidental take of grizzly bears is likely occurring in the Cabinet Face BORZ polygon. The road density values indicate that the level of take is likely higher than inside the recovery

zone, which is being managed specifically for grizzly bears (i.e. lower road densities, higher security areas, less overall disturbance).

Grizzly bear issues related to livestock grazing have generally involved depredations of livestock by grizzly bears, disposal of livestock carcasses, storage of human food and stock feed, and subsequent grizzly bear habituation, food conditioning, and mortality risk associated with these activities. There are many Kootenai Forest Plan management standards and guidelines that deal with range management and potential conflicts with grizzly bears. The management direction is designed to favor the bear in all cases. Livestock allotments are not present in the Cabinet Face BORZ polygon.

Food attractants may be present in the Cabinet Face BORZ polygon; however there have been no documented grizzly bear mortalities on KNF lands due to food attractant. The KNF has a voluntary food storage guideline in place that covers all NFS lands (Kootenai NF Food Storage Guidelines 2001). The guidelines follow the food storage order for the Northern Continental Divide Ecosystem. Outfitter and guide operations on the Kootenai NF are required to follow the guidelines as a condition of their permit. The "Pack-It-In- Pack-It-Out" policy is in place on the Kootenai. Overall, bear resistant garbage containers are in place at most campgrounds that have had any history of bear problems.

Environmental Consequences - Direct, Indirect, and Cumulative

Inside Recovery Zone

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), and by a sixth objective specific to the Kootenai National Forest concerning acceptable incidental take (McMaster 1995). 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.

Table 3-98 summarizes existing conditions, and direct and indirect effects to core, OMRD, and TMRD. Habitat component levels are compared to Wakkinen and Kasworm (1997). Their research documented total motorized route densities of greater than 2 miles per mile square mile averaged 26 percent (range = 14.3 to 38.2 percent) of a female home range, Open motorized route densities of greater than one mile per square mile averaged 33 percent (range = 16.7 to 51.5 percent) of a female home range, and a female home range averaged 55 percent (range = 40 to 71.5 percent) core area. Although the access levels documented in Wakkinen and Kasworm (1997) have not been formally adopted by the Forest as management direction, the research provides for a comparison of BMU access conditions to the averages of those female grizzly bears studied.

Within BMU 6, the existing OMRD of 30% is within the range and better than the average of 33%. The existing TMRD of 32% is within the range, but worse than the average of 26%. The existing core at 53% is worse than the average of 55%, but is within the range.

Within BMU 7, the existing OMRD of 21% is within the range, and better than the average of 33%. The existing TMRD of 20% is within the range and better than the average of 26%. The existing core at 67% is better than the average of 55% and within the range.

According to the USFWS (2004) 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. Johnson (2007) supports this position.

The following tables display the direct and cumulative effects of the proposed activities on the habitat components for grizzly bears. No activities are proposed under Alternative 1 and no direct effects would occur.

Table 3-98: Summary of DIRECT EFFECTS to Habitat Conditions During and Post Alternative

BMU	HABITAT COMPONENT	BEST SCIENCE *	BASELINE CONDITION	ALT 2 DURING	ALT 2 POST	ALT 4 DURING	ALT 7 DURING	ALT 4 AND ALT 7 POST	ALT 6 DURING	ALT 6A DURING	ALT 6 POST
6	% OMRD	33*	30	31	28	32	32	29	32	31	29
	% TMRD	26*	32	33	32	33	33	32	34	33	31
	% Core	55*	53	53	55	53	53	53	54	53	55
	% HE	(70%)	66	67	71	65	67	71	66	68	70
	Linear ORD	<0.75	0.44	0.56	0.40	0.54	0.49	0.38	.63	0.48	0.42
7	% OMRD	33*	21	21	20	21	21	20	21	21	21
	% TMRD	26*	20	21	20	21	21	20	21	21	20
	% Core	55*	67	67	68	67	67	67	67	67	67
	% HE	(70%)	79	78	79	79	79	80	79	79	79
	Linear ORD	<0.75	0.31	0.34	0.32	0.34	0.34	0.31	0.34	0.33	0.33

Cumulatively, the reasonable and foreseeable activities considered in **Alternative 1** ***are the same except*** for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considers the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4 and 7, while CUM2 activities were considered with Alternative 6.

Table 3-99: Summary of CUMULATIVE EFFECTS

BMU	HABITAT COMPONENT	ALT 1 CUM1 DURING	ALT 1 CUM1 POST	ALT 2 DURING	ALT 2 POST	ALT 4 DURING	ALT 7 DURING	ALT 4 AND ALT 7 POST	ALT 1 CUM2 DURING	ALT 1 CUM2 POST	ALT 6 DURING	ALT 6A DURING	ALT 6 POST
6	% OMRD	36	27	36	26	36	36	26	33	26	35	35	26
	% TMRD	34	34	34	33	34	34	33	33	33	34	33	31
	% Core	54	54	54	54	54	54	54	54	54	55	53	56
	% HE	61	72	58	73	59	62	73	61	73	59	59	73
	Linear ORD	0.68	0.36	0.75	0.35	0.73	0.69	0.35	0.66	0.35	0.82	0.71	0.35
7	% OMRD	26	21	26	20	26	26	21	26	20	26	26	20
	% TMRD	21	21	21	20	21	21	20	21	21	21	21	20
	% Core	67	67	67	68	67	67	67	67	67	67	67	67
	% HE	74	79	73	80	74	74	79	74	80	74	74	79
	Linear ORD	0.50	0.31	0.50	0.30	0.51	0.51	0.31	0.50	0.31	0.51	0.51	0.31

*Numbers considered best science for the Kootenai National Forest (Wakkinen and Kasworm 1997 and Johnson 2007)

Private forest management activities on Plum Creek Timber Company occur in both BMU 6 and 7. Activities on only Plum Creek lands but occur within MS-1 habitat, are conducted to Plum Creek grizzly bear habitat standards which involve a linear open road density of 1 mile per square mile, maintenance of cover for bears, and protection of seasonal habitats (Rock Creek Final BO, 2006, supplement 2007).

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

Please note that cumulatively, the reasonable and foreseeable activities considered in **Alternative 1** ***are the same except*** for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). **Alternative 1 CUM1** analyzes the MMI power line in Miller Creek while **Alternative 1 CUM2** analyzes the power line in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4 and 7, while CUM2 activities were considered with Alternative 6.

A. <u>Habitat Effectiveness</u>: 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 minus all land less than ¼ mile from roads open during the bear year (4/1-11/15) and major activities occurring during the bear year.

BMU 6: HE is currently 66 percent, which is less than the recommended 70 percent.

Direct and Indirect Effects

HE during project activities for Alternative 2 and Alternative 7 increases to 67%; decreases to 65% during Alternative 4; and stays at 66% for Alternative 6. During Alternative 6A (a subdivision of Alternative 6) it increases to 68%. Post project, HE increases to 71 percent for Alternative 2, 4 and 7, and increases to 70 percent with Alternative 6. No activities are proposed under Alternative 1 and no direct effects to HE would occur.

Prescribed burning without associated timber harvest is proposed under each alternative and it may occur after the timber sales are completed, but this activity is dependent upon funding. Due to this, impacts to HE from the prescribed burning were analyzed post project. The burn units were grouped by elevation and aspect to assess a worse case scenario effect on HE. Alternative 2 burn units spread over a 4 year burn period and grouped by elevation and aspect would decrease HE by 2 to 7%. Alternative 4 and 7 burn units spread over a 4 year burn period and grouped by elevation and aspect would decrease HE by 3 to 7 %. Alternative 6 burn units spread over a 4 year burn period and grouped by elevation and aspect would decrease HE by 3 to 6%. However, Alternatives 4, 7 and 6 in response to public comment split many of the burn units into smaller blocks to temporally spread any impact on forage production and decrease to HE in any given year would be less than analyzed. In addition, these smaller units would likely be hand-ignited, with only people and fuel being flown in. Per year, the prescribed burning is expected to involve a day or two of ignition by helicopter or a few hours if people and fuel are flown in.

Cumulative effects

During Alternative 1 CUM1 (MMI power line through Miller Creek), HE would decrease to 61 percent, and post project would increase to 72%. Cumulatively, HE during project activity would decrease to 58% with Alternative 2; to 59% with Alternative 4; and to 62% with Alternative 7. During Alternative 1 CUM2 (MMI power line through West Fisher), HE would decrease to 61 percent, and post project would increase to 73 percent. Cumulatively, HE would decrease to 59% with Alternative 6, and to 58% with subdivision 6A considered.

Cumulatively, post Alternative 2, 4, 7 and 6, and other reasonable foreseeable activities, HE would increase to 73 percent.

Post harvest activity, prescribed burning without associated timber harvest could decrease this 73% HE from 2 to 7 percent with Alternative 2; from 2 to 6 percent with Alternatives 4 or 7; and from 5 to 8 percent with Alternative 6. This proposed prescribed burning is dependent upon funding, and prescribed burning would occur in both BMU 6 and BMU 7 over a period of years due to temporal staggering of the burning.

BMU 7: HE is currently 79 percent.

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct or indirect effects would occur. HE during project activities for Alternative 2 decreases by 1% to 78%; and remains at 79% for Alternatives 4, 7, and 6 (and subdivision 6A). Post project, HE returns/remains at 79% for all action alternatives.

Prescribed burning without associated timber harvest is proposed under each alternative and it may occur after the timber sales are completed, but this activity is dependent upon funding. Due to this, impacts to HE from the prescribed burning were analyzed post project. The burn units were grouped by elevation and aspect to assess a worse case scenario effect on HE. Alternative 2 burn units spread over a 4 year burn period and grouped by elevation and aspect would decrease HE by 5 to 10 percent. Alternative 4 and 7 burn units spread over a 4 year burn period and grouped by elevation and aspect would decrease HE by 7 to 20 percent. Alternative 6 burn units spread over a 4 year burn period and grouped by elevation and aspect would decrease HE by 7 to 19 percent. However, Alternatives 4, 7 and 6 in response to public comment split many of the burn units into smaller blocks to temporally spread any impact on forage production and decrease to HE on any given year would be less than analyzed. In addition, these smaller units would likely be hand-ignited, with only people and fuel being flown in. The procedure is expected to involve a day or two of ignition by helicopter or a few hours if people and fuel are flown in per year.

Cumulative effects

During Alternative 1 CUM1 (MMI power line through Miller Creek), HE would decrease by 5% to 74 percent, and post project would return to 79%. Cumulatively, HE during project activity would decrease by 6% to 73% (Alternative 2) or by 5% to 74% (Alternative 4 and 7). Post project, HE would cumulatively increase 1% to 80 percent for Alternative 2, and for Alternative 4 and 7 would return to 79%. During Alternative 1 CUM2 (MMI power line through West Fisher), HE would decrease to 74 percent, and

post project would increase by 1% to 80 percent. Cumulatively, with implementation of Alternative 6 and also during subdivision 6A, HE would decrease 5% to 74%. Cumulatively, post Alternative 6 and other reasonably foreseeable actions, HE would return to 79%.

Prescribed burning without associated timber harvest would decrease HE from 6 to 10 percent with Alternative 2; from 7 to 12 percent with Alternatives 4 or 7; and from 7 to 19 percent with Alternative 6.

For both BMU 6 and BMU 7: HE during activities would *directly* decrease based on the opening of roads for harvest activities, and due to the buffering of helicopter units. Helicopter units are buffered by a one mile displacement zone unless there are topographic or locality reasons for using a different buffer distance. The effect of the harvest activities is that grizzly bears would be displaced due to the human, harvest and helicopter activity in the area. *Cumulatively,* activities on Corporate timber land and mining activity also contribute to changes in HE, as displayed in Table 3-99 for Alternative 1 (CUM1 and CUM2).

The surrounding core habitat would serve as temporary displacement for any bears that may be present during the prescribed burning not associated with timber harvest. The burning of the units would be scheduled either before green-up or after berry season ends and would not interrupt any important biological periods for grizzly bears (breeding, denning, fall feeding). Many of the prescribed burns were planned as a wildlife benefit, including huckleberry production.

Core Areas: The requirements of a core area include: no motorized access (roads or trails) during the active bear season, and be at least 0.31 miles from open or gated roads. The goal is that federal agencies will work toward attaining a minimum core area of 55% in the BMU (Interim Access Management Rule Set for SCYE 1998). Another goal is that **no net** loss of core area will occur on federal ownership within the BMU (Interim Access Management Rule Set for SCYE 1998). The USFWS has stated that "net" means the post project numbers (Ben Conard, USFWS, personal communication, 13 December 2007).

Wakkinen and Kasworm (1997) also indicate at least 55% of a BMU should be in core habitat to avoid displacement of bears.

BMU 6: Existing core is present on 53% of the BMU, 2% below the recommended 55%.

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct or indirect effects to core would occur.

During implementation of Alternative 2, 4, 7, and Alternative 6, subdivision A, core remains at 53%. During Alternative 6 implementation, which occurs after implementation of Alternative 6 subdivision A (required timing mitigation), core increases 2% to 55% as a result of road #4725 located in subdivision A being stored.

Post project for both Alternative 2 and 6, core increases by 2 percent. Post Alternative 2, core would increase to 55% (plus 1,175 acres or 1.8 square miles). Post Alternative 6 core increases to 55 percent (plus 1,314 acres or 2 square miles). Increases in core are due to road decommissioning or storage. Core habitat would remain unchanged post Alternative 4 and 7 (53%).

Cumulative effects

During and post implementation of Alternative 1 (CUM1 or CUM2) core increases 1% to 54 percent.

Cumulatively, when all reasonable and foreseeable activities described for Alternative 1 CUM1 are considered, core increases by 1 percent post project with implementation of Alternative 2 (plus 392 acres or 0.6 square miles), and Alternative 4 and 7 (plus 335 acres or 0.5 square miles).

Cumulatively, when all reasonable and foreseeable activities described for Alternative 1 CUM2 are considered, implementation of Alternative 6 subdivision 6A, core would increase 1% to 54 percent, and during Alternative 6 core would increase 2% to 55 percent. Post Alternative 6, core would increase 2% over the existing condition of 53% to 55 percent (plus 1,880 acres or 2.9 square miles).

No alternatives cumulatively decrease existing core habitat. Cumulatively, planned activities result in an increase in core habitat, ranging from 1 to 2 percent.

BMU 7: Existing core is present on 67% of the BMU.

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct or indirect effects to core would occur. During implementation of the action Alternatives, 2, 4, 7 and 6, core remains at 67%. Post implementation, core habitat for both Alternatives 4, 7 and 6 remains at 67 percent, while planned activities for Alternative 2 increase core by 1% to 68 percent (plus 419 acres or 0.6 square miles). Increase in core would occur on grizzly bear spring/summer and fall range.

Cumulative effects

During and post implementation of Alternative 1 CUM1 (MMI power line through Miller Creek), core remains at 67 percent. Cumulatively when all reasonable foreseeable activities described for CUM1 are considered during implementation of Alternative 2, 4 and 7, core also remains at 67 percent. Post project planned activities for Alternative 2 results in an increase in core by 1% to 68 percent while core post Alternative 4 and 7 remains at 67 percent.

During and post implementation of Alternative 1 CUM2 (MMI power line through West Fisher), core remains at 67%. Cumulatively when all reasonable foreseeable activities described for CUM2 are considered, during and post implementation of Alternative 6 and its subdivision 6A, core remains at 67 percent.

No alternatives cumulatively decrease existing core habitat.

C. <u>OMRD</u>: Open Motorized Route Density (OMRD) is calculated on a BMU basis using moving window analysis. The goal is for **<u>no net increase</u>** in OMRD on NFS lands within the BMU (Interim Access Management Rule Set for SCYE 1998). The USFWS has stated that "net" means the post project numbers (Ben Conard, USFWS, personal communication, 13 December 2007). Wakkinen and Kasworm (1997) recommend no more than 33 percent of each BMU have an open road density greater than one mile per square mile.

BMU 6: The existing OMRD is 30%.

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct or indirect effects to OMRD would occur.

During implementation of Alternative 2 OMRD increases to 31 percent, while during Alternative 4, 7 and 6 it increases to 32 percent. During Alternative 6, subdivision A, OMRD increases to 31 percent. Post Alternative 2 OMRD decreases (improves) by two percentage points to 28 percent, while post alternative 4, 7, and 6 OMRD decreases (improves) by one percentage point to 29 percent. Decreases in post project OMRD are due to planned changes in road access, and thus **all action alternatives meet the standard of no net increase in OMRD.**

Cumulative effects

During Alternative 1 CUM1, OMRD increases to 36 percent, and post project decreases to 27. Cumulatively when all reasonable foreseeable activities described for CUM1 are considered during implementation of Alternatives 2, 4, and 7, OMRD increases to 36 percent during activity, and post project decreases (improves) by 4 percentage points to 26 percent.

During and post implementation of Alternative 1 CUM2, OMRD increases to 33 percent, and post project decreases (improves) by four percentage points to 26 percent. Cumulatively when all reasonable foreseeable activities described for CUM2 are considered, OMRD increases to 35 percent during implementation of Alternative 6, and its subdivision 6A. Post project OMRD decreases to 26 percent. Decreases in post project OMRD are due to planned changes in road access, and cumulatively all alternatives meet the standard of no net increase in OMRD.

BMU 7: The existing OMRD is 21%.

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct or indirect effects to core would occur. During implementation of Alternative 2, 4, 7, 6, and Alternative 6, subdivision A, OMRD in BMU 7 remains at 21 percent. Post project, OMRD decreases (improves) by one percentage point to 20 percent with Alternative 2, 4, and 7, and remains at 21% with Alternative 6. Post project OMRD either decreases due to planned changes in road access or remains at 21%, and thus **all action alternatives meet the standard of no net increase in OMRD**.

Cumulative effects

During Alternative 1 CUM1, OMRD increases to 26 percent, and post project returns to 21%.

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, during implementation of Alternatives 2, 4, and 7 OMRD also increases to 26 percent. Post project cumulative OMRD decreases (improves) one percentage point to 20 percent with implementation of Alternative 2 and remains at 21 percent with Alternative 4 and 7.

Cumulatively, when all reasonable and foreseeable activities as described for CUM2 are considered, during implementation of Alternative 6 and subdivision 6A, OMRD increases to 26%. Post project OMRD decreases (improves) one percentage point to 20 percent.

Decreases in post project OMRD are due to planned changes in road access, and cumulatively all alternatives meet the standard of no net increase in OMRD.

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 (Interim Access Management Rule Set for SCYE 1998). The USFWS has stated that "net" means the post project numbers (Ben Conard, USFWS, personal communication, 13 December 2007). Wakkinen and Kasworm (1997) recommend no more than 26 percent of each BMU have a total road density greater than 2 miles per square mile.

BMU 6: The existing TMRD is 32 percent.

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct or indirect effects to TMRD would occur. During implementation of Alternative 2, 4, 7, and Alternative 6 subdivision A, TMRD increases to 33 percent. During Alternative 6 implementation, TMRD increases to 34%. Post project, TMRD remains at 32 percent for Alternative 2, 4, and 7. Post Alternative 6 TMRD decreases (improves) one percentage point to 31 percent. Post project decreases in TMRD are due to planned changes in road access and thus **all action alternatives directly and indirectly, meet the standard of no net increase in TMRD.**

Cumulative effects

During Alternative 1 CUM1, TMRD increases (worsens) to 34 percent, and post project remains at 34%. This is a two percent increase over the existing condition. Alternative 1 CUM1 results in a net increase in TMRD.

Cumulatively, when all reasonable and foreseeable activities as described for CUM1 are considered, during implementation of Alternatives 2, 4, and 7, TMRD also increases to 34 percent, and post project decreases to 33 percent. This is a one percent increase over the existing condition. This post project cumulative TMRD is due to planned changes in road access in the action alternatives. C**umulatively, when all reasonable and foreseeable activities are considered, Alternatives 2, 4, and 7 result in a net increases in TMRD** and **do not meet the standard** of no net increase in TMRD.

During and post implementation of Alternative 1 CUM2 (MMI power line through West Fisher), TMRD increases (worsens) by one percentage point to 33 percent. Cumulatively **Alternative 1 CUM2 results in a net increase in TMRD and does not meet the standard of no net increase in TMRD**.

Cumulatively, when all reasonable and foreseeable activities as described for CUM2 are considered, during implementation of Alternative 6, TMRD increases to a maximum of 34 percent during project activity, and post project decreases (improves) one percentage point to 31 percent. Cumulatively, Alternative 6, when considered with other reasonable and foreseeable actions considered in the alternative CUM2, results in a post project decreases in TMRD. This is due to planned road decommissioning under Alternative 6. Cumulatively, when all the reasonable and foreseeable activities described for Alternative

1 CUM2 are considered, post project **Alternative 6 meets the standard of no net increase in TMRD**.

BMU 7: The existing TMRD is 20 percent.

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct or indirect effects to TMRD would occur. During implementation of Alternatives 2, 4, 7, 6, and Alternative 6 subdivision A, TMRD increases to 21 percent. Post project, TMRD returns to 20 percent for all action alternatives. **All action alternatives directly and indirectly meet the standard of no net increase in TMRD.**

Cumulative effects

During Alternative 1 CUM1, TMRD increases to 21 percent, and post project remains at 21%. **Alternative 1 CUM1 results in a net increase** in TMRD and does not meet the standard of no net increase in TMRD. Cumulatively when all reasonable foreseeable activities described for CUM1 are considered during implementation of Alternatives 2, 4, and 7, TMRD increases to 21 percent and post project returns to 20 percent. Cumulatively, Alternatives 2, 4 and 7, when considered with other reasonable and foreseeable actions considered in Alternative 1 CUM1 return to 20 percent TMRD, and thus **meets the standard of no net** increase in TMRD.

During and post implementation of Alternative 1 CUM2, TMRD increases to 21 percent. Cumulatively **Alternative 1 CUM2 results in a net increase in TMRD and does not meet the standard of no net increase in TMRD**.

Cumulatively when all reasonable foreseeable activities described for CUM2 are considered during implementation of Alternative 6, and Alternative 6, subdivision A, TMRD increases to 21 percent during project activity, and post project returns to 20 percent. Cumulatively, Alternative 6, when considered with other reasonable and foreseeable actions considered in the Alternative 1 CUM2, returns to the existing TMRD of 20%. Cumulatively, **Alternative 6 meets the standard of <u>no net</u> increase in TMRD**.

E. Linear Road Densities

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's 6 and 7, and the associated bear analysis areas (BAA's) are displayed below for the existing condition, and during, and post each alternative.

Please note that cumulatively, the reasonable and foreseeable activities considered in **Alternative 1 *<u>are the same except</u>*** for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). **<u>Alternative 1 CUM1</u>** analyzes the MMI power line in Miller Creek while **<u>Alternative 1 CUM2</u>** analyzes the power line in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7, while CUM2 activities were considered with Alternative 6.

BMU 6:

Alternative 1 (CUM1 or CUM2) the existing linear open road density within Situation 1 land in the BMU is 0.44 miles/sq. mile. The ORD's in BMU 6 and its associated bear analysis areas (BAA) before, during, and post Alternative 1 are displayed in Table 3-100 and Table 3-101. No activities are proposed with Alternative 1. In BMU 6, the existing BAA 566 linear open road density is 1.11.

Cumulatively, the Rock Creek Mine, the Montanore Mine, and Way-up/Fourth of July mine access would impact BAA 566, as shown in both Table 3-100 and Table 3-101. The effects of Way-up/Fourth of July mine were addressed in a biological opinion amended in 1999 (USFWS 1999). The BAA 566 has exceeded the road standard for years; roading levels are likely to remain high under current private land ownership patterns. BAA ORD also increases during Alternative 1 CUM1 (Table 3-100) and Alternative 1 CUM2 (Table 3-101) due to private timber harvest.

Table 3-100: BMU 6 Linear open road densities (ORD's) for Alternative 1 CUM 1 - Miller

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
564	0.00	0.00	0.00
565	0.24	1.40	0.24
566	1.11	1.22	0.85
567	0.54	1.27	0.54
761	0.48	0.40	0.40
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.68	0.36

* See the Bear Management Unit maps (FIGURE *) for BAA locations.
** Existing ORD > 0.75 mi./sq. mi. due to: Active BAA for project or approved under previous project consultation (Way-up Fourth of July mine).

In Alternative 1 CUM1, BAA ORD's increase in 567 due to MMI power line construction in Miller Creek, in 566 due to private timber harvest, in 565 due to road construction (4th of July Mine access road) and private timber harvest. BAA ORD's decrease due to planned road closures to offset the 4th of July Mine access.

Table 3-101: BMU 6 Linear ORD's for Alternative 1 CUM2 - West Fisher

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
564	0.00	0.00	0.00
565	0.24	1.40	0.24
566	1.11	1.44	0.77
567	0.54	0.54	0.54
761	0.48	0.40	0.40
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.66	0.35

In Alternative 1 CUM2, BAA ORD's increase in 565 due to road construction (Skranak's 4th of July Mine) and private timber harvest, and in 566 due to MMI power line construction and private timber harvest.

For the no action Alternative 1, with either reasonable and foreseeable activity scenario (CUM1 or CUM2), a slight increase in total BMU linear ORDs would occur during project activities. 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 could be displaced due to human presence and project activities. For Alternative 1 (with CUM1 or CUM2), post project linear ORDs for this BMU would either decrease or return to their pre-project existing condition.

Alternative 2, direct, indirect and cumulative effects

Table 3-102. : BMU 6 Linear ORDS with Alternative 2 –Direct Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.)	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
564	0.00	0.00	0.00
565	0.24	0.24	0.24
566	1.11	1.45	0.93
567	0.54	1.10	0.54
761	0.48	0.48	0.48
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.56	0.40

Alternative 2 opens roads for timber harvest in BAA 566 and 567 which increases BAA ORD during activity. A slight increase in total BMU linear ORDs would occur during project activities. The direct and indirect effects of Alternative 2 result in ORDs below the recommended maximum ORD for BMU's (Table 3-102). Planned road closure activity post project decreases the BAA ORD in BAA 566, and the overall BMU ORD.

Table 3-103: BMU 6 Linear ORD's with Alternative 2 – Cumulative Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq.mi.)	During Project ORD (mi/sq.mi.)	Post Project ORD (mi./sq.mi)
564	0.00	0.00	0.00
565	0.24	1.41	0.24
566	1.11	1.51	0.77
567	0.54	1.33	0.54
761	0.48	0.40	0.40
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.75	0.35

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, implementation of Alternative 2 results in a BMU ORD that reaches the maximum of 0.75 miles/square mile of open roads for BMUs during activity (Table 3-103). The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, Alternative 2 post project linear ORDs for this BMU would either decrease or return to their pre-project existing condition.

Alternative 4 and Alternative 7, direct, indirect and cumulative effects

Alternative 7 uses Alternative 4 as a base with the only difference being Alternative 7 requires winter logging on units accessed by roads 4782, 4782A, and 5326. This results in different linear ORD's during summer activity periods as displayed in the during project columns in the direct (Table 3-104) and the cumulative (3-105) tables. Post Project ORD is the same for Alternative 4 and 7.

Table 3-104: BMU 6 linear ORD's with Alternative 4 and 7 - Direct Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.)	During Project ORD (mi/sq. mi.)		Post Project ORD (mi./sq. mi)
		Alt 4	Alt 7	
564	0.00	0.00	0.00	0.00
565	0.24	0.30	0.30	0.24
566	1.11	1.31	1.11	0.86
567	0.54	1.10	1.10	0.54
761	0.48	0.48	0.48	0.48
762	0.01	0.01	0.01	0.01
763	0.00	0.00	0.00	0.00
Total BMU	0.44	0.54	0.49	0.38

Alternatives 4 and 7 open roads for timber harvest in BAA 566 and 567 which increase BAA ORD during activity. Also included in Alternatives 4 and 7 is a proposal for road construction to the Irish Boy Mine in BAA 565. Of the changes to grizzly bear core habitat with Alternatives 4 and 7, motorized access to the Irish Boy Mine property causes a loss of roughly 300 acres of core habitat in BMU 6. A slight increase in total BMU linear ORDs would occur during project activities. The direct and indirect effects of Alternative 4 and 7 result in BMU ORDs below the recommended maximum ORD for BMU's (Table 3-104). Planned road mitigation post project decreases the BAA ORD in BAA 566, and the overall BMU ORD.

Table 3-105: BMU 6 linear ORD's with Alternative 4 and 7 - cumulative effects.

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.)	During Project ORD (mi/sq. mi.)		Post Project ORD (mi./sq. mi)
		Alt 4	Alt 7	
564	0.00	0.00	0.00	0.00
565	0.24	1.41	1.40	0.24
566	1.11	1.42	1.22	0.77
567	0.54	1.33	1.33	0.54
761	0.48	0.40	0.40	0.40
762	0.01	0.01	0.01	0.01
763	0.00	0.00	0.00	0.00
Total BMU	0.44	0.73	0.69	0.35

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, implementation of Alternative 4 results in a BMU ORD that is just below the maximum of 0.75 miles/square mile of open roads for BMUs during activity (Table 3-105). The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, Alternative 4 post project linear ORDs for this BMU would either decrease or return to their pre-project existing condition.

Alternative 6, direct, indirect and cumulative effects

Table 3-106: BMU 6 Linear ORD's with Alternative 6- Direct Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.)	During Project ORD (mi/ sq. mi.)	Post Project ORD (mi./sq. mi)
564	0.00	0.00	0.00
565	0.24	0.24	0.24
566	1.11	1.94	1.03
567	0.54	0.74	0.54
761	0.48	0.48	0.48
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.63	0.42

Alternative 6 opens roads for timber harvest in BAA 566 and 567 which increases BAA ORD during activity. An increase in total BMU linear ORDs would occur during project activities. As a **direct effect** of Alternative 6, the ORD's are below the recommended maximum of 0.75 miles/square mile of open roads for BMU's (Table 3-106). Planned road closures post project decreases the BAA ORD in BAA 566, and the overall BMU ORD.

Table 3-107: BMU 6 Linear ORD's with Alternative 6 - Cumulative Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.)	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
564	0.00	0.00	0.00
565	0.24	1.40	0.24
566	1.11	2.09	0.77
567	0.54	0.74	0.54
761	0.48	0.40	0.40
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.82	0.35

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM2 are considered, implementation of Alternative 6 results in a BMU ORD that is **above** the maximum of 0.75 miles/square mile of open roads for BMU's during activity (Table 3-107). The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, Alternative 6 post project linear ORD's for this BMU would either decrease or return to their pre-project existing condition.

Alternative 6, subdivision A, direct, indirect and cumulative effects

Table 3-108: BMU 6 Linear ORD's with Alternative 6, Subdivision A – direct effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.)	During Project ORD (mi/sq. mi.)	Post Project ORD* (mi./sq. mi)
564	0.00	0.00	0.00
565	0.24	0.24	0.24
566	1.11	1.11	1.03
567	0.54	1.05	0.54
761	0.48	0.48	0.48
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.48	0.42

***Post Project ORD's are the same as Post Alternative 6, direct effects (Table 3-106)**

For Alternative 6, subdivision A**, direct** effects only occur in BAA 567 when road #4725 in BAA 567 is opened for timber harvest. An increase in total BMU linear ORD's would occur during project activities. As a **direct effect** of Alternative 6, subdivision A, the ORD's are below the recommended maximum of 0.75 miles/square mile open roads for BMU's (Table 3-108). Planned road mitigation post project (as described under Alternative 6) decreases the BAA ORD in BAA 566, and the overall BMU ORD.

Table 3-109: BMU 6 Linear ORD's with Alternative 6, subdivision A – Cumulative Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.)	During Project ORD (mi/sq. mi.)	Post Project ORD* (mi./sq. mi)
564	0.00	0.00	0.00
565	0.24	1.40	0.24
566	1.11	1.44	0.77
567	0.54	1.05	0.54
761	0.48	0.40	0.40
762	0.01	0.01	0.01
763	0.00	0.00	0.00
Total BMU	0.44	0.71	0.35

***Post Project ORD's are the same as Post Alternative 6, cumulative effects (Table 3-107)**

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM2 are considered, implementation of Alternative 6, subdivision A results in a BMU ORD that is just below the maximum of 0.75 miles/square mile of open roads for BMU's during activity (Table 3-109). The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, alternative 6 post project linear ORD's for this BMU would either decrease or return to their pre-project existing condition.

BMU 7:

Alternative 1 (CUM1 or CUM2): The existing linear open road density within Situation 1 land in the BMU is 0.33 miles/sq. mile. The ORD's in BMU 7 and its associated bear analysis areas (BAA) before, during, and post the no action Alternative 1 (with either CUM1 or CUM2 cumulative effects scenario) are displayed in Table 3-110 and Table 3-111. No activities are directly or indirectly proposed with Alternative 1.

Table 3-110: BMU 7 Linear ORD's with Implementation of Alternative 1 CUM1

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.67	0.55
6-7-4	0.55	1.08	0.55
6-7-5	0.03	0.04	0.04
6-7-6	0.22	0.68	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.50	0.50	0.50
Total BMU	0.33	0.50	0.31

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

With Alternative 1 CUM1, BAA ORD's increase during due to private timber harvest (Table 3-110). Post Alternative 1 CUM1 BAA ORD's decrease due to gating of BPA power line access roads and of private roads as timber harvest is completed.

Table 3-111: BMU 7 linear ORD's with Implementation of Alternative 1 CUM2

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.67	0.56
6-7-4	0.55	1.08	0.55
6-7-5	0.03	0.04	0.04
6-7-6	0.22	0.68	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.50	0.50	0.50
Total BMU	0.33	0.50	0.31

With Alternative 1 CUM2, BAA ORD's increase due to private timber harvest. Post project BAA ORD's decrease due to gating of BPA power line access roads and of private roads as timber harvest is completed.

