CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

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.

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). As 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 present and reasonable foreseeable actions.

Relationship to the Forest Plan

The Kootenai National Forest Plan (USDA Forest Service, 1987a and b) and its accompanying Environmental Impact Statement and Record of Decision, specify the overall direction by which the resources of the Forest are managed.

The Forest Plan consists of forest-wide and area-specific goals, objectives, standards, and guidelines, which provide for land uses with anticipated resource outputs. It also contains a cumulative effects analysis of anticipated actions on a landscape level. Forest-wide goals and objectives pertinent to the proposed action were discussed in the Purpose and Need for Action in Chapter 1. A description of area-specific goals, standards, and guidelines follow.

The Pilgrim Creek DEIS is tiered to, and incorporates, the Forest Plan EIS in its entirety as encouraged by 40 CFR 1502.20. This DEIS is not a general management plan for the analysis are nor is it a programmatic documents. It is a site-specific link between the Forest Plan and the requirements established by NEPA, which involves the analysis and implementation of management practices designed to achieve the goals and objectives specified in the Forest Plan. This DEIS will discuss the proposed action and its alternatives in a sit-specific manner as required by NEPA.

Scope of the Analysis

The Council of Environmental Quality regulations implementing the National Environmental Policy Act (NEPA) require that all federal agencies consider the following three types of actions in determining the scope of an environmental impact statement (EIS) (40 CFR 1508.25):

Connected Actions are closely related and will be discussed in this DEIS, along with the Proposed Action. Actions are considered connected if they automatically trigger other actions that may require NEPA analyses; if they cannot or will not proceed unless other actions are taken previously or simultaneously; or if they are an interdependent part of larger action and depend on the larger action for their justification.

Connected Actions are part of Proposed Action. The Proposed Action includes all activities needed to complete the timber sales, prescribed burning, road management and watershed improvement activities, while providing for resource protection during and following project completion. Connected actions contained in the Proposed Action include:

- Road reconstruction, road maintenance, and monitoring associated with contract administration.
- Road access management associated with harvest scheduling.
- Tree harvest and monitoring associated with contract administration.
- Prescribed burning, site preparation, and fuels reduction activities, including slashing, fire line construction, underburning, and fuel-moisture monitoring.
- Tree planting, natural regeneration and monitoring of reforestation success.

Similar Actions, which when viewed with other reasonably foreseeable actions or proposed actions, have similarities that provide a basis for evaluating their environmental consequences together, such as similar timing or geography.

A number of similar actions have been identified and evaluated in the analysis of environmental consequences. These are current reasonably foreseeable actions that are described in the following section on cumulative actions.

Cumulative Actions include past, current, and Reasonably Foreseeable Actions that may have cumulatively significant impacts when considered along with the Proposed Action. The past and current activities have contributed to creating the existing condition, as described in the Affected Environment sections of Chapter 3. These activities, as well as reasonably foreseeable actions, may produce environmental effects on issues or resources relevant to the proposal. Therefore, the past, current, and reasonably foreseeable actions have been considered in the cumulative effects analysis for each resource area for the Proposed Action and its alternatives.

Three types of impacts are considered in the scope of analysis: direct, indirect, and cumulative (40 CFR 1508.7 and 1508.8). They are defined in the introduction of Chapter 3.

Past Actions are management activities (timber harvest, precommercial and commercial thinning, road construction, grazing, mineral exploration, special uses, recreation, and prescribed burning) and events (wildfires) that have occurred in the Project Area. The effects of these activities and events were considered in the analysis of the existing conditions of the resources in the project area, which are described in this chapter. Additional information is contained in the Project Files for each of the resources.

The catalog of past projects, to our knowledge, is comprehensive based on information available to the Forest Service. However, there may be some unintended omissions due to lack of current records or knowledge, particularly related to projects which have occurred prior to implementation of the Forest Plan in 1987. Information on past activities was gathered from the Timber Stand Management Record System (TSMRS), historic timber sale maps, road design

packages, District files, aerial photos, and the collective knowledge of local Forest Service employees.

The past activities and events for the Project Area are those that occurred during the past 80-100 years, and are summarized in Table 3-1.

Because cumulative effects vary in time and space, each resource area has defined a specific cumulative effects analysis area in their effects discussion that is pertinent to their specific resource and the issues addressed.

Current and Reasonably Foreseeable Actions are those management activities planned by the Forest Service, private timberland owners, Sanders County, and public which the members of the IDT determined were appropriate to consider in the cumulative effects analyses for their resources. Current and Reasonably Foreseeable Actions would occur regardless of which alternative is selected for implementation.

Current Actions are activities or projects that are ongoing; Reasonably Foreseeable Actions are those that will be implemented within the next 10 years, including those that would recur on an annual basis.

Table 3-1. Summary of Past, Ongoing, and Reasonably Foreseeable Actions

Timber Harvest				
Timber Sale Name	**Decade Harvested**	**Regen Harvest**	**Intermediate Harvest**	**Total Acres**
Smeads Bottom	2000		69	69
Back Road Blowdown SSTS	2000		7	7
Total harvest this decade		0	76	76
Timber Sale Name	**Decade Harvested**	**Regen Harvest**	**Intermediate Harvest**	**Total Acres**
Smeads Rice	1990	361	91	452
Steven Blacktail	1990	240		240
West Fork Pilgrim SSTS	1990		45	45
Huckleberry LPP SSTS	1990	8		8
SW Pilgrim	1990	331		331
Devils Head	1990	8		8
Huckleberry Salvage	1990	7		7
North Branch Marten	1990	20		20
Huckleberry Stevens Resell	1990	80		80

Timber Sale Name	Decade Harvested	Regen Harvest	Intermediate Harvest	Total Acres
Pilgrim Creek LP P&P	1990	5		5
Misc	1990	16		16
Total harvest in the 90s		1076	136	1212
Timber Sale Name	**Decade Harvested**	**Regen Harvest**	**Intermediate Harvest**	**Total Acres**
Huckleberry Stevens	1980	21		21
Stevens Mouth	1980		9	9
West Pilgrim Salvage	1980		16	16
Smeads Salvage	1980	70		70
Rice Paddy	1980	54	16	70
Pilgrim Salvage	1980		19	19
Pilgrim Salvage Resell	1980		8	8
Tuscor Hill	1980		165	165
West Fork Pilgrim Salvage (RSS)	1980		?	?
Misc	1980	11	20	31
Total harvest in the 80s		156	253	409
Timber Sale Name	**Decade Harvested**	**Regen Harvest**	**Intermediate Harvest**	**Total Acres**
Mad Stevens	1970		60	60
Misc	1970		726	726
Total harvest in the 70s	1970		786	786
Timber Sale Name	**Decade Harvested**	**Regen Harvest**	**Intermediate Harvest**	**Total Acres**
Lone Cliff Resell	1960		175	175
Loveland Sale	1960	268		268
Misc	1960	178	430	608
Total harvest in the 60s.	1960	446	605	1051
Timber Sale Name	**Decade Harvested**	**Regen Harvest**	**Intermediate Harvest**	**Total Acres**
Misc	1950	91		91
TOTAL HARVEST	1950	91		91

Total Harvest	**1950-2012**	**1769**	**1856**	**3625**
Precommercial Thinning	**Year**	**Acres**	**Comments**	
	1969-2010	1,838		
	Ongoing	None		
	2011-2020	121		
Road Maintenance	**Year**	**Miles**	**Comments**	
Road Resurfacing	2010		Resurfaced main road from Forest Boundary to top, improved surface water management (BMPs) in South Fork and West Fork Pilgrim.	
Bridge Replacement	2007	N/A	Replaced bridge over WF Pilgrim, restored floodplain access.	
Road Maintenance	Various		Routine brushing and blading occurred on many roads at varying intervals. More intensive maintenance generally occurred in conjunction with timber sales	
Road Maintenance	Ongoing	Varies	Brushing/blading occurs as needed on main open roads.	
Road Maintenance	Future	Varies	Brushing/blading likely to occur as needed on main open roads. Gated and barricaded roads generally receive maintenance as project needs dictate.	
Noxious Weed Treatment	**Year**	**Miles**	**Comments**	
Weed spraying	2002-2010	16	Infestations treated along 16 miles of road, not all miles sprayed along NFSR 151 and 2744. Three applications. SF and WF Pilgrim, Lone Cliff area.	
	2002-2010	4	Two applications on NFSR 2706 to gate. Smeads Creek.	
	2007	3	One application on NFSR 2706 and 2706B, Smeads Bench.	
	2002-2010	3.5	Two applications on NFSR 2746 and 2746A.	
Weed Spraying	Ongoing	Varies	Weed treatment may occur in accordance with the 2007 KNF Invasive Plant Management EIS.	

Noxious Weed Treatment	Year	Miles	Comments
Weed Spraying	Future	Varies	Weed treatment may occur in accordance with the 2007 KNF Invasive Plant Management EIS. Most treatment would likely be focused along open or restricted roads.
Wildfire	**Year**	**Acres**	**Comments**
	1889	36,602	Entire project area burned.
Great Burn	1910	36,000	98% of project area burned
	1940-2010	<20	75 total fires, 65 were less than ¼ acre, 10 were less than nine acres. 58% caused by lightning, 42% were human caused.
Watershed Restoration	**Year**	**Area**	**Comments**
Pilgrim RR Bridge Removal	2006	200 lineal feet	Removed railroad bridge, restored natural channel and floodplain geometry, and stabilized banks.
West Fork Pilgrim Restoration	2007	1100 lineal feet	Returned stream to historic channel, installed grade control and structures and protected banks.
King Reach Revegetation	2007	700 lineal feet	Planted riparian vegetation along banks and in floodplain to improve bank stability, water temperature, and riparian function
Reishus Reach Restoration	2008-9	1000 lineal feet.	Restored channel and floodplain geometry, installed grade control and habitat structures, stabilized banks and revegetated riparian areas.
Watershed Restoration	Ongoing		Maintenance of riparian plantings- King and Reishus properties as needed.
Watershed Restoration	Future		Unknown, none planned at this time.
Minerals Exploration	**Year**	**Comments**	
Pilgrim Mine	Early 1900s	Lode claim in tributary to SF Pilgrim. Three tunnels, no ongoing water quality impacts known. Last worked approx. 1926.	

Minerals Exploration	Year	Comments
Holliday Mine	1939	Lode claim in WF Pilgrim. Two adits, last worked in 1971. Water samples were within water quality standards, but soil samples at the waste dump showed that levels of arsenic, cadmium, copper, lead and zinc were present above Clark Fork Superfund background levels.
Miller Mine	Early 1900s	Lower Pilgrim Creek. Abandoned. No known water quality impacts.
White Star Mine	Early 1900s	Mid-slope above Telegraph Creek. Abandoned. No known water quality impacts.
Minerals Exploration	Ongoing	Holliday Mine is only active claim. No development work occurring.
Minerals Exploration	Future	None anticipated, but difficult to predict.

Recreation	Year	Miles	Comments
Misc. Trail Use		23	Hiking and motorized use on existing trail system.
Misc. Recreation	Past, ongoing, and future.	N/A	Hunting, hiking, fishing, camping.
Trail Maintenance	Ongoing and future.	23	Trails cleared and maintained on yearly or biennial basis.

Miscellaneous	Year	Comments
Firewood gathering	Past, ongoing, and future.	Individual use by private individuals, subject to terms of personal use firewood permits.
Private Land Development	Past	Development on adjacent private lands has occurred for the past 100+ years. These activities include the creation of more open agricultural lands, creation of access roads on private property, and construction of residences and other buildings.
Private Land Development	Ongoing and future.	Continued development of private lands within the area is expected. Development is expected to include continued timber harvest on private lands, land clearing, home construction, road construction, septic system installation, water well drilling, livestock grazing, and watershed improvement work along streams. The exact location and rate of these activities is impossible to predict.

Miscellaneous	Year	Comments
Livestock Grazing on NFS Lands	1920s-30s	Though specific records are lacking, sheep grazing was widespread on the District during this time period and it is likely that some sheep grazing occurred.
Livestock Grazing on NFS Lands	Ongoing and future.	No livestock grazing is currently authorized and none is expected to occur in the future.

The activities shown in the table above, plus other minor or undetermined actions that may have occurred since the inception of the Forest Service, are accounted for in the existing condition description that serves as the baseline for all associated analysis documented for this project and are accounted for in the effects analysis for each resource analyzed. The actions shown above are those actions considered to be the most pertinent to this project but are by no means exhaustive, but rather, are intended to provide the decision maker adequate information to make a reasoned decision. This information represents the best information available for the planning area.

VEGETATION

Introduction

The following vegetation analysis describes the existing condition and effects of the proposed action and alternatives to vegetation and ecological processes in the Pilgrim Creek, Stevens Creek, and Smeads Creek drainages, as well as associated face tributaries to Noxon Reservoir.

Regulatory Framework

Federal

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

State

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

Analysis Area

The Pilgrim analysis area lies within timber stand compartments 13, 17-19, and 22, covering approximately 36,602 acres. The analysis area coincides with the Pilgrim project area. This chapter includes a discussion of potential environmental effects (direct, indirect, and cumulative) of the proposed action and alternatives on the vegetation communities within the analysis area.

The defined boundaries provide an appropriate analysis area for the vegetation resource related to characteristics such as species composition, forest structure and patterns, and disturbances such insect, disease, and fire. The scale of analysis also provides an appropriate size area to monitor changes in vegetation trends over time, natural or human-caused. The period for this effects analysis would extend out to the expected ecological rotation age of the typical forested communities in the area.

Analysis Methods

District vegetation databases (FACTS, FSVeg, and a R1 Summary Database), insect and disease population models (FINDIT), and field reconnaissance were utilized to generate information on forest vegetation attributes such as age class, forest cover type, stand size class, vegetation response unit (VRU) classification, incidents of insect and disease, as well as information on past activities. Aerial observations of insect and disease activities were evaluated to facilitate understanding of longer fluctuations in insect and disease dynamics across the landscape. Aerial photographs, both historic and contemporary were used. Scientific literature, field reviews, and subsequent silvicultural assessment were used in the analysis. These

analysis tools were used to identify site-specific treatment needs that address the purpose and need for the project.

The inherent limitations to the database and models are recognized. Not all surveys and subsequent data come from the same period, with some surveys over 20 years old. Not all stands have on-ground exams, especially those stands found within inventoried roadless areas. Regardless, the data represents the most comprehensive data available for the analysis area. The data is used for broad generalizations, arithmetic sums and means, and to supplement current, site-specific information gathered at each proposed unit and area of interest. FSVeg Spatial has adequate resolution and accuracy for applications required in this effects analysis discussion. The FINDIT program is a simple tool for quick analysis of insect and disease population information taken from stand surveys.

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

Vegetation Response Unit Characterizations and Target Landscape Prescriptions (USDA, 1999) are used to define groupings of Habitat Types into VRUs (Table 3-2). It is felt that because of the abundance of available water in our ecological zone, geologic material is weakly correlated with vegetation patterns and processes. Vegetation Response Units (VRUs) were used to facilitate landscape-level analysis based on similar environments and vegetation characteristics.

Table 3-2: **VRU Groups and Constituent VRUs**

VRU Group	Constituent VRUs	Acres	% of PA	Fire Regime Group
Moderately Warm/Dry	VRU2S	6616	18%	I
Moderately Warm/ Moderately Dry	VRU3	2340	6%	III
Moderately Warm/ Moist	Number and	4505	12%	V
Moderately Warm/ Moist	VRU4S	1052	3%	III
Moderately Cool/ Moist	VRU5N	16307	45%	V
Moderately Cool/ Moist	VRU5S	1015	3%	III
Cool/ Moist	VRU7N	2275	6%	III
Cool/Moderately Dry	VRU9	1407	4%	III

The VRUs have similar patterns in potential natural communities (habitat types), soils, hydrologic function, landform and topography, lithology, climate, climate air quality, and natural disturbance processes (fire regimes, succession, productivity, nutrient cycling). The interaction of these processes creates a mosaic across the landscape. Within individual polygons of any VRU over time, the proportion of age and size classes, succession stage, and impacts of fire and/or disease will be dynamic as natural and managed disturbances occur (USDA, 1999).

Using FSVeg, successional stages are determined by grouping specific data fields related to size class and general canopy development, as a reflection of overall age class. These stand size classes and age classes are used as a proxy for successional stages (Table 3-3).

Table 3-3: Methods for Estimating Stand-level Successional Stages

R1 FSVeg Size Class[1]	Successional Stage
NONS, SEED, SAPL	***Early-Successional*** – these are immature, non-stocked, or seedling or sapling sized tree dominated sites. They are considered to be in the early stage of development, up to sapling sized.
IPOL, MHRP, MLRP, POLE, IMSA, SAWT	***Mid-Successional*** – these sites are pole-sized, or small timber size class dominated forest stands.
SAWT, MHRS, MULT	***Late-Successional*** – these are mature saw timber sized stands, or those which have matured to the point where they are no longer considered as mid-successional. These stands may or may not qualify as designated Old Growth, which relies on different criteria.

[1]IMSA= immature saw timber, NONS=non-stocked, SEED=seedling, SAPL=sapling, IPOL=immature/pole, MHRP=mature/high risk/pole, MLRP=mature/low risk/pole , POLE=pole, SAWT=saw timber, MHRS=multi-story/high risk/saw timber, MULT=multiple canopy.

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

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

- ***Successional Stages*** - Changes in the amount and character of mid-successional forested land realign with desired forest characteristics, as measured by acres of mid-successional areas altered. Changes in successional stages stem from regeneration of these stands to create early successional areas, or intermediate harvests to accelerate development of more mature stand characteristics.

- ***Species Composition*** - Stand-level changes trending toward long-lived early seral species such as western larch and ponderosa pine as measured by acres thinned or regenerated.

- ***Forest Structure*** - Stand-level changes in forest structure as reflected in the horizontal and vertical distribution and relative size of stand components as measured by acres thinned or regenerated to meet these specific objectives, expressed in qualitative terms.

Reference Conditions

Reference conditions refer to past or historic conditions of an ecosystem. Historic Range of Variability (HRV) and Natural Range of Variability (NRV) are terms found in the literature and describe historic (reference) conditions. The purpose of describing reference conditions is to explain how human and natural disturbance have changed forest conditions and succession. 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 (Kaufmann et al, 1994). Fire, wind, insects, and disease are important disturbance processes, creating a dynamic mosaic of forest conditions. These natural events can occur in small, localized areas or impose changes over broad landscapes. Species composition, habitat diversity, age class distribution, and stand structure are direct results of disturbances.

There is 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 (Chatters and Leavell, 1994). As stated by Morgan et al (1994), "*The utility of historical circumstances as reference conditions are in describing the dynamics of ecosystems undergoing continual change.... The status of an ecosystem variable...may have varied dramatically over time, but it did so at characteristic rates that reflect important ecosystem processes.... The rate of change affects the ability of species to adapt to new conditions.... Thus, the rate of change is likely to have as great an influence on biodiversity as the ecosystem conditions themselves.*" We are not attempting to precisely recreate past conditions, and do acknowledge that the modern human imprint cannot be eliminated. While mimicking historic conditions is not the answer or necessarily the desired condition, it does provide a reference, which combined with an assessment of future environment can help managers determine management activities that are ecologically sound and that will trend the landscape toward sustainable desired conditions.

Proposed management activities are designed to fit within acceptable and manageable historic ranges (reference conditions) we have identified, and are designed to foster the processes and patterns that make up the ecosystem. It is hypothesized where community composition and structure occur within a historic range of conditions, the function of the landscape community will also be maintained within its historic range. It is important to note that function cannot be maintained by restoring the vegetative structure, composition and patch size without restoring fire on the landscape. No mechanical means alone can duplicate the unique ecological effects of wild land fire, such as soil heating, nutrient recycling, and the resulting effects to the community composition and structure (Kauffman 2004, Page 880).

It is postulated that the current climate and range of native tree species has existed for about 2,500 years. As trees photosynthesize and grow, carbon is removed from the atmosphere and stored in living tree biomass. As trees die and otherwise deposit litter and debris on the forest floor, carbon is released to the atmosphere or transferred to the soil by organisms that facilitate decomposition (US EPA 2009A). Keane et al., 2009 state that "*Given the uncertainties in predicting climatic responses to increasing CO^2 and the ecological effects of this response….we feel that historic range of variability (HRV) time series derived from the past may have significantly lower uncertainty than any simulated predictions for the future. Recall that large variations in climates of the past several centuries reflect in the parameters used to simulate HRV time series. In that light, Keane suggests it may be prudent to wait until simulation technology has improved to include credible pattern and process interactions with regional climate dynamics and there has been significant model validation before we throw out the concept and application of HRV*."

Fire Ecology and Forest Succession

Fire has been a major influence on vegetative patterns, composition, structure, function, age and development of both individual stands and the larger landscape (Habeck and Mutch, 1973; Arno, 1976; Arno, 1980; Fischer and Bradley, 1987). The intensity and frequency of historic fires and the resulting patch size and vegetative succession are predictable based on the biological, physical, and climatic factors of the landscape. Forest vegetation adapted to these disturbance processes. For example, fire adapted species like western larch, Douglas-fir, and ponderosa

pine have evolved thicker bark and deep root systems that withstand frequent fires of higher intensity more effectively than species with thin bark and shallow roots such as lodgepole pine and true firs. Historically, stand-replacing fires often left the fire-adapted species as single standing trees or groups with an open canopy (Smith and Fisher, 1997). These stands would then reproduce under the open canopy, thereby perpetuating the seral fire-adaptive species.

Historically, fire influence created a mosaic of stands with a variety of vegetative species, sizes, ages, and structures. Prior to European settlement of the western states, the landscapes of western Montana were largely characterized by the natural fire regime; influenced by varying moisture, temperature, and vegetative composition. The availability of seed from lodgepole pine with serotinous cones meant rapid restocking of burned sites – especially in the mid to upper elevations. Persistent, large diameter fire survivors of western larch, Douglas-fir, and ponderosa pine helped to maintain a mix of species.

Historical fire regimes in the analysis area are evident based on fire scar analysis, but largely masked by the 1889 and 1910 fires, which consumed 98% of the analysis area. Regeneration of relatively pure lodgepole pine stands under scattered overstory larch on cool, moist sites; and stands dominated by Douglas-fir with some ponderosa pine on warmer, drier sites resulted from the 1889 and 1910 fires. Today's effects of fire suppression should be viewed with a consideration of the associated effects of weather and climate factors in years following 1910, as well as the development road infrastructure that provided access to logging, mining or other resource operations over time.

Three Fire Regimes occur in the analysis area. Refer to Fire and Fuels Table 3-FF2 for fire regime attributes.

Disturbance Agents

Disturbances characterize all forest types. Effects from disturbances vary from minor (slow) changes to drastic (quick). In addition, continuous landscape alterations can range from small to very large, encompassing a few to thousands of acres. These disturbances historically include fires (wildland and human-caused), wildlife and domestic livestock grazing, insect and disease infestations, floods, windstorms, timber harvesting, and permanent land clearing.

Species composition, habitat diversity, age class distribution, and stand structure are direct results of such disturbances, creating a dynamic mosaic of forest conditions. Since plants and animals adapt to habitat and disturbance conditions, it is considered desirable to manage towards a range of historic conditions. This provides a baseline range of conditions used to evaluate how existing conditions depart from situations that resulted largely from natural processes.

Wind

Wind and the resulting wind throw is an important natural disturbance process in northwestern Montana ecosystems. High-intensity windstorms can heavily impact whole stands. Lower intensity windstorms impact stands with a high percentage of defective or dead trees or those occupying particularly wind-prone sites. Trees that have grown in dense stands are particularly susceptible to wind-throw when surrounding trees are removed (Waring and Schlesinger, 1985). Trees growing in areas with shallow rooting zones (high water table or bed rock) are also more susceptible to wind throw. Trees infected with root disease are more susceptible to wind throw due to the decay in the roots.

Insects and Disease

Most insects and diseases (pathogens) have integral functions in the forest ecosystem. Tree diseases and insect infestations 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 play a role in the fire ecology of northwestern Montana by creating areas of dead conifers that combined with other factors can fuel large, catastrophic stand-replacing fires or mixed severity localized 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).

Historically, the most conspicuous insects and diseases in the forest were bark beetles, defoliators, stem decays, and root disease. Root disease commonly thinned the Douglas-fir and grand fir from early seral stands, allowing the more root disease tolerant ponderosa pine and western larch to capitalize on reduced competition. The ecological reset from the 1910 fire, selective harvest, and fire suppression has reduced the opportunity for early seral species to establish in some root disease areas. 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.

Human Influences

The dramatic change in frequency, distribution, and magnitude of fire since European settlement has had major impacts on many forest types in northwestern Montana. Fires occurred from non-lethal under burning to stand replacing crown fires, burning over a longer period, limited only by fuels and weather and covered large areas. Since the big burn in 1910, fire suppression efforts have been very effective at suppressing the low and mixed severity wildfires, which may have upset the biological “balance” that existed over thousands of years. This balance upset has influenced damage occurring from insects and disease and increased the probability of larger more intense fires with the accumulation of fuels on the analysis area landscape.

From 1880 through 1910, fire was used for debris reduction in logged areas for railroad ties, homesteading, and land clearing without seasonal restrictions. This contributed to the multiple fire starts that grew together to form the regional fires of 1889 and 1910 in conjunction with seasonally high and dry weather events.

In 1882, the Northern Pacific Railroad was constructed along the Clark Fork River. The local communities of Thompson Falls, Trout Creek, Noxon, Heron, and others were soon established. The railroad facilitated trade, commerce, and development within the western lower Clark Fork River valley. There was an increase in logging activities with the railroad needing railroad ties, homesteading and communities needing rough sawn and dimensional lumber. By 1906, the US Forest Service was also established in the area. Prior to 1910, the young communities, counties, railroad and the Forest Service had very few rules, regulations, or policies effectively dealing with fire. After the big burn of 1910, a national fire policy was initiated by the U.S. Forest Service, which contributed to the current stand conditions.

Affected Environment

The analysis area lies within a large ecosystem that stretches across the Northern Rocky Mountains, and is subdivided into Section M333C-Northern Rockies. More specifically, the area

is included in the Northwestern Montana Forest Region described by Pfister and others (1977) and refined by Arno (1979). The *Vegetation Response Unit Characterizations and Target Landscape Prescriptions* (USDA, 1999) reflects these landscape conditions and is a useful reference to describe the departure from historical conditions in the following sections and develop target stand conditions. Figure 3-1 shows the distribution of the vegetation response units (VRUs) within the analysis area.

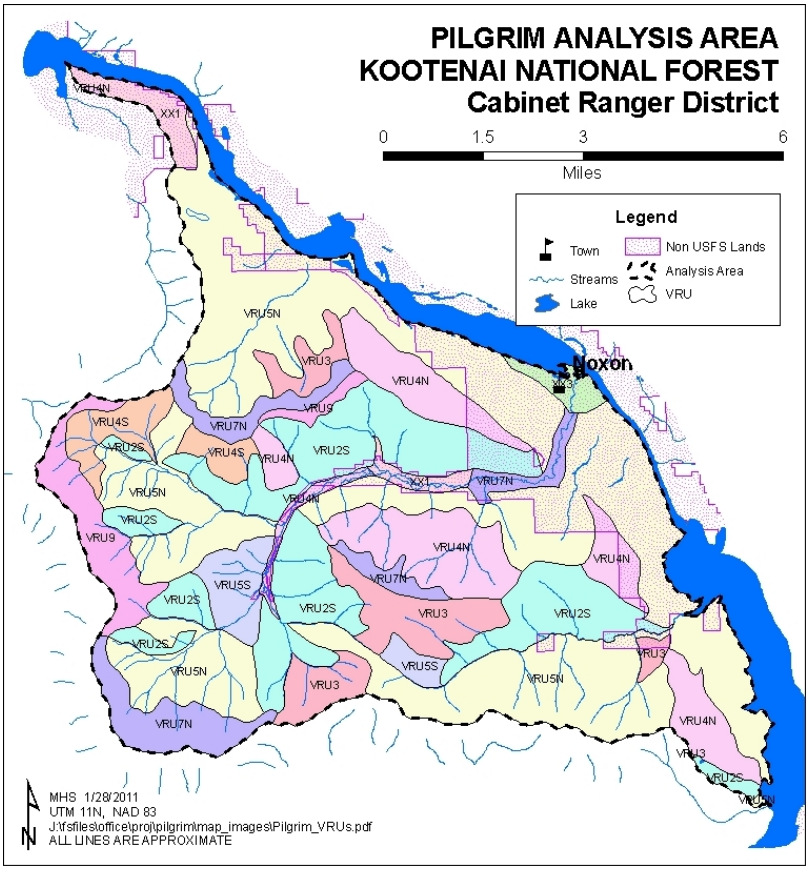


Figure 3-1. VRU Distribution in Pilgrim Analysis Area

Forest Structure, Forest Composition, and Successional Stages

Forest structure, or stand structure, can be defined as "the physical and temporal distribution of plants in a stand" (Helms, 1998). Structure changes as forests age, move across successional stages, and endure disturbance.

Forest composition refers to the species composition. Research by Losensky (1994) depicting forest conditions pre-1900 for a large geographic area that includes the analysis area, states "Settlement began in the 1840's with major development occurring in the 1880's with the arrival of the Northern Pacific Railroad. By the 1890's major portions of the Clark Fork and Bitterroot valleys had been logged." The Pilgrim analysis area is along the Clark Fork River where previous harvest activity combined with the fires of 1889 and 1910 left little evidence of historical reference.

Forest succession is the basic process of change in composition, structure, and function of plant communities over time. A simplified illustration of succession can be described as a forest progresses through stages (early, mid, late, or very late) each stage generally named after the

size class of the trees, or after the dominant life form (i.e.: grass, forbs or shrubs). The amount of forest in early, middle, or late vegetative succession that occurred prior to European settlement is not precisely known, as depicted by Losensky (1994).

Change is fundamental to all ecosystems, and disturbances are inevitable. Change is the only constant in our ecosystems. Vegetation community patterns over northwestern Montana reflect the combined influence of these disturbances along with the effects of settlement, timber management and fire suppression. Resulting plant communities vary considerably with site characteristics such as: topography; solar radiation; precipitation; elevation and soils, and plant species distribution and development patterns. Natural processes, such as fire, insect and disease activity, and succession will continue to change the plant communities. On a local scale, management activities can affect the course of these changes, to some degree, and protect the integrity of the ecosystem while providing for human needs.

Historic Range of Variability

The overall climatic condition on the Kootenai National Forest has remained relatively uniform for approximately the past 2,000 years. Within this period, disturbance processes together with landform and other environmental elements formed the major factors influencing the patterns of vegetation types across the landscape. Species abundance, distribution, and viability resulted from this dynamic pattern. Native plants and animals throughout this period and prior to changes brought about by modern day settlement and management, adapted to the rate of these climatic and disturbance regimes.

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

- Departure from stand structure
- Departure from forest composition
- Departure from successional stages

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

Existing Conditions

Existing vegetative patterns are influenced by both cool, Canadian air masses and the inland maritime weather systems. The maritime system moderates the cold winter temperatures, otherwise typical of a montane environment; and produces the climate necessary for coastal species, such as western hemlock, pacific yew and western redcedar to survive. Average annual precipitation ranges from 29 to 113 inches. At higher elevations, most of the precipitation falls as snow. Rain-on-snow events strongly influence the climate.

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

Forest Structure

Forest structure in the upper elevations are dominated by very large patches of single-storied, uniform stands of lodgepole pine with scattered overstory western larch, subalpine fir, and Douglas-fir. Mid to lower elevation forest structure is comprised of large uniform Douglas-fir stands with limited inclusions of non-uniform stands of mixed species and variable patch size. Existing size classes range from seedling/sapling to mature sawtimber, but dominated by immature sawtimber stands originating post 1910 fire. Stands exhibit a range of stand ages, a reflection of its natural and human-influenced disturbance history. The variation in structural attributes relates to the mosaic of natural disturbance, past harvest, and the resulting habitat characteristics.

Successional Stages and Species Composition

Overall, the analysis area has developed a relatively homogenous cover of densely stocked, mid-successional, even-aged stands. Currently 18% (6,625 acres) of the analysis area is privately owned, and 37% (13,549 acres) is considered unsuitable land where timber production is not permitted by the Forest Plan; i.e. wilderness, non-motorized, old growth, etc. Suitable lands comprise 45% (16,421 acres) of the analysis area. Forest type, year of origin, and size class data for private ownership and unsuitable lands are limited, making landscape species composition and age class distribution difficult. Data used to generate estimates of successional stages are based on inventories on the 16,428 acres of suitable land base. This presents a question of how best to address incomplete information. To address this we will use data from the suitable land base and extrapolate to the entire analysis area. Such an approach utilizes the best available information, from any source, to portray potential effects on the distribution of successional stages in the area, and allows us to make observations of potential effects related to proposed actions. The successional stages and species composition of the unsuitable lands parallel the suitable lands in similar VRU settings due to the 1910 fire influence. Lower elevation VRU's (VRU 2, 3, 4, and 5) are dominated by Douglas-fir and the upper elevation VRU's (VRU7 and 9) are dominated by lodgepole pine.

Dominant tree species, also called forest type, on suitable lands are Douglas-fir at 46%, and lodgepole pine at 15%. The remaining 39% is a combination of western larch, subalpine fir, grand fir, western hemlock, mountain hemlock, ponderosa pine, western white pine, and Engelmann spruce, with each at 5% or less. Above 4,000-foot elevation there is a greater incidence of lodgepole pine dominated stands, some are almost pure stands.

In areas impacted by lower severity fire between 1911 and 1930 there is a combination of two-storied western larch/Douglas-fir/grand fir, with a dense understory of western redcedar and western hemlock. Trees that survived the cooler, less severe fires provided a seed source to restock a second age class of western larch, lodgepole pine and Douglas fir.

In addition to conifer trees, understory vegetation of various shrubs, forbs, and grasses are present. Over 55% of the analysis area lies within the warm and moist VRU4N and VRU5N, where understory vegetation includes: queen cup beadlilly, round-leaved violet, sweetscented bedstraw, coolwort foamflower, Rocky Mountain maple, western serviceberry, pachistima, Utah honeysuckle, common snowberry, and twinflower. Upper elevation cool VRUs include fool's huckleberry, beargrass, and Pacific yew. Understory vegetation in the drier VRU2S, comprising 18% of the analysis area, include common snowberry, ninebark, dwarf huckleberry, ocean-spray, Rocky Mountain maple, spirea, kinnikinnick, and Oregon grape.

Vegetative Response Units (VRUs)

Existing successional class distribution compared to reference successional class distribution for suitable lands within the analysis area is displayed in Table 3-4. Current successional class distribution is based on stand data and year of origin. From the comparison table it is evident that all age classes are outside the historic range, likely a result of fire exclusion on drier VRUs, longer fire return intervals on more moist VRUs, and the continued ingrowth of trees.

Table 3-4. Comparison of Successional Stage Reference Conditions to Current Conditions Found on Suitable Lands within the Analysis Area.

			Successional Stage					
VRUs	**Condition**	**Un-defined***	**Early (0-40 yrs)**	**Mid (41-100 yrs)**	**Late (101-150 yrs)**	**Very Late (150+ yrs)**	**Uneven Aged**	**% of Suitable VRUs**
VRU 2S	ref.		**15-25%**	**15-35%**	**10-30%**	**20-50%**		6%
	current	31%	8.5%	43%	25%	0%		
	Acres	300 ac.	81 ac	414 ac.	241 ac.	0 ac.		955 ac.
VRU 3	ref.		**15-25%**	**20-40%**	**15-35%**	**15-40%**		11%
	current	25%	16%	47%	25%	0%	3%	
	Acres	454 ac.	294 ac.	853 ac	461 ac.	0 ac.	58 ac.	1826 ac.
VRU 4N	ref.		**15-25%**	**20-40%**	**15-35%**	**10-40%**		12%
	current	12%	104%	45%	43%	0%		
	Acres	254 ac.	5 ac.	893 ac.	853 ac.	0 ac		2002 ac.
VRU 4S	ref.		**15-25%**	**20-40%**	**15-35%**	**10-40%**		3%
	current	42%	9%	40%	18%	0%		
	Acres	174 ac.	48 ac.	164 ac.	75 ac.	0 ac		413 ac.
VRU 5N	ref.		**10-20%**	**15-35%**	**10-30%**	**25-55%**		52%
	current	29%	10%	37%	34%	<1%		
	Acres	2516 ac.	863 ac.	3135 ac.	2909 ac.	2 ac.		8568 ac.
VRU 5S	ref.		**10-20%**	**15-35%**	**10-30%**	**25-55%**		5%
	current	28%	14%	54%	17%	0%		
	Acres	243 ac.	121 ac.	477 ac.	149 ac.	0 ac.		880 ac.
VRU 7N	ref.		**15-25%**	**20-40%**	**15-30%**	**15-45%**		7%
	current	15%	19%	56%	29%	0%		
	Acres.	172 ac.	222 ac.	663 ac.	342 ac.	0 ac.		1178 ac.
VRU 9	ref.		**20-40%**	**40-60%**	**15-20%**	**5-10%**		4%
	current	9%	2%	72%	19%	< 1%		
	Acres.	52 ac.	18 ac.	434 ac.	112 ac.	1 ac.		599 ac

Information on this table is from USDA Forest Service, 1999, and the FSVeg data base.
Numbers highlighted grey indicate current conditions outside reference conditions. Acres include all **suitable lands** in the analysis area. Note*: "Undefined" are acres where limited data was available.

Moderately Warm and Dry Habitats Settings VRU2S- Fire Regime I

VRU2S occupies 6,616 acres of the analysis area, of which 955 acres are in suitable timber base. It is characterized as moderately warm and dry, but is a transitional setting that includes

warm, dry grasslands and moderately cool and dry upland sites. Occurring primarily on south and westerly aspect, these dry, lower elevation open ridges are composed of mixed Douglas-fir and ponderosa pine in well stocked and fairly open grown conditions. Moist, upland sites and dense draws also include western larch and lodgepole pine, with lesser amounts of ponderosa pine. Tree regeneration occurs in patches and is largely absent in the understory (USDA, 1999). Aspect in this VRU, along with its associated habitat types, plays a role in this more mesic setting. The nonlethal fire regime is representative of VRU2S on moderately warm dry sites (USDA, 1999). Lodgepole pine is typically seral on Douglas-fir dwarf huckleberry habitats. Both lodgepole pine and western larch occur on moist sites. Western white pine and grand fir are minor component s on some mesic sites and not common over the VRU. Douglas-fir and ponderosa pine are common serals on dryer sites.

Stand structure is a product of frequent low to moderate severity surface fires, and occasional stand replacement events, this VRU is generally a mosaic of stand ages and forest types. Multi-storied stands representing late successional stages also occur as stringers in protected areas that burned less frequently. Patches of even-aged, single storied stands develop after severe burning conditions within a dense understory or an overstocked pole stand after a long fire-free period (USDA, 1999). Historic patch sizes were less than 5 acres within 20 to 200 acre patches. Over all these stands are a diverse mix of open stands with well-spaced trees (15-30 trees per acre (tpa)) interspersed with larger openings and dense patches with multi-aged and 1-2 storied stands. Reference basal area densities are 60 to 100 sq. ft. /ac. in mature stands, and 65-150 on Douglas-fir- pine grass habitat types. Coarse woody material naturally occurs on these sites at 5-9 tons/acre in VRU2S.

Departure from Reference Conditions: Note that reference conditions refer to past or historic conditions of an ecosystem, of which the fires of 1889 and 1910 masked. Since 1910, factors of most influence have become timber harvest and fire suppression, replacing the frequent low intensity burns. Stands have a higher density of middle successional trees, with a more closed canopy and uniform stand structure.

The effect of missed fire intervals is evident given a lack of early successional class in this VRU. Based on stand data in FSVeg, of the 955 acres of suitable timber in VRU2S only 25% is late successional (between 101 and 150 year old age class); minimal is very late successional (151+ year old age class), and minimal early successional (0-40 year old age class). A majority of the area (43%) is represented by the mid-succession (40-100 year old age class). It is difficult to classify the successional stage for the 31% of undefined suitable timber base in this VRU, but a quick review of aerial photography reveals that most is likely 1910 stand origin.

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

VRU3 occurs on 2,340 acres of the analysis area, of which 1,826 acres occur on suitable timber base. This VRU occupies a moderately warm and moderately dry habitat between the drier, warmer sites featuring the Douglas-fir series (VRU 1, VRU 2) and the warmer and moist sites featuring western redcedar and hemlock (VRU 5). Being a transitional setting, this VRU includes characteristics of each (USDA, 1999). Often occurring on moderately steep, northerly slopes and some lower valley sites, VRU3 contains a highly variable assemblage of habitat types, reflective of its wide environmental distribution (USDA, 1999). Western larch, Douglas-fir and ponderosa pine are dominant species at lower elevations and western larch, Douglas-fir and lodgepole pine dominate the moist uplands. This VRU does include grand fir and lesser amounts western white pine and occasional western redcedar. A combination of fire regimes,

mainly low to moderate intensity, has shaped VRU3. Fire has been an important agent in shaping the species composition of this landscape. Characteristic low to moderate severity fires favor western larch and ponderosa pine over Douglas-fir. The less common severe fires favored the development of single species stands, especially lodgepole pine. The diversity of this transitional VRU is reflected in the range of associated fire intervals and severities.

Stand structure is a product of mixed severity fires and occasional stand replacement events; this VRU is generally made up of a mosaic of stand ages and forest types. Historic patch sizes were variable within 20 to 200 acre patches created by mixed and lethal fires. Structure is variable with gaps to large even-aged single storied patches. Single stories stands are prevalent due to most multi-aged multi-storied stands being burned in 1898 & 1910. Reference basal area densities are 80 to 120 sq. ft. /ac., increasing in more productive sites such as riparian areas. Coarse woody material naturally occurs on these sites at 10-20 tons/acre.

Departure from Reference Conditions: Since 1910, factors of most influence have become timber harvest and fire suppression, replacing the frequent low intensity burns. Stands have a higher density of middle successional trees, with a more closed canopy and uniform stand structure.

The effect of a missed fire intervals is evident given a lack of early successional class in this VRU. Of the 1826 acres of suitable timber in VRU3 there is currently minimal very late successional (151+ year old age class) or early successional (0-40 year old age class). There is 25% late successional (between 101 and 150 year old age class). Based on FSVeg Stand data, 47% is represented by the mid-succession (40-100 year old age class). Currently 25% of the suitable timber is not defined; therefore the successional stages are a best approximation.

Moderately Warm and Moist Habitat Settings VRU4N-Fire Regimes V

VRU4N occurs on 4,505 acres of the analysis area, with 2,303 acres of its timber base in suitable. This VRU is ecologically influenced by the moderating effects of the inland maritime climate (USDA, 1999). In this analysis area it is typically bounded by warmer and drier upland sites (e.g. VRU 2 and 3). Large valley bottoms were often composed of fairly open grown, mature western larch with younger lodgepole pine, Douglas-fir and grand fir in the understory. Upland sites had a mixed species composition with a narrow age class distribution and few canopy strata (USDA, 1999).

The characteristic distribution and diversity of forest communities within VRU4N was less than uniform, varying by topographic position and habitat type. Grand fir is common in many areas of this VRU, however due to slower initial establishment and growth; it is usually subordinate to Douglas-fir and western larch. Douglas-fir is a major seral on most sites. Engelmann spruce and lodgepole pine occur on the wet, colder habitat types. Western larch occurs sporadically other than where fire created desirable conditions. Western white pine and ponderosa pine are scattered but are a minor component. Western redcedar and western hemlock appear as incidentals.

A natural disturbance regime of primarily mixed severity fires with infrequent lethal fires, in addition to mortality-caused root disease, created a mosaic of horizontal and vertical forest structure across this landscape. There is a wide range of fire free intervals within this VRU due to the wide moisture gradient and the influence of surrounding stands. Historic patch sizes ranged from 100 to 300 acres or more. Evidence from fire scar studies indicates that historic fire

severity was non-uniform stand replacing fires occurring about every 200 years. This VRU has a higher potential for insects and disease outbreaks due to the longer fire free intervals and high densities of shade tolerant trees.

Departure from Reference Conditions: Analysis in the Beaver Creek drainage (which has similarities to Pilgrim) presents evidence of major change in stand structure, concluding that pre-1889 and 1910 periodic disturbances in all but south aspects would have produced stands of varying age and fuel characteristics. The combination of the 1989 and 1910 fires eliminated this structure and a single, homogeneous age class replaced it (USDA, 1999).

Based on FSVeg Stand data, of the 2003 acres of suitable timber in VRU4N there is currently minimal very late successional (151+ year old age class), and minimal early successional (0-40 year old age class). A majority of the area, 43%, is represented by the late successional (between 101 and 150 year old age class) and 45% is mid-succession (40-100 year old class). Currently 13% of the suitable timber is not defined, making it difficult to classify the successional stage.

Moderately Warm and Moist Habitat Settings VRU4S-Fire Regimes III

VRU4S occurs on 1,052 acres of the analysis area, with 413 acres of its timber base in suitable. Like VRU4N, VRU4S is ecologically influenced by the moderating effects of the inland maritime climate (USDA, 1999).

The characteristic distribution and diversity of forest communities within VRU4S was less than uniform, varying by topographic position and habitat type. Grand fir is common in many areas of this VRU, however due to slower initial establishment and growth; it is usually subordinate to Douglas-fir and western larch. Douglas-fir is a major seral on most sites. Engelmann spruce and lodgepole pine occur on the wet, colder habitat types. Western larch occurs sporadically other than where fire created desirable conditions. Western white pine and ponderosa pine are scattered but are a minor component. Western redcedar and western hemlock appear as incidentals.

A natural disturbance regime of primarily mixed severity fires with infrequent lethal fires, in addition to mortality-caused root disease, created a mosaic of horizontal and vertical forest structure across this landscape. There is a wide range of fire free intervals within this VRU due to the wide moisture gradient and the influence of surrounding stands. Historic patch sizes ranged from 20 to 75 acres for mixed severity fires and 100-300 acres or more for high severity lethal fires. Evidence from fire scar studies indicate that historic fire severity was non-uniform including mixed severity fires on an average of 30-85 years and stand replacing fires occurring about every 200 years. Mixed severity fire would create multi-aged and multi-storied conditions. This VRU has a higher potential for insects and disease outbreaks due to the longer fire free intervals and high densities of shade tolerant trees.

Departure from Reference Conditions: The combination of the 1989 and 1910 fires eliminated the structure and a single, homogeneous age class replaced it. On the drier, south slopes of VRU4S stand density has changed from more open stands with moderate shrub understory to denser stands with much less herbaceous understory as a result of less light penetration and reduced moisture variability (USDA, 1999).

The effects of longer fire return interval is evident given a lack of early successional class in this VRU. Of the 413 acres of suitable timber in VRU4S there is currently 18% late successional

(between 101 and 150 year old age class), minimal very late successional (151+ year old age class), and minimal early successional (0-40 year old age class). A majority of the area (40%) is represented by the mid-succession (40-100 year old age class). Currently 42% of the suitable timber is not defined; therefore the successional stages are a best approximation. Data is based on FSVeg Stand information.

Moderately Cool and Moist Habitat Settings VRU5N-Fire Regime V

VRU5N occurs on 16,307 acres of the analysis area; at 45% it occupies the largest percentage of the analysis area. The suitable timber base comprises 8,568 acres of the VRU. This vegetation response unit has some of the highest biological productivity on the Forest and occurs commonly along benches, stream bottoms, and many of the midslope settings. VRU5N is ecologically influenced by the moderating effects of the inland maritime climate, and is typically bounded by more moderate sites (VRU3 and VRU4) and some cooler sites (VRU7). The environmental conditions within VRU5N, and VRU5S, are very favorable for vegetative growth, species diversity, and habitat variety. Species found in low elevation riparian zones and moist slopes found in VRU5N are: mature western redcedar and western hemlock, with co-dominant Douglas-fir and western larch.

In general, fires in VRU5N can be characterized as non-uniform with infrequent but often extensive stand replacing fires on an average frequency 200 years, i.e. the fire of 1910. Historic patch sizes for stand replacing events ranged from 100 to 300 acres or larger. The potential for larger patch sizes was dependent on fuel, topography, insect and disease conditions and weather. Fire history studies in the Clark Fork River Corridor (Barrett, 1991) indicate an average patch size of 437 acres, ranging from 5-2000 acres (USFS, 1999) pg 80.

The more exposed upper slope ridges and the more protected riparian areas, north slopes, toe slopes and benches are the areas with the highest likelihood of avoiding lethal fires (Zack, 1994).

Departure from Reference Conditions: Since 1910, factors of most influence have become fire suppression and timber harvest, with the later focusing on more accessible and productive sites creating a disproportionate amount of homogenous, uniform patches in the lower elevations. Past stand replacing fires, fire suppression, timber harvest, and blister rust have reduced the abundance of western larch, western white pine and ponderosa pine in these areas. The stand composition and conditions influence the insect and disease infestations, particularly dwarf mistletoe, mountain pine beetle, and root disease.

Based on FSVeg stand data, of the 8,568 acres of suitable timber in VRU5N there is currently minimal very late successional (151+ year old age class), and minimal early successional (0-40 year old age class). A majority of the area is represented by 37% mid-succession (40-100 year old age class) and 34% late successional (between 101 and 150 year old age class). Currently 29% (2,516 acres) of the suitable timber is not defined, making it difficult to classify the successional stage; therefore the successional stages are a best approximation.

Moderately Cool and Moist Habitat Settings VRU5S-Fire Regime III

VRU5S occurs on 1,015 acres of the analysis area. The suitable timber base comprises 880 acres of the VRU. This VRU is very similar to VRU5N, with very favorable conditions for vegetative growth, species diversity, and habitat variety. The exceptional species diversity stems from tremendous growing conditions and long fire-free intervals.

The drier, upland sites of VRU5S are more open with greater vertical structure, often a result of frequent low to moderate-severity fires. The fire regime is periodically interspersed with mixed severity fires on an average frequency of 75 years and, to a lesser extent, low severity underburns. These mixed severity fires can be quite variable, ranging from low intensity, creeping fires that kill primarily shade tolerant trees to severe stand replacing fires that create favorable conditions for tree growth and regeneration of seral species. Historic patch sizes for mixed severity were 100 acres or smaller. Patch size from stand replacement fires averaged 100-300 acres. The potential for larger patch sizes was dependent on fuel, topography, insect and disease conditions and weather. Fire history studies in the Clark Fork River Corridor (Barrett, 1991) indicate an average patch size of 437 acres, ranging from 5-2000 acres. (USFS, 1999).

Departure from Reference Conditions: The lack of mixed severity fires has reduced the abundance of western larch, due to competition from species not requiring disturbance for establishment and a general increase in dwarf mistletoe. The increased composition of western hemlock, grand fir and Douglas-fir has increased the occurrence of root disease. Past harvest did not replicate the larger patch size of natural fire disturbance and often fire adapted trees were removed in the operations. Fire suppression has impacted the role of smaller mixed lethal fires as an agent of disturbance creating more heterogeneous stands. Due primarily to timber management activities, current patch size is smaller, more isolated, and more uniform in size and age class.

The 1910 fire and subsequent missed fire interval is evident given a lack of early and very late successional classes in this VRU. Of the 880 acres of suitable timber in VRU5S there is currently minimal very late successional (151+ year old age class) and minimal early successional (0-40 year old age class). Based on FSVeg stand data, 54% of the area is represented by the mid-succession (40-100 year old age class), and 17% is minimal late successional (between 101 and 150 year old age class). Currently 28% of the suitable timber is not defined; therefore the successional stages are a best approximation.

Cool and Moist Habitat Settings VRU7N-Fire Regime III

VRU7N occurs on 2,275 acres of the analysis area, where the suitable timber base comprises 1,178 acres. This VRU occurs in the moist lower subalpine forest setting and is common on northwest to east facing slopes, stream floodplains, and poorly drained subalpine sites, and moist frost pockets (i.e.: Gem Peak). Warmer sites (VRU 5) and cool, drier subalpine sites (VRU 9) typically border this VRU, which includes characteristics of each. Vegetative productivity is moderate to high due to the high moisture-holding capacity and nutrient productivity of loess deposits, adequate precipitation, and a good growing season. The predominant conifer species are subalpine fir, lodgepole pine, Engelmann spruce, with scattered white pine and western larch.

Moisture and temperature gradients create a complex influence on the fire ecology and the vegetation response in VRU7N. Fires in this vegetation response unit generally burn unevenly and are more intense but less frequent than that of VRU 9. Research demonstrates that infrequent stand replacement fires on a 100+ year fire return interval (Arno and Davis,1980) were the most common, occurring within a mosaic of nonlethal and mixed lethal burning. Well-drained upland sites experienced a higher percentage of stand replacement fires. Patch for mixed severity fires was generally 100 acres or less and lethal stand replacement fires could be as large as 5000 to 100,000 depending on fuel, topography and weather conditions.

Cool and moist conditions, coupled with broken topography and lush understories, undoubtedly limit fire spread and create non-uniform conditions. With fuels drying out slowly, under most conditions fires either burn very small areas or burn large areas in a patchy pattern (Smith and Fisher, 1997). However, because much of this VRU is relatively narrow and is often flanked by riparian areas this fire regime is strongly influenced by that of neighboring landscapes.

Departure from Reference Conditions: The proportions of early, mid, and very late seral age classes are generally not consistent with historical conditions (USDA, 1999). The 1910 fire also influenced the historic conditions.

Based on FSVeg stand data, there are 1,178 acres of suitable timber in VRU7N, of which there is currently minimal early successional (0-40 year old age class), and minimal very late successional (151+ year old age class). Late successional (between 101 and 150 year old age class) is 29%. A majority of the area (56%) is represented by the mid-succession (40-100 year old age class). Currently 15% of the suitable timber is not defined; therefore the successional stages are a best approximation.

Cool and Moderately Dry Habitat Settings VRU9-Fire Regime IV

VRU 9 occurs on 1,407 acres of the analysis area, with a suitable timber base of 599 acres. Sites are generally found on rolling ridges and upper reaches of mountain slopes generally above 4,400 feet in elevation (i.e. Lone Cliff). This VRU occurs on all aspects in the lower subalpine zone on gentle to moderately steep slopes. Climate is characterized by a short growing season with early summer frosts. Soils are generally from loess overlying glacial tills. Vegetation productivity is moderate to high depending on the aspect and soil moisture-holding capacity. These settings are very suitable to lodgepole pine and subalpine fir, the most common conifers, with scattered Douglas-fir and larch.

Lethal and moderately severe fires often create pure even-aged stands of lodgepole pine, as the 1910 fire demonstrated. Patch size resulting from stand-replacement events were typically 5,000 to 100,000 acres (USDA, 1999). The fire return interval for these large non-uniform fires ranged from 100 to 115 years. The mixed severity, non-uniform fires ranged between 50 and 300 acres, on an fire return interval of 50-71 years.

Departure from Reference Conditions: Stand structure is more uniform and less storied, with less shrub field development. Stands have fewer of the large, old overstory trees due to insects, disease, and the fires of 1889 and 1910. There is more homogeneity and uniformity in size and age classes of stands. Western Spruce budworm is common, which is a typical result of dense stocking of shade tolerant trees.

Based on FSVeg stand data, there are 599 acres of suitable timber in VRU9, confined to 72% mid-succession (40-100 year old age class), and 19% late successional (between 101 and 150 year old age class). Currently 9% of the suitable timber is not defined; therefore the successional stages are a best approximation.

Human Influences

Shade-tolerant species are well established across the analysis area due to the long (greater than 100 year) fire return interval. The current long fire interval has allowed stand biomass, ladder fuels and downed woody fuel loadings to increase beyond what these sites likely experienced historically with low to mixed severity fires. It’s important to emphasize the wide

range of conditions in these forest types, and extreme conditions are not unusual. These stands are more likely to experience high intensity fires with greater mortality due to high biomass, less heterogeneity, increased ladder fuels and crown bulk densities, and high down woody fuel loadings. Such densely stocked stands are also more susceptible to insect and disease problems such as root disease, dwarf mistletoe, and bark beetle mortality.

The greatest change in the analysis area has been the 1889 and 1910 fire effects, logging, and to a lesser extent the fire suppression efforts during the last 80 years. Absence of nonlethal low severity fires across the drier sites (VRU2 and VRU3) have altered insect and disease regimes due to increased stand density, and species composition favoring more shade tolerant and less disease resistant species such as Douglas-fir and grand fir. Maturing stands dominated by Douglas-fir and lodgepole pine become at risk as hosts to their respective bark beetle pests of Douglas- fir beetle or mountain pine beetle. Long fire return intervals in the more moist VRUs (VRU7-VRU9) have maturing stands dominated by lodgepole pine which are now enduring a mountain pine beetle infestation.

Although major harvest activities did not begin until the 1950s, the effects of timber harvest throughout the Pilgrim Analysis area are still evident today. As shown in Table 3-5, both regeneration and intermediate harvests were utilized. Overstory trees in well-stocked stands were thinned or widely spaced to relieve competition. Harvest in the 1970's focused mainly on intermediate harvests, where the intention was to enhance growth, quality, vigor, and composition of the stand. These operations focused on commercially viable larger Douglas-fir, western larch and ponderosa pine. The 1980's, like the 1960's, had both intermediate and regeneration harvests. During this time, stands began to show increased signs of root disease.

Table 3-5. Past Harvest Activity on Forest Service Lands in Pilgrim Analysis Area

Decade of Harvest	Regeneration Harvest	Intermediate Harvest	Total Acres
1950's	91	-	91
1960's	446	605	1051
1970's	-	786	786
1980's	156	253	409
1990's	1076	136	1212
2000's	-	76	76
1950-2010	**1768**	**1856**	**3624**

The largest projects in the analysis area came in the 1990's, where harvests influenced the species composition, age class distribution and function of the ecosystem. With effective fire suppression limiting the number and extent of wildfires, these logging activities are becoming the dominant disturbance factor in the forest. Approximately 1,076 acres of regeneration harvest have initiated the seedling-sapling age class (0-40 year old). Without these projects, the age class distribution, which is already below reference range as displayed in Table 3-4 above, would be much lower for the 0-40 age class. Objectives in previous timber sales were to reduce stand density, improve tree growth, and promote a more open stand structure that is conducive to the future use of prescribed fire.

Although older and larger trees were minimal in the analysis area, it is important to clarify that harvest of the older, larger trees was common practice prior to the 1980s and was thought the

best way to manage the forest. Since then understanding of ecosystems and the importance of other Forest resources such as wildlife, water, and soils have improved. The 1987 Forest Plan provides standards and guidelines for balancing the various resource values across the Forest. Additional research and publications in subsequent decades provides the basis for current harvest practices designed to manage multiple Forest resources.

Stand structure from past regeneration harvest units are different than what would be expected after a natural disturbance such as wildfire. Typical post fire-disturbance conditions are large amounts of standing live and dead trees, the majority of which would eventually fall down. Regeneration would slowly capture the site under the partial shade of the standing trees while the dead trees that fall down would also damage some of the seedling/sapling trees, effectively thinning some of the trees in the stand. These conditions with high fuel loading and generally high stocking would be receptive to a high severity fire such as the 1930 re-burn of some of the 1910 fire area. Following a second high severity fire, these sites would, in many ways, simulate a traditional regeneration harvest. A harvested stand will generally have far fewer standing trees, may re-forest faster than naturally due to planting trees, and may need thinning to prevent stagnation and favor seral species. “Edges” are created “edges” are created between harvested and un-harvested areas with a hard transition from forested to non-forested when regeneration harvest occurs. This edge may be more drastic that what may occur naturally. Many of the stands cut in the 1980s and 1990s have sufficient tree regeneration, but still display this hard edge.

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

Insects and Diseases

Major insects and diseases found within the analysis area affecting forest composition, stand structure, and fuel loads are described below. Many agents found affect species composition, but are considered within the "normal or endemic range" of a natural process. A consideration of forest health emphasizes prevention as opposed to suppression as a management strategy for insects, pathogens and natural disturbances that are considered detrimental to resource production. This emphasis is made with recognition of their beneficial role with regard to resources and ecosystem functions.

Forest insect and disease activity has been monitored via aerial observations for many years in Region 1. The 2009 flight revealed mountain pine beetle affecting the lodgepole pine, western spruce budworm, and some Douglas-fir beetle affecting the Douglas-fir in the analysis area (project file). In 2009, Western spruce budworm infested approximately 6,500 acres, and mountain pine beetle infested approximately 1,200 acres of lodgepole-dominated stands. Observations over past years reveal the ebb and flow of these and other organisms in the Pilgrim analysis area. We see that current stand attributes are setting the stage for future outbreaks given favorable weather and conditions. One example would be the lodgepole pine stands, which originated in the 1910 fire. These eighty to one hundred year old stands have a high number of small diameter trees per acre due to crowded conditions, which increases stress on each tree. The age and size of the lodgepole pine combined with stressed conditions are

ideal for an outbreak of mountain pine beetle, one organism that is approaching epidemic conditions in this landscape.

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

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 followed. 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).

Mountain pine beetle continues to increase in lodgepole stands of the analysis area. A site visit by a regional pathologist confirmed that “a significant amount of MPB-caused tree mortality will probably occur over the next 2 years, barring any unusual weather circumstances” (USDA, 2010). This is expected as populations are at extremely high levels in surrounding Forests including the Idaho Panhandle, Flathead, Lolo, Helena, etc. It is expected that infestation in the project area will increase for a few years, until the majority of the susceptible hosts are infected. MPB has reduced the stocking in some stands to unacceptable levels. The majority of the high-risk stands, those with higher percentages of mature to over-mature pine, have already sustained appreciable mortality.

Douglas-fir Bark Beetle (*Dendroctonus pseudotsugae*) is a bark beetle that generally attacks large diameter, mature, and over mature Douglas-fir in dense stands. Characteristics 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). 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, wind throw, 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.

Drought during the summer of 1998 increased the severity of the outbreak. The occurrence of Douglas-fir beetle on the Kootenai National Forest has records since about 1950. The recent outbreak slowly dissipated and beetle populations are endemic now, although surrounding forests are still reporting beetle populations. Current Douglas-fir beetle numbers are at endemic levels and the near normal precipitation levels for the past 2 years is presumed to be a factor. Douglas-fir Beetle infestations are expected to increase with the predicted climate change. Though numbers are now endemic, it should be noted that a large portion of the Pilgrim analysis area is composed of Douglas-fir that is of age, and size to move into a moderate level of risk.

Western Spruce Budworm (*Choristoneura occidentalis*) is a defoliator that prefers true fir, Douglas-fir, spruce and larch foliage. The larvae mine the buds and old needles in the spring,

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

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

Root Diseases. Of all the forest insect and disease agents, root diseases are a special concern because of the large quantity of Douglas-fir dominated stands. These diseases are a site pathogen and cannot be eradicated. The best management strategy for the future on such sites is retention or establishment of those species most tolerant of root diseases. If Intermediate harvest can retain a reasonable complement of species more tolerant of root diseases then conversion of the site can be achieved. If those desirable species are not present or present in smaller numbers, and retention of tolerant species is not feasible, then regeneration may be more suitable or desirable.

Diseases of concern are *Armillaria spp*, *Phellinus weirii*, *Fomes annosus*, and *Phaeolus schweinitzii*. The most common in the analysis area is Armillaria (*Armillaria spp.).* This fungus is the most common and widely distributed root pathogen in the Region 1. *Phellinus weirii* can be found throughout the analysis area, but appears to be in an endemic state. Root disease decays and kills cambium in roots and root collars, causing mortality in groups or scattered individual trees. Most large disease centers occur in western hemlock, grand fir or Douglas-fir habitat types. Primary hosts in this area are grand fir and Douglas-fir.

There is evidence of root disease in many of the proposed units, which is reflective of the ubiquitous nature of these pathogens. Affected stands tend to be dominated by tree species most susceptible to root diseases, specifically Douglas-fir and grand fir. Douglas-fir and Douglas-fir dominated mixed coniferous cover types attribute up to 46% of the suitable timber base within the analysis area. As stands age, and Douglas-fir moves into the late successional stage, more trees will become vulnerable to the disease. Stress due to effects of fire or burning, competition, drought and intermediate harvest heighten the vulnerability to the disease.

White pine blister rust (*Cronartium ribicola*) was introduced to the west coast from Europe and Asia in the early decades of the 20th century. It spread quickly throughout most of the range of five-needle pines, where it has substantially reduced the populations of these pines

throughout most their ranges in the West. This is an exotic pathogen that has not co-evolved with its hosts, and because of the importance of white pine to forest diversity, there is great interest in managing to re-establish rust-resistant strains of this once widespread tree. This fungus has substantially reduced the amount and distribution of white pine within the analysis area.

Climate Change

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).

Environmental Consequences

This section will summarize the changes in species composition, stand structure and forest successional conditions that are likely to occur as the result of implementing the alternatives described in Chapter 2. The successional conditions predicted represent the most logical pathways given the existing stand conditions. Where the effects of the proposed treatments are very similar, disclosures are combined. These potential effects include direct, indirect, and cumulative effects, in full compliance with the National Environmental Policy Act (NEPA) and related law, regulation and policy. Also addressed will be the effects to management from any proposed road construction or reconstruction. This section will also display how each alternative addresses the purpose and need of the project and the major issues identified. The No Action alternative provides a baseline for comparison to the action alternatives. Cumulative effects are described and evaluated the effects of the proposed action with other past, present and reasonably foreseeable actions.

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

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

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

ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Direct and Indirect Effects

No activities would take place with this alternative. Only natural processes and fire suppression would occur, affecting the forest succession and health. Age classes and species composition would continue to trend away from reference conditions. The condition of untreated stands would change over time, with continued mortality over time, with continued mortality, declining growth and wood decay as a result of insect mortality. In many areas this change will continue a trend whereby shade-tolerant species, that are more prone to insects and disease and are less fire-adapted, replace shade-intolerant species that have adapted to the influences of fire and are generally less susceptible to insects and diseases. The no action alternative would not contribute to the purpose and need of; reducing stand densities, improving growing conditions, increasing the proportion of root disease tolerant species; increasing the age class diversity in lodgepole pine dominated forest communities; and improve forage production for wildlife. Also this alternative would not meet the purpose and need to provide wood fiber to support the local and regional economies.

Fire Ecology and Forest Health

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

The immature to mature overstocked stands of lodgepole and western white pine currently impacted by bark beetles would not be treated in this alternative and options to recover economic value and increase species diversity would be deferred. Root disease areas would not be considered for treatments to enhance non-host species, allowing the Douglas-fir and grand fir to mature and succumb to the disease. None of the stands affected by white pine blister rust would be entered for restoration, nor would the western larch stands infested with dwarf-mistletoe. Western spruce budworm will likely remain as an endemic insect in the project area. Defoliation of understory trees would continue, but little mortality is expected in the overstory of most stands. Overstocked sapling-size stands would not benefit from stocking control and future management options would be reduced, as poor quality and excess trees are not removed and shade intolerant species continue to be impacted by high stand densities.

Prescribed fire would not be implemented and those units would likely remain without fire as a process to improve ecological integrity. As a result they would continue to decline in forage, browse, and hiding cover.

Carbon Flux

Those forest stands not affected by recent disturbance events are likely net carbon sinks at this point in their development. Under the No Action alternative, they would continue as sinks until the next disturbance event occurs. Over the long-term (centuries) net carbon storage is often zero, if stands regenerate, because re-growth of trees recovers the carbon lost in the disturbance and in decomposition of trees killed by the disturbance (Kashian et al. 2006).

Although not a statutorily defined purpose of National Forest System management, forests provide a valuable ecosystem service by removing carbon from the atmosphere and storing it in biomass. The Kootenai National Forest currently stores an estimated 171.1 (± 3.9) million metric tons (Mt) of carbon . This represents about 0.004 percent of the total of approximately 42,654 Mt of carbon in forests of the coterminous United States (USEPA 2008). Preliminary estimates indicate that the Kootenai National forest is a net carbon sink, removing from the atmosphere approximately 31 metric tons of carbon per acre per year.
Sustaining forest productivity and other multiple-use goods and services requires that land managers balance multiple objectives. The long-term ability of forests to sequester carbon depends in part on their resilience to multiple stresses, including increasing probability of drought stress, high severity fires and large scale insect outbreaks associated with projected climate change. Management actions - such as those in the Pilgrim proposed action and alternatives - that trend vegetation to a fire resilient landscape, maintain the vigor and long-term productivity of forests, reduce the likelihood of high severity fires and insect outbreaks, and store carbon in harvested wood products, increase the capacity of the forest to sequester carbon in the long-term. Thus, even though some management actions may in the near-term reduce total carbon stored below current levels, in the long-term they improve the overall capacity of the forest to sequester carbon, while also contributing other multiple-use goods and services.

This estimate is based on data collected in the 1990's on 351 Forest Inventory and Analysis plots and stored in the Forest Inventory and Analysis database (USDA Forest Service 2006). Calculations are from the Carbon On-Line Estimator (http://ncasi.uml.edu/COLE). The estimate includes total above ground carbon (bole and crown of live trees, bole and crown of aboveground standing dead trees, coarse woody debris, understory vegetation, and forest floor detritus) and below ground carbon in soil and roots.

These estimates are preliminary because two or more directly comparable forest surveys are not yet available for the Kootenai National Forests. In the late 1990's the Forest Inventory and Analysis Program switched from periodic sampling to annual sampling, and established a nationally consistent sampling and plot design (Gillespie 1999; Bechtold and Patterson 2005). A complete cycle of annualized inventory has not been completed yet for the Kootenai National Forest. The reported estimates are calculated by the GForest software program of the National Council of Air and Stream Improvement, Inc., based upon comparison of the annual inventory "panels." The standard error varies by year, and ranges from 1.37 to 2.56 on the Kootenai National Forest. The GForest software program can be accessed at http://ncasi.uml.edu. These estimates are expected to change over the next 5 to 10 years with the completion of repeat inventory of individual plots.

Forest Structure and Succession

The description of successional pathways outlines stand development that would ordinarily follow natural disturbance processes that include wildfire, insect and disease impacts, blowdown, etc. The descriptions recognize mosaic or patchy conditions that represent variation in species composition, forest type, and stocking levels. Assuming that traditional fire suppression would continue, the successional development described for the No Action Alternative would be inconsistent with ecological processes and may not create long-term, sustainable forest conditions. A comparison of current and referenced successional stage conditions (Table 3-4) shows successional stage distribution by VRU. Under the No Action alternative, trends in successional stage distribution would continue as described previously under the departures from reference condition section.

Moderately Warm/Dry and Moderately Warm/Moderately Dry Habitat (VRU2 and VRU3): These forest settings have historically experienced frequent, low intensity and mixed severity fires as a predominant natural disturbance. It is known that disturbance drives the development of forest structure; there are noticeable trends which can influence ecosystem health and landscape patterns. Without disturbance to open the stand structure for reintroduction, representation of ponderosa pine and western larch would remain as scattered individuals or very small groups as the Douglas-fir and grand fir become more established, somewhat similar to its current contribution within this analysis area. In areas like Smeads Bench and Tuscor Hill the current trend would reduce forage potential for wildlife, reduce maintenance of western larch an ponderosa pine, and not move stands towards a more open condition that better suits the reintroduction of fire as an ecosystem process. Without fires or associated management actions that disturb portions of the landscape, the extent and intensity of insects and pathogens will undoubtedly increase and result in a forest composition that is less resilient. These consequences may lead to a reduction in site quality and continued shift in species composition.

As these conditions border private lands and important wildlife winter ranges, the importance of assessing the risks of no action alternative becomes all the more relevant. A no action alternative decision in these specific conditions would prevent the natural process of fire to be re-introduced onto the landscape and habitat diversity will not be enhanced, resulting in more continuous forest patches with less horizontal diversity.
The no action alternative, coupled with continued fire exclusion, would increase the numbers of wildlife snags due to continued natural decadence. However, since most of these snags would be Douglas-fir, as opposed to ponderosa pine or western larch, which is preferred for its longevity and suitability, this snag benefit is short term.