For Alternative 1 (with reasonable and foreseeable activities as described for CUM1 or CUM2), a slight increase in total BMU linear ORD's would occur during project activities. The ORD's are below the recommended maximum of 0.75 miles/square mile of open roads for BMU's. The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. Post project linear ORD's for this BMU would return to their pre-project existing condition, or decrease.

Alternative 2, direct, indirect and cumulative effects

Table 3-112: BMU 7 linear ORD's for Alternative 2 – Direct Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.69	0.61
6-7-4	0.55	0.55	0.55
6-7-5	0.03	0.03	0.01
6-7-6	0.22	0.22	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.49	0.49	0.49
Total BMU	0.33	0.34	0.32

* See the Bear Management Unit maps in the map section of the document for BAA locations.

Alternative 2 decommissions roads located in BAA 673 which directly results in an increase in BAA ORD during activity. A slight increase in total BMU linear ORD's would occur during project activities, but is well below the 0.75 miles/square mile maximum ORD for BMU's (Table 3-112). Planned road closures post project slightly decreases the ORD in BAA 673 and in the BMU.

Table 3-113: BMU 7 Linear ORD's for Alternative 2 – Cumulative Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.67	0.55
6-7-4	0.55	1.08	0.55
6-7-5	0.03	0.04	0.01
6-7-6	0.22	0.68	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.50	0.49	0.49
Total BMU	0.33	0.50	0.31

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, implementation of Alternative 2 results in a BMU ORD that is well below the maximum of 0.75 miles/square mile of open roads for BMU's during activity (Table 3-113). The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, Alternative 2 post project linear ORD's for this BMU would either decrease or return to their pre-project existing condition.

Alternative 4 and 7, direct, indirect and cumulative effects

Within BMU 7, the activities of Alternative 4 and 7 are the same.

Table 3-114: BMU 7 Linear ORD's for Alternative 4 and 7 – Direct Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.69	0.54
6-7-4	0.55	0.55	0.55
6-7-5	0.03	0.03	0.03
6-7-6	0.22	0.22	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.49	0.49	0.49
Total BMU	0.33	0.34	0.31

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

Alternative 4 and 7 decommission roads located in BAA 673 which directly results in an increase in BAA ORD during activity. A slight increase in total BMU linear ORD's would occur during project activities, but is well below the 0.75 miles/square mile maximum ORD for BMU's (Table 3-114). Planned road closures post project slightly decreases the ORD in BAA 673, and in the overall BMU.

Table 3-115: BMU 7 linear ORD's for Alternative 4 and 7 -Cumulative Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.74	0.56
6-7-4	0.55	1.08	0.55
6-7-5	0.03	0.04	0.04
6-7-6	0.22	0.68	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.50	0.49	0.49
Total BMU	0.33	0.51	0.31

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

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, implementation of Alternative 4 and 7 result in a BMU ORD that is well below the maximum of 0.75 miles/square mile of open roads for BMU's during activity (Table 3-115). Individual BAA ORD increases during activity are due to storage of roads, and private timber harvest. The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, Alternative 4 and 7 post project linear ORD's for this BMU would either decrease or return to their pre-project existing condition.

Alternative 6, direct, indirect and cumulative effects

Table 3-116: BMU 7 Linear ORD's for Alternative 6 – Direct Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.69	0.62
6-7-4	0.55	0.55	0.55
6-7-5	0.03	0.03	0.03
6-7-6	0.22	0.22	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.49	0.49	0.49
Total BMU	0.33	0.34	0.33

* See the Bear Management Unit maps in the map section of the document for BAA locations.

Alternative 6 decommissions roads located in BAA 673 which directly results in an increase in BAA ORD during activity. A slight increase in total BMU linear ORD's would occur during project activities, but is well below the 0.75 miles/square mile maximum ORD for BMU's (Table 3-116). Planned road closures post project should slightly decrease the ORD in BAA 673, and in the overall BMU but the GIS runs did not reflect the changes which were shown for Alternative 2 and 4.

Table 3-117: BMU 7 Linear ORD's for Alternative 6 – Cumulative Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.74	0.56
6-7-4	0.55	1.08	0.55
6-7-5	0.03	0.04	0.04
6-7-6	0.22	0.68	0.22
7-7-1	0.00	0.00	0.00

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
7-7-2	0.49	0.50	0.50
Total BMU	0.33	0.51	0.31

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM2 are considered, implementation of Alternative 6 results in a BMU ORD that is well below the maximum of 0.75 miles/square mile of open roads for BMU's during activity (Table 3-117). Individual BAA ORD increases during activity are due to decommissioning of roads, and private timber harvest. The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, Alternative 6 post project linear ORD's for this BMU would either decrease or return to their pre-project existing condition.

Alternative 6, subdivision A, direct, indirect and cumulative effects

No activities are proposed in BMU 7 during Alternative 6, subdivision A, and no direct or indirect changes to the existing BAA ORD's would occur. Post project ORD's are the same as post Alternative 6, direct effects (Table 3-117).

Table 3-118: BMU 7 Linear ORD's for Alt. 6, Subdivision A – Cumulative Effects

BEAR ANALYSIS AREA (BAA)*	Existing ORD (mi/sq. mi.) **	During Project ORD (mi/sq. mi.)	Post Project ORD (mi./sq. mi)
6-7-3	0.62	0.67	0.56
6-7-4	0.55	1.08	0.55
6-7-5	0.03	0.04	0.04
6-7-6	0.22	0.68	0.22
7-7-1	0.00	0.00	0.00
7-7-2	0.49	0.50	0.50
Total BMU	0.33	0.50	0.31

*Post project ORD are the same as Alternative 6, cumulative effects post project

Cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM2 are considered, implementation of Alternative 6, subdivision results in a BMU ORD that is well below the maximum of 0.75 miles/square mile of open roads for BMU's during activity (Table 3-117). Individual BAA ORD increases during activity are due to storage of roads, and private timber harvest. The effect to grizzly bears would be that bears could be displaced due to human presence and project activities. As a result of both direct and cumulative effects, Alternative 6 post project linear ORD's for this BMU would either decrease or return to their pre-project existing condition.

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

A. Opening size: Proposed timber harvest units in combination with existing un-recovered harvest units should not create openings greater than 40 acres in size.

The existing condition includes past harvest units that are both over 40 acres in size, or are greater than 40 acres when adjacent to other existing units (please see Table 3-85 in the big game section). Most of these units are currently providing hiding cover. The proposed selected alternative, in combination with past harvest activity, will not create any new openings greater than 40 acres in size on NFS lands.

B. Movement corridors: Un-harvested corridors >600 feet in width should be maintained between proposed harvest units and between proposed and un-recovered existing harvest units.

Due to project design, un-harvested corridors greater than 600 feet would be maintained between proposed activity and un-recovered existing harvest units.

On a larger scale, movement corridors of vegetative cover blocks and core area are available across BMU 6 and 7 and into the adjacent BMU's (5 and 8). In Ruediger's "Report to the Interagency Grizzly Bear Working Group on Wildlife Habitat Linkages" important priority wildlife linkages were identified. This report is specific to highways. The Silverfish PSU does not include priority wildlife linkage habitat related to any highway, based on this literature.

Servheen et al. (2001, updated 7/8/2003) identifies linkage zones based on landscape views from the Linkage Zone Prediction Model. The Silverfish PSU is not in any identified Linkage Zone as determined by this model and shown in the document.

The Miller West Fisher Timber Sale activities may temporarily displace grizzly bears attempting to move where the harvest units are occurring.

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 to March 31) (Johnson et al 2008).

All of the proposed timber harvest and prescribed burns are located in spring range. Timing activities for timber harvest include no activities during the spring period, April 1st to June 15th. Any prescribed burning that would take place would limit helicopter activity to 1 to 2 days, with no heavy ground equipment being used. Spring burning is scheduled to occur in the time period between snow-melt and green-up, or between the end of the berry season and before the fall snows begin, and thus would not interrupt any important biological periods such as breeding, denning, or spring or fall feeding.

Den sites are not known to exist within the Silverfish PSU. Den habitat in the recovery zone is generally above 5,000 feet in elevation. Of six known den sites of native grizzlies in the Cabinet Mountains portion of the recovery zone, four were above 6,200 feet in bear-grass side hill parks, one in a timbered shrub field, and one in a mixed shrub field-rock outcrop. The closest known grizzly den from the project area was found north in the Bear Creek drainage. There are both proposed harvest units and prescribed burns that occur within general forest habitats that may be utilized by grizzly bears in the spring. Measurable impacts to grizzly bears due to management activities concurrent with their use of spring range are not anticipated since logging activities are typically restricted in these areas due to spring break-up period when area roads cannot be driven on by logging trucks and equipment. Management activities typically begin on the winter range in the spring and continue up in elevation as soil conditions allow the use of heavy equipment. The proposed harvest units are located in the mid to lower elevations in the Miller and West Fisher drainages. Prescribed burning occurs at higher elevations along the ridges. The influence zones extend both upslope and down slope, but no direct or indirect effects to denning habitat are expected as a result of the proposed activities.

D. Road density and displacement areas: Displacement areas are provided in the core habitat blocks. Road density and core are discussed under Objectives 1 and 6.

Potential displacement of grizzly bears as a result of project activities is of greatest concern during the spring period immediately after den emergence. During the months of April and early May foraging options are generally limited to low elevation sites where early green-up is occurring. Important spring habitat components (riparian stream bottom and wet meadow) occur throughout the Miller Creek, West Fisher, and Silver Butte drainages.

Point source and motorized linear disturbance are recognized as having potential displacement effects to bears. Prior documents providing guidance for grizzly bear management on the Kootenai National Forest established influence zones for both point source and linear disturbances (Christensen and Madel 1982; USFS 1988). The action alternatives will result in point source disturbances, or a motorized linear high-use disturbance with the timber harvest units and hauling of logs. These impacts were considered in the analysis and the units and the roads buffered.

Roads will be opened for timber harvest or for road decommissioning/storage and total acres of displacement increase over the existing condition. Total acres of displacement as a result of project activities differ by alternative, and directly and cumulatively. Displacement acres during the summer/fall period (June 16 to November 30th) occur within core habitat.

BMU 6

During activity, **Alternative 2** *directly* results in an increase of temporary displacement on 4,216 acres (6.6 square miles), and *cumulatively*, when all reasonable and foreseeable activities are considered (as described for Alternative 1), temporary displacement increases on 7,999 acres (12.5 square miles). Post project, due to project mitigation that restricts motorized public access, Alternative 2 *directly* increases effective habitat by 414 acres. No activities are proposed under Alternative 1, and no direct, indirect or cumulative effects would occur. Cumulatively, when all reasonable and cumulative activities as described under Alternative 1 CUM1 are considered with implementation of Alternative 2, effective habitat increases by 1,729 acres.

During activity, Alternative 4 directly results in an increase of temporary displacement of bears on 3,054 acres (4.7 square miles), and cumulatively, when all reasonable and foreseeable activities are considered (as described for Alternative 1 CUM1), temporary displacement increases on 7,285 acres (11.3 square miles). Alternative 7, which uses Alternative 4 as a base but instead requires winter logging on units located on roads 4782, 4782A, and 5326 directly results in an increase of temporary displacement of bears on 1,729 acres (2.7 square miles), and cumulatively, when all reasonable and foreseeable activities are considered, results in a temporary displacement increase on 5,524 acres (8.6 square miles). Post project, due to project activities that restricts motorized public access, Alternative 4 and Alternative 7 directly increases effective habitat by 384 acres, and cumulatively with Alternative 1 CUM1 considered, increases effective habitat by 1,729 acres.

During activity, **Alternative 6** *directly* results in an increase of temporary displacement on 3,772 acres (5.9 square miles), and *cumulatively*, when all reasonable and foreseeable activities are considered (as described for Alternative 1 CUM2), temporary displacement

of bears is increased on by 7,137 acres (11.1 square miles). During activity, **Alternative 6, subdivision A**, *directly* increases temporary displacement of bears on 1,323 acres (2.1 square miles), and cumulatively, when all reasonable and foreseeable activities as described for Alternative 1 CUM2 are considered, temporary displacement for bears increases on 7,791 acres (12.2 square miles). Post project, due to project design features that restrict motorized public access, Alternative 6 *directly* increases effective habitat by 141 acres, and *cumulatively* when all reasonable and foreseeable activities as described for Alternative 1 CUM2 are considered effective habitat increases by 1,731 acres.

Mitigation for the proposed action **Alternatives 2 and 6** would *directly* create displacement or core areas. Project mitigation for **Alternative 2** includes direct creation of about 1,175 acres (1.8 square miles) of displacement habitat and **Alternative 6** results in the creation of 1,314 acres (2 square miles) of displacement habitat, both as a result of road decommissioning (please see Chapter 2 for a list of roads for each alternative).

Prescribed burning without associated timber harvest is proposed under each alternative and may occur after the timber sales are completed, depending upon funding. For this analysis the burn units were grouped by elevation and aspect to assess a worse case scenario effect on displacement. **Alternative 2** burn units spread over a 4 year burn period and grouped by elevation and aspect would increase temporary displacement between 2,381 acres and 5,105 acres. **Alternative 4 and 7** burn units spread over a 4 year burn period and grouped by elevation and aspect would increase temporary displacement between 2,595 acres and 5,177 acres. **Alternative 6** burn units spread over a 4 year burn period and grouped by elevation and aspect would increase temporary displacement between 2,839 acres and 5,421 acres.

Cumulatively, mitigation for other projects would also create displacement or core areas. Please see Chapter 2 for a list of these activities for Alternative 1 (with either the CUM1 or CUM2 cumulative effect scenario). These include the following: creation of core habitat on Great Northern Mountain as a result of earthen barrier placement on the Standard Creek Road # 6745. This action item occurs within BMU 6 and core habitat will be created. Road#4724 (South Fork Miller Creek) located in BMU 6 is also restricted to motor vehicles from April 1 to May 31st, including over the snow vehicles as mitigation for the Skranak-Harpole Wayup-4th of July decision, and included in the USFWS Biological Opinion on the Rock Creek Mine ROD. **Alternative 2**, *cumulatively* when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, post project creates 392 acres (0.6 square miles) of displacement areas, while **Alternative 6** *cumulatively* when all reasonable and foreseeable activities as described for Alternative 1 CUM2 are considered, post projects creates 1,880 acres (2.9 square miles) of displacement areas. This mitigation will help off-set the affects of the displacement acres occurring during the summer/fall period within core habitat located in BMU 6.

Cumulatively, when all reasonable and foreseeable actions are considered, the prescribed burning not associated with timber harvest may increase temporary displacement acres as follows: by 1,065 acres to 3,790 acres for Alternative 2; by 371 to 3,447 acres for Alternative 4 and 7; and by 1,250 acres to 4,498 acres for Alternative 6.

For both direct and cumulative effects, temporary displacement acres for the prescribed burning not associated with timber harvest would be substantially less than discussed for Alternatives 4, 7 and 6 because, in response to public comment, many of the burn units

were broken into smaller blocks to temporally spread any impact on forage production. In addition, these smaller units would likely be hand-ignited, with only people and fuel being flown in. The procedure is expected to involve a day or two of ignition by helicopter or a few hours of helicopter use if people and fuel are flown in, per year.

BMU 7

During activity, **Alternative 2** *directly* results in the increase of temporary displacement of bears on 1,603 acres (2.5 square miles), and *cumulatively* when all reasonable and foreseeable activities as described for alternative 1 CUM1 are considered, results in the increase of temporary displacement of bears on 4,109 acres (6.4 square miles). Post project, due to project mitigation that restricts motorized public access, Alternative 2 *directly* increases effective habitat by 130 acres, and *cumulatively* when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, increases effective habitat by 270 acres.

During activity, **Alternative 4 and 7** *directly* result in an increase of temporary displacement of bears on 208 acres (0.3 square miles), and *cumulatively* when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, results in an increase of temporary displacement of bears on 3,345 acres (5.2 square miles). Post project, due to project mitigation that restricts motorized public access, Alternative 4 and 7 *directly* increase effective habitat by 291 acres (0.4 square miles), and *cumulatively* when all reasonable and foreseeable activities as described for Alternative 1 CUM1 are considered, increase effective habitat by 114 acres (0.2 square miles).

During activity, **Alternative 6** *directly* results in an increase in temporary displacement of bears on 208 acres (0.3 square miles), and *cumulatively* when all reasonable and foreseeable activities as described for alternative 1 CUM1 are considered, effective habitat is temporarily decreased by 3,508 acres (5.5 square miles). During activity, **Alternative 6, subdivision A**, does not directly effect effective habitat in BMU 7, and cumulative effects are as described for Alternative 1 CUM2. Post project, **Alternative 6** has no direct effects to effective habitat. Post project cumulative effects are as described for Alternative 1 CUM2.

Mitigation for the proposed action **Alternative 2** would *directly* create displacement or core areas. Project mitigation for Alternative 2 includes creation of about 419 acres(0.6 square miles) of displacement as a result of road decommissioning (please see Chapter 2 for a list of roads). Post project, **Alternative 6** *directly* results in a 275 acre (0.23 square miles) increase in displacement habitat.

Cumulatively, no mitigation occurs in BMU 7 that would increase core habitat

Prescribed burning without associated timber harvest is proposed under each alternative and may occur after the timber sales are completed, depending upon funding. For this analysis the burn units were grouped by elevation and aspect to assess a worse case scenario effect on displacement. **Alternative 2** burn units spread over a 4 year burn period and grouped by elevation and aspect would increase temporary displacement between 3,521 acres and 6,223 acres. **Alternative 4 and 7** burn units spread over a 4 year burn period and grouped by elevation and aspect would increase temporary displacement between 4,071 acres and 12,018 acres. **Alternative 6** burn units spread over a 4 year

burn period and grouped by elevation and aspect would increase temporary displacement between 4,362 acres and 12,309 acres.

Cumulatively, when all reasonable and foreseeable actions are considered, the prescribed burning not associated with timber harvest may increase temporary displacement acres as follows: by 3,212 acres to 6,083 acres for **Alternative 2**; by 2,702 to 7,984 acres for **Alternative 4 and 7**; and by 4,079 acres to 12,194 acres for **Alternative 6**.

For both direct and cumulative effects, temporary displacement acres for the prescribed burning not associated with timber harvest would be **substantially less than** discussed for Alternatives 4, 7 and 6 because, in response to public comment, many of the burn units were broken into smaller blocks to temporally spread any impact on forage production. In addition, these smaller units would likely be hand-ignited, with only people and fuel being flown in. The procedure is expected to involve a day or two of ignition by helicopter or a few hours of helicopter use if people and fuel are flown in, per year.

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: Alternative 6 would not create any attractants such as garbage sources that increase the risk of conflict with humans. Logging operations are bound by contractual provisions to properly dispose of the waste products, including food attractants.

An integral part of the goal for grizzly bear management on the Kootenai National Forest is to implement measures within the authority of the Forest Service to minimize human-caused grizzly bear mortalities. Human-caused mortality has been identified as one of the main factors in the demise of the grizzly in the Cabinet-Yaak Ecosystem (Kasworm 1988, 1987, 1986). Two of the three grizzlies radio-collared along the east Cabinet front were shot illegally by hunters within five months of capture, illustrating the pressure of human-induced mortality on the population (Ibid).

The potential for a bear encounter would exist as a result of the proposed action alternatives. Thus, there is the possibility of increased mortality to bears as a result of the proposal. Firearms will not be permitted behind restricted roads opened for timber harvest. Thus, the potential for undesirable human/bear encounters should be minimized, reducing the potential for increased grizzly mortality.

Taking into consideration the status of the habitat components listed above, mortality risk to the bear is generally low throughout most of BMU 6 and 7. 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 in the project area is the responsibility of the State of Montana. Cumulatively, risk-of-mortality would not change appreciably due to implementing any of the proposed action alternatives.

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

All of the proposed action alternatives propose prescribed burning on Great Northern Mountain that were designed to improve huckleberry production.

Alternative 2 and Alternative 6 propose two timber harvest units, 129 and 130, with the intent to create openings and re-establish huckleberry for grizzly bear food. These timber harvest units were dropped in Alternatives 4 and 7 due to core habitat. In Alternative 6, these units would be winter logged. Snow plowing along the main access road may change the timing of snow melt at the road edge and thus change the availability of spring green-up food sources.

Riparian habitats are generally considered to be valuable feeding sites. The proposed activity does not include any riparian harvest and would follow other Kootenai Forest riparian management guidelines, Montana Streamside Management Act (HB 731), and INFS 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 would increase during project activity for Alternative 2, decrease during project activity for Alternative 4, and would be maintained during project activity for Alternative 6. Post project activity for all action alternatives habitat effectiveness would increase.

Objective 6: Meet the interim management direction specified in the July 27, 1995, Incidental Take Statement (McMaster 1995).

A. Open Road Density: Manage the density of open roads within the Forest Plan standard. See objective 1 for details.

B. Open Motorized Trail Density: Do not increase the existing density of open motorized trails in the affected BMU. The alternatives would have no effect on existing motorized trail density.

C. Total Motorized Access Route Density (TMARD): Manage all motorized access routes (open and restricted roads and motorized trails) in the affected BMU to avoid a net increase over the existing density. See objective 1 for details.

D. Existing Core Area Size: Manage the amount of Existing Core Area in the affected BMU to avoid a net decrease. See Objective 1.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to grizzly bear because they do not change any of the habitat parameters analyzed for habitat within or outside the recovery zone.

Cumulative Effects within the Recovery Zone

The Silverfish PSU, including BMU 6 and BMU 7, has had substantial 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. Past, existing, and future harvest, on both federal and private lands in the area is described in Chapter 3, cumulative effects.

Previous sales consisted of a variety of harvest types; sanitation salvage, clearcut with reserves, shelterwood, and seed tree. The harvest of these projects is now complete on federal land; however, timber harvest on private land continues. Mining projects also continue to occur on both federal and private land. Cumulatively, the potential exists to displace grizzly bears to core areas and other areas not affected by the activities.

Past harvest has provided 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 will decrease in the future due to planned mitigation from other cumulative, reasonable and foreseeable activities. Core habitat will also increase in the future due to mitigation from cumulative activities.

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.

For both BMU's considered, the effects of timber harvest activities, including felling through loading, are included in the above analysis of displacement acres. The effects of timber harvest may displace grizzly bears from the acres listed for each alternative during periods of activity.

During hauling on new or previously closed roads, the number of acres grizzly bears may be displaced from varies by alternative and is also considered in the acres displayed in the above displacement analysis. The effects of road use have been accounted for through the road density and core standards and any specific associated mitigation for this project.

Outside Recovery Zone

Table 3-119 summarizes effects to incidental take parameters applicable outside the recovery zone on NFS lands within the Cabinet Face BORZ.

Table 3-119: Changes to Incidental Take Parameters by Alternative for the Cabinet Face BORZ Polygon

INCIDENTAL TAKE PARAMETER	EXISTING CONDITION	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2	ALT. 4 AND ALT. 7	ALT. 6
Linear ORD	2.2 mi./sq. mi.	No change	No change	No change	No change	No change
Linear TMRD	3.9 mi./sq. mi.	No change	No change	No change	No change	No change
Livestock	No allotments	No change	No change	No change	No change	No change
Food Attractants	Bear resistant containers in place.	No chance	No change	No Change	No change	No change

Kasworm and Wakkinen (1997) and Mace and Manley (1993) reported that that the level of road densities that result in grizzly bears avoiding an area are approximately one mile per square mile of open road or two miles per square mile of total road. These same road densities also contribute to the other forms of impacts associated with roads (Johnson 2003:5).

Direct, Indirect, and Cumulative Effects Common to All Alternatives in the BORZ Polygon

No net changes to food storage or attractants would occur under implementation of any alternative. There are no livestock allotments within the Cabinet Face BORZ polygon. No net changes in grazing activity would occur with implementation of any alternative.

Direct and Indirect effects of Alternatives within the BORZ Polygon

Alternative 1 (with either CUM1 or CUM2)

No activities are proposed in Alternative 1. Alternative 1 would not **directly** or **indirectly** result in the opening of restricted roads and would have no effect on open or total road density. The baseline existing total and open road densities for the Cabinet Face BORZ would not directly or indirectly change as a result of the implementation of Alternative 1 (with either of the cumulative effect scenarios as described for CUM1 or CUM2).

Direct and Indirect Affect of the Action Alternatives in the BORZ Polygon

Alternatives 2, 4, 6, and 7 will not cause additional incidental take in the BORZ polygon because baseline linear open and total road densities are maintained in the Cabinet Face BORZ polygon. **Alternatives 2, 4, 6, and 7** would directly increase open road densities within a portion of the Silverfish PSU that overlaps with the Cabinet Face BORZ, however the change in mileage is not enough to increase the baseline existing ORD within the BORZ. During the bear year on NFS lands, approximately 1.13 miles of road currently restricted year-round to motorized traffic (over snow included) would be opened for access to harvest units (approximately 1.13 mile of road #4726, 0 located within the BORZ). Implementation of any action alternative would not increase the baseline existing ORD within the BORZ.

Effects of Timber Harvest Activities (includes felling through loading)

Alternative 2 has eight harvest units (Units #1, 2, 3, 4, 5, 201, 202, and 203, consisting of clearcut with reserves, seed tree, and clearcut with seed tree treatments), and two burn units (Units B6 and B11). Units 1, 2, and 203 would be harvested by helicopter**.** **Alternatives 4, 5, 6,** and **7** have five harvest units (Units 2, 3, 4, 201, and 202 consisting of seed tree/regeneration, clearcut/seed tree/regeneration, and clearcut/regeneration harvest treatments) and two burn units (B11 and B24). All units located within the Cabinet Face BORZ for **Alternatives 4, 5, 6**, and **7** are either tractor or skyline logging methods. The point source disturbances from timber harvest actions may displace grizzly bears from the area surrounding these units during the period of activity. For helicopter logging, displacement may be up to one mile.

Effects of Road Construction and Use (includes hauling and all other types of road use)

No hauling on new or previously closed roads will occur within the Cabinet Face BORZ. The effects of road use and displacement effects have been accounted for through the road density and any specific associated mitigation for this project.

Cumulative Effects for all Alternatives in the BORZ polygon

Cumulatively, on NFS lands, other reasonably foreseeable actions include weed spraying on several roads, as well as road access changes approved under the South McSwede EA. Implementation of the access changes approved under South McSwede EA are dependent upon the watershed/wildlife shop obtaining funding. Within the Cabinet Face, access changes could occur on portions of 13 roads. These changes total 3.81 miles of road currently open being gated during the bear year, 7.81 miles of road currently open being stored, and 1.83 miles of road currently open being decommissioned. Cumulatively, if these approved changes occur, Total Road Density would remain the same, but linear open road density would decrease to 2 miles/square mile within the Cabinet Face BORZ polygon on NFS lands.

Other reasonably foreseeable actions in the Cabinet Face BORZ include the Western Montana Gold Prospectors Association Cherry Creek Camping and Trenching, South Flower Snowmobile Trail Construction, and the Stiltner Hard Rock Mining Company Plan of Operation (Houghton Creek drainage). These proposed activities do not result in any new road construction on NFS lands within the Cabinet Face BORZ, and roads currently closed to the public will not be re-opened as a result of the management activities. No impact to linear open road density (ORD) or total road density (TRD) is expected occur.

Prescribed burning and slashing would continue under the FFRWHE program. Opening of restricted roads for spring or fall burning would only require 1 to 2 days of administrative use, with no public use. No increase in the baseline ORD for the Cabinet Face BORZ would occur. Management such as this program that considers historic fire frequencies and intensities should result in productive bunchgrass and shrub field habitat across the treated sites.

Cumulatively, Alternative 1, (with either the CUM1 or CUM1 cumulative activities as described in Chapter 2) could decrease linear open road density in the Cabinet Face BORZ polygon on NFS lands. During activity, cumulative activities could result in

increases in open road density on private lands. The action alternatives, in combination with the baseline conditions and reasonably foreseeable projects, do not change the baseline conditions within the Cabinet Face BORZ. Remaining cumulative effects are as described for Alternative 1 (CUM1 or CUM2). Currently, as analyzed, Alternative 1 (CUM1 or CUM2) does not change the baseline conditions in the BORZ polygon. This could potentially change with the number of access roads built for the power line.

Regulatory Consistency

The Miller West Fisher Project and its action Alternatives 2, 6 and 7 are in compliance with ESA standards for grizzly bear. This statement is based on:

1. Alternatives 2, 6 and 7 comply with the 1998 Selkirk/Cabinet-Yaak Grizzly Interim Access Management Rule Set;
2. Alternatives 2 and 6 comply with the USFWS 1995 Amended Biological Opinion and Incidental Take Statement on the 1987 Forest Plan;
3. Alternatives 2 and 6 comply with the 1987 Forest Plan Standards for grizzly bear; and
4. Consultation with USFWS will occur.

The Miller West Fisher Project and its action Alternative 4 is not in compliance with ESA standards for grizzly bear. This statement is based on

1. Alternative 4 drops HE 1 percent during activity periods, from 66 to 65 percent, and thus does not comply with the1998 Selkirk/Cabinet-Yaak Grizzly Interim Access Management Rule Set which states habitat security will be 'maintained';
2. Alternative 4 does however, increase HE from 66 percent to 71 percent post project;
3. Alternative 4 complies with all other aspects of the 1998 Selkirk/Cabinet-Yaak grizzly interim access management rule set;
4. Alternative 4 complies with the USFWS 1995 Amended Biological Opinion and Incidental Take Statement on the 1987 Forest Plan;
5. Alternative 4 complies with the 1987 Forest Plan Standards for grizzly bear; and
6. Consultation with USFWS will occur.

Cumulatively, when other reasonable and foreseeable activities are considered in Alternative 1 (Cum1 Miller or CUM2 West Fisher) the action alternatives 2, 4, 7, and 6:

- Do not comply with Forest Plan direction on T and E species that apply to grizzly bear;
- And are not consistent with the Endangered Species Act.

Statement of Findings

Alternative 1 would have **no direct effect** on grizzly bears or their habitat. This determination is based on: 1) no harvest or management activity would occur as a result of this alternative, and 2) no direct or indirect habitat changes or disturbances would occur.

Cumulatively, alternative one, the no action, and the action alternatives, when considered with other reasonably foreseeable or connected actions in BMU 6 or BMU 7, may result in adverse effects to the grizzly bear. Alternative one does not add to cumulative effects,

and although the action Alternatives 2, 4, 7 and 6 may result in additional impacts to displacement/disturbance of bears, overall there is an improved condition for most habitat parameters post project.

The action alternatives would result in timber sales that would be planned for bid in 2009. These activities would likely be completed by 2012, with slash disposal and reforestation activities completed by 2015. Temporal overlap of the reasonable and foreseeable activities, including the Montanore Mine power line construction (analyzed in Miller Creek under CUM1, and in West Fisher under CUM2) as analyzed for Alternative 1 could occur. The schedule for the Montanore project, without any appeals or litigation, would begin power line construction in the fall of 2009. As a result of reasonably and foreseeable activities being implemented, such as construction of the Montanore power line and access roads, in combination with all other activities described in Chapter 3, there would be a reduction in the current levels of habitat effectiveness and an increase in all road density levels (OMRD, TMRD, and linear ORD) in the BMU's during activity. Post project parameters for TMRD would not meet "Best Science" or baseline conditions, and/or made worse than present. Post project parameters for OMRD, core, HE, and linear ORD are improved.

Alternative 2, 6 and 7 may affect, but are not likely to adversely affect grizzly bears. This determination is based on the preceding analysis of grizzly bear habitat parameters in and outside of the recovery zone, accounting for mitigation measures such as bear attractant management, road storage, and timing conditions. Post project OMRD and TMRD decrease or remains the same. Road density values slightly increase (due to better mapping) and core habitat and habitat effectiveness increase or remain the same. No increase in incidental take within the recovery zone is expected. Linear open and total road densities in the BORZ polygon are maintained. Some displacement may occur due to localized project activities, but seasonal constraints and establishment of new core areas (in Alternative 6) should minimize impacts.

In BMU 6, for alternatives 2, 7 and 7 temporary displacement will increase during project activity periods, however post project core increases 2% for alternatives 2 and 6, from 53% to 55%, and HE increases 5% for alternatives 2 and 7 from 66% to 71%. For alternative 6, HE creases 4% from 66% to 70%. Long term reduced mortality risk due to increased security would directly occur post-project for Alternatives 2 and 6, and cumulatively for 2, 4, 7 and 6.

Alternative 4 may affect, is likely to adversely affect the grizzly bear. This determination is based on the fact that during activity, in BMU 6, HE would decrease to 65% and objective 1, provides adequate space to meet the spatial requirements of a recovered grizzly bear population, is not met due to a one percent reduction in HE during activity. However, post project no net increase in OMRD, TMRD occurs, core either increases or remains the same, and HE increases in both BMU 6 and 7.

Required mitigation for all action alternatives includes:

1. For Alternatives 2, 4, 7, and 6, firearms, archery equipment etc. will not be permitted behind any gated road accessed for the timber harvest. This mitigation measure will help reduce the potential increase in human-caused mortality risk associated with the proposed activity.