Moderately Warm/Moderately Cool and Moderately Warm/Moist Habitats (VRU4 and VRU5): In comparison with many of the other habitat settings, the no action alternative and continued fire exclusion in many moist landscapes is less significant in the short term, due to the inherently long fire-free intervals. Moist sites found in VRU4 and VRU5 are characterized as having moderate frequency mixed severity fires, and infrequent (average of 200 years) stand replacement fires within a range that is similar to reference levels. In time, it is expected that no action alternative and continued fire suppression of ecologically important mixed severity fires would eventually promote larger stand-replacing fires than typical, particularly as forest homogeneity increases and higher stand densities persist. This is particularly true in the many stands dominated by old, dead or high risk lodgepole pine.

No action alternative and continued fire suppression would continue to move species diversity towards a greater proportion of mid and shade tolerant species, which are less fire adapted. Many of these sites with long interval fire cycles are resulting in much higher proportions of Douglas-fir, grand fir and subalpine fir/mountain hemlock forest types than historically existed in the area. Insect and disease problems can become more significant as forest conditions age, particularly with root disease and/or bark beetles. This is particularly evident in Tuscor Hill, Skeleton Creek, and Smeads Creek where large areas dominated by Douglas-fir, grand fir, and lodgepole pine are being impacted by root disease, bark beetles, and western spruce budworm.

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

The no action alternative would limit the opportunity to restore impacted areas to a fire-adapted species composition with greater resiliency to root disease, bark beetle and western spruce budworm. In the near future, the stands at risk will likely be those currently in overstocked conditions where tree vigor is typically low. As a result, overall landscape diversity could be reduced for some time due to less age class diversity and more fuels continuity.

Dwarf mistletoe in western larch has become more significant in some areas with the absence of fire. Under the no action alternative these trends would continue and without restoration, these important cover types are at considerable risk.

Cool and Moist Habitat (VRU 7): As with VRU4 and VRU5, vegetative trends do not appear as rapidly in this cool and moist habitat due to the infrequent nature of stand replacing disturbances. The no action alternative and continued fire exclusion would be gradual. The general landscape is expected to become less uniform with more connectivity between and within late seral stands, especially in riparian areas. No action alternative and continued fire suppression would minimize mixed severity fire extent, aiding the decline of stand structure variety and increased proportion of fire-intolerant species. Immature sawtimber sized western larch, Douglas-fir and some western white pine are usually favored in the mixed severity fires. Lodgepole pine, subalpine fir and Engelmann spruce may be significantly reduced or eliminated if they are in densely stocked conditions. These occasional maintenance fires reduce understory competition and rejuvenate browse and forage plants.

Continued interruption of the natural fire cycle, particularly mixed severity, would result in higher stand densities and more continuous, heavy fuel conditions across most of this setting. While not readily apparent, this condition would lead to more intense stand replacement fires. In particular, heavily stocked, pole-sized stands have a high crown fire potential (Davis et al. 1980). A high intensity fire will kill most trees in this mid-seral development stage. This could result in a shift to the herb/shrub phase or facilitate the development of lodgepole pine stands. If an area experiences a re-burn within a relatively short interval, the site may revert to a brush field, particularly habitat types such as mid to upper elevation subalpine fir stands. Western larch, Douglas-fir, nor lodgepole pine will likely survive high severity fires in the pole stage.

A gradual shift in species composition and higher stocking levels could result in insect and disease problems due to low tree vigor**.** On sites where fire-resistant species are being replaced by shallow-rooted, thin-barked species there is the potential for a loss of shallow fine roots following a surface fire. This increases the susceptibility to stress and direct entry of root and stem pathogens. Fire-resistant species have lower susceptibility to long-term soil damage from fire as roots are deep and bark is thick. Root disease is expected to cause mortality in Douglas-fir and grand fir overstory. Blowdown is more significant in root-disease affected areas and in Engelmann spruce stands.

Cool and Moderately Dry Habitat (VRU 9): VRU9 comprises of even aged lodgepole stands without a significant component of other species. Historically, as demonstrated by the 1910 fire, mixed severity and lethal fires was the predominant disturbance playing a major role in regularly interrupting succession and perpetuating the presence of lodgepole pine. With a few exceptions, there are a relatively low percentage of early seral stands due to the uncharacteristically low amount of stand replacement and mixed severity fires since 1933.

The no action alternative will allow shifts in vegetative patterns, increased fuel loadings, and changes in species composition. The uncharacteristically low percentage of young stands will continue in the short term, under the no action alternative. If a wildfire occurs in this forest type, it may likely convert mature stands to early seral. Lodgepole pine stands would continue to

experience considerable mountain pine beetle-caused mortality as mature lodgepole pine trees are an optimum food source for the pine beetle. Where management objectives do not include the maintenance of stand vigor, conditions that are very conducive to pine beetle outbreaks are a general result, as is currently occurring. This condition will greatly increase the probability of a stand replacement fire, as fuel loadings would be significant. Between significant fire events, lodgepole pine would be replaced by subalpine fir and Engelmann spruce that fill in the open growing space. Douglas-fir will occasionally fill some low elevation sites. The succession to climax dominated by subalpine fir is often very slow due to either of seed source or apparent low vigor. With time, surviving lodgepole pine increase in growth and become susceptible again to mountain pine beetle attack. It would not be uncommon for the risk of reburn to be high during early successional stand development due to the amount of available fuels.

Cumulative Effects

Past, present, proposed, and reasonably foreseeable activities were reviewed to determine cumulative effects to forest vegetation. Beginning in the 1950s, previous regeneration harvest has occurred on approximately 1,768 acres. These managed stands have a mixed species composition and contribute to the vegetative diversity mosaic that occurs in the analysis area. Since the 1960s, approximately 1,856 acres have been partially cut or thinned resulting in a variety of stand conditions ranging from open to patchy, giving trees sufficient room to grow. Stand composition generally consists of seral or mix of seral and non-seral species. This diversity provides options for future management and varying objectives.

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

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

Forest Plan Consistency

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

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

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

ALTERNATIVES 2, 3, 4, AND 5

Carbon Flux

The action alternatives (alternatives 2, 3, 4 and 5) would remove carbon stored in treatment area biomass through timber harvest and fuel reduction activities, including prescribed burning. A portion of the carbon removed would remain stored for a period of time in wood products (USEPA 2009, Depro et al 2008). As the stands continue to develop, the strength of the carbon sink in the stand would increase until peaking at an intermediate age and then gradually decline but remain positive (Pregitzer and Euskirchen 2004). Carbon stocks would continue to accumulate, although at a declining rate, until impacted by future disturbances. The short-term change in carbon stocks and sequestration rates resulting from the proposed action are minute on global and national scales, as are the potential long-term benefits. Management actions, such as those proposed with this project, that maintain the vigor and long-term productivity of forests, reduce the likelihood of high severity fires and insect outbreaks, and store carbon in harvested wood products, increase the capacity of the forest to sequester carbon in the long-term. Even though some management actions may initially reduce total carbon stored below current levels, they improve the overall capacity of the forest to sequester carbon in the future, while also contributing other multiple-use goods and services.

Direct and Indirect Effects

Harvest Effects on Forest Health

The proposed alternatives would improve forest health to varying degrees depending on treated acres; however, the effects to forest vegetation are generally the same. Table 3-6 provides a comparison of treated acres of each proposed treatment.

Table 3-6. Harvest Method Summary by Alternative

ALT	REGENERATION HARVEST	INTERMEDIATE HARVEST	Total Harvest	RX BURNING	TOTAL ACRES	% PROJECT AREA
2	587	824	1411	4564	5975	16%
3	898	536	1434	4564	5999	16%
4	813	477	1290	4564	5854	16%
5	261	371	632	4564	5196	14%

The action alternatives would meet the project's purpose and needs of; reducing stand densities, improving growing conditions, increasing the proportion of root disease tolerant species, increasing the age class diversity in lodgepole pine dominated forest communities, improving forage production for wildlife, and providing wood fiber to support the local and regional economies. Each alternative would meet these with a varying degree depending on acres treated and the silvicultural system applied.

Where forest conditions are outside the historic range of variability, concerns for forest health, species viability, ecosystem integrity and sustainability area addressed by improving species and structural diversity in a variety of forest settings. Even-aged stands, as those in the analysis area, dominated by mature Douglas-fir or lodgepole pine with moderate to high levels of insects or disease would be harvested. Following harvest, species diversity planting would provide an opportunity to increase the amount and distribution of fire-adapted and root disease tolerant species (i.e. western larch, western white pine, and ponderosa pine). Some natural regeneration would occur in the upper elevations dominated by lodgepole pine. These treatments would contribute to the overall goal of maintaining historic vegetative patterns through retention of most larger, overstory trees, especially western larch, ponderosa pine, healthy western white pine, and western red cedar. These forest health concerns are also addressed through proposed treatment of lodgepole pine and Douglas-fir stands that are either currently impacted by root disease and mountain pine beetles or are candidates for treatment to reduce their susceptibility.

Alternative treatments of intermediate harvest, slashing and prescribed burning as designed, would not convert the current age class to another age class, but would accelerate development of more mature stand characteristics. In the latter scenario, these stands would remain as mid-successional, but considered to be put on an accelerated trajectory toward late-successional community attributes. Regeneration harvest would increase the proportion of the early successional stages across the project area and decrease the amount of the mid-successional stages in the area. This new recruitment will help trend the total age class toward the distribution of historical reference, refer to Table 3-4: Comparison of Successional Stage Reference Conditions to Current Conditions Found on Suitable Lands within the Analysis Area.

Additionally, silvicultural treatments are expected to improve forest conditions that have resulted from the interruption of a natural fire cycle. Following timber harvest, some areas would be grapple piled and burned while low intensity fires through underburning would be reintroduced in other areas. Other areas will be managed to reduce stand density, improve tree growth, and promote a more open stand structure that is conducive to the potential, future use of prescribed fire. These stands are generally located in key wildlife winter range areas that historically have relied upon disturbance to maintain habitat functions and specific forest structure.

Implementation of the proposed regeneration harvests would further initiate change in forest conditions by converting treatment areas from a mature developmental stage to a fairly uniform seedling stage with reserve overstory; essentially re-setting the successional clock. Proposed regeneration harvests are located in areas with declining health and vigor conditions, where thinning would not benefit their condition or composition. Openings created by harvest would be reforested through a mix of conifer planting and monitoring of natural regeneration. Following any proposed burning, browse would be rejuvenated and expand in coverage and nutritional value. Certainly, challenges and unplanned results are part of any project with complex objectives in a natural environment. Monitoring and adaptive management is an important part of restoring functioning ecosystems.

Harvest Effects on Forest Structure and Succession

As a result of past fires, the analysis area has large areas dominated by high density stands of even-aged Douglas-fir. Higher stocking density increases environmental stresses for trees; both diameter and height growth is decreasing, accompanied by a gradual decline in tree vigor. Stands are experiencing a gradual increase in susceptibility to disease and insect attack. Stands dominated by lodgepole pine will remain vulnerable to mountain pine beetle and fire. In the absence of fire or other disturbance, these stands will regenerate to more shade tolerant species, and continue to sustain high fuel loadings.

Regeneration harvest would initiate change in forest conditions by converting treatment areas from a single storied, even aged condition to a fairly uniform seedling stage with reserve overstory. Most regeneration harvest occurs in moist stands that have declining health conditions, generally poor growth, loss of seral species, undesirable forest structural trends and demonstrate a need for restoration. These sites have high productivity due to favorable aspect, generally deeper soils with an ash cap, and adequate precipitation. Also, reforestation potential is very high and suitability for this type of treatment is excellent. Created openings would be reforested through a mix of conifer planting and natural regeneration. This new recruitment will help trend the forest stand structure toward the distribution of historical reference, by redistributing acres to the early successional stage. In areas planned for underburning, browse is expected to increase in nutritional value for the first several years.

Exposing bare soil through burning or other means is fundamental for natural regeneration of seral species such as ponderosa pine, western larch, and lodgepole pine. While natural seeding of conifers is expected to occur in regenerated areas, the timing, distribution and species is not assured. On moderately warm and dry sites (VRU2) through the moderately warm and moist sites (VRU4) ponderosa pine, western larch, and western white pine would be planted the year following harvest and/or fuels treatment where adequate natural regeneration is not expected to occur within desired timeframes. On the moderately cool and moist sites (VRU5) through the cool and moderately dry sites (VRU9) Engelmann spruce would be planted in addition to western larch and western white pine. Post- harvest monitoring exams would provide feedback on whether or not planned artificial reforestation is needed to the extent prescribed, and whether planned natural regeneration will be successful.

In addition to the planted conifers, it is expected that at least 10% of the moderately cool and moist sites will naturally restock with a mix of grand fir, lodgepole pine, western hemlock and western red cedar and others depending on location. It is anticipated that at the time the stands are certified as stocked, at least 20% of the cool moist would be stocked with lodgepole pine and subalpine fir seedlings. Warm, dry sites are expected to fill in with at least 5% Douglas-fir, larch, and lodgepole pine.

In regenerated areas, plants associated with early successional stages would be reestablished in response to day-lighting, decreased competition, and site preparation. Anticipated understory species on the warm, moist sites include Sitka alder, redstem ceanothus, shinyleaf ceanothus, sticky currant, fireweed, bracken fern, aspen, serviceberry, thimbleberry, bunchberry dogwood, rocky mountain maple and Scouler willow. The coniferous trees described above would establish with crown closure anticipated by year 20 within five years of harvest completion.

Anticipated understory species on the cool moist and cool dry sites (VRU7 through VRU9) include Sitka alder, rusty menziesia, huckleberry, sticky currant, fireweed, bracken fern, aspen, rocky mountain maple and Scouler willow. The coniferous trees described above would establish within five years of harvest completion, with crown closure anticipated by year 25. The warm and drier sites would have less canopy cover removed, minimally impacting the present understory composition. Nonetheless, vegetation expected to regenerate within created

openings include ninebark, oceanspray, mountain maple, snowberry, serviceberry, spirea, kinnickinnick, Oregon grape, pinegrass, and elk sedge.

Intermediate harvest would retain desirable species, within the limits of the existing stand characteristics. These treatments would increase the relative *proportion* of early seral tree species (western larch, ponderosa pine, and western white pine) and decrease the proportion of Douglas-fir, grand fir, and lodgepole pine within the areas treated. This species composition would closely mimic historic stand conditions, based on our understanding of regional forest ecology, as summarized in the VRU descriptions. Intermediate harvest would maintain the vigor of the residual ponderosa pine, western larch, and other desirable species in those stands where these species are competing for growing room. Harvest would also allow development of mature and late successional characteristics as the residual stand matures and changes over time.

Plant species associated with early successional stages are not expected to become as widely established with intermediate harvests. Following treatment the existing understory vegetation is expected to continue to dominate these sites and would likely benefit from the associated grapple pile burning that is planned.

Units planned for pre-commercial thinning would increase sunlight to the forest floor and stimulate growth of existing vegetation. Since no mechanized ground-based equipment is utilized, there is no soil scarification and establishment of new vegetation is not anticipated.

In all action alternatives, some level of maintenance burning is proposed as a means to restore and maintain ecosystem processes. Stands that are currently dominated by shrubs, grasses and/or forbs with a few scattered large trees would be maintained in this structural stage by killing invading trees in the smaller size classes and rejuvenating new growth that is beneficial as browse to wildlife. Other stands planned for underburning have a denser canopy but are still open enough to provide for the growth of shrubs, grasses and forbs. An additional benefit may be to provide a seed bed for regeneration and establishment of some early seral tree species. Non-forested shrub/grasslands and open-canopy ponderosa pine/Douglas-fir stands are important elements in the ecosystem that are currently below the reference levels. Some areas (ie: wildland-urban interface) would have saplings cut beneath the large diameter overstory. This is designed to reduce ladder fuels and promote the maintenance of this older age class of trees. The felled saplings will be limbed, lopped and scattered to reduce fuel concentrations and depth while increasing the rate at which this material decomposes on the site. This treatment will also have the long-term benefit of increasing the likelihood that overstory trees can sustain the effects of an underburn when that occurs and would promote the sprouting of browse species for wildlife benefit.

Harvest Effects on Reserve Trees

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

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

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

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

Effects of Road Construction on Forest Vegetation and Management
Forty-seven miles of existing road would be brought up to Best Management Practices (BMP) standards through road reconstruction in all action alternatives. All miles are needed to access proposed harvest units. Table 3-7 lists the acres accessed by new and temporary roads in each alternative. Access allows for more cost effective site preparation for tree planting, reforestation surveys, and other post-harvest activities.

Table 3-7. Proposed Harvest Acres Accessed by Road Construction, Either New Specified Road Construction or Temporary Road Construction.

ALT	MILES OF NEW RD CONSTRUCTION	HARVEST ACRES ACCESSED	MILES OF TEMP RD CONSTRUCTION	HARVEST ACRES ACESSED
2	2.4	352	1.6	138
3	4.7	551	1.6	137
4	-	-	-	-
5	-	-	-	-

Effects of Road Closures on Forest Vegetation and Management
Following all post treatment activities temporary roads would be returned to natural conditions, eventually provide forest cover, although they would likely go through a prolonged period of grass, forbs and/or shrub dominance. Access to new construction and closed roads proposed for use would be controlled post treatment by gates or other closure devices. These closure devices allow for motorized access sometime in the future, which may help fire suppression and stand-tending operations such as pre-commercial thinning.

Effects of Openings Greater than 40 acres
Openings are defined as an area that does not provide vegetation capable of hiding 90% of a standing adult elk as a distance equal to or less than 200 feet. Regeneration harvest alone can initiate an opening greater than 40 acres, as can multiple regeneration harvest units within 600 feet of each other, or the regeneration harvest is within 600 feet of an existing opening that when combined are greater than 40 acres.

The vast acres of Douglas-fir dominated stands infected with root disease are one factor in considering openings greater than 40 acres. A second factor is harvest on Tuscor Hill where

"partial retention in areas of high visual significance" is a standard for the management areas found on Tuscor Hill along the Clark Fork River. Increasing the age class diversity in the lodgepole pine dominated forest communities is a third factor.

The Pilgrim Analysis Area is dominated by Douglas-fir. Research has shown that intermediate harvest does not improve the survival or increase the volume of Douglas-fir, even if the most vigorous trees are retained. Work done in similar forest types in British Columbia, Canada by Morrison and Mallett (1996) suggested, "partial cutting on sites with even a low background level of root infection by *A. ostoyae* increases the incidence of infection and mortality in residual trees". The best management strategy for the future on such sites focuses on retention or establishment of root disease tolerant species like pines and western larch. If those desirable species are not present in the stand or present in smaller numbers and retention of resistant species is not feasible, then regeneration may be more suitable or desirable.

The mountain pine beetle infestation is considered epidemic within the stands of lodgepole pine at the head of West Fork Pilgrim Creek, Skeleton Creek, and the South Fork Pilgrim Creek. The FINDIT model predicts that 40% of the lodgepole pine has already succumbed to the current beetle attack (USDA, 2010). The FINDIT model predicts that following a 10-year MPB outbreak, only 97 of the 240 trees per acre will remain with the majority of the remaining in the smaller size classes (less than 7" dbh). MPB infestation is also evident in the head of Stevens Creek.

As stated earlier, the regional pathologist confirmed that "a significant amount of MPB-caused tree mortality will probably occur over the next 2 years, barring any unusual weather circumstances" (USDA, 2010). Those stands with higher percentages of mature to over-mature pine have already sustained appreciable mortality. MPB has reduced the stocking in some stands to unacceptable levels, therefore limiting the opportunities to commercially thin. Greater than 40 acre openings are planned in areas with the highest concentration of MPB mortality to reduce stand densities, improve forest health, and increase age class diversity.

Three of the four action alternatives propose openings greater than 40 acres. Proposed units are comprised of stands dominated by either Douglas-fir infected with root disease or lodgepole pine enduring a mountain pine beetle attack. Table 3-8 shows the number and total acreage of larger openings created by each action alternative.

Table 3-8. Number and total acreage of proposed openings larger than 40 acres

Alt.	*Total Number of Openings*	*Openings (in acres) Impacted by Root Disease*	*Openings (in acres) Impacted by Mountain Pine Beetle*	*Total Opening Acres*
2	*8*	*390*	*196*	*586*
3	*7*	*408*	*643*	*1051*
4	*5*	*364*	*507*	*871*
5	*0*	*0*	*0*	*0*

Larger openings were designed to produce the following benefits:

1- Reduce the potential for increased blowdown from harvest of the timber. Most of the proposed units are exposed to prevailing winds where smaller cutting blocks would subject the remaining trees to windthrow. Evidence in the Smeads Creek drainage and on Tuscor Hilll has shown the effects of windthrow in root disease and mountain pine beetle areas.
2- The best management strategy for focuses on retention or establishment of root disease tolerant species like pines and western larch. Increase the realization of economic value

from salvage of dead and dying Douglas-fir and lodgepole pine. A one entry harvest would maximize the economic return of salvaged trees.

3- The best management strategy for root disease sites focuses on retention or establishment of root disease tolerant species like pines and western larch.
4- Management activities would be accomplished in one entry rather than two.
5- Larger regeneration patch sizes are more characteristic of the historic range of variablilty.

Cumulative Effects

Past Actions and their Effect on Current Conditions

Historically, fire has been an important factor in maintaining or enhancing seral species across the analysis area, reducing tree competition, regenerating lodgepole pine stands, and nutrient cycling. The 1910 fire burned approximately 98% of the analysis area, initiating vast acres of even aged forest structure, namely Douglas-fir and lodgepole pine. Since 1910, natural disturbances have been replaced by fire suppression, which has been most effective in extinguishing low to mixed severity fires. The loss of these fires has resulted in increased tree canopy layers, higher surface and ladder fuels, and more shade intolerant species.

Harvest entries in the analysis area generally began after 1950, with significant regeneration harvest decades between 1960 and 1970, and 1990 to 1999. Major road construction and the associated removal of larger diameter trees resulted. Smeads Rice, Stevens Blacktail, and SW Pilgrim, all occurring between 1990 and 1999, were largely responsible for the blocks of early-successional forests. Both artificial (planting) and natural regeneration were used to increase the abundance of seral species, which are better adapted to fire, insects and diseases, and under represented on the landscape. In some cases, mechanical scarification was used to reduce shrub competition and create sites for newly planted seedlings. Species composition within these regenerated stands are more in-line with reference condition.

Significant intermediate harvest decades occurred between 1960 and 1980. Tree removal was focused on salvage of dead or dying trees, capturing economic value from blowdown, and/or thinning to emphasize a specific species composition, promote tree growth, vigor, and yield. To date only 10% of the analysis area has been previously harvested, 5% via regeneration harvest systems and 5% via intermediate systems.

Contrasting Effects of Proposed Actions with Past Actions

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

Even-aged stands, with a significant component of uniform mature Douglas-fir and increased fuel loadings would be replaced as would stands of moderate to high levels of insects and disease. Treatments are designed to allow artificial regeneration of tolerant species within Douglas-fir dominated stands currently infected with root disease, natural regeneration within stands dominated by lodgepole pine currently infested with mountain pine beetle, and intermediate harvest within stands were densities are negatively impacting growth and yield. Silvicultural treatments such as these would contribute to the overall goal of maintaining historic vegetation patterns through promoting late successional stands by retaining larger diameter

seral species and increasing proportions of early successional stands through regeneration harvest.

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

Effects of Ongoing and Reasonably Foreseeable Actions

A large portion of the analysis area is composed of even-aged Douglas-fir that is of age and size that is vulnerable to insects and disease. Bark beetles would likely remain endemic in areas at first, but would later increase as the effects of slash build up, increased competition, age, and size would increase stress on the stands. Lodgepole pine stands are also vulnerable to increased attacks by insects, primarily mountain pine beetle. The current infestation is not expected to subside until the majority of the lodgepole pine over 8” dbh has been infested.

Regeneration harvest would reduce acres of susceptible Douglas-fir and lodgepole pine, and thinning should provide improvement of general vigor in the long run. Some units with underburn treatments may experience a short term rise in Douglas-fir beetle populations due to environmental stress from release and added stress related to underburning. Generally, trees greater than 12 inches at DBH (diameter at breast height, 4.5 feet) have a higher probability of surviving prescribed fire, but the best success in in trees greater than 15 dbh. Stands currently infested with root disease may surpass a 10% loss of residual trees if they are under-burned.

Root disease will remain endemic within untreated areas. In treated areas fewer trees will be exposed to infection from surrounding resident populations of root disease. Regeneration harvest units may exceed the 10% loss if stress conditions, such as logging and fuel treatments, affect the residual trees. As the stands recover from stress, the risk in intermediate harvested stands can be initially higher than untreated stands.

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

Mountain pine beetle infestations in the lodgepole pine will be affected by 286 acres of regeneration harvest. These treatments are concentrated in stands of dying moderate to high risk lodgepole pine in lodgepole pine cover type. Another 30 acres of lodgepole pine will be treated in commercial thinning of those stands that include lodgepole pine. Regeneration harvest will result in 4 openings greater than 40 acres. Natural regeneration will be augmented with western larch and western white pine. Also within the regenerated stands, certification of full stocking will occur within 5 years of planting.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions:
The 0.5% and 2.5% of regeneration harvest, depending on the action alternative, will overlap with previous actions due to their extent, placement of these treatments on the landscape, and the vegetative and functional recovery of past harvest units. Alternatives with larger areas of proposed regeneration harvest will initiate openings greater than 40 acres. Regeneration harvest will increase the early seral (1-40 year) age class by the acres proposed for each alternative. Following implementation of proposed *regeneration harvest*, stand-level improvement in overall seral species sustainability is expected. By treating existing fuels and trending these specific stands towards greater species, age class and structural diversity, incremental improvement in resiliency is expected.

The proposed action would increase the level of intermediate harvest in the project area by 1 to 2% depending on alternative. By design, the proposed intermediate treatments are expected to make an incremental contribution towards maintaining the desired seral species composition, creating conditions more typical of a mixed severity fire regime, and trending towards a more open stand structure with improved growth potential. Unlike regeneration harvest, proposed intermediate harvests would not change the successional stage distribution, although the average tree diameter does increase in treated stands. The silvicultural prescriptions prepared prior to implementation provide details of the target stand conditions and unit-specific treatment methodology.

Regulatory Consistency

Consistency with the Regulatory Framework

All proposed treatments in all action alternatives are consistent with the Forest Plan standards (USDA, 1987) for timber management and meet or exceed the standards and guidelines for vegetative management. Forest Plan direction provides that timber management activities will be the primary process used to minimize the hazards of insects and diseases and will be accomplished by maintaining stand vigor and diversity of plant communities and tree species. All action alternatives were designed to meet all Forest Plan standards. However, implementation of Alternatives 2, 3, and 4 require approval by the Regional Office for openings greater than 40 acres. No more than 16% of the entire project area is proposed for treatment. Emphasis is on reducing stand densities, improving growing conditions, and increasing age class diversity.

Consistency with the National Forest Management Act

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

Suitability for timber production: No timber harvest, other than salvage sales or sales to protect other multiple-use values, shall occur on lands not suited for timber production {16 USC 1604(k)}. This proposal includes timber harvest on MA-10 which are not considered part of the

suitable land base (area treated by alternatives are displayed in Chapter 2). However, for this project timber will not be harvested in this MA for production purposes, but rather to meet goals set forth in the 1987 KNF Forest Plan.

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

Clearcutting and even-aged management (16 USC 1604(g)(3)(F)(i)): The Kootenai National Forest Plan direction favors use of even-aged silvicultural systems with the Management Areas proposed for harvest in this assessment. The ID Team has determined that prescribing even-aged systems on specified units is optimal in order to increase representation of desirable, fire- and insect/disease-resistant species in areas where current stand attributes limit options. Some stands proposed for regeneration harvest are lodgepole pine dominated stands with moderate mortality, due to the current and ongoing mountain pine beetle attacks. These stands are incurring greater than 40% or higher mortality (USDA, 2010). Other stands proposed for regeneration harvest currently have high rates of root disease incidence. The only way to increase representation of desirable species in either of these instances is to create growing conditions conducive to their establishment and growth; exposed seed bed, more sunlight, and less competition for nutrients and water from other trees, brush and herbaceous growth. Current insect and disease conditions in the proposed treatment units justify the need to treat these areas now. The decision path for this rationale is displayed in the silvicultural diagnoses in the project file.

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

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

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

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

Proposed regeneration harvests are used to rehabilitate affected areas and move them towards the desired future conditions. These harvest openings would be planted or seeded naturally to create a diverse vegetation community. All harvest units are deemed to be restockable within five years of final harvest. There are no regeneration issues that would preclude successful reforestation either through planting or natural regeneration.
The FACTS database was used to summarize reforestation survey records on the district. All regeneration harvests from 1976 to 2005 were analyzed. Regeneration harvests since 2005 are not required to be restocked until five years post-harvest. Results show that 92% have been satisfactorily stocked within 5 years and 95% are progressing or certified stocked. Poor performance was typically due to poor soils, delay in planting, or drought like conditions. This information demonstrates assurance that the proposed regeneration harvests can be adequately restocked within the required timeframe.

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

Insect and Disease - The Forest Plan identifies a goal of controlling insects and disease to historic endemic levels (Volume 1, pp. II-4). High stocking levels currently in a number of stands would result in an increased vulnerability to an array of insect and disease agents. All action alternatives are consistent with the goal of reducing this risk to varying degrees. These alternatives use treatments that would effectively treat stands with high stand densities, leading to an increased resilience or resistance to these agents and lowering the severity of fire effects within the stand. This would be accomplished by favoring retention of ponderosa pine, western larch, and western white pine, all fire adapted species relatively resistant to an array of common root diseases and mountain pine beetle.

Size of Openings - Forest Service Manual 2471.1 states that the size of harvest openings created by even-aged silvicultural in the Northern Region will be normally 40 acres or less. Creation of larger openings requires 60-day public review and either Forest Supervisor or Regional Forester approval.

All action alternatives would create openings greater than 40 acres. The number and sizes of such openings were discussed in Chapter 2. The openings would occur in dense forest stands dominated by lodgepole pine that is infested with a mountain pine beetle, or stands dominated by Douglas-fir with a moderate to high level of root disease.

While there is a concern regarding the visual impacts of openings greater than 40 acres, there is a need to expand treatments to address stand vulnerability to continued infestation and infection from insects and disease, and to fire and increased fuel loads. Expansion of treatment beyond 40 acres in important to be effective in the larger stands dominated by lodgepole pine and Douglas-fir, specifically to meet the purpose and need statements to reduce stand densities, improve growing conditions, increase the resiliency to root disease, and create age class diversity in the lodgepole pine dominated forest communities. A landscape level visual quality analysis was prepared using Visual Nature Studio 2 model. This information was used to help design the openings consistent with visual quality objectives.

Management Areas Unsuitable for Timber Harvest – All action alternatives include units where proposed timber harvest is in a Management Area designated as Unsuitable for Timber Harvest. Some lands are identified in the Forest Plan as not suitable for timber production due to either (1) assignment to other resource uses, (2) to meet Forest Plan objectives and management requirements, or (3) not being cost effective in meeting Forest Plan objectives over the planning horizon of the Plan. Timber standards for MA 10 states, "*harvest may occur for wildlife habitat maintenance or enhancement*" (Vol. 1, III-39).
MA-10-Harvest is designed to meet specific wildlife habitat enhancement objectives, in full compliance with these standards, as proposed treatments are designed specifically to meet wildlife habitat improvement objectives. The proposed action would harvest 15 acres of MA-10, while alternative 4 would harvest 6 acres.

WILDLIFE

INTRODUCTION

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

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

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

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

OLD GROWTH HABITAT

Data Sources, Methods, Assumptions, Bounds of Analysis

Management and characteristics of old growth and stand attributes necessary for a stand to be considered old growth are discussed and summarized in the KNF Forest Plan (Appendix 17, FP II-1, 7, 22, FP III-54), Green et al. (1992, corrected 2005), Pfister et al. (2000), Kootenai Supplement No. 85 to FSM 2432.22 (1991), Castenada (2004), and Bradford (2007). That information is incorporated by reference. Data sources to identify old growth stands include District files and surveys, the KNF old growth GIS layer developed from stand-level old growth inventory that is aggregated and summarized at the Forest scale, and the Forest Inventory and Analysis (FIA) data which collects and reports data at the Forest scale. For the timber

compartments (13, 17, 18, and 19) found in the Pilgrim Planning Sub-unit (PSU) field verification of old growth stands was completed.

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

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

1) Road length built adjacent or through designated old growth (in feet).
2) Number of proposed units adjacent to old growth
3) Acres of edge effect in old growth
4) Acres of interior habitat remaining in old growth
5) Acres treated to maintain old growth characteristics or trend toward old growth
6) Percent of designated old growth (OG/ROG) in the planning sub-unit.

Current edge effects were determined by buffering existing regeneration harvest units (TSMRS activity codes 4100-4134) that are ≤ 30 years (this is the default age in the model – based on planning unit site specific information you would use age between 20-50 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 is the Pilgrim Creek sub-unit, while cumulative effects to old growth are analyzed at the Forest level.

Affected Environment/Existing Condition

Existing conditions are a result of historic timber harvest and wildfires. Timber harvest and fire history are discussed in the vegetation and fire sections of this environmental document. Old growth surveys within the Pilgrim Creek Planning Subunit have inventoried approximately 5,084 acres. Of those acres initially thought to be old growth, 1,951 acres were determined to not be old growth. This leaves approximately 3,133 acres of inventoried old growth (OG) or replacement old growth (ROG) in the Pilgrim Creek sub-unit. Of these acres, approximately 2,992 acres are located below ≤5,500 feet in elevation. See Figure 3-2, for location of old growth stands within the subunit. Table 3-9 summarizes the designated and undesignated status of the OG and ROG acres in the Pilgrim Creek PSU and the Kootenai Forest-wide situation.

Replacement old growth stands have many old growth characteristics, but not enough to be considered old growth currently. These stands are expected to become old growth in time.

Table 3-9 also shows the minimum acres required to be designated to meet forest plan standards. Designated old growth stands in the project area support the habitat conditions described in “Old Growth Forest Types of the Northern Region” (Green et al. 1992).

The Pilgrim Creek PSU contains 29,702 acres of federal land below 5,500 feet. The present allocations (see Table 3-8) in the Pilgrim PSU meet Forest Plan direction as clarified in FSM 2432.22.

Old growth stands in the analysis area are mainly composed of old larch, ponderosa pine and Douglas fir, and other conifers. Old growth management area designations in the subunit were made to conserve the best old growth attributes available and to provide the best distribution, size, habitat type coverage, and quality of what is available. These old growth stands are physically connected to other old growth stands where possible, or are interconnected to adjacent old growth stands by stands composed of 100+ year old age classes.

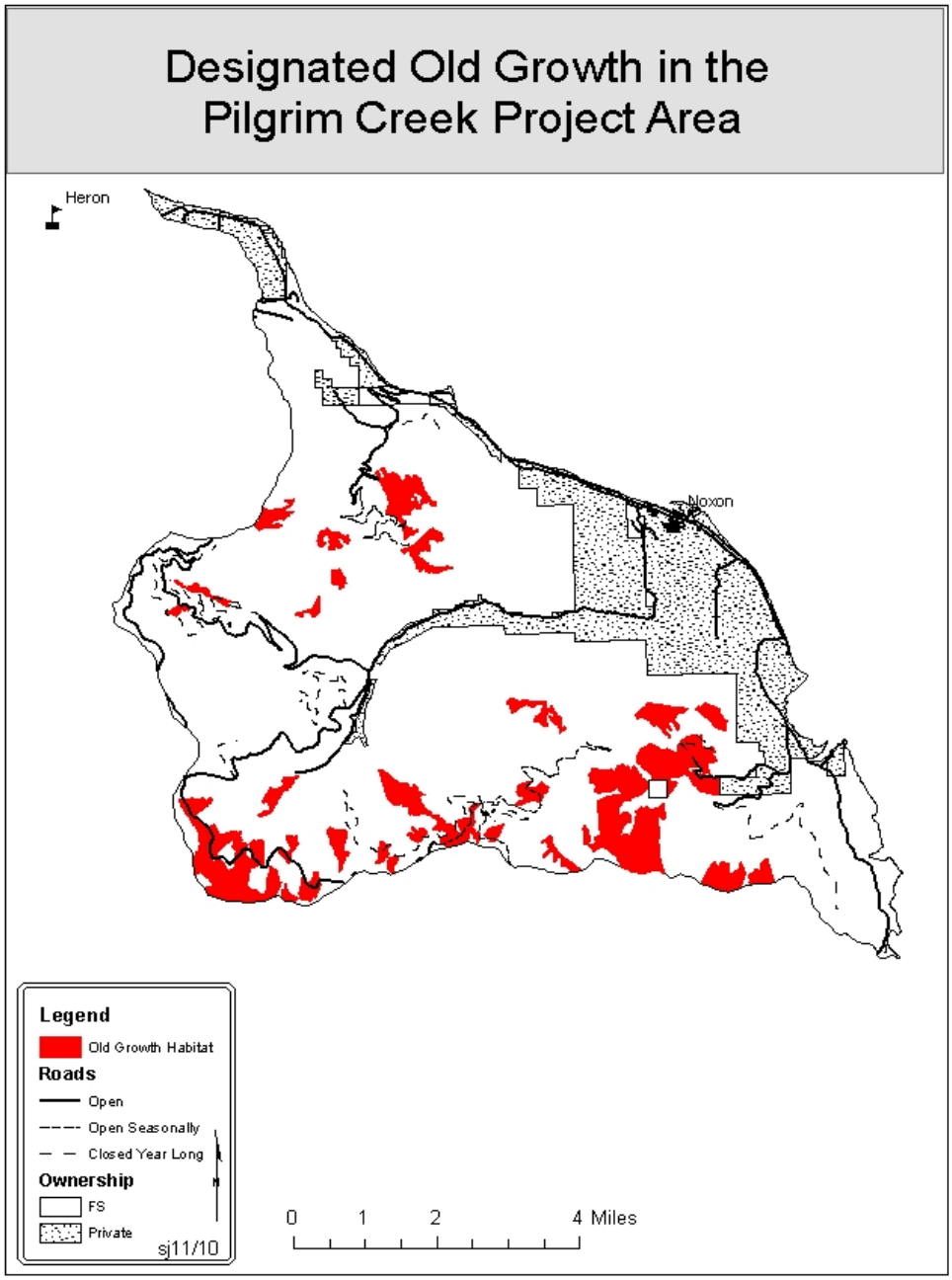

Designated Old Growth in the
Pilgrim Creek Project Area
Heron
Noxon
Legend
Old Growth Habitat
Roads
Open
Open Seasonally
Closed Year Long
Ownership
FS
Private
sj11/10
0
1
2
4 Miles

Figure 3-2

TABLE 3-9 - Old growth acres under 5,500 feet elevation - NFS lands in Pilgrim Creek subunit and Forest-wide.

STATUS	Planning Subunit Acres (Percent)*	Kootenai National Forest Acres (Percent)
Total NFS lands	29,987	
Total NFS lands below 5,500 feet elevation	29,702	1,869,222
Minimum acre designation required by Forest Plan	2,970	186,922 (10)
DESIGNATED OG (MA13, or og MA)		
Designated effective OG	927 (3%)	143,277 (8)
Designated ROG	2,164 (7%)	64,776 (3)
Designated unknown (KNF Forest Plan)	0	18,973 (1)
Total designated OG and ROG	3,091	227,706 (12)
UNDESIGNATED EFFECTIVE OG AND ROG		
Undesignated effective OG	0	58,691 (3)
Undesignated ROG	0	32,941(2)
TOTALS FOR BOTH DESIGNATED AND UNDESIGNATED OG AND ROG		
Total designated and undesignated effective OG	927 (3%)	201,577 (11)
Total designated and undesignated ROG	2,164 (7%)	97,717 (5)
All old growth acres below 5,500 feet	3091 (10%)	286,205 (15)

Acres were updated in 2010 for the Pilgrim Creek subunit. Forest-wide acres as of KNF, 2012.
****Replacement old growth stands were designated to provide old growth in the future within the subunit***

The current Forest Plan Monitoring Report indicates the KNF has 1,869,222 acres below 5,500 feet elevation (minus lakes and highways). Using the stand-level data, there are currently 201,577 acres or 10.8% of KNF acres below 5,500 feet that are old growth (designated or undesignated). An additional 97,717 acres are replacement old growth (designated and undesignated). Forest-wide, old growth or replacement old growth on the KNF totals 299,294 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 5500 feet). Also, to account for changes from when the FIA data was collected (1993 to 1995), any plots with disturbance (e.g., wildfire) were excluded from consideration as old growth. This is a conservative estimate, since some wildfires may not have affected old growth characteristics. The Monitoring Report indicates the Forest is meeting its Forest Plan requirements for managing 10% of the forest as old growth habitat well distributed across KNF lands below 5,500 feet elevation.

Block Size

Within the Pilgrim project area there are a total of 3,091acres designated for old growth management. These acres are in 26 blocks ranging from 26 to 660 acres in size. Of these designated old growth blocks, 50% are greater than 50 acres in size.

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

Distribution

Table 3-10 shows the distribution of old growth (< 5,500' elevation) by VRU. Old growth is well distributed across the vegetation types.

TABLE 3-10. Old Growth (≤5,500' elevation) Distribution by VRU on NFS Lands in the Pilgrim PSU

VRU	HRV % OG \1	VRU Acres (%) NFS Lands	Designated OG Acres (%)	Undesignated Old Growth Acres (%)	TOTAL OG (undesignated and designated) Acres (%)
2	20-50	6,167 (20)	749 (24)	0	749 (24)
3	15-40	2,293 (8)	336 (11)	0	336 (11)
4	10-40	4942 (16)	175 (6)	0	175 (6)
5	25-55	13,281 (44)	1202 (39)	0	1202 (39)
7	15-45	1,899 (6)	578 (19)	0	578 (19)
9	5-10	1,407 (5)	51 (2)	0	51 (2)

\1 USDA Forest Service 1999: stands > 150 years old – Total OG = 3039 acres

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

Stand Structure

Old growth stand structure is described by Green et al. (1992, errata corrected 2005). That information is incorporated by reference. In summary, Green et al. identifies three structural stages that are useful in describing old growth. They are late seral single story (e.g. ponderosa pine, Douglas-Fir, lodgepole sites); late seral multi-story (e.g. larch, whitepine) and near climax (e.g. cedar, grand fir, sub-alpine fir sites). Stands identified as old growth contain one of these structure stages described by Green et al.

Many of the old growth stands in VRU-2 have missed one or more wildfires and are currently over-stocked with small diameter trees. They have the components of late seral single-story old growth (widely spaced, large ponderosa pine, Douglas-fir, etc.), but regeneration has grown up within the stand.

Disturbance

Within existing designated old growth there are a total of 4.4 miles of local roads. Of this, 1.6 miles are restricted seasonally, 0.9 miles are restricted yearlong, 1.9 miles are open year-round; and there are 1.2 miles of motorized trail. These roads and trails either bisect or are adjacent to old growth stands. Roads allow for potential access by firewood cutters to remove standing snags. There are 2 old growth stands adjacent to 3 existing regeneration units (stands < 30 years old). These units create an edge influence on about 35 acres of old growth.

Environmental Consequences

Table 3-11 displays a comparison of effects to old growth habitat by alternative. These criteria are discussed under each alternative.

TABLE 3-11 - Summary of measurement criteria to evaluate effects to old growth

Measurement Criteria	Existing Condition (Alt 1)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Road length (in feet) existing or built adjacent/through designated OG/ROG	23,232	23,232	23,232	23,232	0
Number of existing or proposed units adjacent to old growth	3	4	5	4	4
Acres of edge influence in old growth	35	6.7	10.8	6.0	6.0
Acres of interior habitat remaining in old growth	3,056	3,049	3,045	3,050	3,050
Acres treated with prescribed fire to maintain old growth character	0	697	697	697	697
Percent of designated old growth in Sub-Unit (OG+ROG)	10	10	10	10	10

Management activities (including timber harvest, road construction, mining etc.) have the potential to impact the function of old growth habitat or specific components of old growth, such as interior habitat and vertical structure. Activities may also allow noxious weed invasion.

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 rule of thumb as the distance effects occur. Table 3-21 (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 Pilgrim 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.

Old growth acres not impacted by edge effects provide interior habitat. Due to perimeter:area relationships, larger openings reduce fragmentation and edge effect relative to more small openings.

Alternative 1- No action

Direct, Indirect, and Cumulative Effects

This alternative would have no direct effect on designated old growth or associated plant and wildlife species (also see pileated woodpecker discussion). The conditions for all 6 measurement criteria (Table 3-11) would remain unchanged. No old growth would be treated through prescribed burning. There would be no risks from these activities, such as weed introduction or modification of stand structure. All old growth areas would maintain their existing conditions, and continue to provide habitat for those species which utilize the area over a long term.

Existing conditions include the effects of edge from adjacent regeneration units, and roads opened for firewood cutting during previous years. Roads opened for firewood cutting may result in some continuing level of snag removal from the old growth stands, though old growth areas are signed as closed to firewood cutting (Table 3-10).

Fire suppression in VRU-2 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.

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

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

Effects of the Action Alternatives 2, 3, 4, 5

Direct and Indirect Effects

Timber harvest is not proposed in designated old growth under any of the action alternatives. Each alternative does include 530 acres of prescribed fire in designated old growth within VRU-2 (Figure 3-2). In order to reduce the risk to the over-story trees, slashing (cutting down of saplings) would occur on 9 acres prior to burning. The small trees cut down would be those under the canopy of mature over-story trees. This activity would not only decrease the amount of fire beneath the tree, it would increase the continuity of fuels between the mature trees and permit a more even burn. The purpose of these activities is to return the stands to historic stocking levels after years of fire suppression (see Fuels Section). This treatment will increase growth and vigor in the trees left on site, which would enhance growth into larger tree diameters. The objective of slashing and burning would be the maintenance of old growth structure and function in the treated areas and potentially to increase the number of snags in the stands. The effectiveness of the slashing and burning will be evaluated by pre- and post-activity monitoring. Should too many old growth characteristics be compromised during the burn, there are additional stands, of comparable quality, that would be designated as replacements. This type of treatment has been used successfully in the Beaver and White Pine drainages, monitoring results are available in the project file.

All alternatives propose treatments adjacent to designated and/or undesignated old growth (a portion of the proposed unit is adjacent to one or more edges of the old growth stand) (Table 3-10). Regeneration 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). Under Alternative 2, the alternative with the greatest amount of harvest 1% (46 acres) of the designated old growth would be impacted.

No new roads or temporary roads would be constructed through old growth stands under Alternatives 2 or 3. Alternatives 4 and 5 do not build any road.

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

Cumulative Effects

Cumulatively, when other activities including the harvest on both private and Federal lands discussed under Alternative 1, 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. However, due to cumulative edge effects (Table 3-10) there may be reduced old growth quality for some plant and animal species. Private lands in the Pilgrim PSU were assumed to not provide any old growth, based on past harvest practices.

The action alternatives, in combination with other proposed and reasonably foreseeable Forest Service, State and private activities would maintain the designated management level of old growth. The 2007 Forest Plan monitoring report (USDA Forest Service 2008) documents results for the past 19 years, and indicates the Forest is providing sufficient cavity habitat at the drainage or compartment, as well as the Forest scale.

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 13, 2007 direction (Bradford 2007), old growth will be analyzed on the planning subunit scale. After implementation of the action alternatives, the Pilgrim PSU will have 10% designated old growth below 5,500 feet elevation. The most recent Forest-wide assessment as documented in the Forest Plan Monitoring and Evaluation Report (USDA Forest Service 2010) shows that the Kootenai National Forest has 10% old growth designated. The Kootenai Forest Plan established that maintaining 10% of old growth habitat is sufficient to support viable populations of old-growth dependent species (Vol. 1, II-1, 7, III-54; Vol. 2, A17).

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

MA13 Wildlife and Fish Standards: All alternatives comply with these standards

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

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

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

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

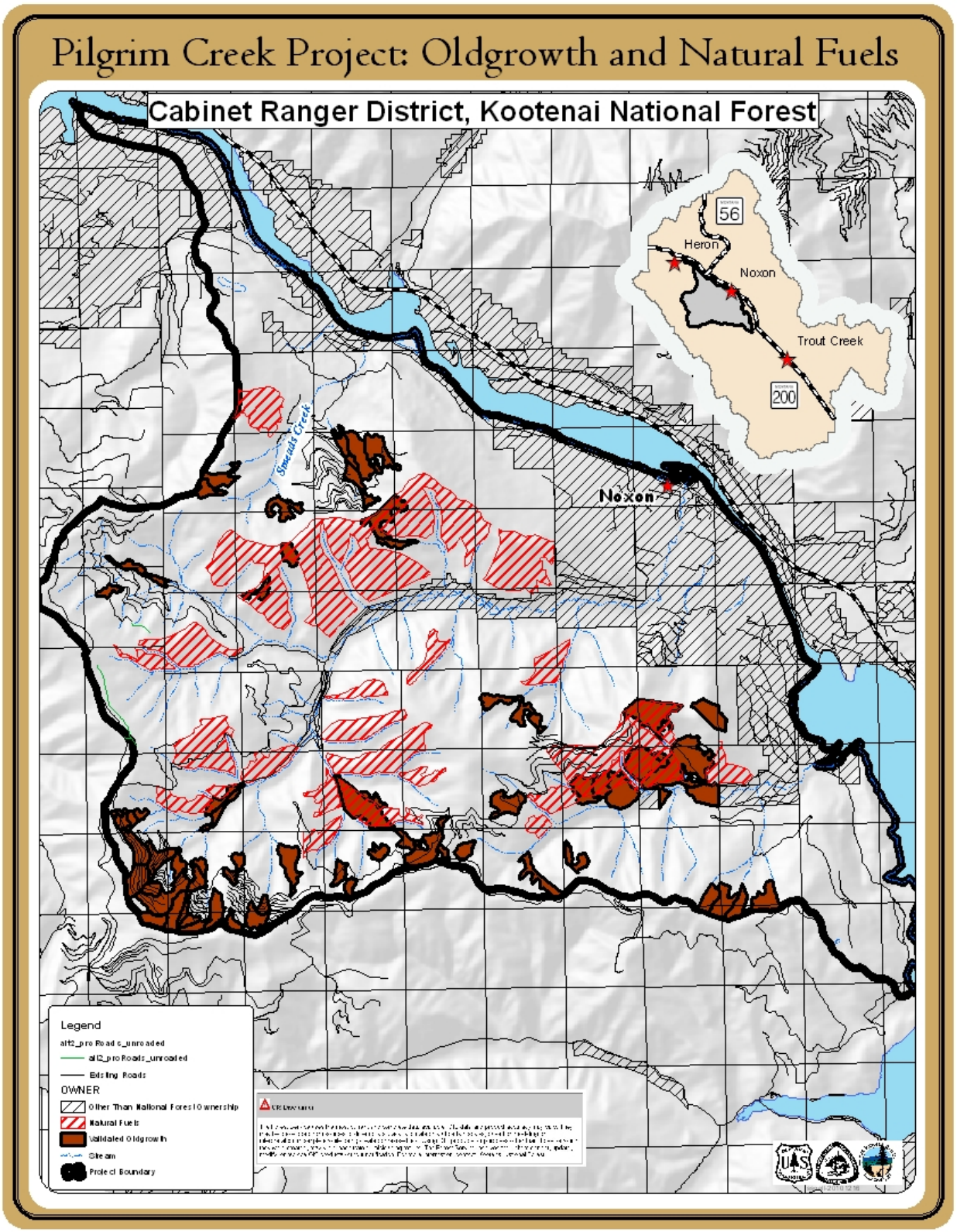


Figure 3-3. Old Growth Habitat and Natural Fuels.

SNAG HABITAT

Data Sources, Methods, Assumptions, Bounds of Analysis

There are no site specific snag surveys in the Pilgrim PSU. Thomas (1979: 72-75) was used to determine the percent of the potential population level to maintain primary cavity excavator populations (snag level % times % of area with that snag level). 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 1998). Regeneration units provide 0-80% SL. The percent varies mostly by period of harvest (pre- vs. post Forest plan: 1987). Units harvested prior to Forest Plan and those planned pre-1987 but harvested thru 1992 basically provide no cavity habitat structures (Johnson and Lamb 1998). Post 1987 Forest Plan, (1993-2002) 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. The Forest Plan riparian standards, as amended by the Inland Native Fish Strategy (INFS) (USDA Forest Service 1995), provide adequate snags and replacement trees to meet the riparian 60% SL standard. Therefore the following analysis focuses on the general forest standard of 40% PPL.

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 3-12 summarizes the existing cavity habitat potential on National Forest system (NFS) lands in the Pilgrim planning sub-unit.

Table 3-12: Existing Cavity Habitat Population Potential on NFS lands in the Pilgrim PSU

Habitat Component	Acres	Percent of Sub-unit	Total Snags per Acre \1	Snag Level (%)	Population Potential \2
Old Growth & Untreated Forest	23,242	79	2-5 (2.25)	100(100 \3, \4)	0.79
Partial Cut Forest \6	2,091	7	3-6 (1.35)	60 (60 \3, \5)	0.04
Past Regen. Harvest (1993-present) \7	528	2	2-4 (0.9)	40 (40 \3, \5)	0.01
Past Regen. Harvest (thru 1992) \7	1,126	4	0 \5	0 \3, \5	0

Habitat Component	Acres	Percent of Sub-unit	Total Snags per Acre \1	Snag Level (%)	Population Potential \2
Roads & Buffer (53 acres per mile)	2,703	9	0 \8	0 \3	0
Total PSU		100	- -	- -	0.84

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

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

\3 Managed snag level percent

\4 Based on Tincher (1998)

\5 Based on Johnson and Lamb (1998)

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

\7 Regeneration harvest includes TSMRS activity codes: 4100 thru 4149

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

Environmental Consequences

In the Planning Subunit (PSU), all action alternatives would provide at least 40% snag levels following management activities (see Table 3-12.). Potential Population Levels would be reduced by 2-3% in the PSU depending on Alternative (see Table 3-13).

Table 3-13. Cavity Excavator Potential Population Level (%) by Alternative based on Forest Plan Standards

	Existing Condition	Alt. 1 (No Action)	Alt 2	Alt. 3	Alt. 4	Alt. 5
PPL (%) In PSU	0.84	0.84 (0)	0.81 (3)	0.82 (2)	0.82 (2)	0.83 (1)
Acres Treated that Reduce Snag Level		0	1,411	1,470	1,290	632

(*) Value in parenthesis is percent change (+/-) due to Alternative. Change in No Action reflects cumulative effects of other known or reasonably foreseeable actions.

Alternative 1 (No Action)

Direct and Indirect Effects

Under alternative 1, no activities would be proposed, so no direct effect to snags is expected. Wildlife use of cavity habitat would continue at current levels. The addition or loss of snags would be dependent on other factors, such as firewood cutting, wind events, natural attrition,

insect/disease or wildfire. The level of impact from these factors cannot be calculated due to the high uncertainty in predicting occurrence and intensity levels.

Cumulative Effects

Alternative 1 (No Action) would not authorize any cumulative snag-reducing activities. Suitable cavity habitat would still occur on National Forest lands.

Cumulatively, Firewood gathering would continue to remove some snags from the open road corridors.

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

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

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). For the proposed activities, this would result 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. Large openings (over 40 acres in size) would not necessarily reduce available snag habitat more than smaller openings. It may be easier to retain snags in the interior of large units due to distance from roads, though wind effects may offset this retention over time.

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 impacting 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

Direct and Indirect Effects

Implementation of the action alternatives would have direct effects on snag habitat. Table 3-14 summarizes those project activities that would change snag levels. Also see Table 3-13 above for the changes in PPL.

Table 3-14. Acres of project activities that impact Snag Level by Alternative

Activity	Alt. 1(\1) (No Action)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Regeneration Harvest	0	587	898	813	261
Partial Cutting	0	824	536	477	371
New Road Construction	0	16	24.8	0	0
Prescribed Fire *	0	4564	4564	4564	4564

*** Acres treated with prescribed fire may increase and/or decrease snag levels**

\1 the acres in the No Action Alternative are the cumulative effects from other reasonably foreseeable projects. They can be added to the acres in the action alternatives to see cumulative effect acres

Regeneration harvest in Alternatives 2, 3, 4, and 5 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). Larger openings (i.e. over 40 acres in size) would be as suitable to some species such as bluebirds and flickers, while others would tend to avoid them (such as goshawks, boreal owls, and brown creepers). Regeneration harvest can potentially impact long-term cavity habitat, since fewer trees are left on site to be recruited as snags or snag replacements.

Commercial thinning in Alternatives 2, 3, 4, and 5 would retain higher levels of existing snags than regeneration units, and green replacement trees would be more readily available for future habitat.

Timber harvest is proposed in MA-10 in alternatives 2 and 4. Loss of snags in MA-10 unit is likely to occur due to OSHA regulations. Specifically, OSHA requires that snags in harvest units be felled to ensure the safety of forest workers. Alternatives 2 and 4 propose some level of harvest (6-15 acres) in MA-10. All snags felled for safety reasons would be left on site.

On units planned for skyline yarding, snags are expected to be lost due to OSHA safety standards. This may also occur on tractor/skidder units, depending on snag condition, location and size in relation to skid-trails and falling personnel. Adequate live trees of larger sizes would be available to provide habitat features needed by snag dependent wildlife in the future.

The subsequent proposed prescribed under burning would reduce the small diameter Douglas-fir encroachment, and any trees that may be killed during the burning would result in the creation of snags. Additionally, fire may facilitate decay in surviving trees by proving an entry

point for fungi, which increases the likelihood that the trees will be used by cavity excavators (Smith et al. 2000).

Site preparation burning, and prescribed fire on non-harvest units will likely result in some fire killed trees and subsequent new snag feeding/nesting sites. Within proposed harvest units, retention of all snags greater than 10" dbh is planned. This would help compensate for deficient snag numbers in existing harvest units.

Cumulative Effects

Earlier harvest (from the 1960s to the 1980s) favored regeneration treatments and did not stress the retention of snags. These areas provide few standing snags capable of providing cavity habitat and are accounted for in the effects analysis. The 1987 Forest Plan provided direction for management of snag retention or recruitment at levels of 1-2 snags per acre, or 40% of potential habitat across the landscape. This direction was utilized in subsequent project design. For example, the Smeads-Rice project (1992) included design criteria to leave all non-merchantable snags within the harvest units unless they were a safety hazard. The more recent Northern Region Snag Management Protocol (2000) recommends that 4-12 snags per acre be left.

The road system on the District expanded from the 1960s through the 1990s. This impacted snags due to loss by harvest or firewood cutting. In the early 1990s, management actions required for big game security included road closures to motorized access. Such closures reduce access and take of snags by firewood cutting. All roads utilized for treatments, except those currently open, would be closed to the public upon the project's completion and many would be closed during activities. Such action would minimize loss of snags from woodcutting activities.

Noxious weed control, road and trail maintenance, and administration of National Forest lands and resources would have no measurable effect on snag habitat or snag levels. Therefore, no adverse cumulative effects from these types of activities would be expected.

Cumulatively, when other activities including the harvest on both private and federal lands discussed under alternative 1, 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. After implementation of alternative 2 and the reasonably foreseeable Forest Service projects, the primary cavity excavator potential population level on NFS lands is estimated to drop from 84% to 81%. After implementation of alternatives 3, and 4 and the reasonably foreseeable projects, the primary cavity excavator potential population level on NFS lands would decrease from 84% to 82%. This level of snag habitat is still expected to provide for an associated species population level above 40 percent, which is thought to be the minimum needed to maintain self-sustaining populations of snag-dependent wildlife (Thomas 1979:72).

The 2007 Forest Plan monitoring report (USDA Forest Service 2008) documents results for the past 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

All proposed units in alternatives 2, 3, 4, and 5 maintain at least 40% snag level. No alternative causes the Pilgrim PSU overall PPL to drop below the general forest 40% or riparian 60% primary cavity excavator potential population level. This is consistent with Forest Plan standards.

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

Kootenai Forest Plan cavity habitat standard in MA10 is met. Alternatives 2 and 4 include a project-specific amendment to suspend the requirement to retain all existing cavity habitat in MA10. The amendment is for the Pilgrim PSU, only for the duration of this specific project. All units will still meet the 40% minimum snag level.

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. The “specific land area” (scale) for providing diversity is established in the framework as the area covered by a Forest Plan (36 CFR 219.3). The regulations also say that Forests “must ensure well distributed habitat” to provide for viable populations of native and desired non-native plants and vertebrate species (36 CFR 219.19). The National Forest Management Act defines a viable population as "... one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area." Under the implementation regulations, the Forest is considered the planning area.

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 (219.19 (a)(1)), the Kootenai Forest Plan (FP) (1987, Appendix 12) identifies management indicator species (MIS) (Table 3-214

The FP states that ”the maintenance of viable populations of existing native and desirable non-native vertebrate species, as monitored through indicator species, will be attained through the maintenance of a diversity of plant communities and habitats.” (FP II-22)

Elk and Whitetail deer are two MIS species that represent similar habitat. Summerfield (1991) recommends determining which big game species will be featured in a particular area, since species winter requirements differ. Based on Forest plan direction, the biological potential of the

area, state wildlife management objectives, public comments during scoping and the information contained within the Kootenai Conservation Plan (Johnson 2004: Appendix H); an emphasis species was identified for this report.

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

Elk

Data Sources, Methods, Assumptions, Bounds of Analysis

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

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

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

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

The Kootenai Forest Plan (1987) recommends a cover/forage 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).

Table 3-15. Management Indicator Species

SPECIES	HABITAT REPRESENTED	COMMENTS
Grizzly Bear (Ursus arctos)	**General Forest**	**See T&E Section**
Gray Wolf (*Canis lupus*)	**General Forest**	**See Sensitive Species 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**	**See Analysis below**
Mountain Goat (*Oreamnos americanus*)	**Alpine**	No alpine habitat in project area. Mtn. Goats not found in project area. Project will have no impact on Mtn. Goats. No further analysis required
PileatedWoodpecker (*Dryocopus pileatus*)	**Snags, Old Growth**	**Also see old growth and snag sections**

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

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

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 $\leq$ 3.0 miles per square mile, which equates to 38% habitat effectiveness.

The percent HE for the PSU, ORD for MA12, and ORD for the combined MA 15, 16, 17 and 18 lands in the PSU are the measures for effects.

Security: Security areas are defined as areas that are larger than 250 contiguous acres in size and more than one half mile from an open road (Hillis et al. 1991). These areas offer elk refuge through reduced vulnerability during the hunting season and can greatly influence the age structure and composition of a herd.

The Kootenai Forest Plan has no standard for security. A panel of state and federal wildlife biologists convened in 1996 and produced, “Integrating Kootenai National Forest Plan and Fish, Wildlife & Parks Elk Management Plan Final Task Force Report (Johnson 2004: Appendix H-B). This document identified security as important component in elk habitat and that the Hillis et al. (1991) method would be used to calculate it. This method recommends a minimum of 30% of an elk’s fall use area be maintained as security habitat. Since elk use in the fall could be any place within a PSU, the 30% minimum is measured against the PSU NFS acres. Appendix H-B (Johnson 2004: p. H-12) also provides the elk management emphasis level by Planning Sub-Unit as well as definitions for security levels (H-B-13).

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

Affected Environment/Existing Condition

The Pilgrim PSU is located in elk hunting district 121. The population in the hunting district is stable (MFWP 2004). In 2006, a total of 878 elk were seen during aerial surveys. Observed calf/cow ratio was 24/100 and bull/cow ratio of 21/100. As a result of decisions made during a previous project the Pilgrim Planning Subunit is divided into two open road density areas (Figure 3-4). The Stevens Ridge Amendment Area includes the area bounded on south by Marten Creek and on the north by Pilgrim Creek. Currently, the cover/forage ratio on winter range is 73/27% and on summer range it is 79/21, habitat effectiveness in the Stevens Ridge Amendment Area is 56%. Outside of the Stevens Ridge Amendment Area, HE is 50% and 50% of the project area is secure habitat (Table 3-16). The PSU is managed with a medium emphasis for elk (Johnson 2004: App. H-B: p. H-12). Specific calving areas are not known to occur in the PSU.

Environmental Consequences - Direct and Indirect Effects

No Action Alternative

Cover/Forage Ratios

Under Alternative 1 (no action) all cover/forage ratios would remain unchanged, in the short-term. However, as trees and shrubs continue to grow and mature the number of acres of productive foraging habitat will decline. As trees continue to encroach upon forage openings and tree canopies close the quality of the forage and number of acres producing forage will decline. The increased tree density and continuous fuel profile from the ground up to the main canopy puts the area at risk of severe wildfire (See Fire section for additional information).

Open Road Density and Habitat Effectiveness

Open Road Densities (see Table 3-15 below) and Habitat Effectiveness would remain unchanged (54%) under the No Action alternative.

Security

Secure habitat for elk would remain unchanged (50% of the planning area) under the No Action alternative.

Table 3-15 summarizes the effects to elk habitat in the Pilgrim PSU by alternative.

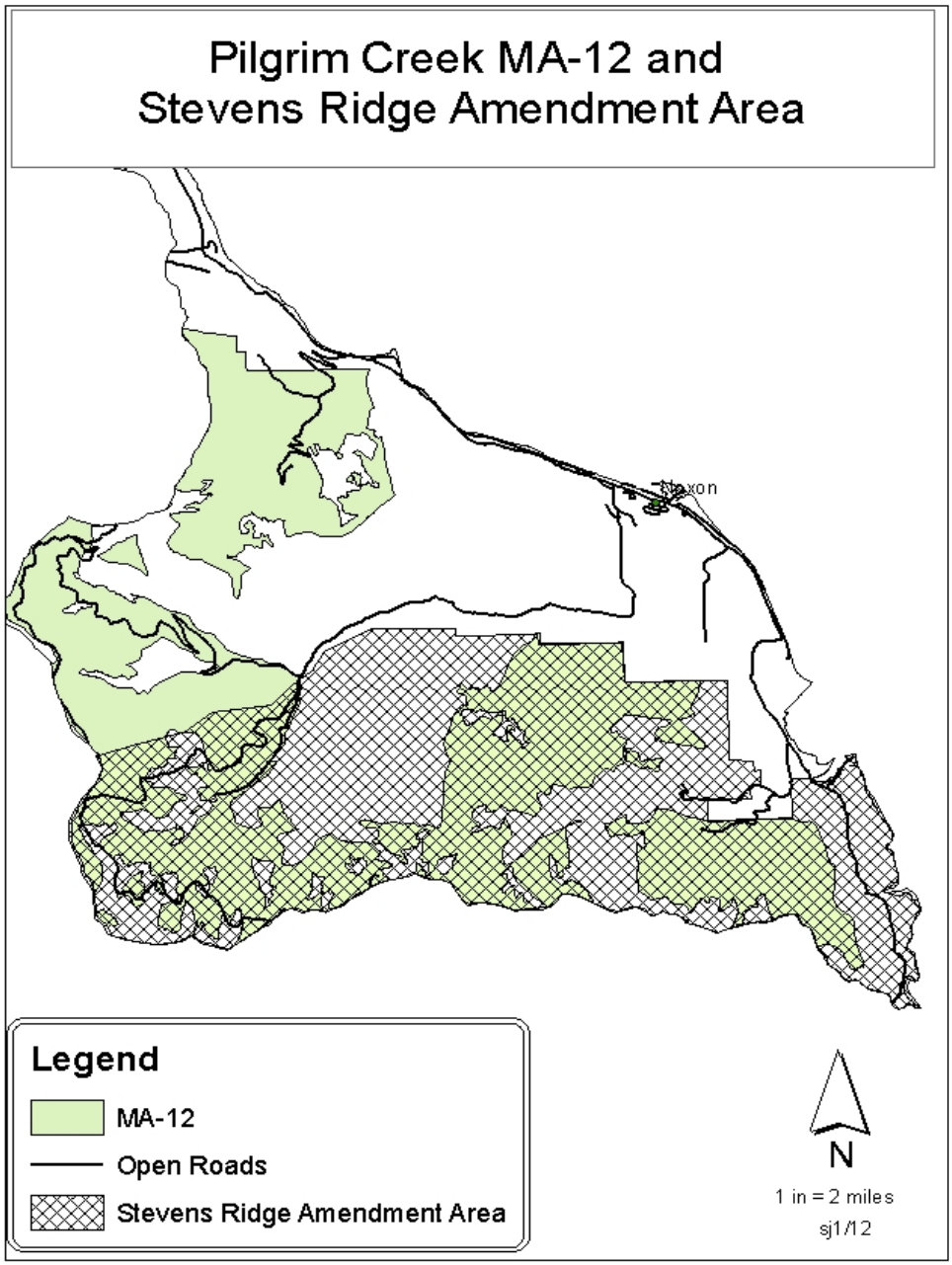

Pilgrim Creek MA-12 and
Stevens Ridge Amendment Area
Nixon
Legend
MA-12
Open Roads
Stevens Ridge Amendment Area
N
1 in = 2 miles
sj1/12

Figure 3-4.

Table 3-16: Elk habitat components by Alternative

Habitat Component	Alternative 1 (No Action) (Existing Condition)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
PSU Cover/forage Ratio Summer Range (guide 60/40) (non-winter range MAs)	79/21	76/24	75/25	76/24	78/22
PSU Cover/forage Ratio Winter Range (MA 10 &11) (guide 60/40)	73/27	72/28	72/28	72/28	73/27
Thermal Cover % Winter range (MA 10 & 11) (guide ≥ 40%)	45%	45%	45%	44%	45%
PSU Security Cover % (guide ≥30%)	50%	47%	41%	48%	50%
Open Road Density Within Stevens Ridge Amendment Area (mi/mi^2) MA-12, std.≤ 1.46 mi./mi^2	1.2	1.7	1.7	1.5	1.2
Open Road Density Outside Stevens Ridge Amendment area (mi/mi$^{2)}$ MA-12, std. ≤ 0.75	1.9	2.3	2.5	2.4	1.9
Habitat Effectiveness Within Stevens Ridge Amendment Area (%) (guide ≥54%)	56%	52%	52%	54%	54%
Habitat Effectiveness Outside of Stevens Ridge Amendment Area (%) (guide >68%)	50%	46%	43%	44%	44%
PSU Open Road Density (mi/mi$^{2)}$ (MA 15,16,17, & 18) (std. ≤3.0)	1.8 mi./mi.2	2.4	2.4	1.8	1.8

Habitat Component	Alternative 1 (No Action) (Existing Condition)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
# Openings > 40 acres	0	8	7	5	0

Action Alternatives

Cover/Forage Ratios

Forage quality and production is generally enhanced by timber harvest. Commercial thinning opens the canopy and allows more light to reach the ground. This increase in available light, within a stand of timber, rejuvenates the existing shrubs, grasses, and forbs and they produce more vegetative material. A regeneration harvest removes most of the trees on a site. This treatment allows much more light to reach the forest floor and also makes more room available for shrubs, grasses, and forbs to repopulate the area. Usually after a regeneration harvest, the unit is burned to remove the wood left onsite. Burning releases nutrients stored in the wood, making them available for forage species. The benefits of commercial thinning usually last for several years, while the increases in the size of foraging areas created by regeneration harvest last a decade or more.

Each alternative includes prescribed burning (see Alternative descriptions), which would occur on approximately 4,564 acres of primarily south and west slopes that make up big game winter range. Burning would improve the palatability and enhance the quality of the forage produced on these acres

The treatment of 26-28 acres (depending on alternative) of aspen is also part of each alternative. The objective is to thin-out conifers growing within the stand and enhance conditions for aspen. Elk preferentially seek out young aspen shoots to eat. Following treatment, the stand will provide an increase in forage in terms of increased herbaceous vegetation and aspen shoots. However, the treatment will be most successful if some of the aspen survive and provide some age variation in the stand.