2. Timing activities for timber harvest include no activities during the spring period, April 1st to June 15th. Any prescribed burning that would take place would limit helicopter activity to 1 to 2 days, with no heavy ground equipment being used.
3. Mitigation for Alternative 6 includes the required timing that all activities in Subdivision A occur and the 4725 and 808E roads are stored before activity on the remaining units in Alternative 6 occurs.
4. The action alternatives should not cause additional grizzly bear mortality risk associated with attractants because all garbage at the logging sites will be removed in a timely manner to avoid potential wildlife conflicts.
5. Units analyzed as winter logging and not impacting grizzly bear, would remain as winter logging during implementation of the sale. If season of activity or method of harvest was changed to occur during the active bear year, additional analysis would be required.
6. Implementation of Alternative 2, 4, 7, and 6 would result in no net increase to the existing baseline Cabinet Face BORZ linear ORD or TRD. No change in food attractants or storage or grazing use is contributed by Alternative 2, 4, 7 or 6. **No increase in risk of incidental take of grizzly bears is expected under the implementation of any alternative.**

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. 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 Rockies Lynx Management Direction (NRLMD) (USFWS 2007c). Lynx occurrence data comes from Forest historical records, and other agencies (MNHP, MFWP, and 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 delineated 47 LAU's which approximate a lynx home range size. Forest-wide lynx habitat was mapped 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 LAU's, 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.

On February 28, 2008, the USDI Fish and Wildlife Service issued their proposed rule in the Federal Register (Vol. 73, No. 40; pp 10860-10896) to revise the critical habitat designation for the lynx in the United States. The proposal delineates lynx critical habitat units and subunits across the lower 48 states from Maine to Washington. Based on these maps, the Silverfish PSU is not located within proposed critical habitat. In addition to the proposed critical habitat delineation, the Fish and Wildlife Service also identified the primary constituent element for lynx, defined as: "boreal forest landscapes supporting a mosaic of differing successional forest stages", containing the following sub-elements: snowshoe hares and their preferred habitat, adequate winter snow conditions, denning habitat with abundant coarse woody debris, and matrix habitat which facilitates lynx movement and dispersal and connects areas of suitable habitat.

The scale for direct, indirect and cumulative effects analysis is the Silver Butte LAU 14502 and the West Fisher LAU 14503. Indirect effects will more specifically consider the impacted LAU's and adjacent LAU's for connectivity effects. The Silverfish PSU overlaps both these LAU's. The Silverfish PSU contains the entire Silver Butte LAU 14502, while just the northern most portion of the West Fisher LAU 14503 extends out of the PSU. Please see the LAU map in the map section of this document.

Affected Environment

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. No lynx have been documented within the Silver Butte LAU 14502, but historic records show 10 documented occurrences of lynx within the Silverfish PSU portion of the West Fisher LAU 14503 (see LAU map in map section of this document).

Lynx observation and monitoring data indicate that most sightings occur in the lower reaches of drainages and in low to moderately sloped areas. Nine casual observations of tracks and two captures have been documented in the Silverfish PSU, all occurring in the northern half of the unit.

Formal winter track surveys by the USFS in the proposed Montanore Mine area were completed during 1988, 1989, 1994 and 1995. Montana Fish, Wildlife and Parks also perform winter track surveys about three times per year, every year, in the same area. Total length of that survey covers about 16.8 miles. Data on FWP track sightings are not readily available. In the Silverfish PSU, the trail to Baree Lake, about 2.8 mi long, is surveyed every year. During 1994 and 1995, there were 19.6 and 28.6 additional miles of track surveys. No lynx tracks were documented by the USFS, though two track sightings by FWP are known, both in the West Fisher. There were no USFS surveys done in during 1988 and 1989 in the Silverfish PSU.

The KNF delineated 47 LAU's which approximate a lynx home range size. Currently, all LAU's meet the NRLMD standards (USDA Forest Service 2007).

Lynx habitat in the Silver Butte and West Fisher LAU's was modeled in terms consistent with the NRLMD. Table 3-120 displays the current lynx habitat conditions on NFS lands in the LAU's which include a portion of the Silverfish PSU. The Silver Butte and West Fisher LAU's meet the NRLMD standards (USDA Forest Service 2007). For LAU map please see map section of this document.

Table 3-120: Lynx Habitat on NFS Lands by LAU's that Overlap with the Silverfish PSU

LAU	TOTAL NFS LYNX HABITAT IN LAU ACRES (%)	UNSUITABLE HABITAT ACRES (%) \1	HABITAT CHANGED TO UNSUITABLE OVER PAST 10 YEARS BY TIMBER MANAGEMENT WITH REGENERATION HARVESTS ACRES (%) \2	NUMBER OF ADJACENT LAU'S THAT EXCEED 30% LYNX HABITAT IN AN UNSUITABLE CONDITION
14502	20,071 (76)	33 (<1)	33 (<1)	0
14503	13,729 (48)	77 (<1)	77 (<1)	0

\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.

There is one identified linkage corridor (USDA Forest Service 2004: Figure 1-1 ;) in the Silverfish PSU that connects adjacent LAU's. This corridor is delineated in a northwest-southeast direction and appears to overlap between the 14502 and 14503 LAU's.

Environmental Consequences

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

Objective ALL 01*: Maintain or restore lynx habitat connectivity in and between LAU's and in linkage areas.*

Direct and Indirect Effects

Lynx habitat would be maintained under all action alternatives within the Silverfish PSU, which has been identified to be within a linkage corridor. Some timber harvest units would re-initiate several areas of general lynx habitat no longer providing foraging opportunities (Alternatives 4 and 6); while Alternative 2 would remove several stands that currently provide foraging opportunities. Stand initiation, while impacting movement or travel in the short-term, would benefit snowshoe hares in the 15 to 40 years following management treatments. None of the alternatives would affect the ability of lynx to move in and between LAU's or established linkage areas.

Cumulative Effects

Cumulatively, the construction of a transmission line for the Montanore Mine either through the Miller Creek drainage (Alternative 1 CUM1) or West Fisher (Alternative 1 CUM2), may displace lynx by removing forest cover in potential movement areas, such as riparian corridors. Some shrub and tree cover would be maintained in the transmission line right of way. Displacement effects from human activity, including low traffic roads, do not appear to be a major concern for lynx (Ruediger et al 2000). Transmission line and access road construction may displace lynx movement within lynx LAU's; however areas of reduced cover for the power line are expected to be small relative to surrounding existing habitat.

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

Direct and Indirect Effects

This standard is met because no permanent development is proposed in Alternative 1 or the action alternatives, and the proposed harvest in Alternatives 2, 4, 6, and 7 maintains habitat connectivity in both LAU's and the linkage area. A large portion of the LAU's are located within the Cabinet Mountain Wilderness and connectivity is maintained in this area. Outside of the wilderness, habitat connectivity is also maintained. Lynx habitat maps with the proposed alternatives are available in the project file. Connectivity with other LAU's is good to the north, west and south. To the east, across US Highway 2, there are no adjacent LAU's.

Cumulative Effects

Cumulatively, permanent development consisting of power line construction is proposed in either Miller or West Fisher Creek as part of the Montanore Mine. Habitat connectivity is expected to still be maintained in the LAU's, both in and out of the wilderness area. Lynx may be displaced from the power line corridor.

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.*

Direct and Indirect Effects

No highway or Forest highway road construction or reconstruction activities are proposed in LAU 14502 and 14503 therefore this guideline does not apply.

Cumulative Effects

Cumulatively, planned re-construction of US Highway 2 may impact lynx movement.

Standard LAU S1: *Changes in LAU boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.*

Direct, Indirect, and Cumulative Effects

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

B: Objectives, Standards and Guidelines applicable to vegetation management projects in lynx habitat within LAU's

Standard VEG S1: If *more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.*

Standard VEG S1 applies to all vegetation management projects that regenerate forests, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitations:

> *Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each National Forest. In addition, fuel treatment projects may not result in*

more than three adjacent LAU's exceeding this standard. For fuel treatment projects in the WUI, see guideline VEG G10.

Table 3-121 displays the percent and acres of lynx habitat on NFS lands not providing winter snowshoe hare habitat, for existing condition, cumulative effects (Alt 1 CUM1 and CUM2), and direct effects for Alternatives 2, 4, 6, and 7.

Table 3-121: Percent habitat on NFS lands not providing winter snowshoe hare habitat within impacted LAU's (percent/acres)

LAU	EXISTING CONDITION	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2	ALT. 4 AND 7	ALT. 6
14502	<1% (33)	<3% (+599)	<3% (+599)	6% (+1,227)	5% (+1,003)	5% (+1,070)
14503	<1% (77)	<2% (+2)	<2% (+51)	+14% (+1,996)	+8% (+1,093)	+8% (+1,168)

Acres under Alternative 1 (either with the CUM1 or CUM2 scenario of cumulative effects) are a result of other reasonable or foreseeable activities. These acres may be added to the acres displayed under the action alternatives for cumulative acres.

Direct and Indirect Effects

No activities are proposed for Alternative 1 (either the CUM1 or CUM2 scenario), and no direct effects would occur. The proposed action **Alternatives 2, 4, 7, and 6** would directly increase the existing level of lynx habitat in the stand imitation structure stage in both LAU's.

In LAU 14502 and 14503 prescribed burning would have the potential to impact lynx habitat. The burns vary from south eastern aspect open park-like ridges to north easterly aspects with even-aged overstories of mostly lodgepole pine. The objective of these prescribed burn units is multiple, including big game wildlife habitat improvement, but also to reduce hazardous fuels and restore natural fire regimes (Chapter 1, Purpose and Need for Action). Prescribed burns which impact lynx habitat **not within** the WUI boundary are B1, B2, B3, B4, B5, B6, B7 (included just in Alternative 2), B20, and the southernmost portion of B19 for Alternative 2, and delineated out as B19A for Alternatives 4 and 6.

In LAU 14503, within lynx habitat, **Alternative 2** would propose 934 acres of timber harvest and 1,062 acres of prescribed burning, resulting in a potential increase of 14 percent of unsuitable habitat over the existing condition. **Alternatives 4 and 7** proposes 761 acres timber harvest and 332 acres of prescribed burning, resulting in a potential increase of 8 percent of unsuitable habitat over the existing condition. **Alternative 6** proposes 836 acres of timber harvest and 332 acres of prescribed burning only, resulting in a potential increase of 8 percent of unsuitable habitat over the existing condition.

In LAU 14502 proposed prescribed burning varies by alternative (Table 3-122), with Alternative 2 proposing 1,227 acres; Alternative 4 proposing 1,003; and Alternative 6 proposing 1,070 acres.

Activities could proceed in both LAU's as the level of lynx habitat in the stand initiation structure stage is well below 30%. As a direct result of implementation of each of the action alternatives, the percent of lynx habitat in the stand initiation structural stage varies from 5 to 14%. This meets, and is better than, the standard.

Cumulative Effects

Cumulatively, reasonable and foreseeable activities considered in **Alternative 1** ***are the same except*** for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 **CUM1** considers the MMI power line in Miller Creek while Alternative 1 **CUM2** considers the power line location in the West Fisher. Cumulatively, for LAU 14502 the Alternative 1 impact acres displayed in Table 3-121 are a result of planned prescribed burning, and in LAU 14503 the Alternative 1 (CUM1 or CUM2) impact acres are a result of timber removal for the proposed Montanore power line. The planned prescribed burning impacts modeled late successional lynx habitat.

Exception to **Standard VEG S1** *for fuel treatment unit's discussion:*

Prescribed burns **within the WUI** boundary and impacting lynx habitat are B16, B18 (just in Alternative 2), B9, B10, B11, B8 (divided into B8A, B8B for Alt. 4, 6, and 7), B12 (divided into B12A, B12B for Alt. 4, 6, and 7), B13, B14 (divided into B14A and B14B for Alt. 4, 6, and 7), B15, and B23 and B24 (included only in Alternatives 4, 6, and 7).

Timber harvest units that meet both a hazardous fuel reduction and vegetative health objective **within the WUI** boundary that impact lynx habitat include Unit # 7, 10, 12, 40, 38 (only in Alternative 2), 39, 111, 133, and 8A.

Table 3-122: Treatment in LAU 14502 Lynx Habitat – Compliance Summary

LAU # 14502	ACRES OF LYNX HABITAT		ACRES OF FUEL TREATMENT IN LYNX HABITAT (BY TYPE OF ACTIVITY) HARVEST/ RX BURN ONLY		ARE STANDARDS AND GUIDELINES BEING MET Y/N (LIST THOSE NOT BEING MET)	EXEMPTIONS BEING USED	ACRES (%) AFFECTED WITH EXEMPTIONS	RATIONALE FOR WHY STANDARDS CANNOT BE MET
Alternative	**Within the WUI**	**Outside the WUI**	**Within WUI**	**Outside WUI**				
1 CUM1	11,007	9,065	0/599	0/0	Y	none	0	**
1 CUM2	11,007	9,065	0/599	0/0	Y	none	0	**
2	11,007	9,065	0/1061	0/166	VEG S6	none	0	NA
4 and 7	11,007	9,065	0/837	0/166	VEG S6	none	0	NA
6	11,007	9,065	0/904	0/166	VEG S6	none	0	NA

**See objective and need for the Forestwide Fuel Reduction and Wildlife Habitat Enhancement EA, 2001; cumulatively, this project may not be meeting Standard VEG S6

Table 3-122A: Treatment in LAU 14503 Lynx Habitat – Compliance Summary

LAU # 14503	ACRES OF LYNX HABITAT		ACRES OF FUEL TREATMENT IN LYNX HABITAT (BY TYPE OF ACTIVITY) HARVEST/ RX BURN ONLY		ARE STANDARDS AND GUIDELINES BEING MET Y/N (LIST THOSE NOT BEING MET)	EXEMPTIONS BEING USED	ACRES (%) AFFECTED WITH EXEMPTIONS	RATIONALE FOR WHY STANDARDS CANNOT BE MET
Alternative	Within the WUI	Outside the WUI	Within WUI	Outside WUI				
1 CUM1	3,419	10,972	10/0	2/0	Y	none	0	NA**
1 CUM2	3,419	10,972	0/0	46/0	Y	none	0	NA**
2	3,419	10,972	175/ 228	729/ 834	VEG S6	none	0	***
4 and 7	3,419	10,972	121/ 282	640/ 50	VEG S6	none	0	NA
6	3,419	10,972	137/ 282	699/ 50	VEG S6	none	0	NA

**timber removal proposed for the Montanore Mine power line (CUM1 in Miller, and CUM2 in West Fisher,) and standards do not apply to removal of vegetation for permanent developments such as mineral operations.
***See objective and need for the Miller West Fisher Project, Chapter 1.

There are no adjacent LAU's that do not meet the 30% standard. The action alternatives do not cause an LAU to not meet VEG S1 or result in three adjacent LAU's to not meet the VEG S1 standards. This meets the adjacency standard.

Forest-wide, all lynx LAU's currently meet standards VEG S1, S2, S5 and S6. Treatment acres in lynx habitat, when considered forest-wide are 0%. No decisions have been signed authorizing treatment within lynx habitat in the WUI that do not meet NRLMD since the NRLMD ROD was signed in March 2007. This meets the ≤6% standard.

Standard VEG S2: *Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU within a 10-year period. The same exception described in standard VEG S1 for fuels projects in the WUI applies to this standard.*

Table 3-123 provides a comparison, by Alternative, of how the impacted LAU(s) comply with this standard.

Table 3-123: Regeneration Harvest in Lynx Habitat on NFS lands in the last 10 years in Impacted LAU's, Existing Condition and Acres of Regeneration Harvest by Alternative

LAU	EXISTING CONDITION ACRES (%)	ALT. 1 CUM1	ALT. 1 CUM2	ALT. 2	ALT. 4 AND 7	ALT. 6
14502	33 (<1%)	0	0	0	0	0
14503	77 (<1%)	+7 (<1%)	+46 (1%)	+934 (+7%)	+760 (+5%)	+836 (+6%)

Acres under Alternative 1 (either with the CUM1 or CUM2 scenario of cumulative effects) are a result of other reasonable or foreseeable activities. These acres may be added to the acres displayed under the action alternatives for cumulative acres.

Direct and Indirect Effects

No activities are proposed under **Alternative 1**. No direct effects would occur. The action alternatives propose both intermediate and regeneration harvest within lynx habitat. **Alternative 2** proposes 934 acres; **Alternatives 4 and 7** propose 760 acres; and **Alternative 6** proposes 836 acres. For all of the action alternatives, the remaining acres of timber harvest proposed within the LAU occur in either low elevation (<4,000 feet) or non habitat.

Cumulative Effects

Cumulatively, planned prescribed burning on federal lands could occur within LAU 14502, and in LAU 14503. Proposed power line construction for the Montanore Mine could range from 7 (CUM1 scenario) to 46 acres (CUM2 scenario) on NFS lynx habitat.

Standard VEG S2 is met in all affected LAU's.

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 white bark pine.*

The same exception described in standard VEG S1 for fuels projects in the WUI applies to this standard.

Exceptions 2 through 6 shall only be utilized in LAU's where standard VEG S1 is met.

Pre-commercial thinning is proposed within the LAU, but the stands are located below 4,000 feet which is not considered to be lynx habitat. Standard VEG S5 is met in both affected LAU's.

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 LAU's where standard VEG S1 is met. The same exception described in standard VEG S1 for fuels projects in the WUI applies to this standard.

Standard VEG S1 is met in both LAU's. No exceptions will be utilized in the LAU's.

The proposed treatment units in each alternative were reviewed with respect to VEG S6, which prohibits reduction of snowshoe hare habitat within multi-story mature and late-successional forest. The purpose of this standard is to assist in maintaining lynx winter foraging habitat considered by lynx biologists to be critical in perpetuating viable lynx populations.

All action alternatives would directly impact modeled multi-story or late successional forest snowshoe hare habitat. Please see Table 3-124 for the acres impacted by alternative.

Table 3-124: Multi-story Mature or Late Succession Forest Snowshoe Hare Habitat Impacted

ALT #	LAU #*	ACRES OF MULTI-STORY MATURE OR LATE SUCCESSIONAL FORESTS	ACRES OF VEGETATION MANAGEMENT IN LATE SUCCESSIONAL FORESTS HARVEST/ RX FIRE ONLY	EXCEPTION(S) APPLIED	ARE STANDARDS S1, S2, S5, S6 BEING MET (Y/N)
1 CUM1	14502	6,304	0 / 164	None	N*
1 CUM2	14502	6,304	0 / 164	None	N*
2	14502	6,304	0 / 122	None	N*
4 and 7	14502	6,304	0 / 84	None	N*
6	14502	6,304	0 / 84	None	N*
1 CUM1	14503	5,395	5 / 0	None	N*
1 CUM2	14503	5,395	14 / 0	None	N*
2	14503	5,395	49 / 174	None	N*
4 and 7	14503	5,395	0 / 161	None	N*
6	14503	5,395	0 / 161	None	N*

***Standard VEG S6 NOT met, Standards VEG S1, VEG S2, and VEG S5 ARE MET**

Direct and Indirect Effects

No activities are proposed under Alternative 1, and no direct effects would occur. The action alternatives include both timber harvest and prescribed burning units located within late successional forest. These are discussed below by LAU:

LAU 14502

In LAU 14502 **Alternative 2** proposes 122 acres of prescribed burning in late successional forest (portions of Units B12, B19, and B20). **Alternatives 4, 7 and 6** propose 84 acres (portions of Units B19A, B, C, D, and B20). Units B12 and most of B19 (Alternative 2), or B19B, B19C, and B19D (Alternatives 4, 6, and 7) are located within the WUI. .

Burns B12 (total 351 acres) B19 (total 441 acres) and B20 (total 173 acres), are fall underburns located along ridge systems. Only very small portions of these units are modeled as late successional forest for lynx, with burn B12 impacting 38 acres, Burn B19 (B19A) impacting 43 acres, and B20 impacting 39 acres.

These burns are largely comprised of natural openings and short bunchgrasses, but Douglas-fir, lodgepole pine and alpine fir timber inclusions occur or are scattered

throughout the unit. These timber inclusions may provide limited suitable winter snowshoe hare habitat. There is potential the prescribed burning within the acres of late successional forest could remove horizontal cover and remove *winter snowshoe hare* habitat. Standard VEG S6 will not be met in LAU 14502.

LAU 14503

In LAU 14503 **Alternative 2** proposes 174 acres (portions of Units B1, B2, B6, B8, B11) and **Alternatives 4, 7 and 6** propose 161 acres (portions of Units B6, B8A, B8B, and B11) of prescribed burning in late successional forest. Burn units B8 and B11 are within the WUI.

Burns B1 (total 130 acres), B2 (total 114 acres), and B6 (total 89 acres) are fall stand replacing prescriptions. These stands are a north easterly aspect with even aged overstories and an unproductive understory. The objective of these burns is to improve huckleberry production for grizzly bears. Only small portions of these units are modeled as late successional forest for lynx, with B1 impacting 27 acres, B2 impacting 21 acres, and B6 impacting 50 acres.

Burns B8A and B8A (total 214 acres) are spring or fall underburns, and B11 (total 146 acres) is a fall mixed severity burn prescription. B8 was divided into two separate units for Alternatives 4, 6, and 7 to temporally space impact to forage and cover. Unit B8 is located along a ridge while B11 has a north westerly aspect. Only small portions of these units are modeled as late successional forest for lynx, with B8A impacting 70 acres; B8B impacting 15 acres, and B11 impacting 26 acres.

There is potential the prescribed burning within the acres of late successional forest could remove horizontal cover and remove *winter snowshoe hare* habitat and thus Standard VEG S6 will not be met for the burns discussed.

The following harvest units by alternative impact modeled late successional forests or multi-storied mature forest habitat:

1) Alternative 2 units: 38, 39, 116, 117, 132, 133, 118A and 118B
2) Alternative 4 units: 119, 39, 117, 118A and 118B
3) Alternative 6 units: 119, 39, 117, 118A, 118B

Units 38, 39, 116, 117 are seed tree/underburn/plant harvest treatments, and units 132, 133, 118A, and 118B are seed tree/grapple pine/plant harvest treatments.

Only three of the proposed timber harvest units located in mapped late succession forest habitat have existing conditions suitable for winter snowshoe hare habitat (Units 38, 132, and 133) based on field reconnaissance. Approximately 49 acres of the existing 6,304 acres of mapped multi-story mature and late succession forests located in the LAU would be impacted by timber harvest (<1%). These units are included in **Alternative 2.** These are the acres displayed in Table 3-124.

- **Unit 38** – (11 acres impacted) harvest would open the unit up and *may remove winter snowshoe* hare habitat;
- **Unit 132** (15 acres impacted) **and 133** (23 acres impacted) - These units were burned in 1910, no old overstory remains. Portions of the stand have overstory down, and young lodgepole is coming up. *Harvest may remove winter snowshoe hare habitat.*

The remaining acres of timber harvest located in mapped lynx late succession forest for **Alternatives 2, 4, 6, and 7** have the potential to improve winter snowshoe hare habitat in the future (in about 15 years) based on field review. These units, and the acres of late successional forest impacted, are listed below. Timber harvest is allowed in areas like these that have potential to improve winter snowshoe hare habitat but presently have poorly developed under stories that lack dense horizontal cover (e.g. uneven aged management systems could be used to create openings where there is little under story so that new forage can grow).

Unit 39 – (39 acres impacted) harvest is expected to enhance winter snowshoe hare habitat in the long term due to current depauperate (lack of vegetation) understory, duff is currently too deep and unit too shaded.
Unit 116 – (15 acres impacted) stand is considered silviculturally stagnant, with a depauperate understory and no tree limbs to the ground. Stand was subjected previously to a liberation harvest and overstory was thinned. Harvest is expected to enhance winter snowshoe hare habitat in the long term, about 30 years, by allowing regeneration of the stand and understory.
Unit 117 – (26 to 39 acres impacted) understory vegetation is lacking, a handful of old trees remain in the unit as stand was previously treated with a liberation harvest and overstory was thinned. Harvest is expected to enhance winter snowshoe hare habitat in the long term, in about 30 years, by allowing regeneration of the stand and understory.
Unit 118A (6 acres impacted) – depauperate understory, no old trees or old growth relics, not much in downed wood or forage. Harvest is expected to enhance winter snowshoe hare habitat in long term, in about 30 years, by allowing regeneration of the understory.
Unit 118B (12 to 13 acres impacted) - depauperate understory, not very many old trees, some old growth relics. Not much downed woody material or forage. Harvest is expected to enhance winter snowshoe hare habitat in long term, in about 30 years, by regeneration of the stand.

Cumulative Effects

Cumulatively, the reasonable and foreseeable activities considered in **Alternative 1** ***are the same except*** for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 **CUM1** considers the MMI power line in Miller Creek while Alternative 1 **CUM2** considers the power line location in the West Fisher. Cumulatively, the acres displayed for Alternative 1 (CUM1 or CUM2) in LAU 14502 in Table 3-123 are a result of planned burning (Forestwide Fuels EA 2001). In LAU 14503, cumulative acres displayed for Alternative 1 (CUM1 or CUM2) are the result of proposed harvest for power line construction.

Objectives VEG 01, 02, 03, 04:

Veg 01 - *Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.*

VEG 02 – *Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.*

VEG 03 – *Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat.*

VEG 04 – *Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat, but presently have poorly developed understories that lack dense horizontal cover.*

Those vegetation management activities that occur in lynx habitat that are providing snowshoe hare foraging habitat move lynx habitat toward the desired conditions that are described in **VEG 01, 02, 03, and 04.** The proposed timber harvest and prescribed burn units are designed to approximate natural succession and disturbance processes. Although three of the proposed harvest units and some of the prescribed burn units are expected to remove existing winter snowshoe hare habitat, habitat components necessary for the conservation of lynx are maintained within both LAU 14502 and 14503.

Guidelines VEG G1, G4, G5, G10 and G11

VEG G1 – *vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce. Priority for treatment should be given to stem-exclusion, closed canopy structural stage stands to enhance habitat conditions for lynx or their prey.*

VEG G4 – *Prescribed fire activities should not create permanent travel routes that facilitate snow compaction and construction of permanent fire breaks on ridgelines or saddles should be avoided.*

VEG G5 – *Habitat for alternate prey species, primarily red squirrels should be provided in each LAU.*

VEG G10 – *Fuel treatment projects within the WUI, as defined by HFRA, should be designed considering standards VEG S1, S2, S5, and S6 to promote lynx conservation.*

VEG G11 – *Denning habitat should be distributed in each LAU in the form of pockets of large woody debris, either down logs or root wads or large piles of small wind throw trees. If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris piles to promote denning in the future.*

The last year large fires moved through both LAU's occurred in 1910. The proposed timber harvest units and prescribed underburns are designed to restore natural ecological processes. Most of the proposed harvest units within the LAU that actually impact multi-story or late succession forest snowshoe hare habitat do treat stands with little timber regeneration and forage and are expected to enhance habitat conditions for lynx or their prey.

Prescribed fire activities do not create permanent travel routes facilitating snow compaction and do not construct permanent fire breaks on ridgelines and saddles. Several proposed mixed severity fall burns are designed to reduce the existing fuel load on ridges and encourage forage production of huckleberries for grizzly bears.

Vegetation management objectives and natural fuel reduction objectives within the WUI comply with **VEG S1, S2, S5 and S6**, except for the three harvest units totaling 66 acres, and several of the prescribed burns, included B6.

The action alternatives would maintain the designated acres of old growth. Old growth habitat would provide for red squirrel habitat in both LAU's. Snags and coarse woody debris associated with lynx denning habitat would remain throughout both LAU's.

Cumulatively, the Montanore Mine proposed actions are expected to maintain some shrub and tree cover in the transmission line right-of-ways, and some coarse woody debris would be maintained. Slash would also be left in the right-of-way, providing coarse woody debris, a component of denning habitat (DRAFT EIS).

Objectives and Guidelines applicable to livestock management projects in lynx habitat within LAU's

Objective GRAZ 01: (please see NRLMD ROD for list)

The project does not include livestock management activities. This objective does not apply.

Guidelines GRAZ G1, G4, G5, G10 and G11 (please see NRLMD ROD for list)

The project does not include livestock management activities. The grazing guidelines do not apply.

Objectives and Guidelines applicable to human use projects in lynx habitat within LAU's

Objectives HU 01, 02, 03, 04, 05, and 06: (please see NRLMD ROD for list)

The proposed action alternatives for the Miller West Fisher project do not include expansion of snow compacting activities in lynx habitat, therefore objective HU 01 and guideline HU G11 do not apply.HU 02, 03, 04, 05, and 06 also do not apply.

Cumulatively, the Montanore Mine is expected to have minimal winter road use in the project area for all proposed alternatives. Traffic volume could increase under the Montanore Mine.

Guidelines HU G1 through G12: (please see NRLMD ROD for list)

The proposed project is not expanding ski areas (HU G1, G2, G10), increasing recreation development (HU G3), developing minerals or energy sites, (HU G4, G5), upgrading roads or building permanent roads (HU G6, G7), not designating over snow routes or play areas (HU G11), or providing winter access to non-recreation special uses, minerals or energy development (HU G12) and these guidelines do not apply.

Cutting brush along low speed, low traffic volume roads within the timber sale area will be done to the minimum level necessary to provide for public safety, and the action alternatives would be in compliance with HU G8. On the temporary roads built for accessing a unit, the roads will be decommissioned, so the action alternatives would be in compliance with HU G9.

Objectives, standard, and guidelines applicable to ALL projects in linkage areas, subject to existing rights

Objective LINK 01: In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat**.**

The Kootenai National Forest has worked in the past with private timber companies to consolidate land ownership in the Silverfish PSU (Checkerboard Land Exchange). Currently there are corporate timber lands within the Silverfish PSU that are for sale. At this time, the Kootenai National Forest is not pursuing conservation easements or land exchanges. Conservation easements and land exchanges are beyond the scope of this project.

However, the proposed action alternatives consider cumulative activities on both private and federal land when looking at lynx habitat. Lynx habitat would be maintained on NFS lands. The proposed management activities do not move lynx habitat on private lands toward the desired conditions that are described in LINK 01.

Standard LINK S1: When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings.

The project does not involve construction or reconstruction of a highway or forest road, in an identified linkage area; therefore this standard does not apply.

Guidelines LINK G1 and G2: (G1: NFS lands should be retained in public ownership, G2, livestock grazing in shrub-steppe habitats etc…. (please see NRLMD ROD for list)

The project does not involve the sale or exchange of NFS lands, therefore guideline LINK G1 does not apply. Neither does it involve livestock grazing in shrub-steppe habitats, so guideline LINK G2 does not apply.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, road storage and decommissioning, access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to lynx because they do not change any of the habitat components analyzed for lynx.

Summary of Cumulative Effects

Alternative 1 does not directly contribute to any cumulative effects. Other actions on federal lands, each with their own federal nexus, and identified in Chapter 3 of the EA and considered in the cumulative effects analysis for lynx, would still take place and add to the cumulative effects. Cumulative effects to lynx habitat on federal lands are displayed in Tables 3-120 through 3-124 and discussed under each guideline, standard, and objective.

Lynx habitat on non-federal lands would continue to decrease due to on-going private timber harvest and subdivision. Within LAU 14502 approximately 233 acres of private timber harvest would re-initiate multi-story mature and late successional forage stands. Within LAU 14503 private timber harvest would occur on about 80 acres of lynx habitat.

The action alternatives, in combination with the existing condition and reasonably foreseeable actions (see list provided in Chapter 3) would result in potential cumulative changes in or loss of lynx habitat on NFS lands due to the prescribed burning. The NRLMD standards and guidelines only apply to NFS lands.

Regulatory Consistency

- The project complies with Forest Plan direction on TE species that applies to the Lynx (FP II-1 #7, II-22) and the NRLMD.
- The project is consistent with the Endangered Species Act.

Statement of Findings

Alternative 2, 4, 7, and 6 **may affect, are likely to adversely affect** the lynx based on not meeting Standard VEG 6. **Alternative 2, 4, 7, and 6,** will have no affect to designation of critical habitat as proposed and delineated by the USDI FWS (2/28/08). These determinations are based on:

1. **Standards VEG S1, S2, S5** are met. **Objectives 01, 02, 03 04 are met** for all action alternatives. All remaining standards, Guidelines, and Objectives are met except for Standard Veg S6.
2. A**lternative 2** includes three proposed harvest units (#36, 132, and 133) which reduce snowshoe hare habitat within multi-story mature and late successional forest on approximately 49 acres, or less than 1% of the 6,304 acres within LAU 14502.
3. **Alternatives 2, 4, 7, and 6** prescribe burn in modeled multi-story mature and late successional habitat that may remove characteristics of the stands that provide habitat for winter snowshoe hare habitat. However **Objectives 01, 02, 03 04 are met** for all action alternatives.
4. **Standards Veg S1, S2, are met** for all action alternatives. The Silverfish PSU is not located within proposed critical habitat based on USDI maps (USDI, USFWS 2008). The proposed alternatives still maintain the option for the USFWS to revise the proposed critical habitat designation for the Canada lynx.
5. The risk of mortality from trapping would not measurably increase as a result of the alternatives.
6. Adequate suitable habitat would be maintained to facilitate movement between and within LAU's.
7. During logging operations, there may be short-term disturbance to lynx within the analysis area.

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 Montana Gray Wolf Conservation and Management Plan FEIS (MFWP 2003). 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). On July 18th, 2008 Judge Molloy of the District Court of Montana ordered reinstatement of the Endangered Species Act protection for the northern Rocky Mountains gray wolf. The Kootenai National Forest is within the NWMT Recovery Area. Information for this population segment is provided by the Rocky Mountain Wolf Recovery 2006 Annual Report (USFWS et al. 2007b) and is incorporated here by reference. Wolf occurrence data comes from recent District wildlife observation records, and other agencies (USFWS, MFWP). The analysis boundary for project impacts to individuals and their habitat is the Silverfish PSU.

Measurement indicators used for this wolf analysis include the following key habitat components found in the Wolf Recovery Plan (USFWS 1987).

1) **Sufficient, year-round prey base for big game or alternative prey**; this component can be measured by adhering to Forest Plan big game management standards and recommendations. Please refer to the MIS ungulate section for a description of the deer/elk habitat requirements that were used for the Silverfish PSU.
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 mile 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 1991). 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 northwest 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 1978 and 1987 all in Frederick 1991, 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 effects to transient wolves and their habitats is the Silverfish PSU. Cumulative effects will be assessed on this PSU.