Cover/forage ratios on winter range would shift one percent toward the Forest Plan Standard because of timber harvest in MA's 10 and 11 (Table 3-16). The largest change would occur under alternative 4, which proposes to harvest a total of 97 acres. Alternatives 3 and 5 do not include any timber harvest in MA-10.

On summer range, cover/forage ratio would shift toward more forage (Table 3-16) under each action alternative. The largest change would occur under alternative 3. None of the alternatives achieves the guideline adopted in Summerfield (1991), leaving summer range cover/forage ratios skewed towards cover in the project area.

Alternatives 2, 3, and 4 include units that will result in openings greater than 40 acres. Many of these openings are made larger by their location adjacent to existing harvest units that have been precommercial thinned recently. Alternative 2 includes 8 openings 40 acres or greater,

ranging in size from 43 to 139 acres. Alternative 3 includes 7 openings 40 acres or greater, with the largest being 321 acres. Alternative 4 includes 6 openings 40 acres or greater, ranging from 40 to 294 acres in size. This could result in openings that may not be fully utilized by elk as foraging areas, until regeneration on these sites reaches a point that it provides some cover. Where possible, 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. No timber management would occur in riparian habitat conservation areas, ensuring the maintenance of travel corridors within riparian zones. Movement corridors would be maintained to adjacent security areas and drainages.

Open Road Density and Habitat Effectiveness

In the Stevens Ridge Amendment Area (SRAA), ORD will increase and HE will be reduced under all action alternatives, except alt. 5 (Table 3-16). Outside of the SRAA, ORD will increase under Alternatives 2, 3, and 4 and HE will be reduced to 46, 43, or 44%, respectively. The MA-12 ORD standard ($\leq$0.75 miles/square mile) is not met under any of the action alternatives outside of the SRAA. Implementation of any of the alternatives requires a Forest Plan amendment. Under all alternatives a Forest Plan amendment for open road density in MA-12 is required that would increase ORD standard in MA-12 to 1.9 miles/square mile.

Upon completion of harvest-related activity the gates may be left open on restricted roads used for the Pilgrim Creek Project for several weeks in order to give the general public an opportunity to remove firewood from project area. Under all alternatives, with the completion of all harvest related activities, ORD would return to 1.9 miles/mile$^{2.}$

Table 3-15 shows the ORD for the combined PSU acres in MAs 15, 16, 17 and 18. All alternatives meet the Forest Plan standard of equal to or less than three miles per square mile.

Security

Because of harvest related activity, big game security in the project area may reach 41% (Table 3-16). Reductions in security would be temporary and extend only to the life of the projects. Upon completion of all projects related to this analysis big game security in the project area would return to 50%. Secure displacement habitat exists within the project area in Inventoried Roadless Areas and adjacent to the project-area in the Elk Creek PSU. Access to secure habitat would be maintained throughout the life of the projects.

Summary

In summary, each action alternative begins the process of shifting the cover/forage ratio toward one more suitable for elk. Increasing the quantity and quality of forage may result in an increase in elk fitness or increased recruitment of elk. Alternatives 2, 3, and 4 increase open road density and reduce security to achieve these results. These changes in ORD and security will be short-lived and upon completion of the project, road density and security levels in the area will return to pre-project levels. Some short-term displacement of big game may occur when harvest occurs in travel corridors or as security is decreased during the life of the project.

Alternative 5 results in less of a change in cover/forage ratios, but does not increase open road density or reduce habitat security.

Post-project large regeneration units and increased hunter activity along closed and obliterated roads may result in increased vulnerability of elk, particularly bulls. This condition will last 5 to 10 years or until trees regenerate enough to provide some screening cover for elk. Overall, elk numbers are not expected to change dramatically as a result of the proposed vegetation management project.

Cumulative Effects

A description of past actions in the project area can be found in Table 3-1. Past actions have resulted in a landscape that is a mosaic of various stages of succession that provide a varying amount of forage, thermal cover and hiding cover. There are also areas with little evidence of human activity, such as inventoried roadless areas, providing security. Historic timber harvest typically focused on regeneration of mature and overmature stands. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. The effects of these types of treatments on elk would have been similar to those discussed above for this project. Past timber harvest likely increased the quality and quantity or foraging areas. While changes in access associated with timber harvest (road construction) reduced the amount of secure habitat.

The cumulative effects of the Forest Plan amendment for changing the open road density requirements have been analyzed and the results are available in the project file. In summary, this amendment, along with three other previously approved forest-wide ORD amendments would slightly lessen the elk carrying capacity on the forest. Approximately 1% of the available elk habitat has been affected by this amendment and the other similar amendments. This change, on a small part of the available habitat on the forest, will not result in a measurable change in big game populations. The cumulative effects of past and present land use patterns as well as random natural events have been taken into consideration in describing the existing condition. There are no reasonably foreseeable activities planned that could change the magnitude or scope of effects described above.

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

REGULATORY CONSISTENCY

Forest Plan

- All Alternatives meet Forest Plan direction for big game species with the required Forest Plan Amendment. (FP Vol. 1, II-1 #6).
- All alternatives, with their associated Forest Plan amendments and Regional Forester approval for the over 40 acre unit request, are consistent with the Kootenai Forest Plan (1987).

State Elk Plan

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

SUMMARY GENERAL FOREST MIS STATEMENT

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

PILEATED WOODPECKER

Data Sources, Methods, Assumptions, Bounds of Analysis

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

Research conducted in the Pacific and Inland Northwest is described in Bull and Holthausen (1993), Bull et al. (1992b), Bull (1987, 1980, 1975), Bull & 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, Univ. of Montana), and Forest historical data (NRIS Wildlife). The pileated woodpecker is the indicator species for old growth and snag habitat on the Kootenai National Forest. Habitat for this species was modeled using all designated and undesignated old growth habitat and old growth replacement habitat, which has currently been mapped for the Kootenai National Forest.

Effects Indicators

The potential population index (PPI) for PWPs on the Kootenai National Forest has been calculated by Johnson (2003). The procedure is based on the assumption that all currently mapped effective and replacement old growth habitat (both designated and undesignated) is providing suitable habitat to support nesting territories. This assumption also includes the premise that all suitable habitat is spatially distributed across the landscape in a pattern that can be incorporated into individual nesting territories. The procedure was based on territory sizes of

pileated woodpeckers as described in research by McClelland (1977) for northwest Montana, and Thomas (1979) and Bull and Holthausen (1993) for northeast Oregon. For the PPI analysis on the Kootenai National Forest (Johnson 2003b), replacement old growth habitat was defined as habitat that had some old growth characteristics, but did not meet the Kootenai Forest Plan (USFS 1987) definition of old growth, or the definition found in Green et al. (1992).

Effective old growth habitat was modeled as supporting one nesting pair per 600 acres, with replacement old growth habitat supporting one nesting pair per 1000 acres. The difference in territory size is based on research that suggests that higher quality habitat can support a breeding pair with fewer acres (McClelland 1977; Bull and Holthausen 1993). Also, allowing for larger territory sizes when habitat becomes fragmented appears reasonable, as territory sizes up to 2,600 acres have been reported for western Oregon (Mellen et al. 1992). Of course, there are numerous and complex interrelated factors that influence the actual size of the home range territory (McClelland 1977).

Project impacts are evaluated based on impacts to important attributes of pileated woodpecker habitat, primarily impacts to designated and undesignated old growth habitat. Specific features of old growth stands evaluated for project impacts include preferred nest tree species, preferred nest tree size, down logs (both size and quantity), basal area (BA), and canopy closure (CC).

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

The analysis boundary for project impacts to individuals and their habitat is the Pilgrim planning sub-unit. 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 2003a). 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 Pilgrim planning sub-unit is displayed in the Old Growth section of this document. This summary indicates that approximately 900 acres of designated effective old growth habitat and about 2,100 acres of designated 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 Pilgrim planning sub-unit could support about 3.6 nesting territories (PPI).

No population data is available for pileated woodpeckers within the Kootenai National Forest. Breeding bird point count surveys have been conducted on the Kootenai Forest since 1994. In this program, transects consisting of multiple bird monitoring points are set up within a wide range of habitats distributed geographically across the Kootenai National Forest. This survey

technique is not specifically designed to census woodpecker species, although all migratory and resident bird species detected by specialists trained in bird identification are recorded at each point on each transect. The rate of detection can vary greatly from year to year, especially for a wide-ranging species like the pileated woodpecker, that may or may not be anywhere near a given point on a given day. During the 1994-2002 periods, the pileated woodpecker was tallied 204 times at the 2,638 individual points surveyed (USDA FS 2003).

Environmental Consequences

Alternative 1 (No Action)

Under Alternative 1 (No Action), natural successional processes will continue to occur throughout existing old growth stands, and stands containing old growth attributes used by pileated woodpeckers. Habitat will be provided for PWP nesting pairs that find suitable feeding and breeding conditions provided by the structural features and overall environment within these stands. There would be no change in PPI (see Table 3-17 below).

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

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

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

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

Action Alternatives

Timber harvest is not proposed in designated old growth under any of the action alternatives. There will be no direct impacts to designated old growth habitat. Indirect impacts will be the same as those described for the No-Action alternative (see above).There will be no road construction adjacent to or through designated old growth areas.

Based on the expected impacts to old growth acres (see Table 3-11 in the old growth section) the PPI is not expected to change.

Table 3-17. Pileated Woodpecker Potential Population Index by Alternative

Analysis Area	Existing PPI	Alt. 1 No Action	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Pilgrim PSU	3.6	3.6	3.6	3.6	3.6	3.6
Forest-wide	425	425	425	425	425	425

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

Cumulative Effects

A description of past actions in the project area is found at the beginning of Chapter 3. Historic timber harvest typically focused on regeneration of mature and overmature stands that likely provided suitable pileated woodpecker habitat. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. The effects of these types of treatments on pileated woodpeckers would have been similar to those discussed above for this project. Past regeneration harvest areas likely provide little in the way of pileated nesting habitat. Past intermediate harvest provides different structure and function as it ages and could be used for foraging. Past activities have reduced the amount of available nesting habitat but provided for habitat diversity in the short and long term but have not markedly altered the ability of the project area to support pileated woodpeckers at or near historical levels.

The No Action alternative would not contribute to any cumulative effects. The Forest-wide PPI (see Table 3-17 above) reflects cumulative changes from each alternative and all past, present and reasonably foreseeable actions.

Regulatory Consistency

Forest Plan

- All alternatives are consistent with Forest Plan direction for old growth (see old growth section)
- All alternatives are consistent with Forest Plan direction for snags and down wood (see snag and down wood section)

- All alternatives are consistent with Forest Plan direction to maintain diverse age classes of vegetation for viable populations (FP II-1 #7).

SUMMARY OLD GROWTH, SNAG AND DOWN WOOD HABITAT MIS STATEMENT

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

Northern Goshawk

Data Sources, Methods, Assumptions, Bounds of Analysis

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

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

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

Goshawk occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS Wildlife). Goshawk habitat was modeled using TSMRS vegetation data. The potential population index (PPI) (habitat acres divided by average territory acres) was calculated using 5,400 acres as the average goshawk pair territory (Reynolds et al. 1992). The analysis boundary for project impacts to individuals and their habitat is the Pilgrim planning sub-unit. The boundary for cumulative effects and determining contribution toward viability is the Kootenai National Forest.

Affected Environment/Existing Condition

Northern goshawk habitat is abundant and well distributed in Region 1 (Samson 2006). The Northern Region estimates that a minimum viable population of goshawks would require 30,147 acres of habitat (Brewer et al. 2009). Johnson (2004) estimates there are 752,296 acres of goshawk habitat on the Kootenai NF.

Goshawk observation and monitoring data indicates that goshawks are currently nesting in the Smeads Creek drainage of the Pilgrim Creek project area. A nesting pair was found in the South Fork of Pilgrim Creek in 2003. The nest site has been monitored annually and was last used in 2005. Johnson (1999) shows goshawk presence confirmed in all eight planning units on the Kootenai. At the end of 2012, Forest survey records show 36 nest sites, with five sites no longer in use.

Goshawk habitat modeling using stand exam data identifies 11,780 acres of potential goshawk habitat in the Pilgrim Creek planning sub-unit (See Table 3-18).

Table 3-18. Home Range/foraging area diversity matrix for goshawk habitat analysis

Tree Size Class (DBH)	Total Acres	% of Total Acres
0.0-4.9	1,399	5
5.0-8.9	19,471	65
9.0+	6,701	22
DBH>5", canopy cover > 40% *	11,780	39
Shrub/grass/forb	2,255	8

*Potential goshawk nesting habitat

Based on the average goshawk pair territory (5,400 acres) and the modeled habitat acres, the potential population index for the Pilgrim Creek planning sub-unit is 2 goshawk pairs. Using the nesting (modeled) habitat acres from Johnson (ibid), the minimum PPI for the Kootenai National Forest would be 139 goshawk pair. The most recent data show 36 known or suspected pairs on the Forest (KNF goshawk data).

Environmental Consequences

Table 3-19 summarizes the changes in habitat acres and PPI due to each alternative.

Table 3-19. Goshawk Habitat and PPI Changes by Alternative

	Alternative 1 (No Action) (Existing Condition)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Acres of Potential Goshawk Habitat (% change)	11,780 acres	10,938 (7)	10,984 (7)	11,121 (6)	11,519 (2)
PPI - Project Area Pair Territories	2	2	2	2	2
Habitat Acres (Forest-wide) (% change)	752,296 acres	751,454	751,500	751,637	752,035
PPI - Forest-wide Pair Territories	139	139	139	139	139

Direct and Indirect Effects

Research is divided on the effects of vegetation management within the nest stand of goshawks. Some studies have shown that modification of nest stands has minimal impact on reoccupancy and productivity of resident goshawks (Penteriani and Faivre 2001, Penteriani et al. 2002, Mahon and Doyle 2005, and Moser and Garton 2009). While other studies have found that vegetation management within the nest stand has a negative impact on reoccupancy and productivity of resident goshawks (Crocker and Bedford 1990 and Patla 2005).

In response to these conflicting findings, under Alternative 3 a buffer of 40 acres was placed around the known goshawk nest and unit 5 was reduced in size from 46 acres to 14. So long as the nest area is considered active (for 5 years after the last documented use of the nest), no ground disturbing activities will occur within the 40 acre buffer area. Additionally, a timing restriction is in place for the 425 acre post-fledging area, no ground disturbing activities would take place between April 15 and August 15. Alternatives 2 and 4 do not include a buffer around the nest or a timing restriction on activities. Alternative 5 does not include unit 5, but does include the timing restriction.

In the remainder of the project area, vegetation management will impact 7% of the project area or less (Table 3-18). The potential habitat change includes both regeneration and intermediate harvest. Regeneration harvest creates an opening that likely will not be used by goshawks although reserve trees will be left that would provide for future habitat diversity and/or perch trees. The object of intermediate harvest is to remove understory trees and enhance growing conditions for the older, more mature trees. The end result is a more open stand that will be more compatible with the goshawks hunting strategy. Intermediate harvest should improve goshawk foraging habitat in the project area.

Large openings, i.e. greater than 40 acres, would tend to be underutilized by goshawks for foraging, though they would likely use edges of these openings. While early successional habitats provide habitat from goshawk prey species, they tend to hunt in mature stands with open flight paths as opposed to more open areas. Over time, as these stands mature, they would begin to provide foraging habitat again.

Cumulative Effects

Summary of the existing condition

The existing condition includes the results from all past activities. The existing condition for the project area provides 2 potential pair home ranges and 11,780 acres of habitat for northern goshawk. This means that 39% of the project area currently provides suitable nesting habitat for northern goshawk.

Past Actions and their effects on current conditions

A description of past actions in the project area can be found in Table 3-1. Historic timber harvest typically focused on regeneration of mature and overmature stands that likely provided suitable goshawk nesting habitat. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. The effects of these types of treatments on goshawks would have been similar to those

discussed above for this project. Past regeneration harvest areas likely provide little in the way of goshawk nesting or foraging habitat. Goshawks are prey generalists and one strategy to provide for their needs is to supply a variety of successional stages and habitat structures. Past intermediate harvest provides different structure and functions as it ages and could be used for nesting or foraging. Past activities have reduced the amount of available nesting habitat but provided for habitat diversity in the short and long term but have not markedly altered the ability of the project area to support northern goshawk at or near historical levels.

Effects of Current and Reasonably Foreseeable Actions

Cumulative effects from ongoing and foreseeable actions are expected to have minor impacts on the goshawk.

Noxious Weed Treatment

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

Fire Suppression

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

Road Management / Use Activities

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

Recreation Maintenance

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

Special Uses

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

Public Use

There may be some situations where isolated or localized cumulative effects may occur, due to an overlap of forest activities, but these situations are typically short in duration, and do not persist through the lifecycle of the raptor, either temporally or spatially.

Other forest product activities occurring presently and typically on an annual basis are the gathering of pine cones, boughs and personal use gathering of Christmas trees. These activities occur throughout the PSU, and have little-to-no effect on the landscape due to the unspecific nature of the use and the low impact on the resources (foot traffic, hand tools) as well as the timing of these activities which occur when goshawks have completed their annual reproductive cycle and are not necessarily tied to a key habitat or portion of a defended nest territory. Additionally, Christmas trees are harvested from existing regeneration units, so this activity would have no cumulative effect on the specialized habitats of goshawks, such as old growth and riparian areas. Also, Christmas tree harvest typically occurs well after the time period when nest territories are aggressively defended during a time when goshawks are using larger areas for foraging.

Private Property

Private activities such as land clearing, home construction, livestock grazing etc. are likely to continue on those private lands within the PSU. Therefore there will likely be a decrease in mature forest within the PSU, but outside of NFS lands. Any cumulative effects to goshawks will be partially dependent on the duration (seasonal versus year-round) of use of these parcels and homes. Anticipated effects include species displacement, nest failure, habitat alteration and/or habitat loss.

Summary of Cumulative Effects

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

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

Regulatory Consistency

Forest Plan

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

National Forest Management Act:

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

Findings

Due to design criteria put in place; 1) Buffer area identified around existing nest or unit dropped, 2) timing restrictions established for post-fledging area, 3) project area will continue to provide sufficient nesting habitat for 2 pairs, 4) intermediate harvest will enhance foraging habitat conditions, alternatives 3 and 5 are unlikely to have an effect on the goshawk nest in the Smeads Creek drainage.

Alternatives 2 and 4 may have an effect on the goshawks nesting in Smeads Creek due to: 1) no buffer area identified around existing nest, 2) no timing restrictions established for post-fledging area, 3) project area will continue to provide sufficient nesting habitat for 2 pairs, 4) intermediate harvest will enhance foraging habitat conditions. However, the activities will not impact the Kootenai Forest's or the Regions ability to support a viable northern goshawk population (Samson 2006a).

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) (36 CFR 219.19) directs the Forest Service to manage habitat to maintain viable populations of existing native and desired non-native vertebrate species. 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.

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 3-20. Sensitive Wildlife Species on the Kootenai National Forest (Weldon 2011)

SENSITIVE SPECIES	STATUS IN ANALYSIS AREA*	COMMENTS**
Bald Eagle (*Haliaeetus leucocephalus)*	K	5
Bighorn Sheep (*Ovis Canadensis*)	NS	1
Black Backed Woodpecker (*Picoides arcticus*)	S	2
Coeur d'Alene Salamander (*Plethodon vandykei idahoensis*)	S	2
Common loon (*Gavia immer*)	NS	1
Fisher (*Martes pinnanti*)	S	2
Flammulated Owl (*Otus flammeolus*)	NS	1
Gray Wolf (*Canis lupus*)	S	5
Harlequin Duck (*Histrionicus histrionicus*)	NS	1
Northern Bog Lemming (*Synaptomys borealis*)	NS	1
Northern Leopard Frog (*Rana pipiens*)	NS	1
Peregrine Falcon (*Falco peregrinus*)	K	3
Townsend's Big-eared Bat *(Corynorhinus townsendii)*	S	2
Western Toad (*Bufo boreas*)	S	2
Wolverine (*Gulo gulo*)	NS	4

*Status Key:
K = This species is known to occur within the project area.
S = Species is suspected to occur within project area.
NS = Species is not suspected to occur within the project area, and is dropped from further evaluation.
** Select All That Apply
1 = Suitable habitat does not occur in the analysis area
2 = Suitable habitat occurs n the analysis area, but there is no record of species presence
3 = Nesting habitat is present in analysis area, use area is outside of analysis area
4=Denning habitat is not present in the analysis area
5 = Suitable habitat is present in analysis area

Bald Eagle

Data Sources, Methods, Assumptions, Bounds of Analysis

Eagle population ecology, biology, habitat description and relationships identified by research are described in USDI U.S. Fish and Wildlife Service (USDI 1995), USDI 1999, Montana Bald Eagle Working Group (MBEWG 1991, 1994) and Montana Bald Eagle Management Guidelines: An Addendum to Montana Bald Eagle Management Plan (1994) (MBEWG 2010). That information is incorporated by reference. Eagle occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS Wildlife), and other agencies (USFWS, MFWP). On August 8, 2007, the bald eagle was removed from the USFWS list of Threatened and Endangered species because the population had increased beyond recovery goals. The USDA Forest Service monitors potential impacts to recently delisted species through the sensitive species process.

Habitat management guidelines from the Montana Bald Eagle Management Plan (MBEMP) and the Montana Bald Eagle Management Guidelines (MBEWG 1991, 1994, 2010) serve as the measure for bald eagle habitat management 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 consultation area agreed to by the USFWS (USDI 2001) will be discussed in relation to these guidelines.

The bald eagle is primarily a species of riparian and lacustrine habitats (forested areas along rivers and lakes), especially during the breeding season. Important year-round habitat includes wetlands, major water bodies, spring spawning streams, ungulate winter ranges and open water areas (MBEWG 1994).

Habitat for bald eagles on the Cabinet District includes suitable nesting, wintering and migration habitat. Nesting sites (both current nesting and suitable habitats) are generally located within larger forested areas near large lakes and rivers where nests are usually built in the tallest, oldest, large diameter trees, primarily along the Clark Fork, and Bull River corridors and associated lakes and reservoirs. Nesting site selection is dependent upon maximum local food availability and minimum disturbance from human activity (MBEWG 1994). The majority of their diet is comprised of fish. Important prey for bald eagles includes; waterfowl, especially in the winter, salmonids, suckers, whitefish, carrion and small mammals and birds (MNHP and MFWP 2011).

Nearly all current nests are located within ¼ mile of and overlook an adjacent water body. The Forest, in concurrence with the USFWS, has mapped potential nesting habitat along all major river corridors and has maintained mature trees within those areas for current and future use by bald eagles. Suitable unused nesting habitat for bald eagles remains available throughout portions of the Forest and it is likely they will continue to expand. Both resident and seasonal winter use also occurs on the Cabinet District and Kootenai National Forest.

The analysis boundary for project impacts to individuals and their habitat is all lands within the Pilgrim Creek PSU.

The temporal bounds of this analysis were assumed to extend approximately ten years from present, approximately five years beyond the likely completion of sale activities (harvesting, burning/slash cleanup). This time period is assumed to provide a reasonable range of environmental extremes to evaluate the potential direct, indirect, and cumulative effects resulting from the proposed action.

Affected Environment/Existing Condition

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 36 nests (on NFS and private land) were known and monitored in 2007. Nest success for active nests from 1985-2005 was 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 versus frozen water for foraging habitat). Mid-winter bald eagle counts have averaged 97 bald eagles from 1987-2007 years (KNF bald eagle monitoring records).

The Pilgrim Creek PSU falls within the Upper Columbia Basin Management Zone (Zone 7) of the Pacific Bald Eagle Recovery Area (USDI 1986). Forest-wide potential bald eagle habitat covers about 564,558 acres (242,965 NFS; 275,470 PVT; and 46,123 water) (based on USDI 2001).

MBEMP 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: I – Nest site area, II – Primary use area, and III – 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. There are two bald eagle nests in the planning area, one on NFS land along Noxon Reservoir, east of Stevens Creek in a small face tributary to Noxon Reservoir (Mad Creek) and another near the mouth of Pilgrim Creek at Pilgrim Creek Park which is administered by Avista Corp. Both nests have successfully fledged young within the last two years. The nest east of Stevens Creek was discovered in 2009 while the nest at Pilgrim Park was first reported in 2007.

Foraging habitat consists of lakes, rivers, wetlands and meadows that provide open flight paths, perches, and adequate prey. It also includes highway and railroad corridors (especially in the winter), due to the dead animals found in these areas.

Winter habitat is generally dictated by the presence and abundance of food, open water, and secure night roost sites (MBEWG 1994). Eagles are known to winter within the Marten PSU,

along Noxon Reservoir, and along the nearby Montana Highway 200, and the Montana Rail Link railroad tracks.

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 PIlgrim PSU all of these risks are likely present.

Environmental Consequences

Direct and Indirect Effects-

No Action Alternative

There would be no direct or indirect effects anticipated from implementation of the no action alternative.

All Action Alternatives

The Pilgrim Creek Park nest is located far enough away from proposed activities that there would be no direct or indirect effects to those birds or their habitat. All other discussion will concern only the Mad Creek nest.

There is no activity proposed within the nest site area of either nest. Unit 40 is located approximately one half mile and 400 vertical feet above the nest with a yearlong open road (NFSR 2229) between the unit and the nest. It is unlikely that harvest or burning activities would disturb the nest beyond the usual levels of disturbance experienced by these birds. The area surrounding unit 40 is likely used only during the hunting season when eagles scavenge for remains left by hunters. Use during the rest of the year is generally concentrated along the reservoir or highway.

There are no prescribed fire units located close enough to the nest to have any direct effects to eagle habitat. Flight paths will be identified and sufficient space given to the nest to avoid nest site disturbance. There are no indirect effects anticipated.

Creation of openings larger than 40 acres would not impact bald eagles directly due to the location of units away from primary habitat components. Eagles would likely forage in these areas and may exploit gut piles that may be left by hunters during fall, but otherwise these larger openings would have generally neutral effects on bald eagles.

Cumulative Effects

Past Actions and their effects on current conditions

The primary influence on bald eagle habitat in the lower Clark Fork area has been the creation of Noxon Rapids and Cabinet Gorge Reservoir, both of which border the project area. While the Clark Fork provided good quality eagle habitat before inundation, the filling of the reservoirs increased the water surface acreage and the total available biomass of eagle prey (primarily fish). Highway improvements over the years and increases in game animal (primarily white-tailed deer) populations have increased the amount of available roadkill available to eagles.

Timber management, primarily on private lands along the reservoirs, has likely removed suitable nest trees from some areas, but suitable habitat exists to support a robust population.

Cumulative Effects- No Action Alternative

Ongoing and reasonable foreseeable activities would continue to influence eagle habitat in the project area, including recreational boating and fishing, driving for pleasure, etc. that would provide localized sources of disturbance but likely still provide sufficient space, solitude, and resources to maintain or increase eagle populations.

Cumulative Effects- All Action Alternatives

The lack of direct or indirect effects from implementation of the action alternatives and effects from ongoing activities would result in similar effects to those described for the no action alternative. There are ongoing or reasonably foreseeable activities anticipated that would change the scope or magnitude of effects expected from implementation of any of the proposed alternatives.

Regulatory Consistency

Forest Plan:

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

National Forest Management Act:

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

Statement of Findings

Implementation of any proposed alternative would have no impact on the bald eagle or its habitat based on the lack of activity proposed near the Mad Creek nest and the lack of direct or indirect effects anticipated from harvest activities in Unit 40. Flight paths for prescribed burning will be planned to avoid nest disturbance, and no indirect effects to habitat or prey items are anticipated from prescribed burning.

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 Powell (2000), Cherry (1997), Hutto (1995), and O'Connor and Hillis (2001). That information is incorporated by reference. Black-backed woodpeckers are robin-sized woodpeckers that live in Montana year-round. They dig into dead trees and eat wood-boring beetles. They find the greatest concentrations of these beetles in

recently burned forests. For 5 years post-fire, black-backed woodpeckers can achieve very high numbers in burned forests. After 5 – 7 years the number of beetles in the stand peaks and begins to decline. Black-backed woodpeckers also find food in forests experiencing an insect outbreak. Black-backed occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS Wildlife). 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 recent (≤ 5 years old) 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). General forest includes isolated stands or individual dead and dying trees as a result of insect/disease outbreaks. 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 Pilgrim Creek planning sub-unit. 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 Pilgrim Creek project area, black-backed woodpecker habitat consists mainly of lower quality general forest habitat with scattered patches of dead and dying trees and snags produced by insect and disease. This lower quality habitat supports low populations of resident black-backed woodpeckers. The project area includes 25,227 acres of general forest habitat. There is no high quality habitat in the form of recent (5 years old or less) mixed lethal and stand-replacing wildfire or prescribed fire in the project area.

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 snag habitat level for the Planning Area is 84%.

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. There have been no sightings of black-backed woodpeckers reported in the project area.

Environmental Consequences

Proposed activities for Alternatives 2, 3, 4, and 5 have the potential to remove or reduce general forest foraging opportunities, and at the same time, create foraging habitat during fuel reduction burning activities. Regeneration harvest would remove general opportunities, leaving a minimum number of trees available for foraging. Regeneration harvest almost always includes under burning, and with heavier slash, has potential to kill trees within or next to the unit. Overall, a larger amount of low-quality habitat would be replaced with a smaller amount of

higher-quality habitat. Commercial thinning would leave a number of trees on site for general foraging opportunities. Under burning in these stands would create more potential for black-backed woodpecker foraging habitat than regeneration harvest. Commercial thinning with under burning and stands with fuel reduction burning-only would be most similar to historical conditions created by mixed-severity fires, and may provide high quality black-backed habitat for several years (Caton 1996, Murphy and Lehnhausen 1998).

Table 3-21. Change in Black-backed Woodpecker Habitat and PPI by Alternative

	Existing	Alt. 1 No Action	Alt. 2 (%)	Alt. 3 (%)	Alt. 4 (%)	Alt. 5 (%)
Acres of General Forest Habitat	25,227	25,227	24,640 (2%)	24,348 (3%)	24,414 (3%)	24,985 (1%)
Acres of Fuel Reduction Burning	0	0	4,567 (18%)	4,564 (18%)	4,564 (18%)	4,564 (18%)
Snag Index Level	84%	84%	81%	82%	82%	83%
PPI – Project Area	31	31	31	30	30	31
Reduction in General Forest Habitat Forest-wide	1,317,790	0	1,317,203	1,316,865	1,316,977	1,317,548
PPI – Forest-wide	1,647	1,647	1,647	1,646	1,646	1,347

Direct and Indirect Effects

Effects of No Action (Alternative 1)

Alternative 1 would maintain/allow the natural insect/disease processes to occur. General forest conditions for foraging opportunities would remain low quality. The potential for stand-replacing fires escaping initial attack would continue to increase as fuel levels increased. 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 five to seven years, until beetle populations declined.

Effects of Action Alternatives

Alternatives 2, 3, 4 and 5 would create forest openings with regeneration harvest on 1 to 3% of the black-backed woodpecker habitat in the Project Area, which would reduce the amount of general forest habitat available, but may create some good forage trees following underburning. A minimum of 96% of general forest habitat would remain following implementation of any of the

Action Alternatives. All alternatives include fuel reduction burning which has the potential to provide additional high quality foraging trees on up to 18% of the black-backed woodpecker habitat in the Project Area. Openings created by regeneration harvest would not provide any high quality habitat and would tend to be underutilized by black-backs, but there would not be any substantive difference in effects of larger (over 40 acre) openings versus smaller openings.

On a Forest-wide level, the reduction in general foraging habitat would amount to less than 1 % under Alternative 3**,** and even less under Alternatives 2, 4, and 5. No effects to distribution of habitat necessary for viable populations of black-backed woodpeckers in the Project Area or the Forest would occur because proposed activities would result in a small net loss of low quality habitat scattered throughout the Project Area. There would be no loss in high quality habitat. In fact, the thinning and under burning treatments may provide additional foraging trees. The resulting change in PPI for the Project Area and Forest-wide is +/-1 pair, respectively.

Cumulative Effects

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. The last major fire occurred in the Pilgrim planning subunit in 1910. Since that event fire suppression activities have effectively reduced the number of acres burned. The existing situation provides adequate available habitat for black-backed woodpeckers based on the availability of potential territories that are of adequate size and even distribution.

Normal road and trail maintenance activities have the potential to remove nesting and foraging trees if they are close to a trail or road and present a safety hazard. Effects would include removing site-specific, individual trees, and would not be expected to adversely affect black-backed woodpeckers.

Firewood cutting would remove snags and would reduce nesting and foraging habitat availability along open roads. The decrease in habitat would be limited to areas within about 150-200 feet of open roads. This loss of snag habitat was accounted for in the analysis of available snag habitat. Overall in the Planning Area, 80% snag habitat level would be available following the past, present, and foreseeable actions. This snag habitat level would maintain minimum viable population levels of cavity nesting birds, including the black-backed woodpecker; no adverse cumulative effects are expected.

Other agency and public actions identified in the 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.

Regulatory Consistency

Forest Plan:

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

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

National Forest Management Act:

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

Statement of Findings

The proposed action is not likely to impact individuals or their habitat and 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) 4% or less reduction in general forest habitat; 2) enhances 18% of general forest through the use of fire; 3) Snag Index level 81 or 82%.

Coeur D'Alene Salamander

Data Sources, Methods, Assumptions, Bounds of Analysis

Coeur d'Alene salamander population ecology, biology, habitat description and relationships identified by research are described in Cassirer et al. (1994) and Maxell (2000: 68-73). That information is incorporated by reference. Coeur d'Alene salamanders are lungless and respire through their skin. Because their skin is highly porous, making them subject to desiccation, they live in cool, damp environments such as springs, seeps, waterfall spray zones, and damp stream banks near talus or fractured rock (Werner et al. 2004). Coeur d'Alene salamander occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS Wildlife) and other agencies (MFWP). The analysis boundary for project impacts to individuals and their habitat is the Pilgrim planning sub-unit. The boundary for cumulative effects and determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

District and Forest Coeur d'Alene salamander observation and monitoring data indicates that there are no known populations in the Pilgrim PSU. Johnson (1999) shows Coeur d'Alene salamander presence confirmed in four of the eight planning units on the Kootenai at 13 different sites. They have been confirmed in two additional planning units since 1999 and the known sites now total 36. Known populations on the KNF are isolated by miles of unsuitable habitat that cannot be crossed (based on Maxell 2000: 69 and Maxell et al. 2003: 40).

Environmental Consequences

Alternative 1 (No Action)

Under Alternative 1 no forest management activities will occur. There will be no roads built, or rebuilt and no culverts replaced. There would be no impacts to potential Coeur d'Alene salamander habitat.

Direct and indirect effects of Action Alternatives 2, 3, 4, and 5

Maxell (2000:69) reviews the risk factors relevant to this species. Timber harvest, fire, road and trail development and maintenance, vehicle use on roads, and isolation are the critical factors. Harvest units have been designed with riparian buffers sufficient to protect their potential habitat from adverse effects associated with logging. There are no harvest units in the area of known Coeur d'Alene salamander populations, so there would be no direct or indirect effects to these salamanders from harvesting. Prescribed burning would not occur in areas with suitable habitat and there would be no effects anticipated from burning.

Cumulative Effects

A description of past actions in the project area can be found in Chapter 3 (Table 3-1). Historic timber harvest typically focused on regeneration of mature and overmature stands that may have provided some suitable Coeur d'Alene salamander habitat in areas near water or with significant groundwater influence. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred, though only a small number of these acres likely provided suitable habitat. These activities had the potential to impact Coeur d'Alene salamander habitat either directly or indirectly as a result of the timber harvest or associated activity. The effects of these types of treatments on salamanders would have been similar to those discussed above. Past activities have not markedly altered the ability of the project area to support Coeur d'Alene salamanders at or near historical levels.