Affected Environment/Existing Condition

At the end of 2007, there were 73 wolf packs in Montana, with 39 meeting breeding pair criteria. These packs contained a minimum estimate of 422 wolves (USFWS, Sime et al 2008). The Montana portion of the Northwest recovery area supported 19 of those packs (10 were breeding packs). This area includes the Kootenai National Forest. There are currently 10 packs (4 breeding packs) using the KNF for all or part of their territories. These packs had a total 44 wolves at the end of 2007 (ibid). There was one known mortality in the KNF packs this past year.

Currently, the FWS recognizes the existence of at least two wolf packs in the northwest Montana recovery area in relative proximity to the Silverfish PSU. The Fishtrap Pack occupies an area just east of the PSU. This pack is known for its long and unpredictable movements, although the pack spends considerable time in the Fishtrap drainage on the Lolo National Forest. The Murphy Lake Pack is located about 50 miles northeast of the Silverfish PSU, and has a long established territory. Their home range encompasses most of the Fortine Ranger District and extends south into the Pleasant Valley area of the Fisher River Ranger District.

Transient use of the Silverfish PSU likely occurs by the Fishtrap Pack. During 2004, on the Kootenai NF, a new pack of wolves, the Wolf Prairie Pack was radio-collared and reproduction confirmed in the Wolf Creek drainage. The Fishtrap Pack also had documented reproduction. Two cattle were confirmed killed and four classified as probable wolf kills in Wolf Prairie Pack territory in July and August 2004. No further losses were reported. The Wolf Prairie Pack territory is to the north of the Silverfish PSU.

Grey wolf observation and monitoring data indicate that sightings in the Southwest region of Libby District have been sparse. There have been seven known casual wolf observations in the Silverfish PSU: two sets of tracks, one in West Fisher Creek drainage

in 2005, the other in North Fork Silver Butte Creek in 2000, and five visual sightings throughout the unit since 1990.

Formal winter track surveys by the USFS in the proposed Montanore Mine area were documented during 1988, 1989, 1994 and 1995. Many of the survey routes were repeated in full or in part for those periods. Montana Fish, Wildlife and Parks also perform winter track surveys about three times per year, every year, in the same area. Data on FWP track sightings are not readily available. In the Silverfish PSU, the trail to Baree Lake, about 2.8 mi long, is surveyed every year. During 1994 and 1995, there were 19.6 and 28.6 additional miles of track surveys. No wolf tracks were documented. There were no USFS surveys done in during 1988 and 1989 in the Silverfish PSU.

Potential denning and rendezvous sites are available within the Silverfish PSU. However no known sites are documented and no special restrictions will be necessary to avoid disturbance of denning or rendezvous sites. Human-caused mortalities have occurred in adjacent planning units (Cripple and Wolf), but no human-caused mortalities have been documented within the Silverfish PSU. The following describes habitat conditions as related to measurement criteria:

Prey Base: The Silverfish PSU supports summer, fall, and winter habitat for ungulate species. White-tailed deer, elk, mule deer and moose are found in the Silverfish PSU. Together, this mix of species provides a good year-round prey base for wolves. Please refer to the MIS ungulate section for a description of the deer/elk habitat requirements and how these criteria are being met in the Silverfish PSU. Sufficient habitat exists to maintain prey species for wolves.

Sufficient space with minimal exposure to humans: Open road densities by Management Area (MA) currently do not meet the Forest Plan standards for MA 12, big game summer range. Other MA ORD standards are being met. Please refer to Table 3-85 in the big game section for a summary of existing ORD within the Silverfish PSU. Security habitat recommendations for elk are within the recommended levels within the Silverfish PSU.

Portions of the winter range within the Silverfish PSU are located on Plum Creek Timber Company lands. The mortality risk for wolves probably increases during the general rifle season on these lands. Many roads are open year round. Those roads closed year-round or seasonally provide an increased measure of habitat security during the general rifle season.

Environmental Consequences

Direct and Indirect effects to Alternatives

Alternative 1 (CUM1 or CUM2)

Under Alternative 1, no activities are proposed. No **direct** effects to wolves would be expected due to implementation of the no action alternatives. **Indirectly**, as a result of plant succession, the level of habitat fragmentation would decrease, and the level of forage available for wolf prey species would also be expected to gradually decrease due to conifer encroachment. Until a fire event naturally treated the area, the level of forage available to ungulate prey species would progressively diminish. In addition, fuel

accumulations would continue to build in areas, and potentially allow for a high intensity wildland fire to occur. Although both of these factors could, in the long term, indirectly affect the gray wolf by a potential decrease in the amount of prey available, any effect is expected to be minor due to the high deer population. Therefore, there would be no expected short-term change in the existing condition for the gray wolf due to implementation of the no action alternative.

Direct and Indirect Affects of the Action Alternatives

All action alternatives will restrict newly constructed temporary roads after post harvest activities are completed. Action alternatives will not disturb known rendezvous sites. All action alternatives will maintain existing riparian vegetation and riparian travel corridors by following INFS direction. All action alternatives will create new forage/forage openings and decrease the amount of cover. The amounts by alternative are displayed in the MIS section of this document. Impacts by measurement criteria are as follows:

Prey base: As discussed in the effects analysis for elk and deer, the action alternatives will decrease habitat conditions for the wolves prey base in the short-term. The quality of prey habitat is evaluated by cover/forage ratios, amount, location and distribution of cover, opening sizes and movement corridors, roads and habitat effectiveness, and security areas. Cover/forage ratios will decrease, and large openings greater than 40 acres in size will be created due to combination of proposed units and existing regeneration units by all of the action alternatives.

Alternative 2 proposes regeneration units greater than 40 acres in size, and improvement harvest units range up to 113 acres in size. Localized movement patterns may be disrupted under all action alternatives through the removal of cover on a ridgeline. However, large scale winter/spring migration patterns are expected to remain. Post implementation, **Alternative 2** would provide 60 percent security habitat, while **Alternatives 4, 7, and 6** would provide 59%. This is due to a slight difference in open roads being restricted in the Silverfish PSU between alternatives. Cumulatively, security habitat within the Silverfish PSU post-activity would increase over existing conditions. Cumulatively, the proposed federal action **Alternatives 2, 4, 7, and 6** may benefit big game by creating foraging areas, which are limited in the project area.

The current trend for big game populations in HD 104, which includes the Silverfish PSU, is upward. This increase has occurred with the existing high open road densities and private timber harvest. Environmental factors such as mild winters also contribute to increases in populations. Based on current population trends, the proposed **Alternatives 2, 4, 6, and 7** should maintain ungulate populations.

Denning/Rendezvous sites: There are no known denning or rendezvous sites within the Silverfish PSU. Suitable habitat for denning or rendezvous sites would remain available following all alternatives.

Sufficient space with minimal exposure to humans: Existing open road densities by MA meet Forest Plan standards except for in MA 12, which exceeds the 0.75 miles/square mile standard with 1.3 miles/square miles of open road currently. A Forest Plan amendment would be obtained for activity periods for Alternatives 2, 4 and 6 as these alternatives exceed the existing ORD during activity. Alternative 7 uses winter logging in MA 12 areas so as to avoid the need for a Forest Plan amendment.

Alternatives 2, 4, 7 and 6 do not allow timber harvest or associated activity access behind restricted roads during hunting season which provides a lower mortality risk to transient wolves.

Hiding cover and or thermal cover would also decrease due to the timber harvest or due to the slashing and burning. The timber harvest, slashing, and prescribed burning has the potential to **directly affect** wolves by having a short-term localized displacement effect to any wolves that may be using the area during the activity period. Effects would be limited to avoidance of activity areas and transient use could still occur. Proposed harvest activities alone would not be considered adverse because most human-caused mortalities result from mistaken identity and are generally independent of harvest activities (Frederick 1991).

Precommercial thinning on is included in A**lternatives 2, 4, 7, and 6**. Precommercial thinning will likely maintain hiding cover values of the stand in a mosaic pattern for associated species. During thinning operations, there will be short-term localized disturbance to wolves and their prey species in the area. Mortality risk for associated species is not expected to increase.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, road storage and decommissioning, access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to the wolf because they do not change any of the habitat components analyzed for wolves.

Cumulative Effects for All Alternatives

Past timber harvest and road construction projects and natural events have created much of the existing habitat conditions found within the Silverfish PSU. Past, current and reasonably foreseeable activities are listed in Chapter 3. Reasonable and foreseeable activities considered for Alternative 1 are the same *except* for the location of the proposed MMI power line (please see Chapter 3 for a full discussion). Alternative 1 CUM1 considers the MMI power line in Miller Creek while Alternative 1 CUM2 considered the power line location in the West Fisher. Cumulatively, CUM1 activities were considered with Alternatives 2, 4, and 7 while CUM2 activities were considered with Alternative 6.

On Plum Creek Timber Company and Montana Department of State lands, timber harvest activities could cumulatively affect the quality of habitat for ungulate prey species by reducing the availability of cover. Potential effects to wolves from ongoing timber harvest and road construction activities on private land would be minor. Private land development may also occur. 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.

The Forest-wide fuels Reduction and Wildlife Habitat Enhancement program will treat 1,056 acres with slashing and/or burning within the Silverfish PSU. These slash and/or burn units are expected to have a beneficial impact to big game species (FFRWHE EA, USDA, 2001, Chap. 3:139-143). On those areas not treated, indirect effects on the drier type old growth areas would be continued Douglas-fir encroachment. This condition has resulted from the exclusion of fire in the ponderosa pine/Douglas-fir timber type. The natural fire regime of periodic, low intensity underburns would have maintained an open understory stand conditions with occasional dense pockets of sapling Douglas-fir and ponderosa pine. These type of winter ranges with higher amounts of hiding and thermal cover are likely more suitable for white-tailed deer and less suitable for mule deer. Annual activities, including road maintenance are not expected to impact the wolf.

Hunting activities within the Silverfish 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 cause effects varying from short-term disturbance to short-term displacement. Mortality risk to the wolf is increased through hunting, however the risk is considered low. Hunting activities on state and private lands are considered to be similar to NFS lands, with similar effects to the wolf.

Alternative 1, when considered in association with the planned activities on both public and private lands, is expected to have **no cumulative** effects that would affect the gray wolf as no activities are authorized and existing conditions would be maintained in the short-term. All federal ongoing and future activities have or would obtain concurrence with the USFWS if any impact to the gray wolf were suspected. Past trends in land development here would suggest that development would continue to occur at a low rate and would have minor impacts on wolves and their prey species within the Silverfish PSU over the next ten years.

Cumulatively, ORD for both the summer and fall periods on all lands would remain higher than recommended for the Salish Elk Management Unit (EMU), which falls within the project area. However, big game currently exist in the Silverfish PSU, and none of the action alternatives are expected to decrease the overall potential of the project area to provide habitat for big game. Sufficient habitat is expected to remain after implementation of **all action alternatives** to maintain available prey species **and no cumulative effects** are expected that would affect the gray wolf.

Regulatory Consistency

All alternatives comply with Forest Plan direction on threatened and endangered species that applies to the gray wolf (FP II-1 #5, II-230 and its prey base (FP II-1 #3, #7, #12; II-7, II-22-23). All alternatives are consistent with the Northern Rocky Mountain Wolf Recovery Plan (1987).

Statement of Findings

All alternatives may affect but are not likely to adversely affect the gray wolf or its habitat based on:

1. No restricted roads will be opened for timber harvest or associated activity during the hunting season (10-15 to 12/1).
2. Mortality risk to the wolf is not expected to measurably increase during proposed

activities and will decrease slightly after post sale activities are completed.
3. Alternatives will not affect known rendezvous sites.
4. There may be short-term avoidance of areas of activity however transient use could continue.
5. Alternatives will meet forest plan big game management recommendations, as amended.

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. On January 17, 2001, the USDA Forest Service and the USDI Fish and Wildlife Service signed a Memorandum of Understanding to complement the Executive Order.

The National Forest Management Act (NFMA) requires that Forest plans "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives, and within the multiple-use objectives of a land management plan adopted pursuant to this section, provide, where appropriate, to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan" (16 USC Chapter 36 1604(g)(3)(B)).

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 Land bird Monitoring Program Coordinator 1999).

Environmental Consequences

Responses of migrant birds to plant succession, timber harvest, burning (prescribed or wildfire) depends upon their individual habitat preferences and needs.

ALTERNATIVE 1, No-Action

Direct and Indirect Effects

This alternative is not expected to directly affect or change the existing habitat use for migrant land birds in the short-term. Plant succession would continue as a result of the no action alternative. As an indirect result of plant succession, the more open habitats of ponderosa pine would continue to be encroached by Douglas-fir. Species such as the Townsend's warbler (*Dendroica townsendi*) which are more abundant in interior forest, and whose nest sites are often found in old growth Douglas-fir/ponderosa pine habitat associated with high canopy volumes of grand fir /Douglas-fir (Dobkin 1992:B-99) may

prefer this. On the Libby Dam mitigation program non-game monitoring program, other species found in sites with well above average canopy cover include the Swainson's thrush (*Catharus ustulatus*) and Townsend's warbler (Casey 1999).

ALTERNATIVES 2, 4, 7, and 6

Direct and Indirect Effects

Increased fragmentation could be detrimental to bird habitat, depending on the species. **Alternative 2** impacts the most acreage with 2,446 acres of harvest; **Alternatives 4 and 7** harvest 1,364 acres, and **Alternative 6** would harvest 1,835 acres. Prescribed burning would occur on 3,175 acres under Alternative 2, and 2,830 acres under Alternatives 4, 7, and 6.

Regeneration harvest removes forest cover used by some species (e.g. brown creeper, golden-crowned kinglet, hermit thrush) and at the same time creates grass, forbs, and shrub habitat used by other bird species (e.g. American kestrel, calliope hummingbird, chipping sparrow). This activity also produces “edge” habitat that still other bird species use (e.g. dark-eyed junco, western tanager, Townsend’s warbler). Edge habitat often is similar to forest stands created with partial cutting (e.g. commercial thinning, shelterwood). 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).

Prescribed understory burns are commonly used to reduce fuel hazards and maintain open forest structure in areas that had high frequency, low intensity fire regimes before fire suppression, such as ponderosa pine stands. Bird mortality could potentially result from either timber harvest or burning. Fire caused bird mortality depends on the season, uniformity, and severity of burning (Lyon et al. 2000:18). Direct and indirect fire effects on bird communities are related to the amount of structural change in the vegetation. The time since burning and the interval between understory fires influence fire effects on bird populations. Research conducted with the Libby Dam mitigation monitoring program indicated that species such as McGillivray warblers and lazuli buntings were quick to respond to shrub development in treated areas, whereas Nashville warblers and flycatchers responded after shrub development was more advanced (D. Bergeron, pers. comm. to A. Bratkovich 2001). Casey's (1999) analysis of the ongoing Libby Dam mitigation non-game monitoring program indicates that habitat treatments that provide for the snag component and encourage shrub growth have the greatest chance of providing habitat for diversity of non-game birds. Protection or creation of snags in treatment areas increases their value to a number of species, and those sites with higher snag densities and dense shrub cover therefore support the greatest variety of species.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP’s, road storage and decommissioning, access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring

developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to migratory birds because they do not change any of the habitat components analyzed for them.

Cumulative Effects for all Alternatives

Cumulative effects are the impact on the species that results from the incremental impact of the proposed activity when added to other past, present, and reasonably foreseeable future actions. Past activities and ongoing and reasonably foreseeable cumulative activities are listed in Chapter 3. These include prescribed burning on NFS lands, which is planned for 1,056 acres.

Alternative 1, when considered in association with the planned activities on both public and private lands, is expected to have no short-term adverse cumulative effects on habitat for migrant birds. This is due to the amount of habitat currently available that exists in a wide variety of successional stages. Indirectly, over the long term, those species associated with old growth stands and interior habitat would continue to find interior forest areas suitable.

The action alternatives in combination with other proposed and reasonable foreseeable activities proposed by the Forest Service and private landowners are not expected to have adverse cumulative effects on any one species of migrant bird. Management indicator species have been designated for the KNF (see the MIS section). These MIS species represent the habitat needs for migratory birds. As habitat for MIS species is being maintained, it is assumed that sufficient habitat and populations of neotropical migratory land birds are also being maintained.

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 Chapter and MIS section). 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 with the Silverfish PSU, and across the Kootenai National Forest, their habitat contributes to the maintenance of habitat and populations of neotropical migratory bird species.

MITIGATION and DESIGN CRITERIA SUMMARY FOR WILDLIFE SPECIALIST REPORT

1. To prevent snags and broken top trees within old growth stands from being felled for safety reasons, no harvest unit landings will be located adjacent to old growth stands.
2. Because no existing snags will be marked to leave in helicopter or skyline units, replacement trees will be marked for future snag and down wood potential. Larger diameter trees will be preferred. Where remnant large diameter mistletoe-infected larch occur, girdling will be necessary after harvest is completed to protect larch seedlings from becoming infected.
3. On those tractor units where snags are marked, safety hazard snags may be cut but they must be left on site within the unit to provide for large down wood recruitment.
4. Tractor units that will not have existing snags marked will be identified and additional replacement trees with future snag characteristics marked.
5. Logging on MA 10 lands will follow guidelines described by the Forest Plan may include additional protection measures designated by the project biologist based on site specific information about elk and deer use in the PSU. These include: winter logging may occur December 1 through March 1st; no harvest activity will occur during green-up period (generally March 1st through May 30th); if elk calving is known, no activity will occur until at least June 15th.
6. All restricted roads would remain closed anytime timber sale activity is not occurring behind the barrier. This decreases the potential for loss of cavity habitat trees and trees within stands to firewood cutting, and helps mitigate potential displacement of big game as a result of timber harvest activities.
7. No timber harvest or associated activity would be permitted on roads restricted to motorized vehicles from 10/15-12/1, general rifle hunting season.
8. If any key habitat features are found during layout, such as wallows and wet meadows, a cover buffer of at least two sight distances, or a minimum of 300 feet would be maintained around them.
9. On roads restricted to motorized traffic, motorized access to accomplish thinning activities is restricted to 14 consecutive days or less. These roads will still be considered closed and ORD's will not change. Thinning activities behind restricted roads will not occur during critical periods (October 15 to June 30).
10. For all action alternatives, firearms, archery equipment etc. will not be permitted behind any gated road accessed for the timber harvest. This mitigation measure for grizzly bears will help reduce the potential increase in human-caused mortality risk associated with the proposed activity.
11. For grizzly bear mitigation, timing activities for timber harvest include no activities during the spring period, April 1st to June 15th. Any prescribed burning that would take place would limit helicopter activity to 1 to 2 days, with no heavy ground equipment being used.
12. All garbage at the logging sites will be removed in a timely manner to avoid potential wildlife conflicts.
13. Units analyzed as winter logging and not impacting grizzly bear, would remain as winter logging during implementation of the sale. If season of activity or method

of harvest is changed such that the activity would occur within the active bear year, additional analysis would be required.

14. Required mitigation for Alternative 6 includes the required timing that all activities in Subdivision A, occurring on roads #4725 and 808E, are completed and these roads stored before activity on the remaining units in Alternative 6 can occur. Additionally, all Montanore activity for power line construction, should it be needed on road 4725, will be completed before these roads are closed and stored.
15. The timber sale contract will contain the contract clause CT 6.251 Protection of Endangered Species (4/90) as amended, which allows the government to cancel or unilaterally modify the timber sale should unanticipated impacts to TES species become a risk.

ECONOMICS

Introduction

The management of the Kootenai National Forest (KNF) has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visitation to the Forest generate employment and income in the surrounding communities and counties and generate revenues that are returned to the federal treasury.

This section presents concepts used to delineate an affected area and methods used to analyze the economic effects of the project, including the project feasibility, financial efficiency, and economic impacts. Project feasibility and financial efficiency relate to the costs and revenues of doing the action. Economic impacts relate to how the action affects the local economy in the surrounding area.

Regulatory Framework

The preparation of NEPA documents is guided by CEQ regulations for implementing NEPA [40 CFR 1500-1508]. NEPA requires that consequences to the human environment be analyzed and disclosed. The extent to which these environmental factors are analyzed and discussed is related to the nature of public comments received during scoping. 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.

Timber management activities within the project area have the potential to impact the economic conditions of local communities and counties. To estimate the potential effect on jobs and income, a zone of influence (or impact area) was delineated. Counties were selected based on commuting data suggesting a functioning economy and where the timber is likely to be processed (log flows). Recent data on log flows from the KNF was provided by the University of Montana's Bureau of Business and Economic Research. The zone of influence for this project is comprised of Lincoln, Sanders, and Flathead counties in Montana and Boundary and Bonner counties in Idaho.

Affected Environment

The combination of small towns and rural settings, along with people from a wide variety of backgrounds, provide a diverse social environment for the geographical region around the Kootenai National Forest. Local residents pursue a wide variety of life-styles, but many share a common theme, an orientation to the outdoors and natural resources. This is reflected in both vocational and recreational pursuits including employment in logging and milling operations, outfitter and guide businesses, hiking, hunting, fishing, camping and many other recreational activities.

Timber, tourism and agricultural industries are important to the economy of local areas. Despite the common concern for, and dependence on, natural resources within the local communities, social attitudes vary widely with respect to their management. Local residents hold a broad spectrum of perspectives and preferences ranging from complete preservation to maximum development and utilization of natural resources.

A comprehensive socio-economic analysis was recently completed for the KNF. See the document "Social and Economic Systems: Conditions and Trends" (available at http://www.fs.fed.us/kipz/documents/plmp/CER/index.php) (USDA Forest Service 2006). This document provides a description of the employment, income and social composition of the counties comprising the analysis area and the impact on counties from management of the Kootenai National Forest. This analysis indicates the counties within the analysis area are affected by timber management on the forest.

Methodology

Four measures are appropriate for the economic analysis: project feasibility, financial efficiency, economic efficiency (if needed), and economic impacts. These measures are described below, including methodologies.

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. The TEA uses regression analysis of recently sold timber sales to predict bid prices. The most recent appraisal 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 or the proposed thinning projects, 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.

Economic impacts are used to evaluate potential direct, indirect and cumulative effects on the economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and between businesses and final consumers. It captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis. IMPLAN translates changes in final demand for goods and services into resulting changes in economic effects, such as labor income and employment of the affected area's economy. The IMPLAN modeling system allows the user to build regional economic models of one or more counties for a particular year. The regional model for this analysis used the 2002 IMPLAN data.

The economic impact effects are measured by estimating the direct jobs and labor income generated by the 1) processing of the timber volume from the project, and 2) dollars resulting from any restoration activities of the project into the local economy affected by the treatments proposed. The direct employment and labor income benefit employees and their families and therefore directly affect the local economy. Additional indirect and induced, multiplier effects (ripple effects) are generated by the direct activities. Together the direct and multiplier effects comprise the total economic impacts to the local economy. The data used to estimate the direct effects from timber harvest is information provided by University of Montana's Bureau of Business and Economic Research. The economic effects tied to restoration activities and the multiplier effects (of both timber harvest and restoration activities) were estimated using IMPLAN.

Potential limitations of these estimates are the time lag in IMPLAN data and the data intensive nature of the input-output model. Significant changes in economic sectors since the latest data for IMPLAN have been adjusted using information from the University of Montana's Bureau of Business and Economic Research.

Environmental Consequences

Project Feasibility

The estimation of project feasibility was based on a transaction evidence appraisal model (TE), 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 each alternative are displayed in Tables 3-125 and 3-126.

The analysis was run on the alternatives twice: with helicopter logging included and without helicopter logging. All alternatives were developed to include helicopter logging. Alternative 2 has the highest component of helicopter logging at 43%. Alternative 4 and 7 have 15% helicopter logging, and Alternative 6 has 21%. The results of including helicopter logging are displayed in Table 3-125. Results of removing all the helicopter acres and volume are shown in Table 3-126.

With helicopter logging included, all alternatives are economically infeasible. This means that the base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury) exceed the amount of timber revenue expected to be generated. The analysis indicates Alternatives 2 and 7 have no expected revenue, while Alternatives 4 and 6 show minimal revenue values. These low revenue values are because of the reduced value of timber and high costs associated with helicopter logging. No alternative would be expected to sell when helicopter logging is included.

Without helicopter logging, the predicted high bid increases under each alternative. All alternatives are feasible when helicopter logging is not included, with predicted high bids greater in value than the required base rates. The feasibility indicates the project is likely to sell when helicopter logging is not included. Alternative 6 has the highest predicted high bid and the greatest feasibility.

There are several factors that contribute to the high base rates. Under all alternatives, the site prep and planting costs and their associated overhead added substantial expense to base rates. Some of the other factors contributing to the base rates are the required mitigation, such as the required winter logging in grizzly bear recovery areas or big game summer range road densities, as is the case in Alternative 7. Logging systems is also a large factor in base rates. Helicopter logging is very expensive due to fuel, aircraft, and other expenses. The high cost of this logging system, combined with a low timber market result in project infeasibility.

The current low timber market is an important factor in the feasibility of project alternatives. The current market is at one of its lowest points ever; log prices are extremely low due to the decline in the housing market, resulting in a reduced demand for lumber. The current market is not expected to improve until the latter part of 2009 or early 2010 according to personal communication with Al Schuler, research economist at the Forest Service Northeast Research Station in West Virginia (Bhuelmann et al. 2008). Much is subject to change based on the market over time. A relatively low WWPA (Western Wood Products Association) average value per thousand board feet (MBF) was used in the analysis. The low revenues in the sale are a direct result of the low timber market. An increased market for timber would result in higher revenues for the sale.

All the revenue estimates discussed above from the feasibility analysis are used in the financial efficiency analysis discussed below.

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 8-10-year project lifespan (2009-2017). 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.

Changes to resources like fisheries and wildlife habitats are further discussed in the corresponding sections of this EIS. Fisheries and wildlife will not be described in this section in financial or economic terms. Recreation was also not included in the financial efficiency analysis. Costs incurred for trail development, bridges and trail head improvements were included in the economic efficiency analysis. There is no generated revenue from recreation calculated into the figures for this project. Improvements to recreation were added simply to conduct a cost comparison for alternatives. Projects to improve forest health, such as proposed tree thinning for overly stocked stands, were also included in the economic efficiency analysis but no revenue is considered in the analysis for these projects. These projects may be funded by some means other than the timber sale.

Planning costs (NEPA) were not included in any of the alternatives since they are sunk costs at the point of alternative selection.

Table 3-125 summarizes the project feasibility and financial efficiency for all alternatives with helicopter logging included. Because all costs of the project are not related to the timber sale, two PNVs were calculated. One PNV indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design criteria. A second PNV includes all costs for each alternative, including other activities that are non-timber harvest related (trail construction, tree thinning, diversity planting, etc.).

Table 3-125 indicates that all Alternatives are financially inefficient when helicopter logging is included.

Table 3-126 shows the tradeoff between all Alternatives without helicopter logging included. Due to the high cost of helicopter logging and the reduced timber market, the option of selling only ground-based harvest units needed consideration in case helicopter logging remains uneconomical when this project is implemented.

The resulting values from removing the helicopter units improved the PNV under all alternatives. Alternative 6 has the highest PNV and is the only financially efficient alternative. The remaining alternatives have negative PNVs, but could become financially efficient if market conditions improve prior to project implementation.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. 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.

Table 3-125 Project Feasibility and Financial Efficiency Summary – Includes Helicopter Logging (2007 dollars)

CATEGORY	MEASURE	ALT. 1	ALT. 2	ALT. 4	ALT. 6	ALT. 7
Timber Harvest Information	Acres Harvested	0	2,508	1,364	1,898	1,364
	Total Volume Harvested (CCF)	0	20,206	11,835	16,485	11,835
	Base Rates ($/CCF)	N/A	$32.42	$24.63	$23.97	$24.63
	Predicted High Bid ($/CCF)	N/A	$0	$3.55	$2.68	$0
	Total Revenue	$0	$0	$31,055	$33,404	$0
Timber Harvest and Required Design Criteria	PNV	$0	-$939,865	-$442,298	-$617,806	-$473,353
Timber Harvest and Other Planned Activities	PNV	$0	-$1,203,250	-$608,015	-$802,965	-$639,070

Table 3-126 Project Feasibility and Financial Efficiency Summary – No Helicopter Logging Included (2007 dollars)

CATEGORY	MEASURE	ALT. 1	ALT. 2	ALT. 4	ALT. 6	ALT. 7
Timber Harvest Information	Acres Harvested	0	1,431	1,156	1,501	1,156
	Total Volume Harvested (CCF)	0	9,594	9,805	12,995	9,805
	Base Rates ($/CCF)	N/A	$28.78	$23.89	$22.74	$23.89
	Predicted High Bid ($/CCF)	N/A	$48.67	$46.45	$55.23	$45.28
	Total Revenue	$0	$393,780	$307,342	$483,916	**$299,642**

CATEGORY	MEASURE	ALT. 1	ALT. 2	ALT. 4	ALT. 6	ALT. 7
Timber Harvest and Required Design Criteria	PNV	$0	-$102,592	-$68,802	$1,459	**-$76,502**
Timber Harvest and Other Planned Activities	PNV	$0	-$301,843	-$224,309	-$164,852	**-$232,009**

When evaluating trade-offs, the use of efficiency measures is one tool used by the decision maker in making the decision. Many things cannot be quantified, such as effects on wildlife, impacts on local economies, and restoration of watersheds and vegetation. The decision maker takes many factors into account in making the decision.

Economic Impact Effects (Jobs and Labor Income)

Timber production from this proposed KNF project would have direct and indirect effects on local jobs and labor income. The Forest used an input-output model, IMPLAN (Impact Analysis for Planning) to estimate effects on employment and labor income within the zone of influence (impact area).

For timber harvest, the direct employment and labor income response coefficients (e.g., jobs and labor income per million cubic feet) were derived by the University of Montana's Bureau of Business and Economic Research. The indirect and induced multiplier effects were estimated using the IMPLAN model for the economic impact area.

For restoration and reforestation activities, the direct, indirect and induced effects were derived using IMPLAN. The resulting direct, indirect and induced employment and labor income coefficients have been incorporated into a spreadsheet developed by the Regional Economist for the USFS, Northern Region.

The analysis calculated the jobs and labor income associated with timber harvest, reforestation, and restoration activities. In order to estimate jobs and labor income associated with timber harvest, the timber harvest levels were proportionally broken out by product type for each alternative (see Table 3-127). In order to estimate jobs and labor income associated with reforestation and restoration activities, expenditures for these activities were developed for each alternative (see Table 3-128).The analysis includes the proposed helicopter logging for each alternative.

Table 3-127
Proportion Timber Harvest by Product Type by Alternative in Percent

PRODUCT TYPE	ALT. 1	ALT. 2	ALT. 4	ALT. 6	ALT. 7
Sawmills	0	0.8	0.8	0.8	0.8
Log Homes	0	0	0	0	0
Post and Poles	0	0.1	0.1	0.1	0.1
Pulp	0	0.1	0.1	0.1	0.1

Table 3-128
Reforestation and Other Restoration Activity Expenditures by Alternative over an eight-year period (2007 dollars) (does not include overhead costs)

REFORESTATION/ RESTORATION ACTIVITY	ALT. 1	ALT. 2	ALT. 4	ALT. 6	ALT. 7
Reforestation Exams	0	$39,852.00	$16,992.00	$22,248.00	$16,992.00
Tree Planting*	0	$332,100.00	$141,600.00	$185,400.00	$141,600.00
Netting Establishment	0	$8,640.00	$8,640.00	$8,640.00	$8,640.00
Netting Maintenance	0	$8,100.00	$8,100.00	$8,100.00	$8,100.00
Post Harvest Exams	0	$30,132.00	$16,368.00	$22,776.00	$16,368.00
Road Decommissioning (non-timber sale)	0	$7,500.00	$7,500.00	$7,500.00	$7,500.00
Site Prep Burning	0	$254,030.00	$105,080.00	$154,080.00	$105,080.00
Total	**0**	**$680,354.00**	**$304,280.00**	**$408,744.00**	**$304,280.00**

Table 3-129 displays both direct and total estimates for employment (part and full-time) and labor income that may be attributed to each alternative. Since the expenditures occur over an eight-year period, the estimated impacts of jobs and labor income would be spread out over the life of the project. Most of the timber harvest and wood processing jobs would occur over the first four years of the project. These are not new jobs or income, but rather jobs and income that can be attributed to this project.

Table 3-129 – Total Employment and Income (2006/2007 dollars) Over the Life of the Project

ANALYSIS ITEM	ALT. 1	ALT. 2	ALT. 4	ALT. 6	ALT. 7
Direct Employment (persons)	0	136	75	104	75
Total Employment (persons)	0	266	152	210	152
Direct Labor Income (Thousands of $)	0	$3,844.90	$2,178.90	$3,021.70	$2,178.90
Total Labor Income (Thousands of $)	0	$6,981.70	$4,014.70	$5,575.20	$4,014.70

Definitions:

1. Employment is the total full- and part-time wage, salaried, and self-employed jobs in the region.
2. Labor income includes the wages, salaries and benefits of workers who are paid by employers and income paid to proprietors.

Estimates in Table 3-129 indicate that Alternative 2 would maintain the highest number of jobs and labor income with total employment at 266 persons and total labor income being $6.9 million dollars. Alternatives 4, 6, and 7 maintain fewer jobs and labor income with Alternatives 4 and 7 generating 152 jobs and a little over 4 million dollars into the economy. Alternative 6 provides 210 total jobs and a total labor income of 5.5 million dollars. Alternative 1 maintains no jobs or income because there are no activities associated with this alternative.

The analysis assumes the timber volume processed would occur within the Kootenai zone of influence. However, if some of the timber were processed outside the region, then a portion of the jobs and income would be lost by this regional economy.

Cumulative Effects

Management of the Kootenai National Forest has an impact on the economies of local counties. However, there are many additional factors that influence and affect the local economies, including changes to industry technologies, management of adjacent national forests and private lands, economic growth, and international trade.

Ongoing and reasonably foreseeable projects that may affect local economies include the following:

Large and small-scale mining activities take place in the project area. Most significant for the economy is the proposed Montanore Mine. The mine itself is outside but adjacent to the project area, with the power line route to the mine passing through the project area. The Montanore Mine would bring a significant amount of jobs and labor income to Libby and Lincoln County.

Small scale mines, including patented claims and placer mining, occur in the project area as described in Chapter 2. These activities generate some economic activity, but would most likely be categorized as minor contributors.

Private timber lands owned by Plum Creek Timber Company and some patented mining claims are either for sale or sold and actively being subdivided in the project area. Real estate transactions could potentially be a significant short-term contributor to the local

economy, though the loss of natural resource extraction activities associated with these lands would have a negative impact to the economy.

The project area is very popular for recreation activities such as hiking, hunting, camping, recreational gold panning, horseback riding, and berry picking. These activities generate income in the local economy through local and non-local participants who purchase goods and services in the area.

Some resource extraction activities still occur on private lands within the project area, including timber harvest.

For the Miller West Fisher project, the jobs and labor income associated with timber harvest, restoration and reforestation activities in the action alternatives, would contribute to the stability of the local economy during the life of the project and also for the future.

CULTURAL RESOURCES

Introduction

Cultural resources include prehistoric and historic properties reflecting the previous occupation and use of an area and have significance in their connection to important events or patterns of history, persons significant in our history, show distinctive characteristics of a type, period, or method of construction and may provide information important to history or prehistory.

Section 106 of the National Historic Preservation Act (NHPA) (Public Law 89-665) requires federal agencies to take into account the effects of their actions ("undertakings") on historic properties. This act also establishes the Advisory Council of Historic Preservation (ACHP) as the oversight agency to consult with federal agencies for the review of undertakings having the potential to affect historic properties. The Region 1 Programmatic Memorandum of Agreement (PMOA) has established a process whereby this consultation is delegated to Montana State Historic Preservation Office (MTSHPO). The NHPA also requires that American Indian tribes be included in consultation. These requirements are carried forward in the Forest Plan standards (Forest Plan, Vol. 1, pages II-25, 26).

Project area inventories and consultation under Section 106 of the NHPA must be completed prior to project implementation. On the Forest, the consultation process has been streamlined by programmatic agreements (PA), for projects meeting specific conditions. Generally, these conditions include:

1) Areas where previous inventories are adequate,
2) Adequate inventories where no historic properties are located in the project area of potential effect, and
3) Particular property and project types with recurring similar impacts allowing predetermined mitigation measures.

Documentation under these agreements is submitted to the SHPO in an annual report, and may or may not be submitted prior to project implementation. The section below includes a list of agreements which affect the consultation process for projects on the Libby Ranger District.

Where a proposed project is likely to adversely effect an eligible historic property and the project cannot be redesigned to avoid the property, mitigating measures must be developed .These measures must be documented and approved by the SHPO and the ACHP prior to project implementation except where streamlined by a programmatic agreement.

On the Kootenai National Forest, two agreements are commonly used. *The Programmatic Agreement Regarding Cultural Resource* with MTSHPO when no inventory is necessary because of adequate previous inventory or low probability, or when no historic properties are located within the area of potential effect. In these cases No Inventory or Negative reports are approved at the Forest level, and are submitted to the MTSHPO annually.

Historic logging and historic trail properties are treated according to the standards previously agreed to with the Montana SHPO in the *Kootenai National Forest Programmatic Agreement regarding Treatment of Historic Trails and Logging Remains* (KNF PMOA). In these cases, consultation with the MTSHPO prior to project implementation is not necessary. The property and standards used are documented and sent to the State of Montana Historic Preservation Office on a yearly basis.

Timber contract clauses such as C6.24 require project implementation to cease if a property is discovered during project implementation so that Forest Archaeologists can complete Section 106 consultation on property eligibility and project effects.

Both the NHPA and the Archaeological Resources Protection Act (ARPA) provide for exemption for the location of properties from public disclosure. The intent of this exemption is to protect historic properties from vandalism and looting (FSH 6209.13 11.22). ARPA also establishes civil and criminal penalties for individuals removing or damaging archaeological resources on federal lands.

Analysis Area

The analysis area is the Silverfish Planning Subunit, also known as the project area.

Analysis Methods

This analysis reviews the history and prehistory of the project area in comparison to proposed activities to determine impacts to cultural resources. Information from previous cultural resource inventories and known historic properties is documented in the Libby Ranger District Cultural Resource files. This information was used along with additional field surveys. Due to public comment on roads with RS 2477 status, a thorough analysis of road history is included for roads proposed for storage or decommissioning.

Historic Land Use of the Kootenai National Forest

(Based on Thoms 1984, Schaeffer 1940, Turney-High 1941, Catherine White 1950, Johnson 1990, Hellgate Treaty 1855, Historic Overview of the Kootenai National Forest, Miss 1994, Libby Time Line 2002, White)

The Kootenai River drainage in general has a long history of human occupation. The earliest sites along the Kootenai River have been recorded north of the Libby Dam and date to more than 7,000 years before present. Prehistoric inhabitants of the Kootenai and Yaak Valleys (as well as in most other parts of North America) practiced what is referred to as a hunting/gathering lifeway. These peoples practiced little or no formal agriculture, but instead utilized resources found in their natural environments. These resources were generally gathered as they became seasonally available, sometimes being processed and stored for later use. As the people followed available resources, they established seasonal rounds throughout their territory. These resources included plants, large and small mammals, fish, and fowl.

At the time of Euroamerican contact with northwest Montana, this region was inhabited by the Kootenai Indians. Kootenai tribal territory centered on the Kootenai River, a large portion of which lies north of the international boundary. The Kootenai were culturally and geographically divided into two bands. The Upper Kootenai territory ran from Windermere Lake, in British Columbia, southwards to near Libby, Montana. The Lower

Kootenai territory covered the area from Libby, around the big bend of the Kootenai River, through the Bonners Ferry area of Idaho, and northwards past Kootenai Lake, British Columbia.

The two Kootenai bands had somewhat different lifestyles based on influences from surrounding groups. Both groups, like the earlier people who inhabited this region, followed a hunting-gathering lifeway. They were highly mobile groups, changing their village and camp locations in response to seasonal changes in plant and animal food availability. Although culturally similar in most respects, the two bands exhibited differences based on the topography of their territories and influences from neighboring groups. The Lower Kootenai were more influenced by the Plateau cultures of the interior northwest. They relied to a large degree on fish such as trout, salmon, and sturgeon. Deer was the primary large game for the Lower Kootenai, and ducks and other waterfowl were taken in large quantities. Many of the fishing activities, duck hunts, and deer drives were highly organized communal activities. Although the Upper Kootenai relied on the horse as a major source of transportation, for the Lower Kootenai, it assumed a much less important role, probably in part due to the very rugged, wooded nature of the territory when compared to the more open Tobacco Plains area. The canoe was used extensively along the lower Kootenai River, its tributaries, and associated lakes.

After 1800 the Northwest Fur Company sent traders across the Rocky Mountains to trade with the Kootenai Indians including LeBlanc and LeGasse who crossed the Rocky Mountains in the spring of 1801. There are no records of where they may have traveled but it is probable they made it into what is now Northwestern Montana. They traded on the west side of the Rocky Mountains until 1803, when they were killed after crossing to the east side of the Rocky Mountains. It was not until 1806 that Jaco Finley and Iroquois employees of the Northwestern Fur Company crossed through Howse Pass to the west side of the Rocky Mountains north of present day Windermere, British Columbia. In 1807, David Thompson of the North West Company crossed the Rockies through Howse Pass in the spring of 1808, and traveled down the Kootenai River in order to extend the fur trade to the Kootenai Indians. Finan McDonald and James McMillan established a temporary winter trading post across the River from modern day Libby. David Thompson traveled through the Kootenai River area from 1808 until 1812, when he crossed back to the east side of the Rocky Mountains for the last time.

The Northwest Fur Company intermittently operated a trading house in several different locations on the middle Kootenai from 1808 until 1821. In 1821 the Hudson Bay Company merged with the Northwest Fur Company and continued to operate posts in the middle Kootenai until 1839. In 1840 operations were moved north to the Tobacco Plains country where the trading post moved several times. In 1865 operations moved north of the Canadian border where Hudson Bay operated posts until 1871.

In 1855, Isaac Stevens, Governor of the Territory of Washington, negotiated the Hellgate Treaty, which removed the Kootenai Tribe from their traditional territory to a reservation south of Flathead Lake along with the Salish and Upper Pend d'Oreilles Tribes. Many of the Kootenai who dissented moved to Canada and other bands moved to the Flathead Reservation in 1895 and 1910 (Johnson 1990, pg 17). Still other bands moved to Idaho and now reside on a small reservation outside of Bonner's Ferry. Article III of the Hellgate Treaty reserved for the Salish, Kootenai and Upper Pend d'Oreilles Tribes the "right of taking fish at all usual an accustomed places, in common with citizens of the

Territory, and of erecting temporary buildings for curing; together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land".

Although missionaries, settlers, prospectors, and military survey expeditions followed the fur trade through the area, extensive Euroamerican use of the Kootenai region was not prevalent until the discovery of gold near Libby in 1867, a second rush in 1885, and the construction of the Great Northern Railway in 1892. Placer mining was supplemented with quartz lode mining of silver, lead, and gold after the construction of the Great Northern Railroad which made it possible to bring in heavy mining equipment to develop the mines. After the economic depression of 1893, silver and lead mining resumed in the mid 1890's. Prospecting for gold and mining for silver, copper, and gold continued to play a role in the economy of northwestern Montana in the 20th century and will continue to do so into the 21st century.

History of the Kootenai National Forest

The Kootenai National Forest was created by Presidential Proclamation on November 5, 1906 and comprised lands north of the Kootenai River from the Big Bend of that river to the Idaho line and north to the boundary with Canada. Lands on the south side of the Kootenai River, including lands around Libby, became part of the Cabinet Forest Reserve on March 2, 1907.

The current project area is within the confines of the original Cabinet Forest Reserve North. The area of the Cabinet National Forest south of the Kootenai River to the divide between the Kootenai River and Clark Fork drainage divide were transferred to the Kootenai National Forest in July of 1908.

After the severe forest fires of 1910, the Forest Service began a fire suppression and control program. Fire lookouts, along with a network of trails and telephone lines, were constructed on hundreds of mountain tops throughout the country. The Civilian Conservation Corp, under the guidance of the U.S. Forest Service, constructed many lookouts, trails, roads, and telephone lines in Lincoln County from 1933 until the disbanding of the CCC in 1942 because of the Second World War. Trail and lookout construction reached their height during the Great Depression of the 1930's.

Historic Logging

Commercial logging began in the Kootenai beginning in 1892 when railroad ties were cut for the Great Northern Railroad as well as timber cut for small sawmills in the construction of towns such as Libby. Large scale commercial logging began in 1899 with a large sawmill constructed west of Libby near the mouth of Flower Creek. Commercial logging greatly increased after the construction of large mill in Libby by the Dawson Lumber Company in 1906. The J. Neils Lumber company began acquiring lands from the federal and state governments through homesteads patented through the Homestead Act of 1862 and the Timber and Stone Act of 1878. The J. Neils Lumber Company purchased the former Dawson mill in 1911 and renamed the company the J. Neils Lumber Company. After the death of Thomas Shevlin Sr. his son, Thomas Shevlin Jr., took over control of the parent J. Neils Lumber Company. A disagreement between Julius Neils and Thomas Shevlin Jr. led to Neils selling the Libby Lumber Company mill in Libby and the timber holdings west of Fisher River divide to Shevlin in January of 1915. At the end of

World War I, J. Neils reacquired the Libby Lumber Company in January of 1919. This operation continued until 1957 when St. Regis Paper Company purchased the J. Neils Lumber Company operations in Libby. In 1983 Champion acquired the St. Regis mill and land holdings and operated until 1993 when the mill in Libby was sold to Stimson Lumber Company and the former J. Neils and St. Regis timber lands sold to Plum Creek. The Stimson plywood plant in Libby closed in 2002.

Analysis Area

The Silverfish Planning Subunit is approximately 69,419 acres of which 60,519 acres are National Forest System (NFS) lands, 640 acres are State lands, 6,196 acres are Plum Creek Timber Company (PCTC) lands, and 2,064 acres are in other private ownership. Important watersheds in the project area include Miller, West Fisher and Silver Butte Creeks and their tributaries.

The legal description of the project area includes all or portions of T27N, R31W, T27N, R30W, T27N, R29W, T26N, R29W, T26N, R30W; T26N, R31W, T25N, R31W, T25N, R30W, T25N, R29W.

Analysis Methods

Analysis methods used in this section consist of a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the analysis area and surrounding area. This information includes a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the analysis area and surrounding area. This information was gathered from General Land Office Plats, and historic U.S. Forest Service maps and records. Other sources include historic newspapers, mineral survey plats and notes, mining journals, geological records, county road petitions and commissioner's journals, mining claim records and other county records from Missoula, Flathead, and Lincoln County records. Other information was gathered from Forest Service cultural resource surveys previously conducted in the planning subunit.

Historic Land use of the Silverfish Planning Unit

Historic Travel Routes and Roads

Native Americans were the first to use game trails to access the various drainages of the project area to camp, hunt game and gather other food resources such as huckleberries. In the later part of the nineteenth century miners and hunters followed the same routes. During the late 1880's and early 1900's miners located mining claims in the project area and built trails to develop their claims. The earliest roads reached the project area during the 1890's and improved travel to the mining districts in Silver Butte and the West Fisher River. After the 1910 fire the U.S. Forest Service began constructing trails to access lookouts and improve accessibility to remote areas for fire fighting.

The Thompson Falls to Libby Creek Trail and Wagon Road from Vermilion to Silver Butte

An early trail connecting the Clark Fork with the Fisher River probably had prehistoric origins. The May 10, 1867, edition of the Walla Walla Statesmen newspaper has an

article noting that 150 miners were prospecting on the Vermilion River in April of 1867 during a short lived gold rush on the drainage.1

Placer and lode claims were again located in the Vermilion drainage during the 1880's with claims begin located in Lyons Gulch into the Silver Butte Country. In 1885, a second gold rush began on Libby Creek via the Vermilion, Lyons Gulch, Silver Butte-Fisher but there was no established trails beyond the Vermilion drainage. The mining district was very isolated and there was a need to construct a trail from Thompson Falls to the placer mines on Libby Creek. It is interesting to note that in August of 1886, Theodore Roosevelt (future President of the United States 1901-1909) who during his tenure as President established many of the National Forests with Gifford Pinchot) hunted in the Vermilion Country. Roosevelt had left his ranch in the Dakota Territory to hunt mountain goat in the Cabinet Mountains. Roosevelt was accompanied by William Merrifield and John Willis was the hunting guide. They hunted up the Vermillion River and Bull River areas.2 The party camped, with minimal comforts in the Vermilion and hunted the main Cabinet Range and possibly into the project area. After completing a successful hunt in the Vermilion where several mountain goats had been killed by Theodore Roosevelt, John Willis would return to the area the next year to locate a trail to connect Thompson Falls with the placer mining on Libby Creek.

The December 24, 1886, edition of the Missoulian had a short mention in the Thompson Falls section about a party of men who were to cut a trail from Thompson Falls via the Vermilion River to the placer mining on Libby Creek.3 The May 6, 1887, edition of the Missoulian has an article on another attempt to lay out a trail from Thompson Falls to Libby. John Willis was engaged to find out if a trail could be opened up but the snow was still deep in the mountains.4 The May 13th, 1887, edition of the Missoulian noted that Charlie Young and A. H. Hartt left Horse Plains for Libby in mid-April. They arrived on Libby Creek on April 27th, after traveling 'over a very rough trail'. The May 27th, 1887, Missoulian column about Thompson Falls indicated that the owners of the mines in the Vermilion had been working on the trail to Libby by way of the Vermilion River. The same column noted the following:

> It would probably be in order to mention that this famous place of contention has now a full fledged pack trail to and from the Libby mining country. Murray Bros have a pony mail and express train making tri-weekly trips to and from Libby and points on the trail. As said trail goes in direction over to the mineral belt of Vermillion, the distance from Libby to Thompson via Vermillion is 54 ½ miles.[5]

In October of 1887 some English hunters and their guide Morris Farrell traveled to Libby Creek to hunt mountain goats. Their return on the trail from Libby Creek to Thompson Falls was described in the November 4, 1887, edition of the Missoulian:

> …Horses gave out and died on the trail, there being no feed for sixty miles, canned goods, pack saddles and the like were left by the wayside, and the party had a six

[1] **The Walla Walla Statesmen,** May 10, 1867, volume VI, No. 21, page 2
[2] **The Weekly Missoulian**, October 15, 1886, Volume XIV, No. 22, page 3
[3] **The Weekly Missoulian**, December 24, 1886, Volume XIV, No.31, page 2
[4] **The Weekly Missoulian,** May 6, 1887, Volume XIV, No. 51, page 3
[5] **The Weekly Missoulian**, May 27th, 1887, Volume XV, No. 2, page 2

days go-as-you please walk into Thompson Falls over a trail that he thinks had not been used to any extent before. They were gone about a month.[6]

In 1887 quartz lode and placer mines were located by prospectors in the Silver Butte drainage. This would lead to the eventual development of several mines in this area.

The first wagon road built into the Silver Butte Country began with a wagon road built up the Vermilion River, from near present day Trout Creek, Montana, across the Clark Fork River via a ferry to the gold mines of the Kentucky and Vermilion Mining Company in the spring of 1889.7 In June of 1889 this road was extended up the Vermilion to the head of Lyons Gulch.8 The road then was extended in 1895, to the Pan Handle Mine at Silver Butte. This mine would eventually be known as the King Mine by the 1940's.

The Proceedings of the Board of County Commissioners for Missoula County printed in the March 27, 1891 edition of the Interlake said the following about the road: 'In the matter of building county road from Vermillion Creek to the head of Fisher Creek, the contract for building the same was awarded to R.R. Schulder for the sum of $3000.00 , payable in county warrants drawn on the General Fund. Road to be completed by July 1, 1891. Bond required in the sum of $6000.00. Contract entered with Co. Commissioners.9 The road was extended by the summer of 1895 to the Montana and Kentucky Mining operations at the Silver Bow, Panhandle, and Monarch Mines on the Silver Butte Fisher and a 100 ton a day concentrator plant constructed.10 Two years later the October 16th, 1897, edition of the Montanian noted that a 500 a day concentrating plant had been installed and that there was electric light and a tramway at the mine. 11

The road up the Vermilion drainage had originally been constructed too close to the Vermilion River and was flooded out when the Vermilion River ran high during the spring during the late 1890's. The Kentucky-Montana Company, who had economic problems, had leased their properties to the Vermillion Mining Company. This later company rebuilt the road in August of 1898.12 After the Silver Butte country was burned in the fire of 1910, a trail was extended from the end of the old mining road into the Silver Butte drainage when homesteaders began to settle in the Silver Butte drainage. By 1916 a road from 'Trout Creek to Libby' had been extended to the southeast ¼ of Section 36, Township 26 North, Range 31 West.13

A petition was submitted to the Lincoln County commissioners for a road to be built up Silver Butte Fisher Creek, via old Highway 2, on May 31, 1919, and the road was approved by Lincoln County Commissioners W. A. Raymond and H. W. Rouse in March of 1920.14 The road was constructed up to Section 30, Township 26 North, Range 29 West. The Lincoln County Map of 1921 shows the connection of the old Silver Butte Road to the new county road coming up Silver Butte-Fisher in Section 34, Township 26

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[6] **The Weekly Missoulian**, November 4, 1887, Volume XV, No 24, page 3, Camping on the Trail
[7] **The Weekly Missoulian**, April 3, 1889, Volume 18, No. 46, page 3, A Ten-Stamp Mill
[8] **The Weekly Missoulian**, June 19, 1889, Volume 18, No. 58, page 4, Mining Matters (MJW 12/03/08)
[9] **The Interlake**, Friday March 27, 1891, Volume II, No. 32, page 2
[10] **The Silver Standard**, Libby, Montana, August 17, 1895, Volume 1, No. 6, page 03
[11] **The Libby Montanian**, October16, 1897, Volume III, No 48, page 3
[12] **Western Mining World**, August 13, 1898, Volume 9, No. 204, page 80.
[13] **General Land Office Plat, Township 26 North, Range 30 West,** surveyed August 21 to September 18, 1916, surveyed by S. Frank Walters, approved December 18, 1917.
[14] **The Western News**, March 11, 1920, Volume XIX, No. 38, page 1, County Road will be Built into Silver Butte

North, Range 30 West.15 The road was rebuilt in 1934, when the Civilian Conservation Corp men from the Vermilion CCC camp rebuilt the Silver Butte Road from the Vermilion.16 A portion of the original old route of the road to the Silver Butte Mine was abandoned in favor of a level grade closer to Silver Butte Fisher Creek. The reconstructed road was completed by August 15, 1934.17 In 1944 a new road was constructed by the U.S. Government from the Silver Butte road (#148), from the segment constructed in 1934, up to the location of the King Mine operations. The King Mine was located on the former properties of the old Kentucky and Montana Mining Company. The Report of the Silver Butte Mine, October 1944, noted that the Silver Butte Zinc Lead Mining Company; 'had succeeded in getting the Government to build a good road to the property'. A U.S. Forest Service engineering map, showing the Silver Butte mining claims, shows the route of the road constructed in 1944.18 The Silver Butte Road (Road #148), though changed in its location in several areas, remains in use to the present day. A short segment of road was constructed from the Silver Butte Road to the Viking Mine in 1934 to bring in the compressor plant, and by 1935, the equipment for a mill.19. The 1935 Kootenai National Forest Map is the earliest map to show this road while the 1937 Kootenai National Forest Map shows the road and the Viking Mine location.

Commercial logging did not take place until the late 1950's and early 1960's in the Silver Butte drainage as much had been burned in the 1910 fire. Logging access roads were constructed during the late 1960's and early 1980's.20 A transmission line access road was constructed in the Silver Butte drainage after 5/27/1969 to aid in the construction and later access the BPA Noxon to Conkelly 230 KV power line.21

West Fisher Roads

The original wagon road built up into the West Fisher drainage was built via Swamp Creek, from the Libby Creek wagon road in the summer of 1899. Portions of the old road to the West Fisher located in the Swamp Creek drainage were incorporated into US Highway 2 after 1912.

The road up the West Fisher drainage had been built on the same general route of an earlier mining trail which had been laid out and constructed in 1892 by Hank Bramlet and other miners who had been some of the earliest miners to locate quartz mining lode claims in the West Fisher mining district. The June 29, 1899 edition of the Weekly Montanian notes that the road was completed in the West Fisher on June 23, 1899. The road was extended to the site of the American Kootenai mine claims by August of 1899.[22] This was via the Cabinet town site where the road forked from the road to the Brick and Branagan Mine. This road was designated as Road #2332 on the 1970 Libby Ranger

[15] **Map of Lincoln County, Montana, Drawn** by M.K.Kedzie, Libby, Montana, March 1921
[16] **Sanders County Independent Ledger**, August 1, 1934, Volume XXXI, No. 27, page 1
[17] **Sanders County Independent Ledger**, August 15, 1934, Volume XXXI, No. 29, page 1
[18] **Engineering Plat of the Road to the Silver Butte Mining Claims,** Kootenai National Forest Historic Archives, Supervisor's Office, Libby, Montana.
[19] **Western News and The Troy Tribune**, July 26, 1934, Volume XXXIV, No. 8, page 1, Moving Machinery Onto Another Mining Property
[20] **Kootenai National Forest Cumulative Timber Sale Index**, 1909-1980
[21] **Fisher River Land Status Book**, T25N, R30W, BPA Memorandum of Understanding-Noxon-Conkelly 230 KV Line, Supplement #18, 5/27/1969
[22] **Western Mining World,** August 12, 1899, Volume 11, No. 256, page 66

District Map. The road was extended to the Mother Lode Mining Property by 1902.[23] The Gold West Mining Company extended a road one mile west from the Mother Lode, or Beager Cabin, to a proposed mill site and then up to the Golden West Mine, then known as the New Discovery Mine, on the south side of the West Fisher.[24] The August 22, 1929 edition of the Western News noted that the Little Annie (Gloria Mine) was reached by a two mile long trail up the hill from the Mother Lode cabin on the West Fisher.[25] One of the Little Annie claims was relocated in 1959 by A. Templin, R. Seifkie and A. C. Lewis and renamed the Gloria.[26] It is possible the four wheel drive trail was built by this time. In September of 1939, $150.00 was approved by the Lincoln County Commissioners for the repair of the Golden West mine road.[27] In the summer and fall of 1939, the West Fisher road was extended to the Wayup Mine by Robert Holiday.[28]

On July 21, 1947, a road petition was submitted to the Lincoln County Commissioners to lay and construct a public highway from about ¼ of a mile above the mouth of Standard Creek and around to the 'sunny side' of Great Northern Mountain and on the north side of the West Fisher River in a west and then southwesterly direction for two and ½ miles where it would connect with the old road to the Mother Lode.[29] On July 27, 1947, the county commissioners appointed County Commissioner Mahoney and County Surveyor Ira C. Miller to be viewers and report to the board of County Commissioners.[30] On August 7, 1947, the commissioners met, but the viewers report was not ready and was to be deferred to another date, but apparently was never presented.[31]

The Road between the Divide of West Fisher, Standard Creek and upper Libby Creek

It appears that no constructed wagon road connected the divide between the West Fisher River and Libby Creek drainages on or after 1899. The original segment of road connecting the Libby Creek drainage, via Howard Lake, the Midas Mine, and Standard Creek, part of Road #4779, had been declared accepted and declared a public highway by the Flathead County Commissioners on September 18, 1895, but there is not indication of any road being constructed coming up the West Fisher until June of 1899.[32] The General Land Office reports that Township 27 North, Range 30 West, was surveyed from May 27, 1900 to June 16, 1900, by Burton S. Adams. The resulting General Land Office Plat for the township shows a wagon road up to Howard Lake and then a trail continuing past this point into the West Fisher. There was an attempt to build a road from the short lived town of Foundation to the West Fisher in June of 1901 but this did not save the town.[33] This may have been the historical beginning of Road #4779 connecting to Standard Creek and Libby Creek.

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[23] **Western Mining World**, May 10, 1902, Volume 16, No. 19, page 13, Mother Lode Mining Company.
[24] **The Libby Times**, June 26th, 1930, Volume 30, No. 3, page 1
[25] **The Western News**, August 29, 1929, page 1, New Gold Strike on Fisher River Shows Startling Values
[26] **Geology and Mineral Deposits of Lincoln and Flathead Counties, Montana**, by Willis M. Johns, Montana Bureau of Mines and Geology, Bulletin 79, September 1970, pages 108-109
[27] **Commissioners Proceedings,** Lincoln County, Book 5, page 443; September 14, 1939
[28] **Taped Interview of Robert Holiday,** July 16, 1996, Mark J. White, interviewer
[29] **Lincoln County Road Petitions,** Road Petition 156, July 21, 1947
[30] **Comissioners Proceedings,** Book 6, Lincoln County, Montana, July 21, 1947, page 573
[31] **Commissioners Proceedings,** Book 6, Lincoln County, Montana, August 7, 1947, page 580
[32] **The Libby News,** June 29, 1899, page 3
[33] **The Weekly Montanian,** June 01, 1901, Volume VII, No. 26, page 3, Assay of the Times

The earliest maps to show a completed road between the West Fisher and Howard Lake are the 1924 Kootenai National Forest Map and 1927 Lincoln County Map.

The West Fisher-Libby Creek and the Upper Standard Creek Road

There is a junction of upper portion of road #6745 which veers off the old road and is closed by a gate in the SE ¼ of the NE ¼ of Section 31, Township 27 North, Range 30 West. This is the place where the old county road veers north to the Midas Mine. The upper part of the Standard Creek Road #6745, a little over two miles long, was probably built over a mining trail to the mining claims of what was called Mustang Gulch on Standard Creek.

The earliest claims on Standard Creek, located in the Sanders County and Lincoln County mining records to this date, included the North Star, located June 10, 1892, by Herman Hildebrandt, William Williams, and Joe Allen. [34] Other early claims included the Sambo and Great Northern Claims, located in July of 1892, by the same men cited previously.[35] Other claims were located on the upper part of Standard Creek including the Independence and Monte Cristo, located at the head of Standard Creek in 1893 by R.P. McDaniels, Hans Peterson, Charles Carlson, and Peter Eulendorf about a mile from the top of the divide between Libby and West Fisher drainages.[36] Just below these claims, on Standard Creek, Herman Hildedbrandt, William Williams, and Joseph Allen located four claims, the Standard, the Generalissimo, the Colonel and Flathead, part of the Standard Group in 1893.[37]

The August 26, 1903, edition noted that Joe Allen and William Williams were going to do development work on the Great Northern group of mining claims which included the Great Northern, Spokane, Libby Chief, Silver Star, Sambo and Nip and Tuck. The article noted that the surface showing of boulders of lead along with lead and silver in the underground workings. The article noted that the owners had constructed a good trail in 1906, for a distance of three miles, from the property connecting with the wagon road at John's placer property near Howard Lake.[38]

There is no trail shown going up Standard Creek via Mustang Gulch on the 1905/1906 vintage map of the Libby and West Fisher Mining Districts.[39]

There are no maps which have been located which show a trail to the upper part Standard Creek prior to 1931. U.S. Forest Service Trail #116 is indicated on the 1931 Cabinet National Forest Map and the 1932 Kootenai National Forest Map. An oblique aerial photograph taken of the West Fisher and Standard Creek drainages does not show the upper road to Standard Creek but segments to the Midas Mine and Howard Lake can be discerned.[40]

The July 26, 1934 edition of the Western News noted 40 years before that a large lead boulder had been found on Great Northern Mountain that consisted of almost solid galena. It had been located on the 'former Billie Williams and Joe Allen ground on Great Northern Mountain' and the vein which the boulder had been a part had been recently

[34] **Mining Deed Record**, Lincoln County Transcribed, Volume 2, page 27
[35] **Sanders County Mining Locations**, Transcribed, Volume 4, page 591.
[36] **Libby Montanian**, April 2, 1898, page 2
[37] I.B.I.D.
[38] **Western News**, August 23, 1906, Volume V, No. 7, page 02, Good Showing on Great Northern
[39] **Map of the Libby and West Fisher Mining Districts**, Lewis A. Clapp, Spokane, circa 1906
[40] **116th Photo Section**, A 312-33, 1933

located by Frank Dube and a man named Anderson. They were building a road on Great Northern Mountain up Sanders Creek to with a half a mile of the property. Ore had to be packed down to the road, but was rich enough to make some money.[41] This appears to be the construction date of the Standard Creek Road (Road #6745).

The upper portion of Road 6745 can be seen in a 1947 aerial photograph.[42] This upper portion of the road is shown as Trail #116 on Cabinet National Forest and Kootenai National Forests Maps between 1931 and 1958. The upper Standard Creek road does not make an appearance on Kootenai National Forest Maps until 1958, where it is indicated as a 'poor motor road'. The old road was used through the 1960's and into the 1970's. The 1978 Kootenai National Forest Map shows the old road from Howard Lake to the West Fisher had been replaced by the current Road #231 sometime prior to 1978.

The lower segment of Road 6745 leaves Road #231 in the SW ¼ of the NE ¼ of the NE ¼ of Section 5, Township 26 North, Range 30 West, to the SW ¼ NE ¼ SE ¼ NE ¼ of Section 31, Township 27 North, Range 30 West, and is built on or near the pack trail constructed in 1887 from Thompson Falls to Old Town or Lake City.

The original road then goes north to the Midas Mine and Howard Lake while 6745 then bends northwest in the Southeast ¼ of the Northeast ¼ of Section 31, Township 27 North, Range 30 West and goes up to the Northwest ¼ of the Northwest ¼ of Section 25, Township 27 North, Range 31 West. This two mile long segment, which connects the West Fisher to Libby Creek near Howard Lake was declared a county road or public highway in 1896 though not actually constructed until somewhere around 1924. Prior to road construction, there appeared to be a trail in that location based on historic maps.

The present West Fisher (Road 231) route, located off of the old historic route, was constructed in the late 1940's to connect with the Libby Creek drainage.

Other early roads built in the West Fisher drainage include the Fourth of July road built by the Libby Mining Company in 1902 up the 4th of July Creek drainage to access their short lived mining operations at the Ida Claim.[43]

A mining road was built to access the portions of the Tip Top claims located on the north side of Blacktail Mountain in August of 1932 from near the Tip Top mill on Bramlett Creek.[44] Logging roads were built in the West Fisher drainage on U.S. Forest Service and private timber company lands between the late 1950's to the early 1980's.[45]

Miller Creek

The Fisher River was a prehistoric travel route and Miller Creek drains into the Fisher River. It is highly likely a prehistoric trail route existed in the Miller Creek drainage. The earliest trail route into Miller Creek is located on the 1900 General Land Office Plat for Township 27 North, Range 30 West. The township was surveyed from May 27 to June 16, 1900, by Burton S. Adams. A trail is shown on north side of Miller Creek. Another early trail is indicated coming over the divide from Howard Lake and then over the divide to the east to the south fork of Miller Creek and into the main Miller Creek

[41] **Western News,** July 26, 1934, Volume XXXIV, No. 8, page 1, Opening Rich Galena Ore; The article has Sanders Creek instead of Standard Creek
[42] **Aerial 8-19-47, Deg-209-84**, Libby Ranger District Heritage Archives
[43] **The Western News**, July 31, 1902, Volume 1, No. 3, page 02, Merrill Mine a Success
[44] **The Western News**, August 4, 1932, Volume XXXII, No. 8, page 1, Big Program of Work Under Way at Tip Top.
[45] **Kootenai National Forest Cumulative Timber Sale Index**, 1909-1980

drainage. There is a good possibility that these trails were associated with early mining in the area.