All action alternatives have the potential to affect downstream riparian habitat. Peak flow increases would be maintained within standards thus preventing adverse water quality changes or physical changes in channel morphology. For further discussion on water quality read the sections on fisheries and water resources. There should be no adverse cumulative effects on the Coeur d'Alene salamander population or habitat on the Kootenai National Forest from any foreseeable activities within the project area.

Regulatory Consistency

Forest Plan:

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

- All Alternatives are consistent with Forest Plan riparian standards and guidelines (FP Vol. 1 II-28 thru 33) as amended by INFS.

National Forest Management Act:

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

Statement of Findings

The proposed action may impact individuals or habitat, but will not likely result in a trend toward federal listing or reduced viability for the population or species for Coeur d'Alene salamander. This determination is based on: 1) no known populations in the project area, 2) specific habitat characteristics have not been found in project area, 3) Suitable habitat would remain distributed across the Kootenai National Forest.

Fisher

Data Sources, Methods, Assumptions, Bounds of Analysis

Fisher population ecology, biology, habitat description and relationships identified by research are described in Powell and Zielinski (1994) and Heinemeyer and Jones (1994). That information is incorporated by reference. Fishers are similar in body form to weasels, but larger. Their fur color varies from very dark brown to blackish brown. Young are born in cavities in either live or dead trees. Mature grand fir and Engelmann spruce forests are common fisher habitat (Heinemeyer and Jones 1994). Fisher occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS Wildlife) and other agencies (MFWP). Fisher habitat was modeled using TSMRS vegetation data (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 to individuals and their habitat is the Pilgrim planning sub-unit. The boundary for cumulative effects and determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

Fisher observation and monitoring data indicates that there have been no sightings of fisher in Pilgrim planning subunit. Remote cameras were placed throughout the PSU for a total of 595 camera nights in an attempt to document the presence of forest carnivores. No pictures of fisher were taken. Johnson (1999) shows fisher presence confirmed in five of the eight planning units on the Kootenai.

Reudiger (1994) shows the Kootenai National Forest as a primary habitat area for fisher. Modeling fisher habitat identifies 8,285 acres of potential habitat in the Pilgrim planning sub-unit. Following the identification process outlined in Reudiger (ibid), the Clark planning unit (major drainage) is assigned as a primary fisher conservation area (Johnson 2004b). The Pilgrim planning sub-unit (sub-drainage) is determined to be low quality fisher habitat (ibid).
Based on the average male and female fisher home range sizes and the modeled habitat acres, the potential population index for the Pilgrim planning sub-unit is 2.2 female, and 0.8 male fisher. Using the yearlong (modeled) habitat acres from Johnson (1999), the minimum PPI for the Kootenai National Forest would be 29 male and 80 female fishers.

Environmental Consequences

Alternative 1 (No Action)

Under Alternative 1 no forest management activities will occur. There will be no impacts to potential fisher habitat.

Table 3-22. Fisher habitat and PPI changes by Alternative

	Alternative 1 (No Action) (Existing Condition)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Habitat Acres - Planning sub-unit (% change)	8,285	8,015 (3)	7,919 (4)	8,026 (3)	8,043 (3)
PPI - Project Area (Males/Females)	0.8/2.2	0.8/2.2	0.79/2.2	0.8/2.2	0.8/2.2
Habitat Acres - Forest-wide (% change)	294,531 acres	294,261 (<0.1)	294,165 (<0.1)	294,272 (<0.1)	294,289 (<0.1)
PPI - Forest-wide (Males/Females)	29/80	29/80	29/80	29/80	29/80

Direct and indirect effects

Each of the action alternatives proposes vegetation management activities (regeneration) that would reduce the amount of fisher habitat in the Pilgrim Planning Sub-unit (See Table 3-22 for acres by Alternative). The quality of fisher habitat would be reduced on an additional 3% to 4% (239 to 306 acres, based on the alternative) as a result of forest thinning. There will be no reduction in high quality old growth habitat.

Openings greater than 40 acres would be produced under each of the action alternatives (see Vegetation section). It is unlikely that fisher would use large openings (Jones and Garton 1994). They will forage along the edge, but it is unlike they will venture into the opening until there is enough regeneration to provide some cover.

While research does not show fisher to be highly sensitive to human activity, the presence of people and machines during project implementation may still temporarily 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. Connectivity with adjacent drainages would be maintained.

Cumulative Effects

A description of past actions in the project area can be found in the beginning of Chapter 3. Historic timber harvest typically focused on regeneration of mature and overmature stands that likely provided suitable fisher habitat. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest has occurred. The effects of these types of treatments on fisher would have been similar to those discussed above for this project. Past regeneration harvest areas likely provide little in the way of fisher denning habitat. Past intermediate harvest provides different structure as it ages and could be used for foraging. Past activities have reduced the amount of available denning habitat, but provided for habitat diversity in the short and long term. Cumulatively, this past activity has resulted in 8,285 acres of potential fisher habitat.

Alternative 1 (No Action) would not contribute to any cumulative effects on fisher or their habitat. The action alternatives, in combination with the baseline conditions and reasonably foreseeable projects would not measurably impact the fisher population forest-wide.
Forest-wide, suitable habitat for the fisher would be available across the landscape as documented in Johnson (1999).

Regulatory Consistency

Forest Plan:

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

National Forest Management Act:

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

Statement of Findings

The proposed action may impact individuals or their habitat, but will not likely result in a trend toward federal listing or reduced viability for the fisher. This determination is based on: 1) 3 to 4% reduction in potential habitat, 2) reduction in quality on 3 to 4% of potential habitat, 3) openings greater than 40 acres would be created, 4) no change to potential habitat in designated old growth, and 5) displacement would last only for the life of the project, 6) connectivity would be maintained with suitable habitat in adjacent drainages.

GRAY WOLF

Data Sources, Methods, Assumptions, Bounds of Analysis

Strategies to protect and recover wolf populations in Montana, as well as the ecology, biology and habitat descriptions of the species are found in the Northern Rocky Mountain Wolf Recovery Plan (USFWS, 1987), The Wolf, The Ecology and Behavior of an Endangered Species (Mech 1970), and Wolf Ecology and Prey Relationships on Isle Royale (Peterson 1977). These documents are incorporated by reference.

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). Wolves in Idaho and Montana were delisted in 2009, listed again in August 2010, per Court Order (Molloy, 08/05/2010). On May 5, 2011, gray wolves were again delisted in Montana and Idaho. In Wyoming they were delisted in 2012.

The Kootenai National Forest is within the NWMT Recovery Area. Information for this recovery area is provided by the Rocky Mountain Wolf Recovery 2011 Annual Report (USFWS et al. 2010) and is incorporated here by reference. Wolf occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS Wildlife), and other agencies (USFWS, MFWP).

Measurement indicators 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 alternate prey: this component can be measured by adhering to Forest Plan big game management recommendations. For this planning area, elk management recommendations were applied. They include cover/forage ratios; road densities; opening sizes; habitat effectiveness levels, and security levels. See the MIS section for details.

2) Suitable and somewhat secluded denning and rendezvous sites: Sensitivity to disturbance at den sites and subsequent abandonment varies greatly among individual wolves. One incident of human disturbance at the den may cause abandonment for some wolves, while other wolves will tolerate some human disturbance (Thiel et al. 1998) and may not abandon dens unless there are repeated or severe incidents of disturbance (Claar et al. 1999). One recommendation for protection of den sites from human disturbance includes restricting human access within a 1.5 mi. radius of an occupied den from 4 weeks prior to whelping to the end of denning activity. Closure area should be irregular in shape to avoid pinpointing den locations. Rendezvous sites should be similarly protected (Frederick, 1999). MFWP is not recommending

any localized closures near wolf den or rendezvous sites on public lands outside national parks (Sime, 2002), and early surveys in N.W. Montana indicated that public support to recover wolves would dwindle if recreational or public lands were restricted to promote recovery (Tucker and Pletscher, 1989). MFWP encourages land management agencies to consider the locations of wolf den and rendezvous sites and habitat security in their future planning activities in the same context as considering the locations of ungulate winter range or bald eagle nests (Sime 2002). Assumptions with this method would include maintaining the habitat integrity of the denning and rendezvous sites. Recommendations in this paper are to identify the proposed action, and any past actions that have occurred near the den site. Proposed actions may be tolerated if they have occurred during the same time period in the past (example: an open road with similar amounts of traffic as in the past). Identify these actions and discuss with the consultation biologist to determine the course of action for each specific situation. Den and rendezvous sites can also be protected by enacting timing restrictions on proposed activities within the denning/rendezvous site areas. These restrictions would limit operating periods to the fall or winter seasons when these sites are unoccupied.

3) Sufficient space with minimal exposure to humans; this component is associated with reducing the risk of human-caused mortality to wolves. Human disturbance and accessibility of wolf habitats (i.e. road densities) are the principle factors limiting wolf recovery in most areas (Leirfallom 1970, US Fish and Wildlife Service1978 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 impacts to transient wolves and their habitat is the Pilgrim PSU.

Affected Environment/Existing Condition

At the end of 2011, there were 130 wolf packs in all of Montana, with 39 meeting breeding pair criteria. These packs contained a minimum estimate of 653 wolves (USFWS, 2012). The Montana portion of the Northwest recovery area supported 85 of those packs (23 were breeding packs). This area includes the Kootenai National Forest. There are currently 17 packs (9 breeding packs) using the KNF for all or part of their territories. These packs had a total 63 wolves at the end of 2011 (ibid). .

There are no known established packs, denning or rendezvous sites within the Pilgrim PSU, but wolves have been observed in the area. Observations of wolves include sightings of individuals and tracks. Potential denning and rendezvous sites are available however there is no evidence of wolves denning in the project area. No human-caused mortalities have been documented in the Planning Area.

Prey Base: The Pilgrim PSU supports year-round habitat for white-tailed deer and elk and they are the most abundant big game species found within the PSU. Most other ungulate prey species are also found in the Planning Area, however in fewer numbers than deer and elk. Together, this mix of species provides a good year-round prey base for wolves. See the MIS species section of this document for more information on elk. The management recommendations for this species are being met in this Planning Unit (see MIS section for details).

Sufficient Space with Minimal Exposure to Humans: Open road densities by Management Area (MA) currently meet amended Forest Plan Standards within this Planning Area (see MIS section for details). Security habitat recommendations for elk are within recommended levels (see MIS section for details).

Environmental Consequences

Direct and Indirect Effects to Alternatives

No Action Alternative

No timber harvest or road construction is proposed in this alternative. This alternative maintains current conditions for denning and human access within the Planning area. As forage availability declines (see elk analysis) there is the potential for a reduction in the number of prey (elk) in the drainage.

Action Alternatives 2, 3, 4, and 5

Prey Base: As discussed in the effects analysis for elk, this alternative will change their habitat conditions, one of the wolves' main prey items. Therefore prey conditions for wolves are likely to be maintained or improved with these alternatives. All habitat management recommendations for elk are being met with these alternatives (see Table 3-16 for a summary of the big game habitat parameters by alternative).

Denning/Rendezvous Sites: There has been no known denning or rendezvous activity within the Planning Area. Suitable habitat for denning or rendezvous sites would remain available following all alternatives.

Sufficient Space with Minimal Exposure to Humans: Open road densities by MA would meet Forest Plan Standards, as amended, in each alternative (see MIS section). Some temporary increases in risk from human-caused mortality would accompany localized increases in ORD during harvest activities and the large openings created. This increased risk would be immeasurable during harvest activities. Effects would be limited to avoidance of activity areas and transient use could still occur. Large openings could marginally increase mortality risk from loss of cover, though this increase is likely immeasurable.

Cumulative Effects

A description of past actions in the project area can be found in Chapter 3. The result of past management activities is a variety of successional stages across the landscape which provide forage for prey species such as ungulates, denning habitat, and thermal and hiding cover. Historic timber harvest typically focused on regeneration of mature and overmature stands that likely provided suitable gray wolf habitat. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. The effects of these types of treatments on wolves would have been similar to those discussed above for this project.

Development of other lands within the Planning area could potentially reduce the amount of hiding cover; however the remaining levels would still meet recommended levels for big game. Some private land development can result in the loss of habitat and decreases in habitat security through road construction. 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 analysis area over the next ten years.

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

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, the project would increase forage openings. Movement/travel corridors would be maintained between existing forage openings and created openings.

Regulatory Consistency

Forest Plan:

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

Statement of Findings

The proposed action may impact individuals but will not result in a loss of viability or trend towards federal listing based on: 1) mortality risk to the wolf is not expected to measurably increase during proposed activities, 2) alternatives will not affect known denning/rendezvous sites, 3) there may be short-term avoidance of areas of activity, transient use could still continue, 4) alternatives meet amended forest plan big game management recommendations.

Peregrine Falcon

Data Sources, Methods, Assumptions, Bounds of Analysis

Peregrine falcon ecology, biology, habitat use, status and conservation are described and summarized in US FWS (1999b, 1984) and Rogers and Sumner (2004). That information is incorporated by reference. Adult peregrine falcons are dark blue to nearly black above and light buffy to creamy below, with dark barring on the lower breast and abdomen and white on the upper breast and throat. They nest on cliff ledges and cavities primarily along major rivers, where their primary prey is waterfowl (Dubois and Becker 1987). Peregrine falcon occurrence data comes from District wildlife observation records and Forest historical data (NRIS Wildlife) and other agencies (MNHP).

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

Affected Environment/Existing Condition

As of 2010 there are five known peregrine falcon nest sites on the Kootenai NF (Sumner 2010). Within the Pilgrim planning subunit, there are two known nest sites, one on the cliffs above the Noxon Reservoir and another above Cabinet Gorge Reservoir. Foraging habitat is on the reservoir and outside of the PSU.

Environmental Consequences

No Action Alternative

No timber harvest, road construction, or prescribed burning is proposed in this alternative. There would be no direct or indirect effects to the peregrine falcon.

Action Alternatives 2, 3, 4, and 5

Direct and Indirect Effects

There are no direct or indirect effects to the peregrine falcon. One of the nests is within an Inventoried Roadless Area and no vegetation management activities will occur there. The second nest is on a cliff face above Noxon Reservoir. The nearest treatment unit is 0.75 miles from the back side of the cliff. There is no helicopter yarding associated with this project.

A helicopter may be used to ignite the prescribed burns. The nearest burn unit to the known peregrine nest is 2 miles away. Before the burns are ignited, the helicopter pilot and burn boss in the ship will be made aware of the location of the nest and a route that avoids the nest will be identified. The helicopter will not fly near the peregrine falcon nest and this avoidance should be adequate to avoid direct or indirect effects to nesting peregrines.

Creation of large openings would have no direct or indirect effects to peregrines. Their habitat is largely associated with the reservoirs and all created openings are well away from high quality habitat.

Cumulative Effects

Because there are no direct or indirect effects, implementation of any alternative would not result in cumulative impacts beyond those described above..

Regulatory Consistency

Forest Plan:

- All Alternatives meet Forest Plan goals (FP pg. II-1 #5 and #6) for peregrine falcon.

National Forest Management Act:

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

Statement of Findings

The proposed action will have no impact on peregrine falcons. This determination is based on: 1) no vegetation management activities with the vicinity of the nests. 2) no helicopter activity within 1 mile of the nests.

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 et al. (1977), Thomas and West (1991), and Pierson et al. (1999). Townsend's big-eared bats are medium sized bats with very long ears. Their wings and tail membranes are hairless. They are associated with coniferous forests and use caves as both day roosts and hibernacula (Hendricks et al. 1996). That information is incorporated by reference. Townsend big-eared bat occurrence data comes from recent District wildlife survey records and Forest historical data (NRIS Wildlife) and other agencies (MNHP).

All known caves, mines, or tunnels, lakes, and old growth were located within the Pilgrim 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 to individuals and their habitat is the Pilgrim PSU. The boundary for cumulative effects and determining trend or viability is the Kootenai National Forest.

Affected Environment/Existing Condition

District, Forest, and MNHP Townsend's big-eared bat observation and monitoring data indicate that no Townsend's big-eared bats have been documented in the Pilgrim PSU. A Kootenai National Forest status summary of the Townsend's big-eared bat was documented by Johnson (1999). Surveys of the Kootenai NF (1993-1995) by Hendricks et al. (1995, 1996) have located 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.

Big-eared bats are known to feed along forest edges, and can be associated with either dry or wet type coniferous forests. The species show a preference for old growth forest for roosting habitat (Thomas and West 1991). Young and mature forests are used for feeding (Ibid), with primary foraging areas near lakes (Grindal 1995). The species could occur in the Pilgrim PSU.

One abandoned mine is known to exist within the Pilgrim PSU. 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 Pilgrim PSU has 3% effective old growth designated, and 10% total old growth acres, designated. These stands and the remaining timbered habitat provide suitable roosting habitat in the form of large snags with cavities, as well as abundant foraging habitat across the forest landscape. The analysis for cavity habitat within the Pilgrim PSU determined that the cavity habitat potential on NFS lands was 84%. Please see the Snag Habitat section of this document for more detailed discussion.

Environmental Consequences

Direct and Indirect Effects

Under alternative 1, no action, no activities are proposed, and no Townsend's big-eared bats would be directly disturbed by any timber harvest or associated slashing and/or under burning. No direct effects to 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 under story 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 under story conifers may decrease the available habitat for prey species. It may also impede flight maneuvers needed for foraging. If a wild land fire was to occur, potential key roosting habitat (caves or mines) is not likely to be impacted. There would be no expected change in the existing condition with implementation of the no action alternative. On NFS lands, no direct effect to cavity habitat potential would occur, and CHP would remain at 84%.

Under alternatives 2, 3, 4, and 5 regeneration and improvement harvest activities have the potential to disturb or reduce day roosting habitat (trees and snags with cavities or thick bark). Improvement harvest that opened up suitable habitat, or edge habitat created may improve foraging opportunities for bats that use the area. Under burning could both reduce and create snag habitat. Disturbance or mortality of bats could occur if bats were using a snag that was cut down. Temporary displacement may occur during prescribed burning. There are no mechanical treatments in designated old growth. There are no activities planned in the vicinity of the known mine adit. Effects would be site-specific, affecting individuals rather than colonies, and are not likely to affect the viability of Townsend's big-eared bats.

Cumulative Effects

A description of past actions in the project area can be found in Chapter 3. Historic timber harvest typically focused on regeneration of mature and overmature stands. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. Past regeneration harvest areas likely provide little in the way of Townsend's big-eared bat roosting habitat. Past intermediate harvest provides different structure and function as it ages and could be used for roosting. Past timber harvest removed standing dead trees as well as live trees with cavities. This harvest reduced the

amount of available roosting habitat, but provided for habitat diversity in the short and long term. They have not markedly altered the ability of the project area to support Townsend's big-eared bat at or near historical levels.

Alternative 1, no action, when considered in association with the planned activities on both public and private land, is expected to have no cumulative effects that would impact the Townsend's big-eared bat.

Implementation of action alternatives and other reasonably foreseeable activities, would drop the estimated CHP from 84% to 81%. Cumulatively, when other activities including the harvest on both private and federal lands are considered 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 NFS lands CHP at 81% is expected to manage for a population level above the 40 percent level which is thought to be the minimum needed to maintain self-sustaining populations of snag-dependent wildlife (Thomas 1979:72).

Regulatory Consistency

Forest Plan:

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

National Forest Management Act:

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

Statement of Findings

The proposed action may impact individuals or habitat, but will not likely result in a trend toward federal listing or reduced viability for the population or species 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) cavity habitat in the form of snags, wildlife trees, and leave trees will continue to be provided across the Forest in managed (no less than 40% snag habitat levels) and unmanaged areas, and 3) a forested environment suitable for foraging would remain distributed across the Pilgrim 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) and Reichel and Flath (1995). That information is incorporated by reference. The western toad has dry warty skin that is olive, brown, or gray with a white stripe that runs down the middle of the back. They mate between May and July and lay eggs in clean standing water (pond, ditch, gravel pit, lake). Western toads wander miles from their breeding sites through coniferous forests and subalpine meadows (Werner et al. 2004). Western toad occurrence data comes from District wildlife observation records and Forest historical data (NRIS Wildlife) and other agencies (MNHP). The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the Pilgrim Planning sub-unit (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 dependent on habitats suitable for migration if the three required habitat types are isolated spatially (Maxell 2000:9). As summarized in Maxell (2000), over-wintering may take place in underground 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 found in seven of the eight planning units. The population size is unknown and direct measures of population trend on the Kootenai are not available (Ibid 1999). However, many surveys have been conducted on the Forest since 1993. Surveys conducted between 1993 and 1995 located only 63 adults. Of the 134 wetland sites surveyed during the 1993-94 field season, only 10 had evidence of successful breeding (Werner and Reichel 1994); five additional sites were confirmed during the 1995 field season (Werner and Reichel 1996). Surveys of approximately 200 potential sites were conducted in the Bull River drainage during the 1997-98 field season, but evidence as a breeding site (tadpoles and eggs) were found at only eight sites (Corn et 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).

Results of annual district surveys have not identified any breeding sites in the Pilgrim PSU. Potential breeding habitat is present in the Pilgrim PSU in the form of temporal ponds or road ditches. The remaining terrestrial habitat within the Pilgrim PSU is considered upland foraging habitat

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

1) known breeding/rearing habitat impacted
2) acres of upland foraging habitat harvested and burned
3) acres of upland foraging habitat (prescribed burned only)

Environmental Consequences

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

Direct and Indirect Effects

Table 3-23 summarizes the direct and indirect changes in habitat acres due to each alternative.

Table 3-23 Western Toad habitat impacted by Alternative

Comparison Criteria	Existing Condition	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Known breeding/rearing habitat impacted	0	0	0	0	0
Acres upland foraging habitat harvested *	0	1,411	1,516	1,290	633
Acres upland foraging habitat treated by prescribed burned only **	0	4,564	4,564	4,564	4,564

*Existing condition column acres harvested through 2010, most are considered to not/have enough cover for toad movement

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

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

Timber Harvest and Road Building

Maxell (2000) showed the effect of timber harvest on amphibians in Montana has been studied only once. A review of the available literature by Semlitsch (2000) in the United States indicates timber harvest and road construction activities can impact aquatic breeding habitat by altering the hydrological cycle of wetlands which can impair completion of larval metamorphosis through early pond drying (hydroperiod shortened), or through increased predation (if hydroperiod is lengthened). Aquatic habitat quality can also be reduced by sedimentation and increased water temperatures.

The effects of timber harvest on upland habitats are summarized in Semlitsch (2000) and include elimination of shade, increase surface temperatures, disruption and compaction of soil structure, reduction in soil moisture, removal of coarse woody debris, and sedimentation of aquatic habitats from logging roads. The fragmentation of natural habitats from timber harvesting and road building may impede dispersal and decreases the probability of wetland re-colonization (Semlitsch 2000). Timber harvest (especially clearcutting) and associated silvicultural practices appear detrimental to terrestrial amphibian populations (Bury et al. 2000). Impacts from intensive forest management (e.g., even-aged harvesting) practices extend beyond the boundaries of harvested stands (deMaynadier and Hunter 1998). Recommendations for buffer zones and terrestrial habitats for corridors of movement for amphibian species are discussed by several authors (Semlitsch 1998, Hannon et al. 2002). Western toads are considered to be more terrestrial generalists (deMaynadier and Hunter 1998), and tend to be more tolerant than salamanders of forest edges, tree harvests, and declining patch size (Renkin et al. 2004).

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

Alternative 3 has the greatest potential for impacting toads or their habitat with timber harvest followed by alternative 2. Alternatives 4 and 5 would treat the fewer acres. Please see Table WL-12 for acreage comparisons. Alternative 3 also proposes the most new road construction with approximately 6.3 miles (permanent and temporary), followed by alternative 2 with 4 miles. Alternatives 4 and 5 have no new road construction.

All action alternatives include the creation of harvest units greater than 40 acres. It is unlikely that western toads will use these openings until they begin to provide some cover in 5-10 years.

Fire

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

There are few reports of fire-caused injury to herpetofauna even though many of these animals, particularly amphibians, have limited mobility (Russell et al. 1999). The resultant microsite variation within burns may account for observations that fire has little effect on herpetofaunal species (Lyon et al. 2000). Maintaining preferred or required habitat features presumably

outweighs any fire-induced mortality that occurs (Russell et al 1999). Mortality may be associated with the direct and indirect effects of fire that alter prey availability or change shelter and microclimate (Lyon et al. 2000, Russell et al. 1999). Indirectly, although fire-induced disturbance may decrease herpetofauna within a particular patch, the prescribed burning should result in a mosaic of successional stages and habitat structure that should increase diversity on a broader scale (Russell et al. 1999).

Site preparation burning in timber harvest units is also proposed under all alternatives. Alternative 3 would treat the most acreage (646) followed by alternative 2 (634), alternative 5 (517), and then alternative 4 (423). *Slash and/or burning* activities would occur on 4,564 acres under all action alternatives. 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

Past Actions and their effects on current conditions

A description of past actions in the project area can be found in Chapter 3 (Table 3-1). Historic timber harvest typically focused on regeneration of mature and overmature stands. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. The effects of these types of treatments on western toads would have been similar to those discussed above for this project.

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

The action 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 (2-3 years). The temporary reduction in habitat is not likely to result in a declining population trend for this species. Cumulative effects of all past, ongoing, and reasonably foreseeable activities are the same as discussed under alternative 1

Forty Acre Openings

Each action alternative in the Pilgrim Creek Project includes the creation of openings greater than 40 acres in size. See the Vegetation section for a more complete description of the rationale and objectives of these openings. There are two ways these large openings would be created. Several of the units would be placed next to (within 600 ft.) existing harvest units that do not currently provide cover and the total acreage of both units is more than 40 acres. These openings would have some cover within the unit from the existing opening or the unharvested corridor between the units. The remaining large openings are the result of individual harvest units. All of the prescriptions for the units call for reserve trees to be left in the unit. These

reserve trees would provide some screening within the unit and break-up the large opening and long sight distances, to some extent.

The creation of large openings (greater than 40 acres) more closely resembles those created by natural processes. However, elk do not fully utilize large openings for feeding (MT Coop Elk Study 1985, Leege 1984, Thomas 1979), especially in northwestern Montana where large openings are scarce. They feed along the edges of the unit (generally within 600 feet) and do not venture into the middle of the opening. The result is that elk do not have access to all of the forage available in the area until shrubs and trees in the opening begin to provide some cover.

Another impact of large openings is the loss of security cover. Without trees to block the view of hunters, elk are left with topography to hide them from hunters. Several of these openings are along yearlong open roads that are popular with road hunters. An example of this is the opening that results from the combination of harvest units 3, 4, and 5 in Alternative 2 and the existing harvest units. Altogether they create an opening of 134 acres, with a seasonally restricted road going through it. All of the openings would be accessible to hunters on foot via closed or obliterated roads. It is estimated that in 15–30 years shrub and tree regeneration would be tall enough to provide security for an elk.

It is unlikely that fisher (Jones and Garton 1994) and western toad (Bury et al. 2000) would use the large openings. They would forage along the edge, but it is unlikely they would cross the large openings until there is enough regeneration to provide some cover (5 to 10 years post harvest). Gray wolf would experience a reduction in security due to the large openings, especially in those units adjacent to open roads. There should be enough cover in the openings to hide a wolf in 10 to 15 years.

The large openings should have no additional impacts on black-backed woodpecker, Coeur d'Alene salamander, peregrine falcon, or Townsend's big-eared bat in addition to those described.

Regulatory Consistency

Forest Plan:

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

National Forest Management Act:

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

Statement of Findings

The proposed action may impact individuals or habitat, but will not likely result in a trend toward federal listing or reduced viability for the population or species for the Western toad. This determination is based on: 1) removal and partial consumption of coarse woody material in upland sites due to harvest activities and/or fire, 2) the creation of larger than 40 acre openings, 3)the longer-term recruitment of coarse woody debris due to fire killed trees falling over time, 4) no impact or change to the current availability of breeding habitat, 5) retention of riparian movement corridors, 6) the low risk of direct mortality during burning and the limited direct mortality risk during timber harvest activities, and 7) Suitable habitat would remain in the Pilgrim PSU and distributed across the Kootenai National Forest.

Table 3-24. Sensitive Species Summary

Sensitive Species Summary
Black-backed woodpecker, common loon, flammulated owl, harlequin duck, northern bog lemming, northern leopard frog, and wolverine are not suspected to occur in the project area and are dropped from further analysis. There would be no impacts to these species or their habitat. The proposed action and alternatives 3, 4, and 5 will have no impact on Peregrine falcon or bald eagle. The proposed action and alternatives 3, 4, and 5 may impact individuals or habitat, but will not likely result in a trend toward federal listing or reduced viability for the population or species for the Coeur d'Alene salamander, fisher, gray wolf, Townsend's big-eared bat, and western toad.

THREATENED, ENDANGERED, AND PROPOSED SPECIES

REGULATORY FRAMEWORK

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

The National Forest Management Act (NFMA) (36 CFR 219.19) directs the Forest Service to manage habitat to maintain viable populations of existing native and desired non-native vertebrate species. 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 8/2/2011. The FWS concurred with potential listed species distribution maps and resulting consultation areas for the KNF in 2001 (USDI FWS: Wilson 2001). Species status in the influence area of the proposed project is shown in Table 3-25.

Table 3-25: Threatened, Endangered, and Proposed Wildlife Species: Project Area Status

SPECIES	ESA STATUS	STATUS IN ANALYSIS AREA*	COMMENTS**
Grizzly Bear	Threatened	Suspected to occur.	Outside of recovery zone but w/in identified BORZ polygon
Canada Lynx	Threatened	Not suspected to occur as residents, unlikely as transients. Suitable habitat exists.	No reports, sightings, or detections.

*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 = Analysis area is inside Recovery Zone or reoccurring use area, or FWS agreed to consultation area
2= Analysis area is within Bears Outside of Recovery Zone Polygon

Grizzly Bear

Data Sources, Methods, Assumptions, Bounds of Analysis

Grizzly bear population ecology, biology, habitat description and relationships identified by research are described in USFWS (1993), the annual progress reports for the Cabinet-Yaak grizzly bear research (Kasworm et al. 2000-2009), Kasworm and Servheen (1995), Kasworm and Their (1990-1994), Kasworm and Manley (1988), Kasworm and Brown (1984), and Kasworm 1984-1986. That information is incorporated by reference. Grizzly bear occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS Wildlife), and other agencies (USFWS, MFWP).

The grizzly bear is one of two subspecies of the brown bear (*Ursus arctos*) which occupy North America. Coloration varies from light brown to almost black. Grizzly bears are generally larger than black bears (*Ursus americanus*), ranging between 200 and 600 pounds (lbs), and can be

distinguished from them by longer, curved claws, humped shoulders, and a more concave face. Although relatively long-lived (20-25 years in the wild), the grizzly bear has a low reproductive rate due to the late age of first reproduction (4-7 years), small litter size (two cubs), long intervals between litters (three years), and limited cub survival (less than 50 percent).

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

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

In 2002, agency biologists recognized that grizzly bears were occurring and sometimes living in areas outside of established grizzly bear recovery zones and warranted some level of management consideration. Biologists from federal and state agencies and Native American Tribes with jurisdiction over grizzly bear or their habitat met and identified areas where one would reasonably expect to find grizzly bear use occurring during any/most years. The data used to identify these areas were female and cub monitoring data, nuisance bear activity, radio locations, and creditable observations from the past 5-10 years (from 2002). One of the areas identified was the Clark Fork Bears Outside of the Recovery Zone (BORZ) polygon, which included all federal land west of the Clark Fork River on the Cabinet Ranger District (Wittinger, unpubl. rept., October 9, 2002; Wittinger, unpubl. rept. May 13, 2003).

Each Forest was then asked to determine an estimate of bear numbers, analyze habitat conditions relative to linear open and total road densities for BORZ polygons within their jurisdiction. They also examined food attractant and storage problems in each polygon, and evaluated conflicts between grizzly bear and livestock grazing. In addition, the analysis had to display all steps to minimize “incidental take” based on existing management direction.

Since 2007 a Level 1 team of Idaho Panhandle, Lolo, and Kootenai National Forests, and USFWS personnel have met regularly to identify a process for determining recurring use areas for grizzly bears. The process included using 6th order HUCs (mid-sized basins, 20-30,000 acres in size) as the boundary around a valid set of bear observations. They also developed standards for the observations that would qualify for use in determining occupied BORZ polygons. These included multiple individuals, females with cubs, multiple years of use, and radio-locations (Grizzly Bear Access Amendment-Recurring Use Area Delineation, September 28, 2009 notes). At a subsequent meeting it was decided to define a time frame for valid grizzly observations of 15 years or less (Access Amendment Level 1 Meeting Agenda, 3/1/2010).

As a result of the standards for determining occupancy a large portion of the Clark Fork BORZ was no longer eligible for inclusion in the new polygon. The Trout Creek, White Pine, Beaver and Little Beaver Creek drainages were found to not qualify as occupied 6th order HUCs based on the new standards.

The analysis boundary for direct, indirect, and cumulative project impacts to individuals and their habitat is the Clark Fork grizzly bear outside the recovery zone reoccurring use polygon (BORZ polygon, Figure 3-5). This is the appropriate boundary for the analysis of effects because of the low number of bears potentially inhabiting the area and the size of the area (>100,000 acres). In establishing the BORZ polygons the USFWS acknowledged that grizzlies living in BORZ polygons live under different conditions than those in the Recovery Zone and it is inappropriate to combine the two because of differences in how road density is calculated and the size differences in the polygons (USDI 2011). There is also no evidence of a resident population of grizzlies south of the Clark Fork BORZ on the west side of the reservoirs. Bears that have been detected within the project area and larger BORZ are suspected to have originated within the recovery zone. At least one bear has been documented moving across the river back into the recovery zone after being radio collared and relocated within the BORZ in 2007. While habitat conditions within the BORZ are under the jurisdiction and control of the Forest Service, we have no authority on private and other lands in the matrix between the recovery zone and BORZ. It is not likely that activities associated with this project would have any discernible impacts on lands between the BORZ and the recovery zone and as such would not cumulatively impact habitat suitability in those intervening lands. The BORZ remains the appropriate scale at which to evaluate cumulative effects to bears from this project.

Within BORZ polygons there is no MS-1 or MS-2 habitat and habitat standards are different from those in the Recovery Zone. The standards in BORZ are:

- No permanent increase in total or open road density above baseline levels.
- Potential increases in miles of open or total roads must be compensated for with in-kind reductions concurrently or prior to such increases.
- A provision for temporary increases in linear miles for projects but also measures to minimize the impacts of such increases, such as seasonal restrictions of public use to the June 16 – August 31 period.
- Scheduling considerations in future timber sale planning to avoid concurrent disturbance in multiple watersheds.

By meeting these standards the Pilgrim Creek Project is consistent with the Forest Plan Amendments for Motorized Access Management with the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (USDI 2011). Additionally, a food storage order designed to reduce bear/human conflicts and corresponding mortality risk is in place on the Kootenai NF.

Habitat effectiveness and point source disturbance was calculated by buffering proposed timber harvest units and new and existing roads with a ¼ mile buffer on all sides. Human activity within proposed harvest units and along roads has the potential to disturb grizzly bears. These disturbances disrupt a grizzly bear's living patterns, such as the amount of time spent feeding or resting. Ultimately these repeated disruptions may reduce the health and fitness of a bear.