In 1932 the U.S. Forest Service had extended a trail east along Teeters Peak ridge where it went to the Teeters Peak Lookout. Teeters Peak was previously called Miller Mountain.

The wagon road built to the West Fisher Mining District crosses Miller Creek near its mouth into the Fisher River.

The first road built up Miller Creek was constructed about 1931 or 1932 through Sections 24, 23, and 22, Township 27 North, Range 30 West to access the homesteads and mining activities on Miller Creek.46 The majority of road construction in the Miller Creek drainage is from the later part of the 1960's as timber harvesting replaced mining as the principal activity in the area. During the late 1970's the roads were constructed up the South Fork of Miller Creek (Road 4724) and the North Fork of Miller Creek (Road 4725) were built to access logging areas and to provide access for mining and recreation activities.

Early Trails

As described above, the earliest trail route into Miller Creek is located on the 1900 General Land Office Plat for Township 27 North, Range 30 West. This same plat shows the old mining trail built in 1887, most likely over an earlier prehistoric route, going through the north side of the Standard Creek drainage and going up towards the divide between the West Fisher and Libby Creek.

The General Land Office Plat for Township 26 North, Range 30 West, surveyed by Fred I. Hubbard from October 3 through 25th, 1903, shows segments of various trails, including the Thompson Falls to Libby Creek pack trail, coming down from Iron Meadow down to Trail Creek and crossing the West Fisher at Foundation Fisher, an early geographical point for miners. The trail continues west northwest on the north side of the West Fisher. Another trail is shown going up Fourth of July Creek and was associated with early mining activities.

U.S. Forest Service Trails were constructed in the project area after the 1910 fire to provide access to remote areas, administrative stations, and lookouts. Trails were built to lookouts such as Kenelty Mountain, Miller Mountain (later renamed Teeters Peak), Barren Peak, Allen Peak and other lookouts.

Trails were built from 1910 with U.S. Forest Service trail construction and reconstruction reaching its height during the 1930's. Some of the forest service trails were built on the routes of earlier trails such as the trail coming up from Silver Butte through Iron Meadow and down Trail Creek to the West Fisher. Many U.S. Forest Service Trails have been impacted by road development for timber harvest on U.S. Forest Service and private timber lands. Other historic U.S. Forest Service trails are still being maintained for public use.

[46] **Miller Creek Integrated Resource Analysis,** Libby Ranger District, Kootenai National Forest, December 1993, page 43

Historic Mining

Silver Butte Drainage

Placer mining in the project area may have occurred as early as the spring of 1867 in the Vermilion drainage. The miners who prospected on the Vermilion may have explored and prospected into the Silver Butte Country. The first rush on the Vermilion was noted in the April 10, 1867, edition of the Walla Walla Statesmen which tells of 150 miners that had come from the Jocko and were laying out claims on the Vermilion. This must have been a short term discovery because there is not subsequent mention of mining on the Vermilion and Lyons Gulch country until the 1880's.

In 1885 a second rush began on Libby Creek with miners coming from Thompson Falls via a route up the Vermilion River, over Lyons Gulch, through the Silver Butte drainage and over into the West Fisher to the placer mining on the upper part of Libby Creek near the mouth of Ramsey Creek in August of 1885 and the rules of the Libby Creek Mining District established on September 25, 1885.47

The earliest mining claims, located thus far, in the Silver Butte portion of the project area included the following claims:

Silver Butte Quartz Lode, located on June 20, 1887, by Wilbur Criderman, N. B. Donley, and J. L. Hartt48

Monarch Quartz Lode, located on June 20, 1887, by the same miners mentioned in the previous claim

Silver Star Quartz Lode Mining Claim, located on September 23, 1887, located by Wilbur Criderman, N. B. Donley, and J. L. Hart.

Caribou Mining Claim, located on February 23, 1889, by Wilbur Criderman, N. B. Donley, and J. L. Hart.

During the late 1880's gold and silver claims were located in Silver Butte drainage and by 1891 the Silver Star mining claim was being worked under bond. The Pan Handle, one of the mines that would be part of the later Kentucky and Mining operations, had been worked as well and had been worked with a tunnel over 200 feet long.49 Very little can be found on the mines in the vicinity of Silver Butte after 1892, but it can probably be tied to the financial Panic of 1893 and subsequent plummet in the price of silver. Economic conditions for the silver mining industry improved in the mid 1890's.

The Kentucky and Montana Mining Company began development of the Silver Butte Mine in 1895 with the construction of the road to their operations. The mines produced silver, lead and zinc.

In 1897 the road was improved and a sawmill for building a mill and associated buildings, concentrating equipment, tramway equipment, and other mining equipment were brought in for further development of the Silver Butte Mine. The mine apparently was not profitable as the mine was attached by creditors and was to be sold in an auction

[47] **The Weekly Missoulian**, October 16, 1885, Volume XIII, No. 22, page 2imeMi
[48] **Quartz Locations**, Book 1, Lincoln County, Montana, Transcribed, page 49
[49] **Missoula Gazette**, December 18, 1891, Volume 4, No. 112

by the Flathead County Sheriff on December 8, 1899.50 The property sold for $7,789.80 to Jay Lawyer representing the interests of Baldan and Baldan, a legal firm in Spokane, Washington.51 The mine operated in 1900 but the mill burned to the ground some years prior to 1905.52 In 1943, the old Kentucky and Montana mines were owned by F. O. Berg of Spokane, Washington. A new company, the Silver Butte Zinc-Lead Mining Company was formed, and began redeveloping the mines. The old mining operations were renamed the King Mine. By 1946, $100,000 had been expanded in developing the mines. The development included the construction of an 80 ton a day flotation mill but operations must not have been successful. The property was sold for taxes in the 1950's and the mill dismantled.53

The Viking Mine, also located in the Silver Butte drainage, was a gold mine developed during the Great Depression of the 1930's. The Gold Hill, Gold Hill No. 2 and Gold Hill No. 3 claims were located by Mark Fowler in April of 1934.54 The Viking Mining Company was incorporated on June 11, 1934.55 Construction began on the mill in 1934 and 1935.56 The expense of mill construction coupled with mismanagement and lack of technical advice led to the failure of the operation.57 Tunnel development continued to 1939 but by the early 1940's operation came to a halt and the mill was eventually disassembled.

The West Fisher Mining District

The West Fisher Mining District was a quartz gold mining district in which initial lode claims were located in 1892. Some of the earliest claims in the district were located on Standard Creek. Records for these claims were located in the mining records of Sanders County and Lincoln County. The North Star, on Standard Creek, was located June 10, 1892, by Herman Hildebrandt, William Williams, and Joe Allen. [58] Other early claims included the Sambo and Great Northern Claims, located in July of 1892, by the same men cited previously.[59] Other claims were located on the upper part of Standard Creek included the Independence and Monte Cristo, located at the head of Standard Creek in 1893 by R. P. McDaniels, Hans Peterson, Charles Carlson, and Peter Eulendorf about a mile from the top of the divide between Libby and West Fisher drainages.[60] Just below these claims, on Standard Creek, Herman Hildebrandt, William Williams, and Joseph

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[50] **The Interlake**, November 17, 1899, Volume 11, No. 13, page 8, Sheriff's Sale
[51] **The Libby News**, December 21, 1899, Volume II, No. 37, page 3, Fifty Thousand in the Hole
[52] **A Geological Reconnaissance in Northern Idaho and Northwestern Montana by F.C. Calkins with Notes on the Economic Geology by D.F. McDonald**, Department of the Interior, United States Geological Survey, Bulletin 384, 1909, page 105
[53] **Geology and Mineral Deposits of Lincoln and Flathead Counties, Montana**, by Willis M. Johns, Montana Bureau of Mines and Geology, Bulletin 79, September 1970, pages 121-122
[54] **Mineral Survey 10755**, Plat of the Claim Known as the Gold Hill, Gold Hill No. 2 and Gold Hill No. 3 Lodes.
[55] **Western News**, Thursday, July 26, 1934, Volume XXXIV, No. 8, page 1, Moving Machinery Onto Another Mining Property
[56] **The Life and Times of the Viking Mine, The History of a Depression Era Gold Venture**, by Steve Land, The Fisher River Ranger District, Libby, Montana, 1993, page 16
[57] **A Report on the Gold Hill Group of Mining claims, Cabinet Mining District, Lincoln County Montana** by Uuno M. Sahinen, August 31, 1946
[58] **Mining Deed Record**, Lincoln County Transcribed, Volume 2, page 27
[59] **Sanders County Mining Locations**, Transcribed, Volume 4, page 591
[60] **Libby Montanian**, April 2, 1898, page 2

Allen located four claims, the Standard, the Generalissimo, the Colonel and Flathead, part of the Standard Group in 1893.[61] Some of the early claims between Bramlet Creek and the West Fisher included the Blacktail Quartz Lode Mining Claim, located on July 12, 1892, by Don E. Schanck, J. H. Bramlet, John Cowell, and Albert Roderick.

The Depression of 1893, curtailed further development work in this gold mining district for a number of years though many claims had been located throughout the West Fisher drainage. In the summer of 1899 the West Fisher Mining District began to see major development with the construction of a wagon road that connected the district to Libby and the railroad that would make it possible to bring in the mining equipment to work the mines. The heyday of the West Fisher Mining District was from 1899 until about 1910 with another spurt of activity in the 1930's and 1940's.

Some of the major mines included the Brick and Branagan Mine which was operated by the Fisher Creek Mining Company. In 1900 the Fisher Creek Mining Company built a 1,500 foot long tramway and built a stamp mill. There were 18,000 tons of ore processed from the Branagan mines between 1901 and 1903. $150,000 in value was produced though milling was only 60% efficient. The mine operated intermittently until 1950. The Courageous Mining Company built the new mill in 1940 and produced 24,239 tons of ore.[62] The new mill in 1940 utilized an Allis-Chalmers jaw crusher where it went to a cone crusher and then to a Union Iron Works ball mill. The gold was taken out by an amalgamator and riffles. Eventually the remaining muddy water containing ore was sent to flotation cells where metals were recovered through the flotation method and then dried.[63]

The American Kootenai Mine on West Fisher Creek operated from 1899 to 1910. The mill was constructed in 1900 and began operating in December of 1900 but then was closed due to mechanical problems with the main shaft that drove the mill in January of 1901.[64] The mill resumed operation in spring of 1901 and operated until November of the same year. A snow slide destroyed the tramway system and upper camp for the American Kootenai. The mines operated until 1910 when a snow slide destroyed the mill. Repairs were completed on the mill by 1912 but the mine operations never resumed operations.

The Blacktail Group of mines, located in 1892, was developed by the Blacktail Mining Corporation which formed in December of 1900.[65] The mine was a producer of gold and galena ore. The original locaters of the Blacktail Group; Don Schanck, J.H. Bramlet, John Cowell and Albert Roderick, the original locaters of the claims had a legal battle with Mr. Rockerfeller and Flick of Anaconda who had filed counter claims on the same ore lead. The case went to court where a compromise was reached. The partners signed over half their holdings to Sanford and Grubb, the lawyers who took their case. The two Kalispell lawyers organized the Blacktail Mining and Milling Company. The mill was completed for the Blacktail Group in December of 1901. The mill was damaged by snow slide in March of 1902 and the engine house demolished and the mill crushed.[66] Operations resumed in June of 1902. Operations ceased after this time. In 1909 and 1911 the mine

[61] I.B.I.D.
[62] **Geology and Mineral Deposits of Lincoln and Flathead Counties, Montana**, by Willis M. Johns, Montana Bureau of Mines and Geology, Bulletin 79, September 1970, pages 107
[63] **Western News**, October 24, 1940, Volume XV, page 1
[64] **Western Mining World**, January 3, 1901, Volume 14, No. 1, page 7
[65] **Western Mining World**, December 15, 1900, Volume 13, No. 24, pages 281 and 282, Black Gold Mine
[66] **Western Mining World**, March 15, 1902, Volume 16, No. 11, page 16

operated by lessees but operations stopped again until the 1920's.[67] In 1913 Mr. S.A. Whiting and John Branagan located two claims on the north side of Blacktail Mountain which was called the Blacktail Mine. John Branagan passed away and Whiting became the sole owner of the mines. He also acquired the old American Kootenai Group and in the summer additional veins were found on the south side of Blacktail Mountain. In 1926 Oscar Miller was taken into partnership and the Branagan Mill and mill site on Branagan Creek were acquired. In 1927, the ten-stamp mill was repaired and a dam and penstock built. A 1450 long tramway with two buckets was installed to take ore from the veins on the south side of the mountain to the mill.[68] In February of 1928 the Tip Top Mining Company was incorporated by S.A. Whiting, V.W. Weller, and O.V. Miller. In 1932 a twelve foot dam was built at Bramlet Lake and road was built around the north side of Blacktail Mountain.[69] The Blacktail, Tip Top, and New Deal Properties were all part of the Jumbo Group of claims. Gold ore was processed from the Tip Top Mill in 1928 and 1929. The mines and mill operated until 1941.[70]

The Golden West Mining Company developed the Golden West and Little Annie (later known as the Gloria) two gold mines in 1930. The Gloria (Little Annie) primarily produced some gold but had some silver as well.

The mines operated until about 1939. The Little Annie was relocated in 1959 by A. Templin, R. Seifkie and A. C. Lewis but there appears to be little development after this time.[71] There is no evidence a mill was constructed and ores were shipped out of the mines by truck.

The original claims for the Midas Mine were located in 1905. Construction of the initial stamp mill took place in 1914 with the construction of a five stamp mill.[72] A large log mill building was constructed and was described as the largest log building in Lincoln County, Montana. It contained two batteries of stamps with five stamps in each.[73] The mill was built and new equipment installed in 1927 by the Midas Gold Mining and Mill Company.[74] Electric drills were utilized in the mines and a small electric locomotive pulled ore cars from the mine to the mill. The new mill used jaw crushers and ball to process the ore through flotation process. The mill could process between 50 and 75 tons of ore a day.[75] In May of 1928, cyanide equipment was installed at the Midas to aid in recovering tungsten.[76] The mine produced $59,000 between 1905 and 1933 with 4,500 tons of gold ore processed through the amalgamation in 1932.[77] The mine operated until 1936. The flotation mill at the Midas was also used as a custom mill to process ore from

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[67] **Geology and Mineral Deposits of Lincoln and Flathead Counties, Montana**, by Willis M. Johns, Montana Bureau of Mines and Geology, Bulletin 79, September 1970, pages 107
[68] **Western News**, February 28, 1928, Volume XXVII, No. 37, page 1, Organize New Mining Corporation
[69] **Western news,** Thursday, August 4, 1932, page 1
[70] **Geology and Mineral Deposits of Lincoln and Flathead Counties, Montana**, by Willis M. Johns, Montana Bureau of Mines and Geology, Bulletin 79, September 1970, pages 107
[71] I.B.I.D., pages 108-109
[72] **Western News**, October 27, 1914, Volume XIII, No. 17, page 1
[73] **Western News**, August 23, 1914, Volume XVII, No. 9, page 1, Equipment and Prospects of Rose Consolidated Mine are Encouraging to Owners
[74] **Western News**, July 21, 1927,.Volume XXVII, No. 6, page1, Midas Will Build Steel Frame Mill
[75] **Western News**, March 8, 1928, Volume XXVII, No. 39, page 1, Libby Men Spend Day at Midas
[76] **Western News**, May 3, 1928, Volume XXVII, No. 47, page 1, Installing Cyanide Equipment at Midas
[77] **Geology and Mineral Deposits of Lincoln and Flathead Counties**, Montana, by Willis M. Johns, Montana Bureau of Mines and Geology, Bulletin 79, September 1970, pages 105-106

the Branagan mine in the early 1930's.[78] The mine had some production during World War II with some 10 tons of ore processed in 1945 but closed permanently after this time.[79]

There were many small mines operated in the district from 1899 to the 1960's such as the John Geiger's Illinois and Montana Mining Company operations in the Geiger Lake at the turn of the century and many other small mines.

Miller Creek Mining

Mining on Miller Creek was limited in scale compared to the West Fisher and Standard Creeks. There were claims located on upper Miller Creek in 1897 by John Vest, Albert Higgins, Thomas Dunn, R. P. McDaniels, and Hans Peterson.80 Mining claims were located on the South Fork of Miller Creek on July 27, 1900 by Charles McDonald, George McKay, and D. J. McDonald. Later claims were located or relocated over older claims in 1935, 1939, 1951, 1954, and 1970. Very little gold was located in these prospects.

Placer Claims were located in 1901 at the mouth of Miller Creek where B. F. Howard located the Lexington Placer on January 23, 1901, the Edna Placer on April 13, 1901, and the Caroline Placer on April 10, 1901. The claims were platted in July of 1901. Miller Creek flows through the Caroline and Edna Placers in Section 30, Township 27 North, Range 29 West. The lands were patented to B. F. Howard on July 8, 1907. The J. Neils Lumber Company acquired these patented properties which later transferred to Plum Creek Timber Company.81

The Forest Fire of 1889

The Silver Butte drainage may have burned in August of 1889. The August 14,1889, edition of the Missoulian reported that fires were fierce on the Vermilion, Lyons and Libby Creeks.82 The cause of the fire was sparks from a locomotive on the Northern Pacific Railroad on the Clark Fork River.

The Forest Fire of 1910

During the last week of August of 1910, forest fires came up from the Vermilion River and burned the Silver Butte drainage. The fire then reached Silver Butte Fisher River and reached the West Fisher. Another forest fire burned from Swamp Creek on the Clark Fork River and burned on the head of the West Fisher and Miller Creek.83 Heavy rains fell at the end of the month and the situation improved for fire fighters by September 1, 1910.84 The fires extensively burned the Silver Butte, West Fisher and Miller Creek drainages. The fire of 1910 burned over the former town sites of Foundation and Cabinet. All of the mills in the district, including the American Kootenai mill, were burned except

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[78] **Taped Interview of Robert Holiday**, July 16, 1996, Mark J. White, interviewer

[79] **Geology and Mineral Deposits of Lincoln and Flathead Counties, Montana**, by Willis M. Johns, Montana Bureau of Mines and Geology, Bulletin 79, September 1970, page 105

[80] **Libby Montanian**, April 2, 1898, page 03

[81] **Miller Creek Integrated Resource Analysis**, Libby Ranger District, September 1993, Chapter II, page 46

[82] **Missoulian**, August 14, 1889, Volume 18, No. 12, page 4

[83] **Western News**, August 25, 1910, page 1

[84] **Western News**, September 1, 1910, page 1`

for the Brick and Branagan Mine on Bramlet Creek.85 The fire in the Silver Butte drainage opened the area for homesteading.

Historic Logging

Logging took place in conjunction with the development of mining operations at the Silver Butte Mine in 1897 and in the West Fisher Mining District from 1899 until the 1910 fire. Small sawmill operations were utilized in conjunction with the construction of mine buildings, mine timbers, and town sites. The Burlingham Brothers operated a small sawmill in the West Fisher for construction of the buildings of the town of Foundation.86 Large areas of the Silver Butte, Miller Creek, and West Fisher drainages burned in August of 1910 and it was about half a century before large scale logging took place in the project area.

Logging on a large scale commenced by St. Regis Timber Company in the project area in the late 1950's and reached its height in the early 1980's. Logging continues to this day on a smaller scale on private and U. S. Forest Service lands.

Railroad Grants

Much of the Plum Creek checkerboard landholdings, including portions of the former Champion International Lands, were originally Northern Pacific Railroad grant lands. In 1864 Congress passed an act which directed for the construction of a railroad route from Lake Superior to Portland, Oregon Territory. A charter was provided for the Northern Pacific Railroad which acquired the largest railroad grant in the history of United States railroads. There were 44 million acres of land granted by the United States Government to the Northern Pacific Railroad. There were 17 million of these acres granted inside the Montana Territory. The lands granted to the Northern Pacific Railroad were to be surveyed and were granted in a checkerboard pattern on either side of the right-of-way. The other sections were retained by the government. Some lands had been already taken for Indian reservations, homesteads, or preempted so the United States Congress set aside an additional 10 miles of checkerboard land grants on either side of the railroad right-of-way.

Later Congress authorized land certificates to the Northern Pacific Railroad beyond these limits which included 40 and 50 mile limits on the Northern Pacific right-of-way grants. The Northern Pacific Railroad was constructed into northwestern Montana in 1883. Many of the Northern Pacific selections in the West Fisher were made between 1918 and 1923. In the early 1900's the Northern Pacific Railroad began to dispose of portions of their holdings in Lincoln and Sanders Counties. The Big Blackfoot Milling Company, a subsidiary of the Anaconda Mining Company, sent timber cruisers throughout northwestern Montana to acquire the best timber lands of the Northern Pacific Railroad. Portions of what were then Missoula and Flathead Counties, later Lincoln and Sanders Counties, were cruised by Big Blackfoot Surveyors from 1901 to 1903. The Northern Pacific Railroad retained some lands in northwestern Montana which eventually were transferred to Plum Creek Timber Company along with lands acquired from Champion Timber Company in 1993, after their divesture of their lands and mill in Lincoln County.

[85] **The Western News**, August 29, 1929, page 1
[86] **The Libby Montanian**, March 14, 1901, page 03

Plum Creek Timber Company has, in recent years been converting areas of former timberlands into real estate development.

West Fisher Settlement

Native American use of the West Fisher drainage took place for thousands of years. The Ktunaxa, or Kootenai people have utilized resources such as huckleberries for generations. Settlement of the West Fisher by Euroamericans began in the project area in the early 1890's, when miners began to prospect on the West Fisher, until the first decades of the twentieth century. The earlier homesteads were in the major drainages and near mining areas, or well watered areas with trail access. Homesteads in the West Fisher date as early as the late 1890's. Some homesteads were established under the Homestead Act of 1862, the Timber and Stone Act of 1878, the Agricultural Act of 1906, or the Forest Homestead Act. Miners built cabins to work their claims while the larger mines built facilities for their work force.

The West Fisher drainage was settled during the development of the West Fisher Mining District in 1899. Some of these settlers were the early miners and businessmen who settled on lands during this development period.

One early homesteader in the West Fisher drainage was J. R. Henry of Libby who filed a "Declaration of Occupancy" for a homestead on Bramlet Creek on September 5, 1899. The homestead was never patented.87 Hans Peterson, one of the early miners who had been prospecting on the West Fisher since 1893, had a cabin in Section 2, Township 26 North, Range 30 West, which was noted on the 1904 General Land Office Plat. Fred I. Hubbard, who was the contract surveyor for the General Land Office, surveyed the north half of the township from October 3 to October 25, 1903. This homestead was patented on June 28, 1909 under the Forest Homestead Act. Many of the cabins in the West Fisher were occupied by miners. One miner was Herman Hildebrandt who had prospected in the West Fisher beginning in 1892 and worked in the district until he left the West Fisher in 1904.

Two small short-lived mining camps developed in the West Fisher were Foundation and Cabinet City. Foundation, the earlier of the two camps, was first mentioned in the June 10, 1899, edition of the Montanian. Herman Hildebrandt and a company from Thompson Falls had located the new town at the time the West Fisher was having its initial boom. The town was originally named Manila.88 The name of the town was changed several weeks later to Foundation due to its proximity to the Foundation-Fisher crossing on the West Fisher of the old trail from Thompson Falls to Libby Creek. The small camp boomed for a short period of time but was never very large. At one point in 1901 The West Fisher Gazette, a newspaper edited by G. E. Shawler, was published in Foundation from April to September of 1901.89 Shawler's venture soon failed as well as the town itself. There was a hotel run by a Captain Lucas and Thomas Houston as well as a store operated by E. J. Merrin. The Burlingham Brothers operated a small sawmill on the West Fisher and cut the lumber for the town.90

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[87] **Declaration of Occupancy**, Lincoln County, Transcribed, Book 1, page 141
[88] **The Weekly Montanian**, June 10, 1899, page 2
[89] **The Weekly Montanian**, September 7, 1901, Volume VII, No. 40, page 2
[90] **The Libby News**, March 21, 1901, page 3, Building Boom On

By 1902 buildings were being moved out of Foundation and being hauled to the new town of Cabinet.91 The township where the town was located was surveyed by Fred I. Hubbard in October of 1903. He noted that the old town of Foundation contained three unoccupied buildings.92 The site of the town was burned in the 1910 fire.

In 1901 the town site of Cabinet was established in the West Fisher Mining District on what had been the Huckleberry Placer. In June of 1901 four new buildings opened up at the forks of the road where one road went to the mines on Bramlet Creek while the other road went over the hill to the mines on the West Fisher.93 By August of 1901 four blocks of land were being cleared for a new town site that would be called Cabinet. The August 31, 1901, edition of the Montanian noted that the people of the West Fisher Mining District needed a supply point located in the proper place. This may be the reason that Foundation was abandoned because it was not located in an optimal location for access to the mines. It also noted in the same edition that a post office, general merchandise store, hotel, two saloons, barber shop and feed stable had been built.94 The town boomed briefly but then began its decline after 1903. The fire of August 1910 burned over the Cabinet town site and the town was never rebuilt.

Silver Butte Fisher Settlement

Native Americans had traveled and camped in the area for thousands of years but in the 1880's miners began to build cabins and the mines developed in the upper reaches of Silver Butte. Homesteading in the Silver Butte drainage did not take place until after the 1910 fire had burnt much of the forest in the drainage. In 1912, Herbert J. Fowler and his family moved into the Silver Butte country by way of the Vermilion and Lyons Gulch to Silver Butte Pass using the old wagon road to the former Kentucky and Montana mines at Silver Butte. This was the end of the road at that time and a trail was cut for seven miles down the Silver Butte drainage and pack horses used to bring their possessions to their new homestead near Trapper Creek.95 A. E. Peterson was another homesteader who moved into the Silver Butte Country in about 1914. He received patent to his homestead on July 18, 1918. By March of 1920 the Western News noted that there were about a dozen ranchers living in the Silver Butte valley.96 Enough families lived in the area that Lincoln County School District #22 was established on January 17, 1920, and a school built next to the Silver Butte Road.

Miller Creek Settlement

The Miller Creek drainage, much like Silver Butte Fisher and the West Fisher drainages, was used by Native Americans for thousands of years. Early newspapers published in Libby indicate that prospectors began to work on the upper end of Miller Creek in 1897.97 Homesteading began near the Miller Creek drainage in the late 1890's. A series of homesteads were established between 1903 and 1906 and have the appearance of

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[91] **The Weekly Montanian**, May 17, 1902, Volume VIII, No. 18, page 2
[92] **Field Notes of the Survey of T 26 N, R 30 W**, as Surveyed by Fred I. Hubbard, October 26, 1903, page 764
[93] **The Weekly Montanian**, June 08, 1901, Volume VII, No. 27, page 3
[94] **The Weekly Montanian**, August 31, 1901, Volume VII, No. 39, page 2
[95] **In the Shadow of the Cabinets, Early Kootenai Country**, Published by the Libby Institute of the Art's Writers Group, Inc. "Homestead on Silver Butte", page 117
[96] **Western News**, March 11, 1920, page 1, County Road will be Built into Silver Butte
[97] **Libby Montanian**, April 2, 1898, page 03

timber acquisition of the government domain by 'dummy entrymen' who were financed by timber companies to occupy and file on timber lands and, after receiving land patents, selling them to the timber companies. A number of homesteads were patented in the Miller Creek drainage and later sold to Julius Neils in 1906. He used the process to acquire timberlands and consolidate them into a growing timber base for future operations or timber trades with other companies in what would later be Lincoln County. An early settler in the area, John H. Geiger, had a ranch on the Fisher River near the project area in the late 1890's that did not sell to Julius Neils.

Some of the early settlers on Miller Creek included the following:

Julia A. Brown received a patent for 80 acres on Miller Creek on February 12, 1903. She sold the property to Julius Neils on May 2, 1906.

John W. O'Brien received a patent for 80 acres in a different section on February 12, 1903. He sold the property to Julius Neils on May 2, 1906.

Gordon B. Haynes received a patent for 160 acres on May 20, 1903. He sold the land to Leon N. Brown, who acquired the land on the same day. Julius Neils acquired the 160 acres from Leon N. Brown on May 2, 1906.

Harry J. Stoops received a patent for 160 acres on Miller Creek on September 21, 1903. The land title was transferred to C. F. Mogle on April 25, 1905. A. LaCharity acquired this parcel on October 8, 1908. John B. LaCharity acquired the land on August 14, 1943 and sold it to the J. Neils Lumber Company on August 28, 1945.98

Unfortunately for J. Neils, the fire of August 1910 destroyed most of the timber in the Miller Creek drainage.

The last homestead patent in the Miller Creek drainage was for 67.50 acres granted to Harriet Ralston on October 16, 1939, in Section 22, Township 27 North, Range 30 West. The land had originally been filed on by Mr. Frank Ayotte on May 15, 1914. The Ayotte family had been early settlers who had camped up on Swamp Creek at the Fisher Divide in the early 1890's99 The homestead claim was located on U.S. Forest Service land that had burned in the 1910 fire and was listed as potentially agricultural. Frank Ayotte had 160 acres listed to him on September 9, 1915, under List #1-2971. He later relinquished his claim and Mr. H. K. Shelly entered on the same 160 acres June 24, 1921. He didn't last very long and relinquished the land on December 5, 1922. H. Keinitz entered on the Forest Service list for the land on February 8, 1924. Mr. R. W. Heeter filed on the same area on February 8, 1924. There was no residence established on the claim since October 1, 1923.

On September 25, 1925, Ranger E. A. Woods of the Swamp Creek Ranger Station submitted a Recall of Lists Report on List 1-2971. He noted that the only evidence of settlement on the claim was a 10 foot by 12 foot cabin and a 10 foot by 12 foot frame structure. The frame structure had been constructed by H. Keinitz during the summer of 1923. The party who constructed the other cabin was unknown. E. A. Woods noted in his report that one and a quarter acres had been slashed adjacent to the cabins. The Assistant Commissioner of the United States Department of the Interior revoked 92.5 acres from

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98 98 **Miller Creek Integrated Resource Analysis**, Libby Ranger District, Kootenai National Forest, December 1993, Chapter II, page 50

99 **Wandering Feet**, Don E. Schanck, 1919, page 34.

the claim on May 1, 1926. On May 10, 1926 Mr. Rudolf W. Heeter filed his entry on this parcel. He then lost the entry of July of 1929. Mr. and Mrs. Frank Ralston filed on the claim in 1932 and received title to the 67.50 acres. The land remains private to the present day100.

U.S. Forest Service

The Cabinet Reserve was proclaimed in March of 1907. In July of 1908, the area south of Kootenai River and north of the divide of the Kootenai and Clark Fork drainages was transferred to the Kootenai National Forest. Early Ranger Stations adjacent to the project area include the Raven Ranger Station built in 1908 and the Swamp Creek Ranger Station built in 1908 and abandoned by 1935. The West Fisher Administrative Station was built near the Foundation Fisher on the West Fisher after 1912. The fire of 1910 led to fire suppression efforts through the construction of lookouts, trails, telephone lines and tool caches in the project area beginning in the early 1920's. There were lookouts built on Teeters Peak (then known as Miller Mountain), Allen Peak, and Barren Peak in the project area in the 1930's. Only the Barren Peak lookout remains standing in the project area.

Forest Plan Standards and Guidelines

Cultural resource inventories are required prior to any ground-disturbing activities, in an effort to locate and evaluate historic properties. The Forest Service and other Federal Agencies are required to address historic properties in the United States under several statutes, most notably the National Historic Preservation Act of 1966. These requirements are carried forward in the Forest Plan (Forest Plan, Vol. 2, Appendix 19).

Historic properties identified by a cultural resource inventory are evaluated for eligibility to the National Register of Historic Places. Properties that are determined as eligible are managed to either protect them in-place or to mitigate adverse project impacts. Eligibility and management provisions must be reviewed by the State Historic Preservation Office. This process must take place prior to impacts on the ground.

The location of historic properties is exempt from public disclosure as described in FSH 6209.13 11.2 and.22. The purpose of this exemption is to protect properties from harm and to retain confidentiality of properties culturally significant to American Indian Tribes.

Affected Environment

The affect environment includes the West Fisher, Miller Creek, and Silver Butte drainages and their tributaries. The legal description of the project area includes all or portions of T27N, R31W; T27N, R30W; T27N, R29W; T26N, R29W; T26N, R30W; T26N, R31W; T25N, R31W; T25N, R30W; and T25N, R29W.

Eighty-six previous cultural resource inventories had been completed in the project area. There are 38 previously recorded sites in the project area. Specific information about these inventories and sites is located in the project file. The site types that have been recorded in the project area consist of: nine prehistoric sites (one which is also has a

[100] **Miller Creek Integrated Resource Analysis**, Libby Ranger District, Kootenai National Forest, December 1993, Chapter II, page 50

historic component), seven historic trails, four historic mining roads, eleven historic mining sites, four mining occupation cabin sites, one historic townsite and two lookouts. There were sixteen determined or presumed eligible to the National Register of Historic Places located in the project area.

The cultural resource inventory was conducted under the direction of the Kootenai National Forest Guidelines for Site Survey Strategy, 2001.

Fieldwork for the Miller-West Fisher project area has been completed and the results of the inventory will be documented in a Cultural Resource Inventory of the Miller West Fisher EIS Project, 09-KO-5-01 and will be submitted in accordance with Section 106 of the National Historic Preservation Act. All associated sites will be recorded and impacts to eligible historic properties mitigated with the Montana State Historic Preservation Office. The Confederated Salish and Kootenai Tribes will be included in these discussions where American Indian affiliated sites are involved.

The results of the inventory will be documented and submitted to the Montana and Idaho State Historic Preservation Offices in accordance with Section 106 of the National Historic Preservation Act. The Confederated Salish and Kootenai Tribes will be included in those discussions where historic properties associated with aboriginal occupation are involved.

Environmental Consequences

Historic properties can be diminished in value by any change in their historical, architectural, archaeological, or cultural character. Adverse impacts to historic properties can result in their damage or complete destruction, the effects of which are irreversible. In cases of partial damage, the undisturbed portion of the property may still provide valuable information.

The management intent is to identify all historic properties, evaluate their eligibility to the National Register, and avoid or mitigate any adverse effects of proposed activities. The potential exists for unidentified properties to be found and disturbed as the project proceeds. If previously undiscovered properties are found, they would be protected under conditions on Forest activities, such as timber sale contract provisions, which provide for their protection. Implementation of any alternative will not result in any impacts on historic properties, as long as the Forest Plan Standards are followed.

The effects on historic properties may vary with the type of property, as well as the type of project. All historic properties may be impacted by activities which draw people into an area, increasing the likelihood of vandalism, looting or incidental damage done through use of an area.

Where avoidance of an eligible historic property is not possible, measures are developed to mitigate or limit the effects of the project. Where the loss of the property or a portion of the property will occur, the loss can be mitigated by data recovery. Data recovery generally includes a synthesis of known information about the property, and a plan for research to retrieve further information from the property. Further information may be retrieved through excavation and analysis of the results and through research and documentation of the relevant records and histories. Interpretation of the property is generally intended to inform the public about the history of the area to provide greater understanding of their cultural environment. Limiting the extent of disturbance to a

property could include modifying the operating season of a project so that soil disturbance is kept to a minimum or limiting the equipment used, or the area where operations can take place to only a portion of the property.

ALTERNATIVE 1- NO ACTION

Under this alternative no action is planned, and any unknown but existing properties, as well as those known properties would remain undisturbed outside of natural deterioration.

ALTERNATIVES 2, 4, 6, and 7

Direct and Indirect Effects

The project area has been inventoried. The inventory will be submitted to the Montana State Historic Preservation Office in accordance with the provisions of the Region One Programmatic Agreement regarding Cultural Resource Management in the State of Montana (R1 PA) prior to project implementation. Three previously recorded cultural sites, including one site determined eligible to the National Register of Historic Places and two sites presumed eligible, are located in areas of potential effect of the project but will be avoided or protected. Sites recorded during this inventory included three mining sites which are located outside the area of potential effect of the project. The Barren Peak Lookout, 24LN311, an eligible historic lookout, is located in a prescribed burn unit, and will be protected. Historic trails located in prescribed burn units or harvest units will be protected under the stipulations of the standards agreed to with the Montana SHPO in the *Kootenai National Forest Programmatic Agreement Regarding Treatment of Historic Trails and Logging Remains (KNF PMOA*).

If additional properties are encountered in the course of further inventory or project implementation, the District Archaeologist would determine the eligibility of the property and project effects. The Forest Archaeologist would consult with the State Historic Preservation Office and The Confederated Salish and Kootenai Tribes, where historic properties associated with aboriginal occupation are involved.

Effects of Other Activities

A combination of additional activities is included in the action alternatives. These include road reconstruction and implementation of BMP's, road storage and decommissioning, access changes, trail reconstruction, trailhead improvement, construction of stock corrals at Lake Creek Campground, fuel reduction and hazard tree removal in Lake Creek Campground, pool creation and stream bank stabilization in project area watersheds, private access to the Irish Boy Mine property, and spring developments in the North Fork of Miller Creek. These activities will not contribute a measurable effect to cultural resources because impacted areas have been inventoried and potential impacts mitigated.

Cumulative Effects

Past Action and their Effect on Current Conditions: Before the National Historic Preservation Act (NHPA) of 1966 was implemented project planning did not include consideration of impacts to historic properties. Any projects such as timber harvest, road building, fire suppression activities etc that occurred prior to this, had the potential to

adversely impact historic properties, and many of these projects occurred in areas considered high probability for cultural resources and so probably damaged or destroyed cultural sites. Conversely, the remains of some of these activities that took place longer than 50 years ago may now be considered cultural resources, 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 the 1970s, 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 resource is ongoing, 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 also allows the potential for management action to abate or mitigate natural processes which adversely affect the historic record.

As described in the direct and indirect effects section, there will be no adverse or beneficial effects to historic properties from any of the action alternatives. Ongoing efforts to locate and document historic properties allow their protection from proposed undertakings.

Effects of Ongoing and Reasonable Foreseeable Actions: The ongoing and foreseeing activities listed in the Past, Present, and Reasonably Foreseeable Actions section of Chapter 3 were considered in this analysis. Fire suppression activities can impact cultural resources; however, Appendix 3 of the Northern Region Programmatic Agreement regarding Cultural Resources Management on National Forests in the State of Montana seeks to limit the potential of fire suppression activities to impact sites by setting out guidelines for protecting cultural resources during these activities.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions: Cumulatively, when considering past, proposed, and ongoing and foreseeable actions, the Miller West Fisher project will not exacerbate effects to historic properties. The post-project condition and trend would continue the current condition and trend which protects historic properties through inventory and project design so no historic properties are impacted by project implementation.

Mitigation

The effects on historic properties may vary with the type of property, as well as the type of project. All historic properties may be impacted by activities that draw people into an area, increasing the likelihood of vandalism, looting or incidental damage done through use of an area.

Where avoidance of an eligible historic property is not possible, measures are developed to mitigate or limit the effects of the project. Where the loss of the property, or a portion of the property will occur, the loss can mitigated by data recovery. Data recovery generally includes a synthesis of known information about the property, and a plan for research to retrieve further information from the property. Further information may be retrieved through excavation and analysis of the results and through research and documentation of the relevant records and histories. Interpretation of the property is

generally intended to inform the public about the history of the area to provide greater understanding of their cultural environment. Limiting the extent of disturbance to a property could include modifying the operating season of a project so that soil disturbance is kept to a minimum or limiting the equipment used, or the area where operations can take place to only a portion of the property.

No mitigation measures have been identified as necessary for cultural resources for the Miller West Fisher project.

Forest Plan Consistency

The forest plan, in accordance with Section 106 of the National Historic Preservation Act, requires integration of cultural resource management into the overall multiple resource management effort. In addition, the forest must work closely with the appropriate scientific communities and American Indian tribes. Cultural resource inventories must be completed prior to ground-disturbing activities (Kootenai Forest Plan page II-5).

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 protection on federal lands require consultation with the State Historic Preservation Officers (SHPO) of Montana and Idaho, who serve in advisory capacities. The policies of the USFS and SHPO are consistent. Assuming that the surveys and any mitigation measures developed in consultation with the Montana State Historic Preservation Office are applied, the implementation of these alternatives will be in compliance with the 2001 Kootenai National Forest guidelines for Site Survey Strategy.

Cultural resource inventories are required prior to any ground-disturbing activities, in an effort to locate and evaluate historic properties. The Forest Service and other Federal Agencies are required to address historic properties in the United States under several statutes, most notably the National Historic Preservation Act of 1966. These requirements are carried forward in the Forest Plan standards (Forest Plan, Vol. 2, Appendix 19).

Historic properties identified by a cultural resource inventory are evaluated for eligibility to the National Register of Historic Places. Properties that are determined as eligible are managed to either protect them in-place or to mitigate adverse project impacts. Eligibility and management provisions must be reviewed by the State Historic Preservation Office. This process must take place prior to impacts on the ground.

The location of historic properties is exempt from public disclosure as described in FSH 6209.13 11.2 and 11.22. The purpose of this exemption is to protect properties from harm and to retain confidentiality of properties culturally significant to American Indian Tribes.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

Effects of Alternatives on Social Groups:

Executive Order 12898 ordered federal agencies to identify and address the issue of environmental justice (i.e. adverse human health and environmental effects of agency programs that disproportionately impact minority and low income populations). Based on experience with similar projects on the Libby Ranger District, none of the alternatives would substantially affect minority or low-income individuals, Native American Indians, women, or civil rights. The implementation of this project is expected to provide job opportunities in communities such as Libby, Montana. Small or minority-owned businesses would have the opportunity to compete for some of the work, including timber sales, non-commercial thinning, and fuels reduction projects.

Effects on Floodplains and Wetlands:

Floodplain areas constitute all of the wetlands in the project area and are protected as RHCA's. Wetlands may occur in the form of seeps, springs, and small bogs; however, the exact locations of all these have not been identified prior to unit layout. These seeps, springs, and small bogs are not evident through aerial photography and are probably less than one-quarter acre in size. These areas would be protected by adhering to the Montana Stream Management Zone regulations, Kootenai National Forest Riparian Area Guidelines as amended by INFS (USDA, Forest Service, 1987), Best Management Practices and Section 404 of the Clean Water Act (33 CFR 323). See the Water Resources section of this chapter for more specifics.

CHAPTER 4: CONSULTATION AND COORDINATION

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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TRIBES:

Confederated Salish and Kootenai Tribes
Kootenai Tribe of Idaho

Distribution of the Draft Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, Sate and local governments, and organizations representing a wide range of views.

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United States Fish and Wildlife Service
Montana Department of Environmental Quality
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Cabinet Back Country Horsemen (Danny Lewis)
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Miller West Fisher Draft EIS

Appendices

Appendix 1

Watershed Forest Plan Standards and Guidelines

Kootenai National Forest plan/INFS

Prior to 1995 the Forest Plan contained only qualitative direction, which could be used to measure existing fisheries habitat conditions or possible effects of management activities on populations or habitat (discussed below). In 1995 standards and guidelines were developed through the Inland Native Fish Strategy (INFS). This strategy is intended to provide interim direction for forest management on National forests, including the Kootenai. The purpose of INFS is to maintain options for native fish by reducing the risk or loss of populations and reducing potential negative impacts to aquatic habitat.

Goals and Objectives (II -1 thru II-12)

The goals outlined in the Forest Plan include; Construct and reconstruct roads only to the minimum standards necessary to prevent soil loss and maintain water quality. Meet or exceed State water quality standards.

In order to accomplish these goals the following objectives were identified:

Timber

The amount of timber harvest allowed will depend on the rate of hydrologic recovery after timber has been removed. The soil and water conservation practices specified in FSH 2509.22 will be applied during Forest Plan implementation to ensure that Forest water quality goals are met.

Soil and Water

Ground disturbing activities such as road construction, road reconstruction, and timber harvest will be accompanied by mitigating measures to prevent or reduce increases in sedimentation and stream channel erosion. The amount of timber harvest allowed will depend on the rate of hydrologic recovery after timber has been removed. Soils and water conservation practices as outlined in the Soil and Water Conservation Practices Handbook (FSH 2509.22) or those activities or standards, which will prevent or reduce stream sedimentation will be implemented. Examples include; location of roadbeds out of stream bottoms, design of stream crossing structures to allow water to freely pass, rock surfacing of roads at stream crossings, keeping equipment from operating in or alongside streams, and maintenance of roads to allow proper drainage. These practices will be implemented in order to maintain water quality. Each project plan for which the use of heavy equipment is required shall evaluate the effect of operating that equipment on soil productivity.

Riparian Areas

Site specifically identify and map all riparian areas on the Forest before project activity.

Forest Plan Standards

Protect and maintain important riparian zone features, marshes, and water bodies.

Soil and water conservation practices as outlined in the Soil and Water Conservation Practices Handbook (FSH 2509.22) will be incorporated into all land use and project plans as a principal mechanism for controlling non-point pollution sources and meeting soil and water quality goals and to protect beneficial uses. Activities found not in compliance with the soil and water conservation practices or State standards will be brought into compliance, modified or stopped.

A floodplain/wetlands analysis will be made for all management actions involving wetlands, streams, or bodies of water.

Each project plan for which the use of heavy equipment is required shall evaluate the effect of operation that equipment on soil productivity as described in the Soil and Water Objectives portion of the Forest Plan.

Projects involving significant vegetative removal will, prior to including them on implementation schedules, require a watershed cumulative effects feasibility analysis to ensure that water yield or sediment will not increase beyond acceptable limits. The analysis will also identify opportunities, if any exist, for mitigating adverse effects on water-related beneficial uses.

Riparian Areas (II-28 thru II-33)

The goal for riparian area management is to manage the vegetation to protect the soil and water resources and to provide high quality water and fisheries habitat.

Riparian Area Standards

Assure that there are streamside timber stands to provide for log and debris recruitment necessary for sufficient pool development and organic energy (organic debris) into the aquatic ecosystem.

Identify the riparian areas in each allotment that domestic livestock can use. Prevent livestock use of other than permitted segments of riparian areas.

Simultaneous openings resulting from timber harvest on both sides of a stream are not permitted, unless the results can be shown to be an enhancement for the riparian area.

Dozer scarification and landings are not permitted in riparian areas unless the results can be shown to be an enhancement of the riparian area.

Special uses, rights of way and cost share roads are permitted and riparian area management objectives will be incorporated into all agreements and permits.

Roads that parallel streams will be located at a distance determined by sediment transport models, and outside the 100-year floodplain.

When funds for road maintenance are limited, roads and drainage structures in riparian zones will be a top priority.

Necessary stream course crossings will insure fish passage, non-erosive water velocities and channel stability, and insure erosion control on cuts, fills and road surfaces.

Road closures will be used to protect the riparian habitat and values.

Inland Native Fish Strategy (INFS)

INFS includes eight riparian goals listed below that establish the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. Also included in INFS are interim riparian management objectives (RMO's) (discussed on page 8 of this report) that are indicators of ecosystem health, are quantifiable, and are subject to accurate repeatable measurements. In order to reach the goals of INFS standards and guidelines (Appendix 1 of this report) are outlined which apply to riparian habitat conservation areas (RHCA's) and to projects and activities in areas outside RHCA's that would degrade RHCA's. All activities occurring on Forest Service lands are required to meet the standards and guidelines outlined in INFS.

Since the quality of water and fish habitat in aquatic systems is inseparably related to the upland and riparian areas within watersheds, these goals were established to maintain or restore watershed, riparian and stream channel conditions including:

1. Water quality
2. Stream channel integrity, channel processes, and the sediment regime under which the riparian and aquatic ecosystems developed.
3. Instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels and the ability to route flood discharges.
4. Natural timing and the variability of the water table elevation in meadows and wetlands.
5. Diversity and productivity of native and desired non-native plant communities in riparian ecosystems.
6. Riparian vegetation to: provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems; provide adequate summer and winter thermal regulation within the riparian and aquatic zones; help achieve rates of surface erosion, bank erosion, and channel migration characteristics of those under which the communities developed.
7. Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region.
8. Habitat to support populations of well distributed native and desired non-native plant, vertebrate and invertebrate populations that contribute to the viability of riparian dependent communities.

Riparian Management Objectives (RMO's)

The Inland Native Fish Strategy identifies 6 parameters (RMO's) using stream inventory data for pool frequency, large woody debris, bank stability and lower bank angle, width to depth ratio, and water temperature. These objectives have been determined to be good indicators of ecosystem health and represent a good starting point to describe the desired condition for fish habitat. These RMO's for stream channel conditions provide the criteria against which attainment or progress toward attainment of the riparian goals are measured. Actions that

reduce habitat quality would be inconsistent with the purpose of this interim direction (INFS EA, pg E-3).

Number of pools - Pool frequency has been identified as the key feature in meeting the life history requirements of fish communities inhabiting a watershed. Pools are the least common stream habitat component in a watershed. They are also sensitive to non-point land use effects. Most fish species use pools at some stage in their lifecycle, and pools are particularly important as extreme low-flow refuge habitat. Pools are bowl shaped depressions in the stream channel where the stream surface is nearly flat. The desired pool frequency varies by channel width with larger stream channels having fewer pools.

Number of pieces large woody debris - large woody debris (LWD) in forested streams is critical to habitat composition and cover for fish populations. It is important in pool formation, channel bank stability, fine sediment and gravel storage, and organic nutrient storage (USDA Forest Service, 1994b). A decrease in LWD can have major effects on these physical habitat parameters. Channel and bank instability resulting from decreases in LWD can have a direct effect on survival of some juvenile salmonids during peak flow events (Reimer and McIntyre 1993). Loss of habitat formed by LWD reduces overwinter survival of fish. LWD also creates structure for storing spawning gravel. Reduction in LWD could result in less spawning area and decreased natural production. In addition, nutrient stored in the fine sediment trapped by the LWD and the wood itself is used by macroinvertebrates which are a food source for fish (USDA Forest Service, 1994b).

LWD is the tree stems that are (or will be) part of the stream channel structure. Woody debris comes in four varieties, fine particulate matter being transported by the stream flow, coarse particulate matter that is temporarily stored on the stream bottom (leaves and stem fragments), small woody debris (stems) that are larger than 4" at its largest end and large woody debris that is larger than 6" at its largest end. The desired situation and that which was used to measure large woody debris would be 1 piece, >12" in diameter, and greater than 35' long, every 250 feet of stream length.

Bank (channel) stability - bank stability looks at the stability of stream banks rather than the whole channel. This is different than the Pfankuch channel stability procedure used for many years in determining water yield increases on the Kootenai, although the relative condition of the stream channel would be considered similar with either measurement. Fisheries research has found that the channel stability survey has enough bias and variability in it that fish abundance is not related to that estimate. A variety of species use stream banks as cover at some time of the year. By measuring this habitat element, we directly measure hiding cover availability and indirectly approximate the availability of other types of cover that disappear as stream banks erode and send sediment downstream. Stream channel stability is determined from observation of a series of channel parameters and given a numerical rating based on those observations. Channel stability for a given stream reach for that particular set of parameters is then determined as fair, good or poor. By using both bank and channel stability measurements we are able to identify weak links in the stream system. The desired level for percent stable banks is 80 percent.

Stream temperature - temperature is a major factor affecting fish survival, distribution, production, and community composition in forest streams of the Pacific Northwest (Beschta et al. 1987). Elevated temperatures from exposed riparian areas are expected to increase summer

daily temperatures. It is important to know whether a stream is near or above the thermal maximum for coldwater biological communities or whether there is an extreme range in temperatures over the course of several days. INFS recommends no measurable increase in maximum water temperature (7 day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7 day period). INFS also recommends maximum water temperatures below 59 degrees within adult holding habitat and below 48 degrees within spawning and rearing habitats.

Width/depth ratio - There are two Rosgen channel types that naturally meet the standards identified in INFS for this parameter: Types B and C have a width/depth ratio greater than 12. These RMO standards need to be adjusted to match geomorphic stream types and not attempt to make all streams fall into a single category this will better match conditions on the Kootenai National Forest.

Riparian Habitat Conservation Areas (RHCA's)

RHCA's are portions of watersheds where riparian dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. RHCA's include traditional riparian corridors, wetlands, intermittent streams and other areas that help maintain the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, aquatic matter, and woody debris to streams, (2) providing root strength for channel stability, (3) shading the stream and (4) protecting water quality (Naiman et al, 1992). In order to reach the goals of INFS, standards and guidelines are outlined which apply to RHCA's and to projects and activities in areas outside RHCA's that would degrade them.

Appendix 2

Kootenai National Forest BMP Process

In 1990, the Montana Department of State Lands began the Forestry - Best Management Practices Implementation Monitoring Program. The thrust of this program has been to conduct IDT audits on all ownerships that are actively involved in timber harvest. Since that date, field audits have been completed state- wide in 1992, 1994, 1996, 1998, 2000, and 2002. Also beginning in 1990, the Kootenai National Forest began completing forest-wide BMP implementation and effectiveness reviews and field audits. Results of these on-forest audits by KNF personnel are shown below. Table 1 identifies the success of the BMP Program from 1990-2003. Table 2 expands on Table 1, adding years 1990 through 1993, and documents the specific scores on the 1-5 point scale:

Table 1: BMP Monitoring by Kootenai Forest Personnel, 1990 - 2003.

Year	# of Forms Completed	Rating Type	% BMP's Meeting	% BMP's Not Meeting
1990	255	Implementation	96	4
		Effectiveness	91	9
1991	328	Implementation	96	4
		Effectiveness	88	12
1992	401	Implementation	93	7
		Effectiveness	86	14
1993	491	Implementation	98	2
		Effectiveness	96	4
1994	461	Implementation	99	1
		Effectiveness	99	1
1995	198	Implementation	92	8
		Effectiveness	92	8
1996	409	Implementation	98	2
		Effectiveness	100	0
1997	594	Implementation	98	2
		Effectiveness	99	1
1998	169	Implementation	98	2
		Effectiveness	97	3
1999	95	Implementation	98	2
		Effectiveness	95	5
2000	60	Implementation	99	1
		Effectiveness	94	6
2001	77	Implementation	96	4
		Effectiveness	92	8
2002	141	Implementation	99	1
		Effectiveness	99	1
2003	62	Implementation	99	1
		Effectiveness	99	1

Table 2: KNF BMP Monitoring Ratings, 1990 - 2003.

			PERCENT	RATING	
Year	Type of Monitoring	Acceptable or Better	Unacceptable	Very Unacceptable	Grossly Unacceptable
1990	Implementation	96	3.6	0.4	0
	Effectiveness	91	8	1	0
1991	Implementation	96	3	1	0
	Effectiveness	88	12	0	0
1992	Implementation	93	6	0	0
	Effectiveness	86	13	2	0
1993	Implementation	98	1.8	0.2	0
	Effectiveness	96	3	1	0
1994	Implementation	99	0.98	0.02	0
	Effectiveness	99	1	0	0
1995	Implementation	92	8	0	0
	Effectiveness	92	8	0	0
1996	Implementation	98	1.98	0.02	0
	Effectiveness	100	0	0	0
1997	Implementation	98	1.9	0.1	0
	Effectiveness	98.7	1.2	0.1	0
1998	Implementation	98	2	0	0
	Effectiveness	96.7	3.2	0.1	0
1999	Implementation	98	1.6	0.4	0
	Effectiveness	95	4.6	0.4	0
2000	Implementation	99	0.9	0.1	0
	Effectiveness	94	4.0	2.0	0
2001	Implementation	96	3.5	0.5	0
	Effectiveness	92	5.7	2.3	0
2002	Implementation	99	0.6	0.4	0
	Effectiveness	99	0.6	0.4	0
2003	Implementation	99	1.0	0	0
	Effectiveness	99	0.5	0.5	0

The State audits identified that there are some specific practices that have the potential to create the greatest adverse effects to the soil and water resource. These specific "high risk" BMPs have been tracked on the Kootenai National Forest and are displayed below in Table 3.

Table 3: High Risk BMP Evaluations, KNF, 1994 - 2003.

				PERCENT	OF	BMP'S	MEETING	INTENT	OF	PRACTICE	
Year	Type of Monitoring	14.06	14.08	14.15	KNF 14.18	BMP 15.05	Number* 15.06	15.08	15.12	15.16	18.03
1994	Implementation	95	100	100	100	88	95	91	100	90	--
	Effectiveness	95	100	100	100	--	--	100	100	100	--
1995	Implementation	81	86	70	87	100	91	100	100	100	100
	Effectiveness	78	91	78	84	100	86	100	100	100	100
1996	Implementation	96	98	98	100	100	100	100	100	100	--
	Effectiveness	97	100	95	98	100	100	100	100	100	--
1997	Implementation	96	96	97	100	98	92	100	100	100	100
	Effectiveness	91	100	95	100	100	97	100	100	100	--
1998	Implementation	100	99	97	100	100	99	100	100	100	--
	Effectiveness	100	99	99	100	100	88	100	100	100	100
1999	Implementation	100	100	100	100	100	100	--	100	--	100
	Effectiveness	--	100	100	100	100	99	--	100	--	100
2000	Implementation	100	100	100	100	100	100	100	100	100	--
	Effectiveness	100	100	100	83	100	100	--	100	100	--
2001	Implementation	91	98	96	95	100	100	100	75	33	100
	Effectiveness	100	100	80	100	100	100	100	67	67	100
2002	Implementation	100	100	99	98	100	98	--	100	97	100
	Effectiveness	100	100	99	89	100	96	--	100	97	100
2003	Implementation	100	100	97	100	100	100	--	--	100	--
	Effectiveness	100	100	95	100	100	100	--	--	100	--

*KNF BMP	State BMP	Practice Description
14.06	II.B.1	Riparian Area Designation (RHCA)
14.08	II.A.5	Tractor Skidding Design
14.15	II.C.2a	Erosion Control on Skid Trails
14.18	I.E.2	Erosion Control Structure Maintenance
15.05	I.D.2	Slope Stabilization and Prevention of Mass Failures
15.06	I.C.1	Mitigation of Surface Erosion and Stabilization of Slopes
15.08	II.C.2a	Pioneer Road Construction

15.12	I.C.6	Control of Construction in Riparian Areas
15.16	III.C.3	Bridge and Culvert Installation
18.03	II.D.9	Protection of Soil and Water From Prescribed Burning Effects

-- = Practice not Applied

From these tables, we can conclude that beginning in 1993, except for 1995 and two practices in 2001, the Forest has generally done a good job in implementing and evaluating BMPs, including these "high risk" BMPs. Table 4 is a Forest summary of all the BMP's combined to give an idea of the overall quality of the implementation and effectiveness of the BMP's.

Table 4: Forest Summary Information for All BMP's Combined

	IMPLEMENTATION SCORES								EFFECTIVENESS SCORES							
Forest Summary	1	2	3	4	5	**Total**	% 4 or 5	% 3 or less	1	2	3	4	5	**Total**	% 4 or 5	% 3 or less
Totals by score	16	141	938	30,414	358	31,867	97%	3%	21	119	702	16876	160	17,878	95%	5%
Scores as % of total Implementation	0.05%	0.44%	2.94%	95.44%	1.12%	**Total SUM of Implementation And Effectiveness scores=**									**49,745**	
Scores as % of total Effectiveness.	0.12%	0.67%	3.93%	94.40%	0.89%											

Libby Ranger District BMP Process

In 1998, the Forest began to implement a Revised KNF BMP Process (2/98). Projects being initiated from that date should utilize this process, with the level of documentation commensurate with resource risks.

The following process is being implemented on the Libby Ranger District as part of the Forest BMP program. Project specific forms have been completed and the District BMP Monitoring Team is responsible for reviewing a wide range of activity types to document the implementation and effectiveness of numerous BMP's, including the "high risk" BMP's.

1) **Project Scoping Form**: This form is very similar to completing a NFMA analysis on the district level. This form needs to completed by the entire IDT to ensure that all concerns are being met through the BMP process. This form should be completed by the end of the first IDT meeting for the project in question. This form should be kept in the NEPA Project File.

2) **BMP Tracking Form**: This form will be almost entirely created by taking the information from number 11 of the Project Scoping Form. This form is used to create a list of any "watch out" areas that either need extra protection or strict adherence of our normal BMPs to maintain or improve watershed conditions. This form is to be completed by the IDT or the Watershed/Soils specialist by the end of the scoping process. This form should be kept in the NEPA Project File

3) **BMP Form 1**: This form should be tailored to meet the needs determined by the IDT by either adding or deleting from the "base" form of listed BMPs. This form should be completed by the IDT after all public scoping has been completed and the activities have been decided upon. This form should be kept in the NEPA project file and a copy should also go to the District BMP Coordinator.

4) **BMP Form 2**: This form can be broken into the specific section that needs to be reviewed (i.e. planning, timber, engineering or fuels). This form should be created by reviewing **BMP Form 1** and <u>all the listed BMPs</u> should be transferred to **BMP Form 2** for the specific section being reviewed. This form is for the field person responsible for the implementation of the listed BMPs. A copy of this completed form should go the District BMP Coordinator.

5) **BMP Form 3**: This form can also be broken into the specific section that is being field reviewed but the reviewing team will usually be looking at all the BMPs that were applied for the activity or sale. This form is completed after the activity has been accomplished. This form will be completed by the IDT or the District BMP Review Team. A copy of this completed form should go the District BMP Coordinator.

6) **BMP Feedback Loop**: Information from analysis of the BMP Program will be fed back into the system so that problem practices can be improved or replaced; and activities needing additional protection practices can have them developed.

Appendix 3

Kootenai NF Landtype Information

Landtypes 101, 102, 105, 106, 108, and 112 occur on 10% of the area. These riparian areas contain flat to gently undulating lacustrine terraces at low elevations. The surface layer is a yellowish-brown silt loam, 7-12 inches thick. The subsoil is a light gray silt loam, 15-30 inches thick. These landtypes are well suited to timber management and poorly suited to road construction. The material exposed by road construction is erosive and can plug culverts. Cut slopes slump readily. Management concerns in landtype 101 are protection of stream channels and banks and limiting unnatural sediment additions. Channel changes within this landtype can produce high amounts of sediment. The major watershed concerns for the rest of the landtypes include controlling sediment resulting from the highly erodible soils. Practices that disturb soil on or adjacent to stream banks have a high potential for increasing stream sediment.

Landtypes 201, 251, and 252 occur on 1.3% of the area, and consist of steep break-lands. The drainage patterns are parallel. The soils are not easily identified by unique landscape features. They are from 4 to 20 inches deep over bedrock or 20 to 40 inches deep over bedrock. The content in their angular rock fragments in their subsoils ranges from 50 to 70 percent. All the landtypes have high sediment delivery efficiency due to the steepness of the landforms. Because of this steepness, timber harvest is usually limited to cable systems.

Landtypes 301, 302, and 303 occur on 10% of the area, and consist of convex ridge tops and ridge noses that occur on south and southwest aspects on mid-elevation drainage divides. The landforms are rounded due to glacial scouring. There is no surface drainage system. The soils were formed in glacial till and residuum. These landtypes are poorly suited for timber production. Revegetation is limited by moisture stress and solar insolations on southerly slopes. Landtype 303 is moderately suited to road construction, but the exposed material is difficult to revegetate. Soil erodibility is moderate, landform sediment delivery efficiency is low, and the feasibility of controlling sediment is moderate.

Landtypes 322, 323, 324, 325, and 328 occur on 0% of the area, and consist of low relief rolling foothills. The drainage pattern is random. The soils were formed in volcanic ash-influenced loess overlying dense glacial till. Surface soils are composed of a dark reddish brown silt loam, 7-12" deep and have a high erodibility rating. Sub-surface soils are composed of a gravelly, silty clay loam, 10-20" deep and are highly erodible. These landtypes have low sediment delivery efficiency. These landtypes are moderately suited to road construction, although the material exposed by road construction tends to slump on cut banks. Road surfaces are dusty when dry and become rutted when wet. Road surface treatments help control dust and prevent rutting. Bearing strength is low. The feasibility of controlling sediment from timber harvest and road construction is high. Major watershed management concerns are; sediment hazards due to cut bank slumping and highly erodible soils.

Landtype 351 occurs on less than 2% of the area, and consists of dissected glaciated mountain slopes that occur on north aspects on mid-elevation drainage divides. This landform has a mantle of glacial till and closely spaced, deeply incised, V-shaped drainages. Landslides can occur in the drainages. The soils contain 20 to 50 % course rock fragments. Soil erodibility is moderate, landform sediment delivery efficiency is high, and the feasibility of controlling sediment is low. There are no activities planned in this landtype with this proposal.

Landtypes 352, 353, 355 and 357 occur on 44% of the analysis area. These landtypes generally contain convex mountain slopes. The landform has been glacially rounded. The drainage pattern is dendritic. The landtypes contain soils formed in volcanic ash-influenced loess overlying dense glacial till. Over 25% of the surface is rock outcrop exposed by glacial scouring. These landtypes are well suited to timber management, and moderately suited for road construction. Surface erodibility is high and sediment delivery efficiency is moderate except in landtype 357 which is high. No special watershed protection measures are required for management practices commonly applied to these landtypes.

Landtype 360 occurs on 1% of the analysis area. This landtype contains glaciated mountain ridges. The landform has gradients between 15 and 35%, with almost no surface drainages. The landtype contains soils formed in volcanic ash-influenced loess overlying bedrock. The content of angular rock fragments ranges from 45 to 70 percent. No special watershed protection measures are required for management practices commonly applied to these landtypes.

Landtype 381 occurs on less than 1% of the analysis area. This landtype contains steep mountain slopes that are structurally controlled. Sediment delivery efficiency is high, and there is a potential for debris slides in the drainages. There are no activities planned in this landtype with this proposal.

Landtypes 401, 403, 404, 405, 406, 407, and 408 occur on 30% of the analysis area. This landtype contains glaciated mountain ridges. The landforms have gradients from 15 and 80%, with dendritic first order surface drainages. The landtype contains soils formed in volcanic ash-influenced loess overlying bedrock. The content of angular rock fragments ranges from 45 to 60 percent. Materials exposed in cut banks tend to ravel and are difficult to revegetate because of the harsh subalpine climate.

Landtype 555 occurs on less than 1% of the analysis area. This landtype occurs on steep mountain slopes. These soils have a surface layer of loess 7 to 14 inches thick. The content of angular rock fragments in the subsoil ranges from 50 to 70%. The hazard of erosion is moderate along skid trails and fire lines and in areas where soil material has been exposed by road construction. Sediment delivery efficiency is moderate.

Appendix 4 – RHCA Widths

Table 1 displays site specific RHCA's which have been selected for particular units of the action alternatives. Although it is thought that all stream systems and wetlands have been identified and mapped, it is possible that depending on hydrologic conditions, additional changes may be necessary with implementation of any action alternative.