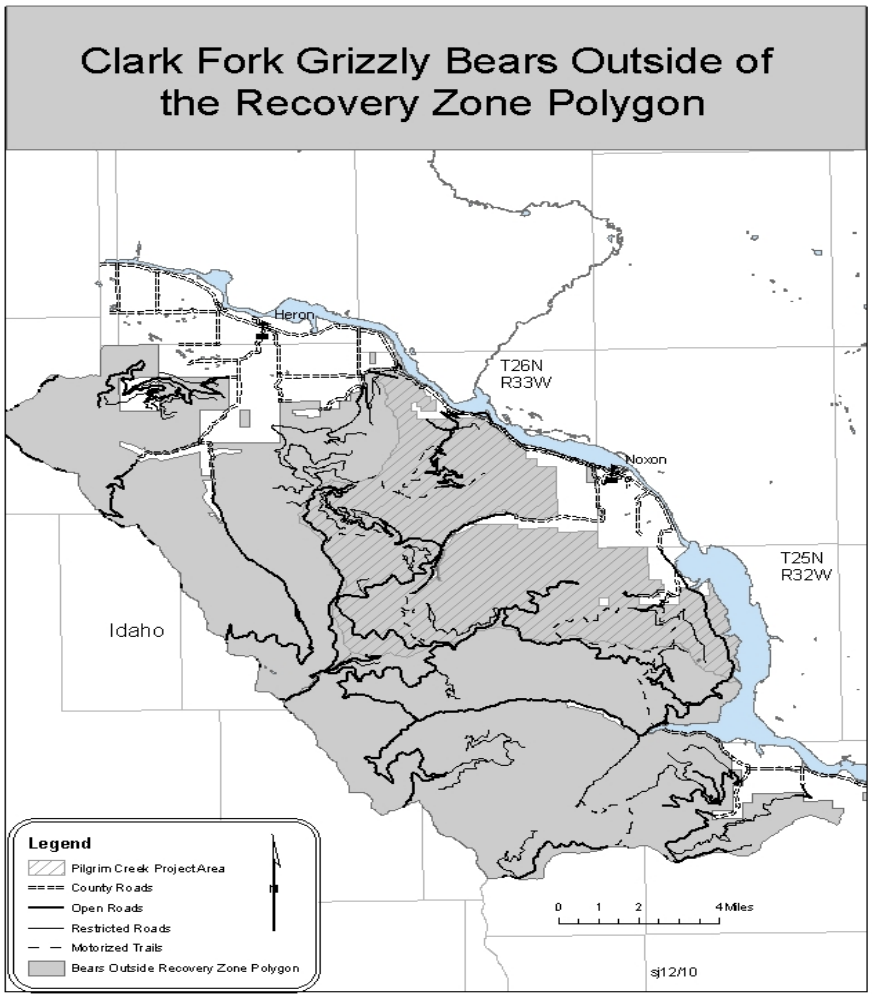


Figure 3-5 Clark Fork BORZ Polygon

Affected Environment/Existing Condition

Documented bear activity in the impacted BORZ polygon began in 2001 when a grizzly sow was found dead along the railroad tracks east of Heron, MT. The next spring (2002), three subadult grizzly bears were trapped by USFWS personnel near Heron. The bears were relocated to the Elk Creek and Marten Creek drainages. The female of this group was found dead in 2002. The two male bears have not been heard from since. In 2007, residents east of Noxon, MT reported a grizzly sow with two cubs in the area. The bears were trapped by USFWS personnel and relocated to upper Marten Creek. Within a few weeks the bears returned to Noxon and then crossed the reservoir and entered the Cabinet-Yaak Recovery Zone. During the summer of 2009, two female grizzly bears were captured in the Northern Continental Divide Recovery Zone and moved to the Cabinet-Yaak Recovery Zone as part of an ongoing population augmentation program. By early fall, the two bears were traveling together and had moved south of Noxon Reservoir. One of the bears was shot by a homeowner in their yard. The other sow died when it was hit by a train. There have been no grizzly bears killed on National Forest System lands. During 2008 and 2009, USFWS conducted a hair snagging survey in the Bitterroot Mountains that included the Clark Fork BORZ. That survey did not document the presence of any grizzly bears in the Clark Fork BORZ (Servheen and Shoemaker 2010). US Fish and Wildlife Service trappers were unable to capture a grizzly bear during two months of trapping during the summer of 2011. On June 3, 2011, the Kootenai National Forest enacted a Food Storage and Sanitation Special Order that requires users of the Kootenai National Forest to store all bear attractants (human and pet/livestock food, garbage, and animal parts) in a bear resistant manner.

The existing condition in the Clark Fork BORZ polygon includes 177 miles of open motorized routes and 251 miles of total motorized routes.

Livestock are not present in the Clark Fork BORZ polygon.

All Forest Service facilities within the Clark Fork BORZ polygon are pack in/pack out sites. The major recreation site in the area, Marten Creek Campground, has food storage lockers available for campers. The Forest has a mandatory Food Storage Order in place designed to reduce mortality risk to bears.

Environmental Consequences

Table 3-26 summarizes effects to incidental take parameters applicable outside the recovery zone.

Table 3-26. Changes to Grizzly Habitat Parameters by Alternative for the Clark Fork BORZ Polygon

Incidental Take Parameter	Alt. 1 (No Action) (Existing Condition)	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Open Motorized Routes[1]	176.9 mi.	176.9 mi.	176.9 mi.	176.9 mi.	176.9 mi.
Total Motorized Route[2]	251.1mi.	263.8 mi.	266.4 mi.	259.2 mi.	251.1 mi.
Livestock	None present	No Change	No Change	No Change	No Change
Food Attractants	None present	No Change	No Change	No Change	No Change

[1] includes open roads and motorized trails during project

[2] includes open roads, restricted roads, and motorized trails during project

Direct and Indirect Effects

The existing condition in the Clark Fork BORZ (No Action alternative) has resulted in reduced habitat effectiveness on 39,115 acres due to disturbance from existing point source disturbances, such as human use on currently open roads. This leaves 62,570 acres of undisturbed habitat, 14,000 acres of which is in Inventoried Roadless Areas.

Under alternatives 2 and 3 new roads will be constructed. Additionally, under alternatives 2, 3, 4 and 5 some existing roads that currently have gates or earth barriers in place will be used to access harvest units. All new and currently restricted roads used for the project will be closed with a gate for the life of the project. While the project is active only administrative use will occur on the roads (FS personnel and government contractors). There will be no public access on the new and currently restricted roads in the project area unless project activities are completed during an active bear year and public firewood gathering is feasible. At that point, the road may be opened to the public during the big game hunting season. Alternative 5 does not build any new road and will not use any restricted roads.

Upon completion of project-related activities all of the previously restricted and new roads used for the project will be closed with a permanent closure device (earth berm, rocks, reclamation) and closure order. There will be no public access on the new and currently restricted roads in the project area. Increases in linear miles of Total Road will be temporary. Upon completion of project-related activity, linear miles of open and total road will return to baseline condition and therefore the project is consistent with the Access Amendment.

Effects of Timber Harvest Activities (includes felling through loading)

The point source disturbances from timber harvest actions may temporarily displace grizzly bears under each of the action alternatives while the project is active. This potential displacement will not include the entire project area for the life of the project. Displacement from an area will likely occur when harvest activity is occurring in the units, resulting in a disturbance that moves around the project area. See Table 3-27 for display of the number of acres of potentially reduced habitat quality due to point source disturbance. Secure habitat is available within Inventoried Roadless Areas within the Pilgrim PSU and the Elk Creek drainage. The proposed timber harvest will enhance the production of grasses, forbs, and berries within the harvest units.

Table 3-27. Grizzly bear habitat impacted by point source disturbance.

Alternative	Acres Affected
2	2,590
3	2,664
4	2,169
5	1,176

Effects of Road Construction and Use (includes hauling and all other types of road use)

Grizzly bears may be displaced from habitat adjacent to roads during hauling on new or previously closed roads. This potential displacement will last for the life of the project. Post-project road management status will return to the baseline conditions. Previously restricted (gated roads) will remain gated and new roads constructed for the project will be made impassable to motorized vehicles. See Table 3-28 for the number of acres of potentially reduced habitat quality due to motorized activity on roads. Secure habitat is available within Inventoried Roadless Areas within the Pilgrim PSU and the adjacent Elk Creek drainage. Alternatives 4 and 5 use only existing roads, they do not build new permanent or temporary roads.

Table 3-28. Acres impacted by road construction and use.

Alternative	Acres Affected
2	1,881
3	2,101
4	1,281
5	822

The proposed timber harvest would enhance grizzly bear forage in the project area. Commercial thinning of units would open-up closed stands and allow more light to reach the forest floor. Acres that receive regeneration treatments will also be burned. Burning the remaining logging waste releases the nutrients tied up in that wood. Both of these treatments help grasses, forbs and berry producing shrubs to return to the site and grow vigorously.

The proposed project would not change the livestock situation in the BORZ polygon.

The food attractant situation would not change with implementation of the proposed action.

Cumulative Effects

A description of past actions in the project area can be found in Table 3-1. Historic timber harvest typically focused on regeneration of mature and overmature stands. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. The effects of these types of treatments on grizzly bears would have been similar to those discussed above for this project. Currently, past regeneration harvest areas provide foraging habitat (huckleberries). Past intermediate harvest areas provide forage and rest areas. Road building associated with the past harvest has reduced the amount of secure habitat in the area.

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

It is reasonable to assume that some corresponding increase in human use of National Forest System lands is likely to occur over time. This increase is likely to be gradual and tend to be focused on areas along or near roads open to motorized traffic. Bears may, over time, experience more frequent disruption of their daily activities if they are in proximity to roads. The relationship of this project to increased recreational use of the area centers on the potential for illegal shooting of grizzlies. It is reasonable to assume that loss of cover from this project coupled with increased recreational use may increase mortality risk. The rate of increase in recreation in the area has been modest thus far. By the time there is a noticeable increase in recreationists the harvest units treated under this project will have recovered and will likely provide security cover.
Based on the nature and magnitude of potential cumulative effects to bears independent of this project, there are no cumulative effects anticipated that would change the effects determination to grizzly bears from implementation of the proposed federal action.

Regulatory Consistency

The project is in compliance with ESA. This statement is based on: 1) Project is consistent with the Forest Plan Amendments for Motorized Access Management within the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (2011), 2) Informal Consultation with FWS completed.

Statement of Findings

The proposed action *is not likely to adversely affect* the grizzly bear. This determination is based on: 1) no permanent increase in mortality risk resulting from the temporary increase in total road density in the Clark Fork BORZ polygon, 2) temporary roads constructed for the project will be restricted to the public, while the project is active, 3) Post-project, roads may be temporarily left open to allow the public an opportunity to harvest firewood, 4)Suitable secure habitat exists within and adjacent to project area, 5) there is the potential for temporary displacement, 6) No change to livestock or food attractant situation.

CANADA LYNX

Data Sources, Methods, Assumptions, Bounds of Analysis

Lynx population ecology, biology, and habitat description and relationships are described in Ruggiero et al. (2000) and Ruediger et al. (2000). That information is incorporated by reference. In addition, the final lynx listing rule (Clark 2000) gives population and habitat status on a national scale. Lynx occurrence data comes from Forest historical records (NRIS Wildlife), and other agencies (MNHP, MFWP, USFWS).

The Northern Rockies Lynx Management Direction (NRLMD) objectives, standards, and guides (attachment 1) were used, when appropriate to the proposed project activities, during Alternative development.

The effects analysis follows the standards and guidelines established in the NRLMD (USDAFS 2007). *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 NRLMD).* Those considered but found "not applicable" are found in the project file. Lynx habitat, in impacted LAUs, was mapped using the timber stand database version of the Kootenai National Forest model with NRLMD definitions. Connectivity was evaluated by visually examining lynx habitat and past management activities to determine possible movement areas and potential areas where lynx travel may be hindered. Ridge lines and draws were considered high value movement areas.

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

The Canada lynx is a low density, wide-ranging forest carnivore with limited local distribution. The species is a year-round resident on the northern portion of the KNF. Canada lynx was listed on March 24, 2000 (65 Federal Register 16052), as a threatened species under the Endangered Species Act 1973 in 14 of the lower 48 states. The USFWS released their revised, final designation of critical habitat for Canada lynx on February 25, 2009. Based on the presence of a lynx population in the Purcell Mountains, habitat on the KNF north of U.S. Highway 2 was designated critical lynx habitat (USDI 2009).

Exact lynx population numbers are unknown for the Kootenai National Forest. Research has been conducted on the KNF to capture and radio collar lynx in the Purcell Mountains. From 2003 to 2005, 25 individual lynx were captured and collared (Squires et al. 2003).

Lynx occur in mesic boreal forests that have cold, snowy winters and provide a prey base of snowshoe hares. They usually use mature and late-successional forests where there are accumulations of down logs for denning (Koehler and Aubry 1994, and Ruggiero et al. 2000). Other key habitat features appear to be remote and secure habitats, and habitat connectivity (Claar et al. 2003, Koehler and Aubry 1994, Wisdom et al. 2000).

Snowshoe hare is an important food source, comprising 35 to 97 percent of the diet throughout the range of lynx. In periods of low snowshoe hare densities, starvation can account for up to two-thirds of all natural lynx mortality. Other prey species include red squirrel, northern flying

squirrel, grouse, marten, voles and occasionally small birds. The primary limiting factor for this species appears to be suitable winter foraging habitat. Primary winter foraging habitat is found in multi-story mature or late-successional forests that hold good populations of snowshoe hare. Recent research in northwest Montana demonstrates that mature, multi-storied forests provide important winter snowshoe hare habitat and are more important than younger stands (USDA 2007). Red squirrels may be an important prey species, especially when hare populations are low. Ongoing research on the KNF is identifying which types of stands support snowshoe hares in a high enough density to support lynx populations.

Summer foraging habitat (summer hare habitat) consists of early successional stages of dense, young (approximately 15 to 30-year old) forests. This short time frame (about 15 years) does not last long on the landscape before growing into a structure that does not provide good foraging for lynx. A regular influx of early successional vegetation is important to maintain a level of summer foraging habitat through time. This can be created by any disturbance process, such as fire, windthrow, or vegetation management activities. Generally, maintaining no more than 30 percent of a lynx home range in early succession habitat is considered good for lynx management.

Affected Environment/Existing Condition

District files contain no occurrences of lynx within the Pilgrim planning sub-unit (PSU). Surveys conducted for lynx include 595 camera nights of remote camera carnivore survey and winter track surveys. No lynx have been detected in or near the Pilgrim Creek drainage in at least the last 20 years. The project area was not designated critical habitat because it is not occupied by Canada lynx. It contains habitat which is considered suitable for lynx despite the lack of recent evidence of use. The lack of use cannot be attributed to any specific cause with any degree of certainty, but anecdotal information (Squires, pers. comm.) suggests that there is a strong negative correlation between red cedar climax communities and lynx occurrence, and that lynx are notably absent in Pacific maritime climates. There has been only one verified detection of lynx on the Cabinet Ranger District since at least 1997, that being a single instance of tracks in the Snake Pass area in 1998, approximately eight miles north of the project area across the Clark Fork River. Lynx are not suspected to occur in the project area based on a lack of reports of occurrence and Pacific maritime influences on snow conditions and climate.

The KNF has delineated 47 LAUs which approximate a lynx home range size. At the end of 2008, all LAUs except three met the LCAS primary habitat standards ($\geq$10% denning habitat; $\leq$30% unsuitable habitat; $\leq$15% changed to unsuitable condition in last 10 years) (USDA Forest Service 2010).

Lynx habitat in the impacted LAU was mapped in compliance with LCAS project planning standard #1 (see Figure 3-6). Table 3-29 displays the current lynx habitat conditions in the PSU.

Table 3-29. Existing Lynx Habitat Components on NFS Lands in LAU 14706, Elk-Pilgrim Creek.

Lynx Habitat Components	Elk/Pilgrim LAU
Early Stand Initiation Acres (currently unsuitable)	159
Stand Initiation Acres (currently suitable)	1,230
Stem Exclusion Acres (currently unsuitable)	2,805
Multi-story Forage Acres (currently suitable)	14,834
Non-Habitat Acres (matrix)	9,006
Non-Habitat acres (Low elevation)	2,489
No Data Acres	370

Using the Table 3-29 habitat information, Table 3-30 provides the existing condition of lynx habitat for components identified by the NRLMD and addressed by the standard for the LAUs potentially affected by the project. Standards associated with these components are noted.

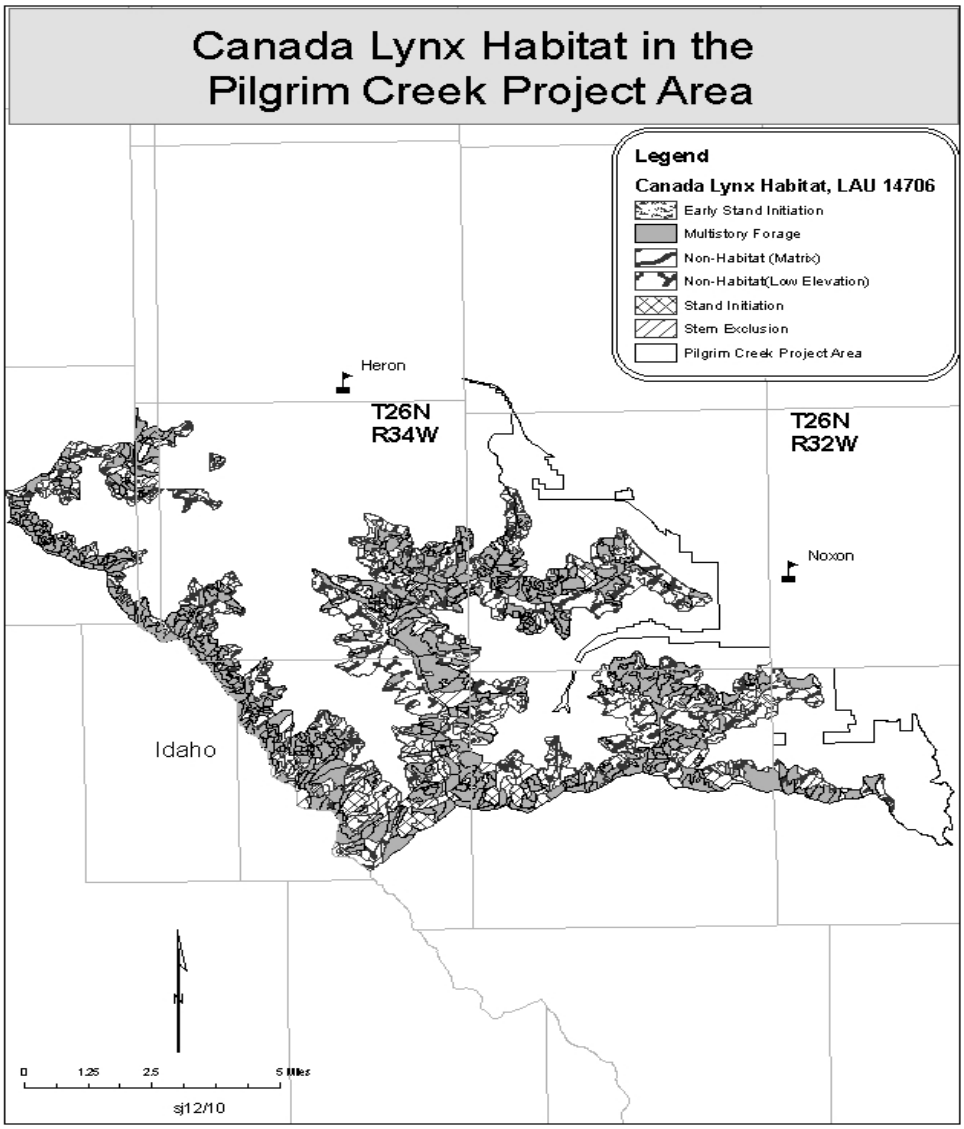


Figure 3-6. Lynx habitat in the Pilgrim Project Area

Table 3-30. Existing Lynx Habitat Components on NFS Lands as they apply to NRLMD.

Lynx Habitat Components	14706 Elk/Pilgrim LAU
Total LAU acres	30,893
Total Lynx Habitat Acres	19,028
Stand Initiation (winter forage) [1] Acres (% of lynx habitat)	1,230 (6%)
Early Stand Initiation (summer forage only) [2] Acres (% of lynx habitat) VEG S1	159 (0.8%)
Multistory (forage)[3] Acres (% of lynx habitat) VEG S6	14,834 (78%)
Other (non-forage)[4] Acres (% of lynx habitat)	2,805 (15%)
Regeneration Harvest in the Last 10 Years (% of lynx habitat) VEG S2	0 (0%)
Number of adjacent LAU that exceed 30% lynx habitat in unsuitable condition VEG S1 Monitoring	0

[1] Stand initiation structural stage that currently provides winter snowshoe hare habitat

[2] Stand initiation structural stage where trees have not grown tall enough to protrude above the snow in winter.

[3] Multiple age classes present in stand, understory may or may not provide foraging habitat based upon height of understory.

[4] Stands currently not providing snowshoe hare habitat, due to closed canopy.

There are no identified linkage corridors (USDA Forest Service 2004: Figure 1-1; KNF Lynx Taskforce 1997: 6) in the Elk/Pilgrim LAU or adjacent LAUs. The Pilgrim PSU is not Canada lynx critical habitat.

Environmental Consequences

Direct and Indirect Effects- All Alternatives

Conservation Measures Applicable to All Programs and Activities

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

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

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

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

This standard is met because connectivity is maintained. Habitat connectivity within the impacted LAUs is generally good. Connectivity with other LAUs is good to the north, south, and west, but poor to the east due to private land, railroad, and Cabinet Gorge Reservoir.

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

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

No highway or forest highway construction or reconstruction activities are planned with this project, therefore this guideline does not apply.

Standard LAU S1: Changes in LAU boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.

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

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

Standard VEG S1: If more than 30 percent of the lynx habitat in an LAU 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. Exception: Fuel treatment projects in the WUI, as defined by HFRA, subject to the following limitation – fuel treatment projects in the WUI that do not meet Standards VEG S1, S2, S5 and S6 shall occur on no more that 6 percent (cumulatively) of lynx habitat on each National Forest. In addition, fuel treatment projects may not result in more than three adjacent LAUs exceeding this standard. For fuel treatment projects in the WUI, see guideline VEG G10.

See Table 3-31 for how the impacted LAU meet or exceed the 30% standard.

Table 3-31. Percent Unsuitable Habitat within impacted LAUs

LAU	Existing Condition	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
14706	159 acres (1%)	159 (1%)	532 (3%)	719 (4%)	564 (3%)	306 (1%)

The proposed activities would increase the existing level of unsuitable habitat in the Elk/Pilgrim LAU. In LAU 14706, 373 acres would be converted to unsuitable by the proposed action. Under alternative 3, 560 acres would be converted to unsuitable and 405 acres would be converted under alternative 4 (Table 3-31). Under alternative 3, the total amount of unsuitable habitat in the LAU, may reach 4%. Alternatives 2 and 4, it may reach 3% and under alternative 5 it may reach 1%. This meets the standard.

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

This standard is met in the affected LAU. Table 3- 32 provides a comparison, by Alternative, of how the impacted LAU(s) comply with this standard. There has been no regeneration harvest in the project area for the past 15 years. The proposed project will regenerate between 1 and 3% of the habitat.

Table 3-32. Regeneration Harvest in Lynx Habitat in the last 10 years in Impacted LAUs

LAU	Existing Condition Acres (%)	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
14706	0 (0%)	0 (0%)	373 (2%)	560 (3%)	405 (2%)	147 (1%)

Standard VEG S5: Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only:

1. Within 200 feet of administrative sites, dwellings, or outbuilding; or
2. For research studies or genetic tree tests evaluating genetically improved reforestation stock; or
3. Based on new information that is peer reviewed and accepted by the regional level of the Forest Service and state level FWS, where a written determination states:
   a. that a project is not likely to adversely affect lynx; or
   b. that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long term benefits to lynx and its habitat; or
4. For conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline; or
5. For daylight thinning of planted rust-resistant white pine where 80% of the winter snowshoe hare habitat is retained; or
6. To restore whitebark pine.

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

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

Standard VEG S6: Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only:

1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or
2. For research studies or genetic tests evaluating genetically improved reforestation stock; or
3. For incidental removal during salvage harvest (e.g. removal due to location of skid trails).

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

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

uneven aged management systems could be used to create openings where there is little understory so that new forage can grow).

Timber harvest is proposed in stands identified as multi-story forage lynx habitat by the Kootenai National Forest Lynx Habitat model. Horizontal cover surveys (Bertarm and Claar 2008) conducted in the stands demonstrates that one stand contained enough cover to serve as snowshoe hare habitat. That unit was dropped from alternatives 3, 4, and 5. The remainder of the stands were also field verified and do not meet the definition for suitable snowshoe hare habitat. Timber harvest and post-harvest burning will move these stands back to an early stand initiation stage and result in a dense understory of seedlings and shrubs in approximately 10 years that will provide suitable snowshoe hare habitat. The snowshoe hare habitat created by these vegetation treatments will be located within the matrix of potential Canada lynx denning habitat

Table 3-33. Multi-Story Forage snowshoe hare habitat impact summary

ALT #	LAU #	Acres of Multi-Story Forage	Acres of Vegetation Management	Exception(s) applied	Is standard VEG S1 being met (Y/N)
2	14706	14,834	308	No	Yes
3	14706	14,834	493	No	Yes
4	14706	14,834	341	No	Yes
5	14706	14,834	119	No	Yes

Objectives VEG 01, 02, 03, 04:

The proposed project meets VEG O1, VEG 02, and VEG O4 by maintaining habitat components for lynx in stands where they currently exist. The stands proposed for treatment under this project currently do not have the horizontal cover necessary to support populations of snowshoe hare. The treatments proposed will promote the development of a vigorous understory, more suitable for hares. VEG 03 does not apply to this project.

Guidelines VEG G1, G4, G5, G10 and G11

Guideline VEG G1 is met by the Pilgrim Creek Project because treatment will occur in stands that are currently in the stem exclusion phase. They have a closed canopy and generally a depauperate understory. A result of the treatment will be the development of an understory more suitable for snowshoe hare.

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

Denning habitat does not appear to be lacking in LAU 14706, VEG G11 is met. Much of the LAU (14,000 acres) is in one of two Inventoried Roadless Areas (Lone Cliff Smeads and Huckleberry Mountain). Inventoried Roadless Areas are largely unmanaged, therefore large woody debris is common. Outside of IRAs, root rot is common in the forest which results in a continuous supply of downed woody debris.

Conservation Measures to Address Mortality Risk Factors

As described in the LCAS (pp. 7-12 and 13), there are 5 measures used to address mortality risk factors. They are: trapping, predator control, shooting, competition and predation as influenced by human activities, and highways. Predator control is not within the authority of the Forest Service and therefore is not applicable to Forest Service projects.

Trapping (legal and non-target) and Shooting: Federal agencies should work to reduce incidental take of lynx related to trapping and shooting. The Forest service role in these issues is access. New road construction would occur under two of the alternatives. Alternative 2 includes 1.8 miles of new permanent roads and alternative 3 includes 4.4 miles. Gates will be installed when the roads are built and these roads will only be used by Forest Service Personnel or contractors. Upon completion of post-harvest activities the roads will be left in place, but made impassable to motorized vehicles. Roads may be open to the public for short periods to allow firewood gathering, but would not be open during the trapping season. Alternatives 4 and 5 do not include any road construction. The risk of mortality from incidental trapping would not increase as a result of the Pilgrim Creek project. There would be no other change in road management associated with allowable snowmobile use, and increased use would not be expected. These conservation measures are met.

Competition and Predation as Influenced by Human Activities: “On federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU. This is intended to apply to dispersed recreation, rather than existing ski areas.” This standard is met. Currently, there is one groomed snowmobile route in the project area that has been in place since before Canada lynx were listed and was consulted on as an ongoing activity at that time. The proposed activities would not cause any change or increase in groomed or designated over-the-snow routes and snowmobile play areas. Although winter logging could occur, no increase in groomed or designated over-the-snow routes and snowmobile play areas would result. Snowmobiles can legally use the project area under current management and there will likely be some use of the new harvest units until the trees grow above the snow-level.

Highways: “Within lynx habitat identify key linkage areas and potential highway crossing areas.

Not Applicable. No highways are located within impacted LAUs or between them or any adjacent LAU.

Conservation Measures to address Movement and Dispersal

The programmatic planning objectives, standards, and guidelines to provide landscape connectivity are being incorporated into the Northern Region Lynx Amendment to the Forests Plans.

Highways - Project planning standard #1: Not Applicable. No highways are located within impacted LAUs or between them or any adjacent LAU.

Land Ownership – Project planning standard #1: "...protect/ enhance key linkage areas." Key linkage areas do not exist in the Pilgrim PSU or between affected LAUs and adjacent LAUs (see *Conservation Measures Applicable to All Programs and Activities* - Project planning standard #3: "Maintain habitat connectivity within and between LAUs."). Alternatives were designed to assure protection or enhancement of key linkage areas (see Alternative descriptions).

The planned activities comply with these conservation measures. Landscape connectivity will be maintained as described under Conservation Measures Applicable to All Programs and Activities, Project Planning Standard #3. No highways, land ownership adjustments, or ski areas/resorts are involved. Creation of larger openings, i.e. greater than 40 acres, would result in creation of areas that would not likely be used for lynx foraging until regenerated stands begin to provide cover, approximately 15 years post-harvest.

Cumulative Effects

The Affected Environment section describes in detail, past and present factors affecting the current habitat conditions in the Elk-Pilgrim Creek LAU (14706). As required in 36 CFR 220.4(f) these factors considered and described all relevant past actions that may have affected lynx habitat and they form the baseline for the existing condition. This cumulative effects section describes other reasonably foreseeable contributions potentially impacting lynx habitat (in terms of the standards and guidelines of the NRLMD)

.

Past, ongoing, and foreseeable timber harvest and post-harvest activities were included in the effects analysis for lynx. A description of past actions in the project area can be found in Chapter 3. Historic timber harvest typically focused on regeneration of mature and overmature stands that likely provided suitable Canada lynx habitat. Approximately 1,769 acres of regeneration harvest has occurred in the project area. Additionally, another 1,856 acres of intermediate harvest occurred. The effects of these types of treatments on lynx would have been similar to those discussed above for this project. Past regeneration harvest areas likely provide stand initiation summer foraging habitat and may provide winter foraging habitat. Past intermediate harvest provides different structure and functions as it ages and likely serves as non-forage lynx habitat. Past activities have reduced the amount of available foraging habitat but provided for habitat diversity in the short and long term.

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

The action alternatives, in combination with the existing condition and reasonably foreseeable actions (see list provided earlier) would not result in cumulative changes in or loss of lynx habitat. The affected LAU would continue to meet LCAS standards and guidelines. Since all LCAS standards would be met with both the proposed alternatives and with ongoing and foreseeable actions, no adverse cumulative effects would be anticipated.

Regulatory Consistency

- The project complies with Forest Plan direction on T&E species that applies to the Lynx (FP II-1 #7, II-22).
- The project is consistent with the Endangered Species Act as evidenced through consultation with the FWS and receipt of concurrence.

Statement of Findings

The proposed action will have no effect on the Canada lynx. This determination is based on: 1) all standards, guidelines, and objectives designed to maintain lynx habitat are met, 2)vegetation management in stands that currently do not provide snowshoe hare habitat will enhance conditions for lynx, 3) there will be no increase in access, 4) the project area is not located in Canada lynx critical habitat; and 5) the lack of verified sightings anywhere on the District in the last 15 years makes is unlikely that lynx would be present or affected by project activities.

MIGRATORY BIRDS

Executive Order #13186 (January 10, 2001): “Responsibilities of Federal Agencies to Protect Migratory Birds” was issued by President Bill Clinton in furtherance of the purposes of the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Acts, the Fish and Wildlife Coordination Act, the Endangered Species Act, and the National Environmental Policy Act. This order requires including effects of federal actions on migratory birds as part of the environmental analysis process.

A Memorandum of Understanding between the USFS and USFWS was signed in late 2008 (USDA and USFWS 2008) (FS Agreement #08-MU-1113-2400-264). The MOU outlines the responsibilities for both parties regarding migratory birds, including the USFS’s responsibilities regarding consideration of migratory birds in NEPA projects. The MOU was used to help guide the development of this effects analysis.

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

Affected Environment

Neotropical migratory birds are those bird species that migrate to more northerly latitudes to breed on the Kootenai National Forest each summer. Come fall, these species migrate south to spend the winter months. Of the approximately 205 bird species known to occur on the Forest

as breeders, migrants, winter visitors, or transients, about 70 species could be classified as neotropical migratory land birds (Al Bratkovich, Libby District Wildlife Biologist and Forest Land bird Monitoring Program Coordinator, pers. comm. with Steve Johnsen 1999).

The USDA Forest Service is a partner with other government agencies, and private organizations in several bird conservation efforts, including the North American Bird Conservation Initiative (NABCI) and Partners in Flight (PIF). In 1998, NABCI introduced Bird Conservation Regions (BCR), a method to identify large areas that contained similar bird habitat. The Kootenai National Forest is in BCR 10, Northern Rockies. Within BCR 10, bird habitat is delineated into grassland, shrubland, forest, riparian, wetlands, and unique habitat. Each of these general catagories is further subdivided into more specific habitat associations, such as cedar-hemlock, dry forest, and aspen. NABCI states that the USFS administers 42% of western forests and that 34% of the birds that use USFS land are found in western forest (2011 NABCI).

The Pilgrim Creek PSU lies within the Forest Habitat component. Montana PIF priority species for that type of habitat are found in Table 3-34.

Table 3-34. Partners in Flight priority habitats/species for BCR10 (PIF 2000a)

Partners in Flight Priority Habitats and Species			
Habitat	**Species**	**Priority Level**	**Is the Forest w/in the range of species?***
Forest			
Dry Forest	Flammulated owl	I	Y
	Lewis's woodpecker	II	Y
	Blue grouse	III	Y
	Chipping sparrow	III	Y
	Cassin's finch	III	Y
	Red crossbill	III	Y
Cedar Hemlock	Brown creeper	I	Y
	Vaux's swift	II	Y
	Winter wren	II	Y
	Chestnut-backed chickadee	III	Y
	Golden-crowned kinglet	III	Y
	Varied thrush	III	Y
Burned Forest	Black-backed woodpecker	I	Y
	Olive-sided flycatcher	I	Y
	Three-toed woodpecker	II	Y
	Townsend's solitaire	III	Y
Moist Douglas-fir / Grand fir	Northern goshawk	II	Y
	Williamson's sapsucker	II	Y
	Sharp-shinned hawk	III	Y
	Pileated woodpecker	II	Y
	Plumbeous/Cassin's	III	N/Y

	vireos		
	Townsend's warbler	III	Y
Whitebark pine	Clark's nutcracker	III	Y
	Red-naped sapsucker	II	Y
Wet Subalpine fir (spruce/fir)	Great gray owl	III	Y
	Boreal owl	III	Y

Several of these species are analyzed elsewhere in the document: flammulated owl, black-backed woodpecker, and pileated woodpecker.

Most of the habitats found on the Forest host one or more species of migratory birds. Generally speaking the birds arrive in the spring to set up territories for breeding purposes. Young are raised and fledged by mid-summer. Most species leave the Forest by late summer.

The following table displays the dominant vegetation types in the project area. There is some overlap in categories, and therefore some double-counting. For example, some acres counted as "riparian" would also be counted under the other forested types. Additionally, specific tree species may be found in more than one category, although for the purpose of display they were placed in only one category. Tree species may also be found in several other forest types. For example, aspen is displayed as a separate category, although aspen can be found in smaller quantities scattered throughout the other forested types.

Table 3-35. Dominant vegetation type for the project area approximating PIF priority habitats.

Dominant Veg Type	Estimated % of analysis area	Estimated Acres of the analysis area
Dry forest (ponderosa pine / Douglas-fir)	22	6,604
Douglas-fir/grand fir	22	6,655
Cedar / western hemlock	43	12,901
Subalpine fir (spruce/fir)	5	1,489
Misc. forest (alpine larch, mountain hemlock, western larch, white pine, intolerant mix)	5	1,430
Riparian, Aspen, Cottonwood	3	1,098
Waterbodies (lakes, ponds, reservoirs, marsh, swamp, river)	<1	57
Burned forest*	0	0
Non veg	<1	231

*Recently burned, unharvested acres based on 2003-2009 fires and 2003-2010 harvest. For species such as the black-backed woodpecker, recently burned forests are the most suitable habitat.

Percentages and acreages do not tally to 100% due to rounding and overlap between some of the categories leading to double-counting

The habitat requirements of the species listed above, as well as range information, can be found online at NatureServe Explorer's database: http://www.natureserve.org/explorer/index.htm. Population estimates can be found on the Partners in Flight online database: http://rmbo.org/pif_db/laped/.