Unit #	RHCA Width in feet (minimum each side)
2	50
3	50
4	50
5	50
6	50
7	50
8A	50
8B	50
10	50
11	300
12	50
15	50
21	50
22	50
23	50 and 300
24	300
25	50 and 150
26	50
27	50 and 150
28	50
30	50
31	50
44	50
45	50
46	50 and 150
47	50
48	50
49	300
50	300
52	150
55	300
101	50
105	50
108	50
111	50
113A	50
114B	50
116	50
117	50
118B	50
123	50 and 300
127	300
202	150

Unit #	RHCA Width in feet (minimum each side)
203	50 and 150
208	300
210A	300
210B	300

Appendix 5 - Road Project Information

The IDT has identified road restoration projects, which are expected to improve channel stability and water quality in streams within the analysis area as well as improving big game habitat effectiveness and security. The team looked at the following criteria in identifying roads for restoration:

- Roads that were originally built as temporary roads but were left in place;
- Roads with known erosion and sedimentation problems (i.e. sediment from roads is directly entering streams);
- Multiple roads access the same area (high road density);
- Roads with numerous stream crossings in short stretches;
- Roads with high maintenance costs and undersized culverts at stream crossings;
- Roads with no management entries planned for the next 20 to 30 years.

Figure 1: Typical culvert failure caused by an undersized culvert.

Almost all roads chosen for some level of restoration will have one thing in common. All live stream culverts will be removed in the process of the activity. This is needed for two reasons; 1) the roads were originally built to lower standards than required today and all culverts are undersized. 2) because the roads will be left in an undrivable state, access will not be possible for maintenance in the future. Figure 1 displays a typical culvert failure caused by an undersized culvert. Figure 2 displays the typical amount of work required for this activity.

Figure 2: Typical view of a culvert removal with reconstruction of channel and stream banks.

Road restoration proposals have been grouped into 2 categories depending upon the level of work needed to make the road neutral in its effects to the landscape.

"Temporary Stored Service" would include surface ripping, seeding, and/or cross ditching and some sections of partial road recontouring will also be required in areas where there is high precipitation. These areas often have an established road ditch to collect the intercepted water from the road. Roads would be undrivable (except for isolated segments) following restoration activities; however, snowmobile use may continue to occur on these roads until they are reclaimed by the development of trees and shrubs. These road prisms are expected to be needed for access in the future so they will not be considered as permanently removed from the transportation network. When the work is completed these road segments are considered "stored". Figures 3 and 4 display the typical amount of work required for this activity. This level of restoration typically costs from $2,000 to $2,500 per mile to complete.

Figure 3: Typical view of surface ripping and water bar installation.

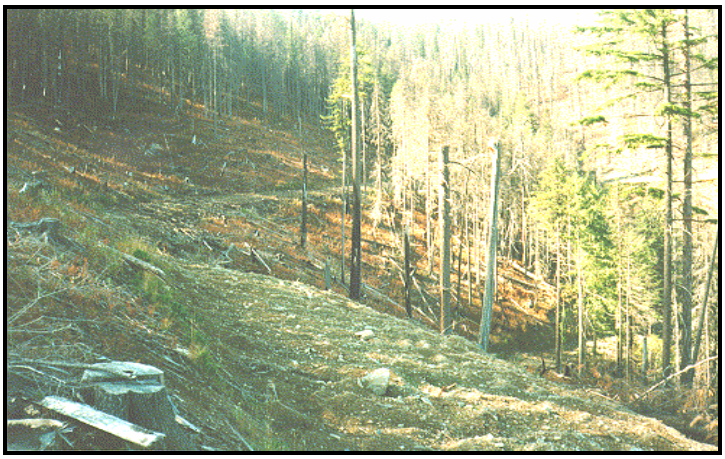

Figure 4: Typical view of a partial recontouring after the work is complete.

"Road Decommissioning" would include roads that are no longer needed in the transportation network, or have been chronic problem roads. These roads would be partially recontoured to the extent needed to re-establish overland flow processes through the road prism. Only short sections of the roads next to stream channels would require complete recontouring. Figure 5 displays the typical amount of work required for this activity. This level of restoration typically costs approximately $4,000 per mile to complete.

Figure 5: Typical view of a decommissioned road after the work is completed.

Proposed Watershed Restoration Road Work in the Silverfish Planning Area

ROAD #	ROAD NAME OR LOCATION	MILES	PROPOSED TYPE OF STORAGE/DECOMMISSIONING
148A	Silver Butte Pass A	0.31	Partial recontour, remove stream crossings
2314M	Porcupine Ridge M	0.68	Water bar
5326	Standard Creek Miller Creek Oldie	1.07	Partial recontour, remove stream crossings
6744	Standard Creek West Fisher	1.43	Water bar, remove stream crossings
99816	Iron Meadow Creek	1.03	Water bar, partial recontour
99816A	Iron Meadow Creek A	0.24	Water bar, partial recontour, remove stream crossings
99803	King Mine	1.21	Partial recontour, remove stream crossings
99803A	King Mine	0.36	Partial recontour
99813	King Mine	0.27	Place earthen barrier
4725	North Fork Miller	4.22	Leave side drainage culverts and road prism in place; remove stream crossing so as to permit foot and stock travel.
5200	Upper Teeters Mountain	0.92	Remove stream crossing, partial recontour
5007A	South Teeters Face A	0.52	Water bar
5199	Teeters Mountain Too	1.33	Partial recontour/water bar, remove stream crossing
5198	Teeters Mountain Oldie	1.77	Remove stream crossings, partial recontour
6743	Teeters Mountain	3.45	Remove stream crossing, partial recontour
	TOTAL	**18.81**	

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Appendix 7 - Best Management Practices Form (below)

LIBBY DISTRICT - BMP IMPLEMENTATION AND EFFECTIVENESS DOCUMENTATION FORM (KNF-BMP-3)

SECTION: ____PLANNING ____TIMBER ____ENGINEERING ____FUELS ____MINERALS ____RANGE

Activity Name: **Miller West Fisher Timber Sale** Date of Review: ___/ ___ / ___
Type of Activity: _____ Legal Description: T ____ R ____ S
Sale unit/road numbers evaluated: _____ EIS/EA unit/road numbers:
Named Stream Below Activity: _____ Stage of Sale Completion: _____Complete ___ Incomplete
Preparer(s): _____ Decision Document:

Is this an activity with special watershed concerns? (see decision document): __X__ yes* ____ no
* (review should probably include a soils, hydrology, or fish specialist)

Implementation Evaluation
5-BMP implementation exceeds requirements of contract
4-BMP implementation meets requirements of contract. Satisfactory implementation on all specified areas.
3-Minor deviation in BMP implementation from intent of contract. Implementation ok on 2/3 or more of specified areas.
2-Major deviation in BMP implementation from intent of contract. Implementation incorrect or correct on < 2/3 of specified areas.
1-Non-implementation of BMP

Effectiveness Evaluation
5-BMP exceeds intent of SWCP objective.
4-BMP meets SWCP objective over entire specified area.
*3-BMP meets SWCP objective on 2/3 of specified area. BMP over remaining 1/3 of area does not meet SWCP objective.
*2-BMP meets SWCP objective on less than 1/3 of specified area. BMP over remaining 2/3 area does not meet SWCP objective.
*1-BMP does not meet SWCP objective on any of the specified area. A BMP was either not implemented or was completly ineffective.
* - Add explanation of likely effects of SWCP objective not being met (e.g. soil is eroding onto flat area w/o risk to water quality etc.). Also describe what could have been done differently to meet SWCP objective.

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
14.01	TIMBER SALE PLANNING - To incorporate soil and water resource considerations intoTimber Sale Planning			All	Water and soil resource protection will be accompolished by the IDT during the NEPA process.	
14.02	TIMBER HARVEST UNIT DESIGN- To insure that timber harvest unit design will secure favorable conditions of water flow, maintain water quality and soil productivity, and reduce soil erosion and sedimentation.			All	Timber harvest design will include a cummulative effects analysis to determine effects to water yield and stream habitat features. RHCA's will be designated as a part of this process.	
14.03	USE OF SALE AREA MAPS (SAM's) FOR DESIGNATING SOIL AND WATER PROTECTION NEEDS -To delineate the location of protected areas and available water sources and to insure their recognition, proper consideration, and protection on the ground			All	The IDT will identify water courses to be protected, unit boundaries and other features required by other means such as "C" provisions. Ground verification, and preparation of SAMs to be included in TSC will be done by pre-sale forester. TSA reviews areas of concern with purchaser before operations.	
14.04	LIMITING THE OPERATION PERIOD OF TIMBER SALE ACTIVITIES - To minimize soil erosion and sedimentation and loss in soil productivity by insuring that the purchaser conducts his/her operations in a timely manner.			All	If limited operating periods are identified and recommended during the analysis by the IDT, the pre-sale forester will prepare a contract that that includes provision C6.31.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
14.05	PROTECTION OF UNSTABLE AREAS - To protect unstable areas and to avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation.			All	If at all possible all known unstable areas that occur within the Sale Area Boundary will be avoided. Soil resource specialist should also be consulted in the planning process.	
14.06	RIPARIAN AREA DESIGNATION - To minimize the adverse effects on riparian areas with prescriptions that manage nearby logging and related land disturbance activities			Units: 2, 3, 4, 5, 6, 7. 8A, 8B, 10, 11, 12, 15, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 44, 45, 46, 47, 48, 49, 50, 52, 55, 101, 105, 108, 111, 113A, 114B, 116, 117, 118B, 123, 127, 202, 203, 208, 210A, 210B	All streams and wetlands in the decision area will comply with KNF Riparian Area Guidelines (Appendix 26) and KNF Forest Plan as amended by INFS/UCRB. The width of the riparian areas will be decided upon by the IDT. These widths will be included on the sale area map and marked on the ground. This information will be included in the timber sale contract.	
14.07	DETERMINING TRACTOR LOGGABLE GROUND - To protect water quality from degradation caused by tractor logging ground disturbance.			All reviewed 2, 5, 17, 19, 20, 37, 40, 47, 48, 50, 53, 54, 55, 101, 114A, 114B, 118A, 118B, 119, 120, 121, 122, 123, 124, 125, 129, 130, 131, 132, 133, 201, 202, 210A, 210B, 214, 215	IDT has identified tractor loggable ground (in conjunction with personnel from timber operations) during transportation and timber sale planning process. The results have been used to determine intensity of and restrictions for land disturbance activities. PSF will prepare a TSC that includes provisions stating areas and conditions that tractors can operate.	
14.08	TRACTOR SKIDDING DESIGN - To minimize erosion and sedimentation and protect soil productivity by designing skidding patterns to best fit the terrain.			All tractor units listed above	IDT has identified sensitive areas during the planning process. The TSA will execute the plan on the ground by locating the skid trails with the timber purchaser or by agreeing to the purchaser's proposed locations prior to operation.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
	TIMBER OPERATIONS					
14.09	SUSPENDED LOG YARDING IN TIMBER HARVESTING - To protect the soil from excessive disturbance and accelerated erosion and to maintain the integrity of the riparian areas and other sensitive area.			Skyline: 3, 4, 5, 11, 12, 15, 16, 17, 21, 25, 26, 36, 37, 39, 46, 49, 52, 56, 116, 117, 118A. 120, 123, 128 Helicopter: 1, 2, 7, 8A, 8B, 10, 13, 18, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 38, 43, 44, 45, 46, 47, 48, 51, 56, 57, 58, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 115, 121, 127, 203, 208	Sensitive areas have been designated and equipment limitations have been placed on specific units.	
14.10	LOG LANDING LOCATION AND DESIGN - To locate in such a way as to avoid soil erosion and water quality degradation.			All	Approved landing locations will meet the criteria of: minimal size, least excavation needed, minimum skid roads necessary, no side-cast material into sensitive areas, and have proper drainage.	
14.11	LOG LANDING EROSION PREVENTION AND CONTROL- To reduce erosion and subsequent sedimentation from log landing through the use of mitigating measures.			All	Approved landing locations will meet the criteria of: minimal size, least excavation needed, minimum skid roads necessary, no side-cast material into sensitive areas, and have proper drainage.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
14.12	EROSION PREVENTION AND CONTROL MEASURES DURING THE TIMBER SALE OPERATION - To ensure that the purchaser's operations shall be conducted reasonably to minimize soil erosion.			All	Erosion control is kept current on all areas disturbed during the harvest activity. This prevents operation when excessive impacts are possible due to high soil moisture .	
14.13	SPECIAL EROSION PREVENTION MEASURES ON AREAS DISTURBED BY HARVEST ACTIVITIES - To prevent erosion and sedimentation on disturbed areas.			All	If there is an erosion problem the IDT will recommend specific BMPs based on site surveys. BMPs may be adjusted by the TSA to meet operational requirements	
14.14	REVEGETATION OF AREAS DISTURBED BY HARVEST ACTIVITIES - To establish a vegetative cover on disturbed areas to prevent erosion and sedimentation and weeds.			All	IDT has established vegetation and fertilizer mix to be used in the project area with outlines on the extent to which it should be used. TSA is responsible to see that revegetation work required by purchaser is done correctly and in a timely manner. For this project, the purchaser will be responsible for revegetation immediately after the completion of harvest. Funds will be collected for the District to do follow-up seeding/fertilizing in years two and five after harvest.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
14.15	EROSION CONTROL ON SKID TRAILS - To protect water quality by minimizing erosion and sedimentation derived from skid trails.			All	IDT will identifiy areas where special concerns need to be addressed, such as harvesting in fire salvage situations. Eoriosion control measures may be recommended by the IDT, but site-specifically adjusted by the TSA. TSA will ensure erosion control measures are applied prior to expected hydrologic events (spring runoff, high-intensity storms, etc.). Maintenance of erosion control structures by the purchaser may be necessary and requested by the TSA.	
14.16	MEADOW PROTECTION DURING TIMBER HARVESTING - To avoid damage to the ground cover, soil, and water in meadows			All	IDT has identified areas needing special protection. PSF will verify the areas needing protection and prepares the contract to prevent damage to meadows. The TSA will be responsible for on the ground protection of meadows. If meadows are found by the TSA during operations, it is their responsibility to either afford them the proper protection or to pursue a contract modification.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
14.17	STREAM CHANNEL PROTECTION (IMPLEMENTATION AND ENFORCEMENT) - To protect natural streamflows; to provide unobstructed passage of flows; reduce sediment input; and to restore flow if diverted by timber sale activity.			All	IDT had identified the location of channels in the decision area. PSF will prepare a SAM locating the channels needing protection. Lay-out crew marks boundaries and trees according to HB-731 and FP guidelines. TSA will see that TSC items are carried out on the ground. Technical assistance will be consulted as needed.	
14.18	EROSION CONTROL STRUCTURE MAINTENANCE - To insure that constructed erosion control structures are stabilized and working effectively.			All	During the period of the TSC the purchaser is responsible for maintaining their erosion control features. If work is needed beyond this time, the district will pursue other sources of funding.	
14.19	ACCEPTANCE OF TIMBER SALE EROSION CONTROL MEASURES BEFORE SALE CLOSURE - To assure the adequacy of required erosion control work on timber sales.			All	A careful review of erosion prevention work will be made by the TSA before each harvest unit is considered complete. The inspection will determine if the work is acceptable and will meet the objective of the erosion control feature. A feature is considered not acceptable if it does not meet standards, or not expected to protect soil/water values. Technical assistance will be used as necessary.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
14.20	SLASH TREATMENT IN SENSITIVE AREAS - To protect water quality by protecting sensitive tributary areas from degradation which would result from using mechanized equipment for slash disposal.			All	All activities will comply with the KNF Riparian Area Guidelines (FP Appendix 26). Where harvest within riparian areas is proposed, either the slash would be removed with the tree or the slash would be scattered and not treated.	
	ENGINEERING					
15.02	GENERAL GUIDELINES FOR THE LOCATION AND DESIGN OF ROADS AND TRAILS - To locate and design roads and trails with minimal soil and water impact while considering all design criteria.			All New Roads	Consult KNF Land type inventory to determine if project is located in a area of unstable soils.	
15.02E	Stream crossings of proper size and conform to natural streambed and slope			All	Culverts were sized for the 100 year event, following INFS standards.	
15.02C	Roads avoid high hazard sites			All new roads	KNF landtypes were consulted to avoid high hazard sites.	
15.02F	Road drainage routed through adequate filter			All	Drainage from road surface is routed to a filteration area before it is allowed to enter a stream.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
15.02F	Ditch relief culverts installed to remove drainage before it enters stream and routed to a filteration location.			All	Ditch relief culverts are installed to allow ditch water to be deposited into a filtering device before it enters a stream. Ditch relief culverts are skewed to allow proper functioning.	
15.03	ROAD AND TRAIL EROSION CONTROL PLAN - To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction by timely implementation of erosion control practices.			All New Roads	Consult KNF Land type inventory to determine if project is located in a area of unstable soils.	
15.04	TIMING OF CONSTRUCTION ACTIVITIES - To minimize erosion by conducting operations during minimal runoff periods.			All New Roads	Timing of repair work needs to be coordinated with the District Fisheries Biologist in watersheds with high aquatic values.	
15.05	SLOPE STABILIZATION AND PREVENTION OF MASS FAILURES - To reduce sedimentation by minimizing the chances for road-related mass failures, including landslides and embankment slumps.			All Roads	Consult KNF Land type inventory to determine if project is located in a area of unstable soils.	
15.06	MITIGATION OF SURFACE EROSION AND STABILIZATION OF SLOPES - To minimize soil erosion from road cutslopes, fill slopes, and travelways.			All Roads	Consult KNF Land type inventory to determine if project is located in a area of unstable soils.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
15.07	CONTROL OF PERMANENT ROAD DRAINAGE - To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and drainage control structures.			All Roads	Measures that can be implemented include but are not limited to: drive through dips, rubber surface deflectors, gravel placement, seeding and fertilizing.	
15.08	PIONEER ROAD CONSTRUCTION - To minimize sediment production and mass wasting associated with pioneer road construction.			All new Roads	Consult KNF Land type inventory to determine if project is located in a area of unstable soils. Road locations should be on as gentle slopes as can be achieved in the project area.	
15.09	TIMELY EROSION CONTROL MEASURES ON INCOMPLETE ROADS AND STREAM CROSSING PROJECTS - To minimize erosion of and sedimentation from disturbed ground on incomplete projects.			All new Roads	Erosion control measures can include but are not limited to: straw bale detention dams, slashfilter windrows, fabric mats, seeding and fertilizing, and rip-rap placement.	
15.10	CONTROL OF ROAD CONSTRUCTION, EXCAVATION, AND SIDE-CAST MATERIAL - To reduce sedimentation from unconsolidated excavated and side-cast material caused by road construction, reconstruction, or maintenance.			All new Roads	Consult KNF Land type inventory to determine if project is located in a area of unstable soils. Erosion control measures can include but are not limited to: straw bale detention dams, slashfilter windrows, fabric mats, seeding and fertilizing, and rip-rap placement.	
15.11	SERVICING AND REFUELING EQUIPMENT - To prevent contamination of waters from accidental spills of fuels, lubricants, bituments, and other harmful materials.			All roads	No servicing or refueling of equipment is allowed within the designated RHCA's or within 300 feet of any stream channel.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
15.12	CONTROL OF CONSTRUCTION IN RIPARIAN AREAS - To minimize the adverse effects on riparian areas form roads.			All roads	IDT shall determine if road construction is allowable. For construction projects, 15.09, 15.08, 15.07, and 15.13 objectives must be enforced.	
15.13	CONTROLLING IN-CHANNEL EXCAVATION - To minimize stream channel disturbances and related sediment production.			Where needed	Any in-channel excavation needs to be ok'd by either district fisheries biologist or hydrologist to ensure water resources are being protected.	
15.14	DIVERSION OF FLOWS AROUND CONSTRUCTION SITES - To minimize downstream sedimentation by insuring that all stream diversions are carefully planned.			Where needed	Any projects that require the diversion of flows must be ok'd by district hydrologist and must have the required permits completed.	
15.15	STREAM CROSSINGS ON TEMPORARY ROADS - To keep temporary roads from unduly damaging streams, disturbing channels or obstructing fish passage.			N/A	All temporary stream crossings should be completed with the least amount of damage to the channel and must have the required permits returned from the Montana Dept. of Fish, Wildlife and Parks. A 3A permit mus also be obtained for the construction and use period of the structure.	
15.16	BRIDGE AND CULVERT INSTALLATION - To minimize sedimentation and turbidity resulting from excavation from in-channel structures.			Where needed	All stream crossings should be completed with the least amount of damage to the channel and must have the required permits returned from the Montana Dept. of Fish, Wildlife and Parks. A 3A permit must also be obtained for the construction and use period of the structure.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
15.17	REGULATION OF BORROW PITS, GRAVEL SOURCES, AND QUARRIES - To minimize sediment production from borrow pits, gravel sources, and quarries, and limit channel disturbance in those gravel sources suitable fro development in floodplains.			All	An approved operating plan must include input form fisheries and watershed resources to ensure water resources are being protected. Sediment production needs to be stabilized and contained on the project location.	
15.18	DISPOSAL OF RIGHT-OF-WAY AND ROADSIDE DEBRIS - To insure that debris generated during road construction is kept out of streams and to prevent slash and debris from subsequently obstructing channels.			All	Sidecasting of road materials is not allowed within RHCA's or within 300 feet of stream channels. Material cannot be placed in a manor that will restrict the effectiveness of the road drainage structures.	
15.19	STREAMBANK PROTECTION - To minimize sediment production from streambanks and structural abutments in natural waterways.			All	The only activity that allows equipment activity in the RHCA are 15.13- 15.16. Any such activity must meet the requirements set forth in those descriptions.	
15.20	WATER SOURCE DEVELOPMENT CONSISTENT WITH WATER QUALITY PROTECTION - To supply water fro road construction and maintenance and fire protection while maintaining water quality.			All	Development of water sources for road construction or fire supression activities will not include any permanent diversion or blockage of natural stream channels or wet areas	
15.21	MAINTENANCE OF ROADS - To maintain all roads in a manner which provides for soil and water protection by minimizing rutting, failures, side-cast, and blockage of drainage facilities.			All	Road maintenance associated with a timber sale is the responsibility of purchaser. The ER/SA will ensure that the purchaser maintains roads according to the appropriate maintenance level.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
15.22	ROAD SURFACE TREATMENT TO PREVENT LOSS OF MATERIALS - To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production.			All	Sidecasting of road materials is not allowed within RHCA's or within 300 feet of stream channels. Material cannot be placed in a manor that will restrict the effectiveness of the road drainage structures.	
15.23	TRAFFIC CONTROL DURING WET PERIODS - To reduce the potential for road surface disturbance during wet weather and to reduce sedimentation.			All	Road restrictions, and traffic control measures will be implemented on all roads when damage would occur during spring breakup. The decision to restrict a road is made by the ER. Hauling restrictions would be controlled by the TSA.	
15.24	SNOW REMOVAL CONTROLS - To minimize the impact of snow melt on road surfaces and embankments and to reduce the probability of sediment production resulting from snow removal operations.			All	Snow removal will be kept current on all roads associated with winter logging operations. The TSA ensures compliance with contract provisions.	
15.25	OBLITERATION OF TEMPORARY ROADS To reduce sediment generated from temporary roads by obliterating them at the completion of their intended use.			All new temp roads	This work will be done on all new temporary roads in the decision area. The work will be done by the purchaser with compliance by the TSA.	
	FUELS TREATMENT					
18.02	FORMULATION OF FIRE PRESCRIPTIONS - To provide for the protection of soil and water resources while achieving the management objective through the use of prescribed burning.			Burn Units: All proposed units	The prefered burning conditions should be used as the optium requirement used to achieve the desired effects from the project.	

SWCP Objective		Implementation (1-5)	Effectiveness. (1-5)	Unit or Road Number	BMP or alternative method used to meet the SWCP objective.	Comments (How did BMP meet obj.? If SWCP objective was not met, was it due to BMP selection, design, implementation? What are the likely effects?)
18.03	PROTECTION OF SOIL AND WATER FROM PRESCRIBED BURNING EFFECTS - To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water.			Burn Units: All proposed Units	The prefered burning conditions should be used as the optium requirement used to achieve the desired effects from the project.	
18.03A (KNF)	PROTECTION OF RHCA'S DURING FUELS TREATMENT - To maintain the integrety of the RHCA's during broadcast burning and machine fuels treatment.			Burn Units: All proposed units	The prefered burning conditions should be used as the optium requirement used to achieve the desired effects from the project. For RHCA's that require additional protection, firelines may need to be constructed at the boundary of the units.	
18.04	MINIMIZING WATERSHED IMPACTS FROM FIRE SUPRESSION EFFORTS - To avoid watershed impacts in excess of that which is caused by the fire itself.			Burn Units: All proposed units	The resource advisor should be consulted before fireline work is completed in sensitive areas to determine of the work will result in an overall benefit to the area.	
18.05	STABILIZATION OF FIRE SUPRESSION RELATED WATERSHED DAMAGE- To stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by supression related activities.			Burn Units: All proposed units	Treatments include , but are not limited to: installing water bars and other drainage diversions in fire roads, firelines, and other cleared areas; seeding, planting and fertilizing to provide vegetative cover; repairing damaged road drainage facilities; and clearing stream channels of debris that is deposited by supression activities.	

Appendix 8 - Water Yield Modeling Discussion

KNF Equivalent Clearcut Acres (ECA) Calculator

Lynn Cain, user interface design and development (ArcMap, Visual Basic)
Don Tincher, Oracle development, scoping and project design

ECAC Model Capabilities and Limitations:
The KNF beta version of the Equivalent Clearcut Acres Calculator (ECAC) is a GIS interface with management activity databases (Oracle and TSMRS), that allows watershed specialists to model the current equivalent clearcut acres (ECA) within a watershed of interest. The ECAC model calculates ECA for a specified watershed based on the most recent and most impactive (greatest crown removal) management activities associated with roads, timber harvest, prescribed fire, and wildfire. The ECAC model does not model peak flows or sediment production and transport. Watershed specialists must use additional models, indices, measures, monitoring, site specific data, and experience to model these watershed variables and analyze cumulative watershed effects.

The most current model for reviewing the effects of forest management activities has been the R1-WATSED model (USDA, 1991). Watershed modeling is used to predict and evaluate the cumulative watershed effects of the existing harvest, roading and proposed alternatives within the subject watershed. The Kootenai National Forest uses the R1 - WATSED model which is considered to be "state-of-the-art". The values produced are estimates, and are used to compare effects between the existing conditions and alternatives. The R1 - WATSED model predicts the highest 30-day-average water yield increase and the annual sediment yield increase using naturally caused and human activities in the watershed as input. Water yield and sediment yield recovery is also predicted by the model. The model calculates disturbances based on the "ECA" (Equivalent Clearcut Acre) procedure, for example a 100 acre harvest area with 50 percent canopy removal would equate to a 50 acre clearcut. Information on how the model functions and the data required to complete an analysis is located at the end of this discussion. Included in the model discussion are the values the Kootenai National Forest has input into the various data bases required to run the model. The values for these data bases have been adjusted for site specific conditions found on the Kootenai National Forest. The predicted values generated by the model do not reflect rare or episodic weather events (such as the rain-on-snow events that have occurred in this area in the past), or the effects the predicted increases will have on fish or aquatic habitat.

R1 -WATSED also requires the input of local adjustments for variables like delayed recovery for different disturbances, and canopy removal due to natural causes, like fire. The most recent local research and field data were used to generate these adjustments. The following adjustments have been used during the completion of the R1 - WATSED model runs on the forest.

Canopy Removal From Fire:

Fire Intensity	Percent Canopy Removed
High	80
Moderate	55
Low	25

Delayed Recovery (in years) by Habitat and Disturbance Type:

	Disturbance Types			
Habitat Type	Harvest and Site Prep.	Fire (low)	Fire(mod.)	Fire(high)
Fast Growing	5	0	5	8
Moderately Growing	7	0	7	11
Slow Growing	9	9	9	14

The Kootenai National Forest (Libby Ranger District) is currently reviewing and compiling data to begin the validation process for the R1 - WATSED model for the forest. The initial efforts at validation have showed that the water yield portion of the model displays good correlation between collected data and the model predictions (see below). Additional intense sediment data collection is needed to get a better idea on the sediment volume predicting possibilities of the model. One data set has been used thus far for validation of the sediment prediction capabilities of the model. That analysis showed the model under predicted actual measurements by 300%. The values for sediment prediction should only be used for comparison purposes between different alternatives. The volumes predicted for sediment generation reflect only increases of suspended sediment in the stream, at the analysis point. Predicted sediment is delivered to the stream from upslope activities only and does not include any in-channel generated sediment. The sediment values predicted are not exact amounts.

Water and Suspended Sediment Yield Validation Example for R1 WATSED

Assumptions: 95% of suspended sediment occurs in a one month period.
Stream flow is divided equally per day in the high month period.
Routed sediment from R1WATSED is equivalent to suspended sediment.
Sediment (tons/ day) = mg/L TSS x cfs x .0027

Example Calculations: Quartz Creek (34.07 mi.^{2})
R1WATSED - Natural Conditions; Average 30 day Peak flow = 161.7 cfs, Routed Sediment = 8.1 tons/mi^2

8.1 tons/mi^2 x 34.07 mi^2 = 276 tons/year
276 tons/year x .95 (high month) = 262 tons
262 tons / 30 days = 8.74 tons/ day
High 30 day average mg/L TSS = 8.74/ 161.7 x .0027 = 20 mg/L TSS

R1WATSED - 1995 Estimates; Peak flow Increase = 7%, Annual Sediment Increase = 123%

Average 30 day peak flow = 173 cfs, Routed Sediment = 18.06 tons/mi^2

18.06 tons/mi^2 x 34.07 mi^2 = 615 tons/year
615 tons/year x .95 (high month) = 584 tons
584 tons / 30 days = 19.5 tons/ day
High 30 day average mg/L TSS = 19.5/ 173 x .0027 = 42 mg/L TSS

Collected Data -1995; Avg. 30 day peak flow = 212 cfs, 7 day peak flow = 261 cfs, One day peak flow = 292 cfs

1,864 tons TSS in high 30 day period, 1,864 tons/ 30 days = 62.1 tons/day

1,176 tons TSS in high 7 day period, 1176 tons/ 7 days = 168 tons/day

562 tons on high day

High 30 day average mg/L TSS = 62.1/ 212 x .0027 = 108 mg/L TSS

High 7 day average mg/L TSS = 168/ 261 x .0027 = 301 mg/L TSS

High day mg/L TSS = 562/ 210 x .0027 = 991 mg/L TSS

Water Year 95 = 22 inches ppt., 80 year average = 17.6 inches ppt. Water Year 95 is 130% of average

1995 collected high 30-day flow data is 122% above what R1WATSED predicted for the 30 day peak flow.

On Libby Ranger District during the mid-1990's numerous watersheds were run to obtain existing conditions. Because of computer system changes, personnel changes, and problems with interfacing various evolving data bases and the model, a process was completed that allowed an easier path to the data that WATSED provided. This process included separating watersheds by size class and precipitation regime that had already been run through the model and comparing their results with the above mentioned ECAC process to look at water yield estimates. This procedure has allowed us to use a more simplified analysis path based on ECA's to generate water yield estimates that have been validated by comparison with the WATSED model output. A new version of WATSED is in the process of been completed and beta tested for use. The process on Libby Ranger District uses regression lines created from WATSED outputs to determine the number of ECA's required to generate a 1% increase in peak flows and also the number of ECA's that recover each year in a watershed based on its drainage size and precipitation regime. Copies of the regression graphs are included in the project file.

Because the sediment validation of the model needs extensive data collection and a secure amount of long-term funding, sediment validation of the model has been lagging. Suspended sediment data collection has been ongoing on the District for a few years but the time need to complete the validation process does not allow both project work and validation work to proceed. Validation work is completed on a "free-time" basis and thus far has not been completed. For this reason the effects analysis for sediment concerns is based on actual data such as stage/discharge relationships, suspended sediment sampling (daily and grab), stream core sediment sampling, and macroinvetebrate sampling.

The values generated from the ECAC process are related to actual project area stream flow monitoring or stream flow monitoring from a representative watershed near the project area with similar attributes (precipitation, geology, development history, etc). The values are compared to the actual data and based on the stream geomorphology and professional judgment is used to determine the potential effects to the watershed resource.

USDA - FS. 1991. R1-WATSED Water Yield and Sediment Yield Model. USDA Forest Service, Northern Region.

APPENDIX 9: Miller West Fisher Monitoring Plan

ITEM #	RESOURCE	OBJECTIVE	TIMING	METHODOLOGY	RESPONSIBLE
	Weeds	Noxious weed control	At close of timber sale contract	FS will monitor herbicide treatments along open NSF roads and all accessible haul roads for several years following sale activities.	Weed specialist
	Recreation	Protect NFS Trails 505, 118, 300, 110, and trailheads during timber harvest activities.	During implementation of timber sale	Trails will be monitored during timber harvest operations by the timber sale administrator to ensure trails are protected during operations. The trails through Units 38, 39, 26, 29, 31, 16, 17, 121 and 203 will be reviewed by timber sale administrator and recreation specialist PRIOR to accepting those units as complete so that the operator can repair necessary damaged areas.	Timber Sale Administrator and District Recreation Specialist
	Wildlife	Protect flammulated owls from impacts due to logging activity	Before, during, and after timber sale implementation	Survey Units 11, 37, 38, 39, 43, 44, 45, 46, 47, and 49 using standard flammulated owl survey protocol to determine presence or absence in harvest units with suitable habitat. Protect nest trees with buffers if detected.	Wildlife biologist
	Fisheries	Monitor fish populations and habitat	After project implementation	Electrofish project area streams to determine fish species, populations, and extent	Fisheries biologist