Environmental Consequences

Responses of migrant birds to timber harvest and burning (prescribed or wildfire) depends upon their individual habitat preferences and needs. Regeneration harvest removes forest cover used by some species (e.g. brown creeper, chestnut-backed chickadee, varied thrush) and at the same time creates grass, forbs, and shrub habitat used by other bird species (e.g. sharp-shinned hawk, Hammond's flycatcher, chipping sparrow). This activity also produces "edge" habitat that still other bird species use (e.g great gray owl, olive-sided flycatcher, Townsend's solitare). Edge habitat often is similar to forest stands created with partial cutting (e.g. commercial thinning). Species using edge are often found in partial cut stands, so this management practice may provide additional habitat for these species (Hutto and Young 1999).

Effects common to all alternatives

Management indicator species have been designated for the Kootenai National Forest (See the discussion of MIS above). These MIS species represent the habitat needs for migratory birds. As habitat for MIS species is being maintained, it is assumed that sufficient habitat for neotropical migratory land birds is also being maintained.

Alternative 1 (No Action)

The No Action alternative maintains the existing condition in the PSU. Conifer encroachment will continue on south and west aspects and forest stands on those aspects will continue to become more crowded. Understory seedlings and saplings will continue to grow into the canopy and put the overstory at risk, when a fire begins. Insect and disease issues will remain unaddressed and fuel levels in the PSU will increase. Bird populations within the PSU will continue to respond to these changes as they have in the past, subtle changes will occur as birds return to their summer habitat and find that it no longer is suitable for them. The result will be a redistribution of birds throughout the PSU.

Action Alternatives (2, 3, 4, and 5)

Each of the action alternatives includes some level of vegetation management (thinning, shelterwood harvest, burning). These activities may change the suitability of the stand for the birds currently using the stand. For the lighter treatments, the change may not make the stand unsuitable for those species with broader habitat requirements. Those species with narrow habitat requirement or in the stands where a more drastic change in the vegetation is made, birds may not find the habitat components they require. However, there are bird species that use open forest or burned forest stands and they will find suitable habitat in the treated stands. The result will be a redistribution of birds throughout the PSU.

Cumulative Effects

The area analyzed for cumulative effects includes the Pilgrim Creek Planning Subunit on the KNF as well as the surrounding other ownerships. The time period examined included the

entire life of project activities, as well as into the past to cover such activities as previous fire suppression and timber harvest.

The effects of past firewood removal can be seen in the loss of snags along the open roads in the project area. Snag losses would be expected to continue into the future under the current management strategies. Roaded access would continue to allow the removal of snags and down wood. Snags created by underburning in the treatment stands would also be subject to loss from firewood gathering, especially in those areas proximate to open roads.

As discussed previously, past timber harvest has largely been accomplished using even-aged management systems, such as shelterwoods and clearcuts. This has reduced the amount of large trees (highest levels of the canopy) and has been focused on stands containing mature, or old growth characteristics. These activities have removed or altered cover and habitat that could have been used for nesting by various neotropical migrant species.

Timber harvest, fire suppression, fuels reduction, and other activities would likely continue on adjacent ownerships as well. These activities would have similar effects as those discussed above on NFS lands.

Regulatory Framework and Consistency

There are no specific goals or standards for migratory land birds in the Kootenai Forest plan. It does contain the goal to: “Maintain diverse age classes of vegetation for viable populations of all existing native, vertebrate, wildlife species (FP, Vol. 1, II-1, goal #7). All alternatives are consistent with the Kootenai Forest plan, as a wide range of successional habitats would be available (See Vegetation and MIS sections). The alternatives are in compliance with the “Executive Order titled “Responsibilities of Federal Agencies to Protect Migratory Birds”. In addition, as habitat for MIS species is being maintained in the Pilgrim PSU, and across the Kootenai National Forest, their habitat contributes to the maintenance of habitat and populations of neotropical migratory bird species.

FIRE AND FUELS

Introduction

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

Forest Fuels

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

Regulatory Framework

The two guiding documents used to establish direction and provide the framework for this analysis are the Forest Plan and the Forest Service Manual. These documents provide direction for implementing a fire management program. Fire handbooks, guides, research, and technical papers also provide insight.

Forest Plan

The Kootenai National Forest Plan (1987) objective for fire management program is to seek to minimize the number of acres lost to damaging wildfire. Specifically, the program's aim is to minimize cost plus net value change while providing for the safety of the public and personnel engaged in fire protection activities. The following are the key goals currently guiding the Kootenai NF Fire Management Plan:

- Use prescribed fire to simulate natural ecological processes, prevent excessive natural and activity fuel buildups, create habitat diversity for wildlife, reduce suppression costs, and maintain ecosystems.
- Protest Forest users, property, and resources from wildfire.

Bounds of Analysis

The fire and fuels analysis coincides with the project area boundary to utilize topographic features. The Pilgrim Creek analysis area boundary encompasses 36,602 acres within the Pilgrim Creek Drainage. Direct, indirect, and cumulative effects with regards to fire and fuels were analyzed for this area. This is an appropriate analysis area for Fire/Fuels due to the objective of reducing crown fire potential. In addition to modeling crown fire potential within the stand being analyzed, it also displays that if a crown fire enters the analysis area from a different stand or drainage it would transition to a surface fire.

Temporal

Time period covered by the effects analysis includes:

- Large fires from 1889 to present.
- All recordable fires from 1940'S to present.
- Fuels reduction associated with past and present timber harvest activities.
- 1989, 1995 and 2010 stand exam data.
- Analysis methods used analyze current and future fuels conditions by alternative. This time period covers present to forty years into the future to display effects and future treatment opportunities.

Analysis Methods

Data

Types of data used in the effects analysis includes:

- 1989, 1992 and 2010 stand exam data within the project area. 1989 and 1992 stand exam data was grown out to present conditions using the Forest Vegetation Simulator (FVS) model described below. The data collected was appropriate for analyzing the fire behavior measurement indicators for existing conditions and post treatment effects related the purpose and need of the project.
- Walk through exams were conducted included fuel model identification, tree composition, crown spacing, and canopy base heights.

Methods and Models

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

General Limitations of Fire Behavior Models

<u>Model Applicability/Limitations</u>

- The model assumes continuous, uniform, and homogeneous fuel beds.

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

Accuracy of Data

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

Monitoring

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

Measurement Indicators:

1. Fire Behavior Indicators were used to evaluate fire hazard and the associated changes in fire behavior by alternative.
    - **Flame Length (FT) –** used to estimate surface fire intensity and the trends of surface and total flame lengths over time as a measure of treatment success.
    - **Crown Base Height (CBH)** – the lowest height above the ground in feet at which there is a sufficient amount of canopy fuel to propagate fire vertically into the crowns. The lower the CBH, the greater possibility of crown fire initiation.
    - **Crowning Index (CI)** – the wind speed, 20 feet above the canopy at which crowning is possible (Duveneck and Patterson III 2007). The crowning index is the point at which active crowning – a solid wall of flame extending from the fuel bed surface through the top of the canopy (Scott and Reinhardt 2001) – is possible, not necessarily the point at which it can be initiated. Passive crown fire usually happens first, where individual or small groups of trees torch out. The 97th percentile critical wind speed for analysis is 22 mph.
    - **Crown Bulk Density (CBD)** – the mass of available fuel per unit of canopy volume (kg/m^3). It is a bulk property of a stand, not an individual tree. CBD is an

important crown characteristic needed to predict crown fire spread. Values above 0.08 kg/m^3 have probability to sustain a crown fire.

2. Acres treated in Fire Regime Group I (areas that have missed at least two fire cycles).

Affected Environment

Historical Condition

An analysis was conducted to demonstrate the scope of the major fire event that shaped the Pilgrim Creek landscape during the past 100 + years. The analysis included a combination of existing stand data information and aerial photo interpretation. The entire area was burned in the 1889 fire. The fire of 1910, also known as the Big Blow-up, burned 98 percent of the Pilgrim Creek Drainage. By the 1950's, fire suppression had become more effective which, in part, accounts for a decreased occurrence of stand initiating fires since that time. Based on catalogued fire records starting in the 1940's there were eighty two fires that occurred in the Pilgrim Creek project area. Forty four were lightning caused and the remaining, thirty eight, were human caused.

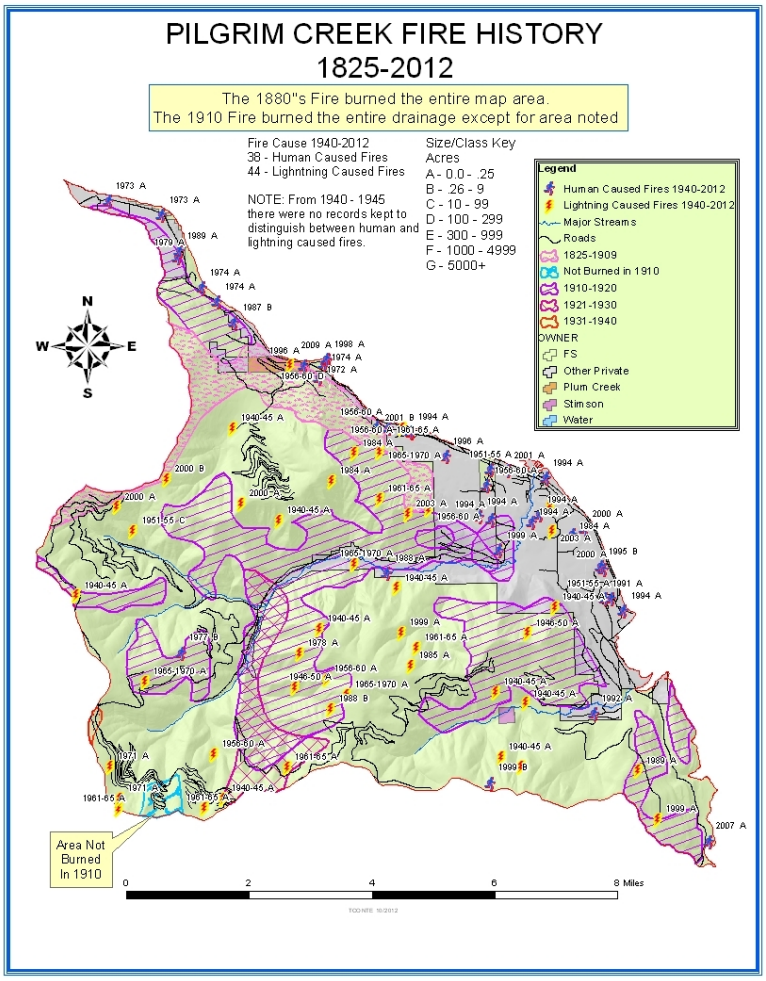


Figure 3-7. Pilgrim Creek Fire History

Existing Conditions

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

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

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

Fire Frequencies and Fuel Characteristics

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

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

Table 3-36. Fire Regime Condition Class

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

The natural fire regime is a general classification of the role fire would play across the landscape in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). The natural or historical fire regimes are classified by number of years between fires (frequency) and the severity of the fire on the dominant overstory vegetation.

Fire Regime Definitions:

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

Figure 3-8 Fire Regime Definitions

Fire Regime Group I (18% of project area) - 0-35 year fire frequency and low to mixed severity (defined above). Low severity fires would consist mostly of light intensity surface fires, whereas a mixed severity fire could result in up to 75% replacement of the dominant overstory. These include ponderosa pine and dry-site Douglas-fir.

Fire Regime Group III (22% of project area)- fire frequency of 35-100+ years of mixed severity. In the project area, these sites would have been moister than fire regime group I. Stands would have been dominated by western larch, ponderosa pine, Douglas-fir, and some lodgepole.

Fire Regime Group V (57% of project area) - fire frequency is 200+ years (110 to 340 year range) of generally nonuniform, lethal stand replacing fires. This fire regime occupies the cool and moist sites in the project area. Detailed discussions of VRU's, and the role of fire in each, are covered under the vegetation report of this document.

The remaining 3% consists of water bodies, private rural and agricultural lands.

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

Group Four: Classified as warm, dry Douglas-fir habitat type. Ponderosa pine is the major seral or climax species, especially at lower elevations, maintaining open, park-like stands. Fire return interval ranges from 5 to 25 years. Fuel loads average 11 tons per acre, but tend to increase with stand age.

Fire Group Six: Classified as a moist Douglas-fir habitat type typically having large components of ponderosa pine and western larch where low to moderate fires occurred. Fire return interval varies from a mean of 15 to 42 years. Downed, dead fuel loads average about 12 tons per acre, but can be much heavier.

Fire Group Seven: Classified as cool and moderately dry subalpine fir habitat types. Lodgepole pine is the seral dominant in most stands, with western larch and Douglas-fir occurring as scattered overstory relics. Fire return interval ranges from 100 to greater than 200 years. Fuels loadings average 15-20 tons per acre.

Figure 3-9. Fire Group Definitions

Table 3-37. VRU Summary Table

VRU	Fire Regime Group	Primary Fire Groups	Fire Return Interval (Yrs.)	CWD Tons/Acre	Acres
2S	I	4	5-45	5-9	6,616
3	III	6	15-45 (75-80 in lodgepole stands)	10-20	2,340
4N	V	11	50–200+ avg.	15-30+	4,505
4S	III	11	30-85 range	13-38	1,052
5N	V	11	110-340 range	25+	16,307
5S	III	11	17-113 range	15-32	1,015
7N	III	9	128 avg.	12-25+	2,275
9	III	7	110-120 avg.	15-25+	1,407

Fuel Models:

Due to slope, aspect, and associated terrain and vegetation, it is possible that several different fuel models were present historically in the project area – representing three of the main fuel

model groups where grass, shrubs and brush, or timber litter would have been the main carriers of a surface fire.

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

Fuels models contained within the project area, as described by Anderson (1982), is defined below:

Fuel Model 2 (Timber, grass and understory). Fire spread is primarily through the fine fuels, such as grass and pine needles. The stand is open where larger pine and Douglas-fir cover one to two thirds of the area. Surface fuel loading, less than 3 inches in diameter, averages 4 tons per acre. Surface fuel bed depth is 1.0 feet. An open ponderosa pine stand with a grass understory is a representative example of this fuel model and contained within the project area.

Fuel Model 8 (Timber, closed timber litter). A typical stand includes a closed canopy of short-needled conifers, such as Douglas-fir. The compact litter layer consists of needles, leaves and occasional twigs. Surface fuel loading, less than 3 inches in diameter, averages 5 tons per acre. Surface fuel bed depth is 0.2 feet.

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

Table 3-38. Existing Fuel Models and Crown Fire Potential

Fuel Model	Units	Crown Fire Potential?
2	601, 602, 603, 606, 607, 608, 609, 611, 612, 613, 615, 616, 618, 619	YES
8	4, 10, 11, 12, 14, 15, 17, 18, 19, 20, 21, 23, 24, 25, 26, 29, 30, 31, 32, 33, 34, 36, 38, 40, 604, 605, 610, 614, 617	YES
8	1, 2, 3	NO
10	5, 6, 8, 9, 13, 16, 27, 28, 35, 37, 39, 41	YES

Fuel Loading

Excessive fuel loads created through disease, decadence, and fire exclusion now occur over large portions of the project area. Stands where light burn events created a patchy mosaic over the course of many years can experience fire events of high severity and great magnitude. Such events result in areas with very little if any variation in age, patch size, and species composition. No such events have occurred in the last one hundred years. If these ecosystems are to

experience a disturbance regime similar to that which they are adapted, fuel loads must first be reduced to keep fire effects within a historic range of variability.

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

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

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

Canopy Characteristics:

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

Crown Fire Potential

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

Canopy Base Heights

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

continuity from the surface fuels to the crown fuels has created the potential for surface fire to propagate to the crowns of the overstory trees.

Canopy Bulk Density

Canopy bulk density (CBD) is the mass of available fuel per unit of canopy volume (kg/m^3). It is a bulk property of a stand, not an individual tree. CBD is an important crown characteristic needed to predict crown fire spread. Canopy bulk densities were estimated from a combination of FFE-FVS outputs for representative stands within the project area as well as comparing site-observations to available research such as Scott and Reinhardt (2001). (Canopy photo plots were also taken within the treatment area and are located in the project file). Dense stands can have a CBD of 0.30 kg/m^3. It is a difficult canopy characteristic to measure directly (short of cutting down the trees); FVS uses a technique to estimate "effective" CBD in non-uniform stands from a stand inventory that does not assume a uniform vertical distribution of canopy fuel – uniform measurement can be estimated by dividing canopy depth into canopy load (Scott and Reinhardt 2001).

Scott and Reinhardt (2001) describe the criteria necessary for active crown fire: Mass-flow rate is defined by Van Wagner (1977) as the rate of fuel consumption through a vertical plane within the fuel bed and it is a product of CBD and spread rate. CBD affects the critical spread rate needed to sustain active crown fire. If the mass-flow rate falls below a certain threshold, active crowning is not possible. Therefore, the lower the canopy bulk density, the lower the potential for active crown fire. It can be assumed, under extreme conditions that CBD's above .08 kg/m^3 will sustain an active crown fire.

Table 3-39. Current range of CBH and CBD in treatment areas

Canopy Base Height (feet)	1 - 42
Canopy Bulk Density (kg/m³	0.07 – 0.34

Crowning Index:

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

3 Key Fuels Factors for Crown Fires

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

Figure 3-10

Surface Fire Behavior

Under the existing fuel conditions, surface fires in the event of a summer wildfire, ***under extreme weather conditions***, would exhibit behavior that limits direct attack to ground machinery and aerial resources. Expected flame lengths would be greater than the limit that can be safely attacked by hand crews. **Predicted flame lengths would exceed 4 feet, which is the limit for safe direct attack by firefighters.**

Environmental Consequences

ALTERNATIVE 1 – NO ACTION
Direct and Indirect Effects

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

Cumulative Effects

Past fire history, fire suppression policies and actions, timber harvest and grazing since settlement times (1880's) have had the greatest influence in present conditions of natural fuels and fire hazard in the project area. Other activities and management activities shaping the current condition of the fuels profile include past vegetation management (thinning, reforestation), firewood gathering, road building, and private land development and associated activities. Fire suppression strategies (control) would continue to be increasingly difficult to attain over time due to increased fuel loadings and higher risk of escape. Overall, these recent and ongoing actions have not addressed fuels management on the landscape-level in the Pilgrim Creek project area.

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

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

ACTION ALTERNATIVES (Alternatives 2, 3, 4, and 5)

Fire behavior modeling displayed outputs very similar for all action alternatives. When the output graphs are overlayed there isn't a significant difference in the potential effects on fire behavior between the action alternatives 2, 3, and 4 over time. Alternative 5 is modeled independently due to the significant reduction in acres treated even though it displays similar effects of the fuel treatments over time. Fire behavior effects for each alternative are located in the fire/fuels section of the project file.

Direct and Indirect Effects

The direct and indirect effects of specific treatments on the forest vegetation are covered in the Vegetation Report of this document. This section discusses the effects of the action alternatives on fuels and fire behavior.

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

- Reduction in surface fuels (Reducing the flame lengths)
- Reduction in ladder fuels (Increasing the canopy base heights)
- Reduction of crown bulk density (Reducing crown fire spread from tree to tree)
- Higher Crowning Index (Increase in wind speed needed to sustain an active crown fire)

The action alternatives would implement commercial and non-commercial vegetation management activities that would also accomplish fuels objectives.

Effects of natural fuels treatments in old growth

All action alternatives include 3754 acres of natural fuels burning of which 530 acres is in designated old growth. Nine acres of the designated old growth is proposed for understory slashing prior to burning. These prescribed burns would be conducted under spring or fall conditions when soil moisture is high with the objective of reducing surface fuels and understory species (ladder fuels) to increase forage production. Fifty to eighty percent of small size class surface fuels would be consumed (less than 3 inches in diameter) while the majority of the larger surface fuels would remain intact. Over story mortality would be less than 10 percent and the majority of this would occur in Douglas-fir and grand fir. This overstory mortality would create snag habitat for the future. It is estimated that 50 to 80 percent of the area within the mapped units would burn thus maintaining a mosaic pattern on the landscape. Monitoring of past projects indicates prescribed fire, and slashing followed with prescribed fire, are valid treatments to protect and enhance old growth characteristics. See the Wildlife section of Chapter 3 for additional information of the effects of burning in old growth.

Table 3-40. Vegetative treatment acres by alternative.

	Commercial	Non-Commercial	Total
Alternative 2	1,411	4,564	5,975
Alternative 3	1,434	4,564	5,998
Alternative 4	1,290	4,564	5,854
Alternative 5	632	4,564	5,196

Fuels reduction treatments would include mechanical removal of trees, hand slashing, hand piling, pile burning, underburning, ecosystem burning, and mechanical slash treatments. The mechanical slash treatments could include excavator piling, slashing of sub-merchantable conifer, lopping and scattering, utilization of non-saw material, or hauling off site.

Table 3-41. Fuel Reduction Activity Treatment Types by Alternative.

Treatment Type	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Acres	Acres	Acres	Acres
Commercial Thin/Grapple Pile	315	182	182	182
Regeneration/Grapple Pile	55	299	215	37
Commercial Thin/Prescribed Fire	171	179	164	130
Regeneration/Prescribed Fire	463	419	259	168
Commercial Thin/Lop & Scatter	338	175	131	59
Regeneration/Lop & Scatter	69	180	339	56
Non-Commercial Slashing/Prescribed Fire	810	810	810	810
Prescribed Fire	3,754	3,754	3,754	3,754
Total Treatments	5,975	6,080	5,854	5,196

Proposed treatments would remove the majority of the ladder fuels, thus raising the canopy base heights to greater than 35 feet. This height would inhibit surface flame lengths from readily moving into the tree crowns. The key in treating the crown fuels by removing overstory trees is to effectively reduce the canopy bulk density to a level where active crown fire is not possible or the chances are significantly reduced (Scott and Reinhardt 2001). The direct effects of these treatments would accomplish fire behavior objectives. Removal of the overstory trees would increase the space between tree crowns, reducing the likelihood of crown fire spread from one tree to the next. These fuel reduction methods will result in a probability of torching near zero and a probability of sustained crown runs near zero with extreme wind speeds. Silvicultural prescriptions will focus on retention of the largest trees in the stand, which are generally the most fire-resistant (Agee and Skinner 2005).

It should be noted that a direct effect of mechanical treatments is the creation of activity fuels (slash). Fire hazard would greatly increase over the existing conditions and would remain high until fuel treatments are accomplished. This would be mitigated by requiring post treatment of harvest related fuels in the contract. Lopping and scattering would occur on 407 acres to mitigate the post-harvest activity fuels. Harvest activities associated with this slash treatment will reduce the crown fire potential by thinning the tree crowns, but has little effect on the harvest generated surface fuels. This treatment is proposed in units that have a high probability of overstory mortality associated with post treatment underburning. The fire behavior effects of this treatment type will increase the surface flame length forty percent post harvest. Hand piling followed by burning of hand piles is a possible means to mitigate the post harvest activity fuels. At this time it is cost prohibitive for this fuels treatment alternative. All proposed post-harvest

treatments will likely take 1-10 years to accomplish. The 810 acres of non-commercial slashing will create an increased surface fire hazard for 1-3 years or until underburning is accomplished. Once accomplished, this treatment will significantly reduce the likelihood of a crown fire for approximately 30 years.

Direct Effects on Fire Behavior

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

Table 3-42. Existing and Post Treatment Fuel Models and Crown Fire Potential by Alternative

Unit(s)	Fuel Model	Existing Crown Fire Potential?	Fuel Model	Post Treatment Crown Fire Potential?
	Alternative 1		Alternative 2	
10, 11, 12, 14, 15, 17, 18, 19, 20, 21, 23, 24, 25, 26, 29, 30, 31, 32, 33, 34, 36, 38, 39, 40, 604, 605, 610, 614, 617	8	Yes	8	No
6	10	Yes	11*	Yes/Limited
1, 2, 3	8	No	8	No
13, 27, 28	10	Yes	8	Yes/Limited
4, 5, 8, 9, 16, 28, 35, 37, 41	10	Yes	11	No
601, 602, 603, 606, 607, 608, 609, 611, 612, 613, 615, 616, 618, 619	2	Yes	2	No

***Fuel Model 11 (Slash, light logging slash).** Fire spread is primarily through post- harvest slash and herbaceous material intermixed with the slash. Surface fuel loading, less than 3 inches in diameter, averages 11.5 tons per acre. Surface fuel bed depth is 1.0 feet. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential.

Alternative 3				
Unit(s)	Fuel Model	Existing Crown Fire Potential?	Fuel Model	Post Treatment Crown Fire Potential?
10T, 10S, 10B, 12, 12S, 18, 19, 20, 21A, 21B, 23, 23B, 24, 25, 29, 30, 31, 32, 34, 34A, 39, 39A, 39B, 40, 40C,	8	Yes	8	No

Alternative 3				
Unit(s)	**Fuel Model**	**Existing Crown Fire Potential?**	**Fuel Model**	**Post Treatment Crown Fire Potential?**
604, 605, 610, 614, 617				
6, 28	10	Yes	11	Yes/Limited
1, 2, 3	8	No	8	No
12B, 26, 27	10	Yes	8	Yes/Limited
4, 5, 6, 8, 16, 35, 36, 37, 40B	10	Yes	11	No
601, 602, 603, 606, 607, 608, 609, 611, 612, 613, 615, 616, 618, 619	2	Yes	2	No
Alternative 4				
Unit(s)	**Fuel Model**	**Existing Crown Fire Potential?**	**Fuel Model**	**Post Treatment Crown Fire Potential?**
10, 11, 12, 18, 19, 21A, 21B, 23, 23B, 24, 25, 28A, 29, 30, 31, 32, 34, 34A, 39, 39A, 39B, 604, 605, 610, 614, 617	8	Yes	8	No
6, 28	10	Yes	11	Yes/Limited
1, 2, 3	8	No	8	No
12B, 26, 27	10	Yes	8	Yes/Limited
4, 5, 6, 8S, 8T, 16, 35, 36, 37, 40	10	Yes	11	No
601, 602, 603, 606, 607, 608, 609, 611, 612, 613, 615, 616, 618, 619	2	Yes	2	No

Alternative 5				
Unit(s)	**Fuel Model**	**Existing Crown Fire Potential?**	**Fuel Model**	**Post Treatment Crown Fire Potential?**
10, 12S, 18, 19, 20, 21B, 24, 25, 28A, 29, 30, 31, 32, 34, 34A, 604, 605, 610, 614, 617	8	Yes	8	No
28	10	Yes	11	Yes/Limited
1, 2, 3	8	No	8	No

Alternative 5				
Unit(s)	Fuel Model	Existing Crown Fire Potential?	Fuel Model	Post Treatment Crown Fire Potential?
13	10	Yes	8	Yes/Limited
4, 8, 35	10	Yes	11	No
601, 602, 603, 606, 607, 608, 609, 611, 612, 613, 615, 616, 618, 619	2	Yes	2	No

The above tables are representative of the proposed treatment units under Alternative 2, 3, 4, and 5. Fire behavior modeling for each treatment type and unit by alternative is located in the Fire/Fuels section of the project file. As an example, under alternative 2, a couple of points are worth noting: for some fuel models pre and post-treatment do not change. Units 1, 2, 3, 10, 11, 12, 14, 15, 17, 18, 19, 20, 21, 23, 24, 25, 26, 29, 30, 31, 32, 33, 34, 36, 38, 40, 604, 605, 610, 614, 617 currently exist as a fuel model 8 and will remain as a fuel model 8 after treatment. These units would be less susceptible to crown fire due to treatment of surface fuels, ladder fuels, and/or canopy fuels; thereby, increasing canopy base height and reducing canopy bulk density. Although the proposed units, 28 and 33 display crown fire potential post-treatment, they are only vulnerable if an active crown moves in from an adjacent stand and should only exhibit single or group tree torching. This post-treatment crown fire potential is due to the CBH remaining near levels that can sustain a passive crown fire. Units 4, 5, 6, 8, 9, 16, 28, 35, 37, and 41 will exhibit a post-treatment fuel model 11. Although there is low probability for any type of crown fire, the surface fuels created from lop and scatter harvest activities will remain on site and abate naturally. These units are located in root rot areas and post-harvest residual overstory trees would be susceptible to high mortality following the application of prescribed fire. More information concerning root rot can be located in the vegetation report. The above examples are reflective of the same post treatment results that would take place under alternatives 3, 4, and 5.

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

Another direct effect of Alternatives 2, 3, 4, and 5 is a trending of the warm and dry habitats (fire regime group 1) from Condition Class 2 toward a Condition Class 1. This is proposed for alternatives 2, 3, 4, and 5 on 4,564 acres and includes 3,754 acres of ecosystem underburning and 810 acre of noncommercial slashing followed by underburning. The moderately warm and moderately dry habitats in fire regime group III will remain stabile within the current condition class.

Indirect Effects on Fire Behavior

The intensity, torching, crowning, and resistance to control (fire containment and suppression) of a potential wildland fire within the treated areas would be reduced, resulting in safer conditions for firefighters and the public.

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

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

Cumulative Effects

The cumulative effects of the actions identified as reasonably foreseeable, combined with the past and present actions identified (see the introduction to the environmental effects section) would reduce the fuel hazard within the project area.

The greatest effect from past timber harvests and fire suppression has been a change in the natural fuel loading. Fire suppression and timber harvest have allowed for an increase in ladder fuels and stocking levels, which in turn increase the risk for wildfires to be more intense than what may have occurred historically.

Effective fire suppression has all but eliminated natural wildland fire, which was significant in shaping and maintaining ecosystems in this area. As directed by federal wildland fire policy, fire suppression will continue in the project area. Without maintenance treatments like ecosystem burning, fire suppression would, over time, return the treated stands to the current conditions.

Cumulative effects of fire suppression

Activities under alternatives 2, 3, 4, and 5 would maintain the Fire Regime Condition Class 1. Proposed activities would alter the Fire Regime Condition Class 3 areas to a Fire Regime Condition Class 1. This would be accomplished by the modification of vegetation composition/structure (towards historic reference conditions), modification of fuels to reduce fire severity, and the introduction of fire where fire return intervals are departed from reference values due mostly to successful fire suppression.

Fuel Accumulation

Alternative 1 allows the continued threat of uncontrolled wildland fire to exist with no proactive management to protect forest resources. Site-specific fuel and stand inventories have established that the current insect and disease within the project area are contributing to the high fuel loadings and will continue to do so into the future. These current and foreseeable fuel loadings will contribute to extreme fire behavior under certain weather conditions, and would make fires difficult to control even under moderate conditions. Alternatives 2, 3, 4, and 5 provide fuel reduction protection for suppression activities in the face of fire seasons that have proven to be longer, resulting in an increased incidence of large wildfires in some places (Westerling et al. 2006).

Alternatives 2, 3, 4, and 5 will effectively modify the fuels characteristics of the treated area to be consistent with that of a fuel model 8 (light timber litter – see Table 3-38 and and Figure 3-9). Effective reduction in expected surface flame lengths will best be achieved by post treatment underburning. Fire behavior associated with slash treatment types will be modified as reflected in the tables and text that follow.

Measurement Indicator 1

Flame lengths

Table 3-43. Suppression Capabilities based on flame length by Alternative

Surface Flame Lengths (Feet)			
Alternative 1	**Direct Attack?**	**Alternatives 2, 3, 4, and 5**	**Direct Attack?**
2-8 Feet	No*	1-8 Feet	Yes**

* The currently low canopy base heights could propagate the surface flame lengths into the crowns of trees, thus overall flame lengths are predicted to average 60 feet with passive and active crown fire for Alternative 1. Units 28, 31, and 33 of Alternatives 2 and units 28 and 31 of Alternatives 3, 4, and 5 would remain susceptible to passive crown fire due to the amount of post treatment regeneration.

**Lop and scatter slash treatments associated with Alternatives 2, 3, 4, and 5 would increase the surface flamelength by 40 percent post treatment. Direct attack would only be possible with heavy equipment or aerial resources under this surface fire scenario.

Effectiveness depending on the type of post-harvest treatment

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

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

Fuel Model 8 – Proposed Commercial Thin Treatment

Figure FF-4. Commercial Thin Post Harvest

Figure FF-5. Commercial Thin Post Harvest with Prescribed Fire

The above figures show an example of effectively reducing the surface, ladder, and crown fuels followed by prescribed fire in a similar forest type on the Cabinet Ranger District through mechanical treatment followed by underburning (Figures FF-4 and FF-5). This treatment type represents approximately 30% of Alternative 2, 35% of Alternative 3, 26% of Alternative 4, and 34% of Alternative 5 that are associated with the proposed commercial activities.

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

Measurement Indicators 2, 3, 4, and 5

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

Table 3-44. Summary: of Fuel Indicators by Alternative

	Canopy Base Height (feet)	Crowning Index (mph)	Canopy Bulk Density (Kg/M3)
Alternative 1	1 - 42	4 - 30	.07 - .34
Alternatives 2, 3, 4, and 5	10 - 64	27 - 91	.02 - .07

Measurement Indicator 5

Acres Treated Within Fire Regime Group I

Table 3-45. Acres treated in Fire Regime Group 1 by Alternative

	Alternative 1	Alternatives 2, 3, 4, and 5
Acres Treated	0	4,564

Effectiveness into the future

The following graphs compare the general effectiveness of Alternative 1 with Alternatives 2, 3, 4, and 5 for the indicators of surface flame lengths, total flame lengths, crowning index, canopy base heights, and canopy bulk index into the future.

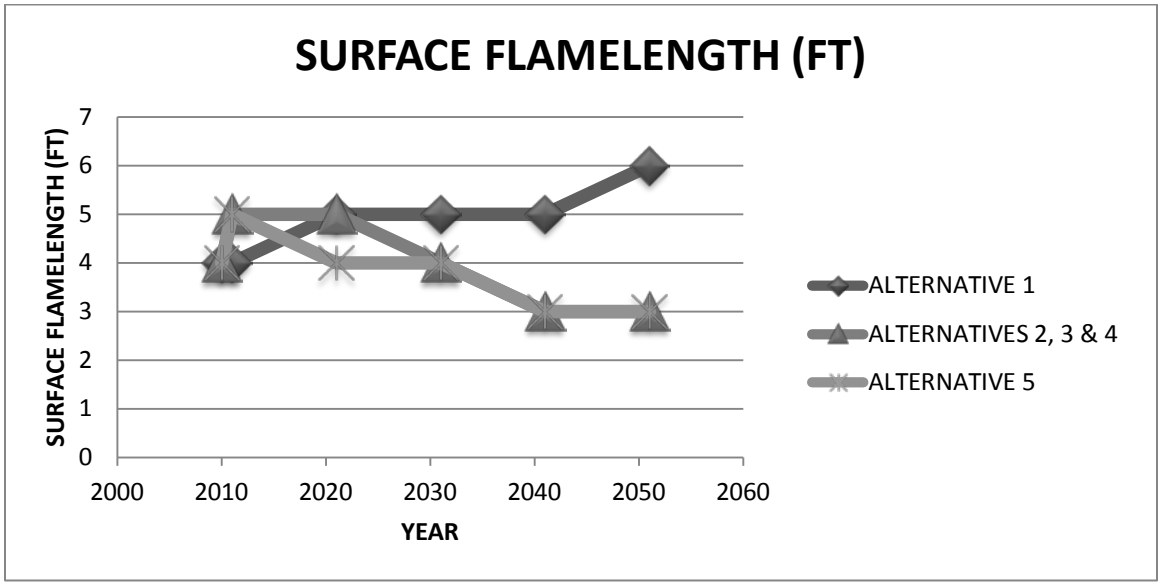


Figure 3-11. Comparison of expected Surface Flame Lengths in the proposed treatment areas by Alternative.

Alternatives 2, 3, 4, and 5 display an immediate increase in surface flame length. This is due to the slash treatment types associated with the activity fuels taking two to seven years to complete. Once completed, they would be effective at keeping the expected surface flame lengths under the direct attack threshold for at least 40 years into the future. Without treatment the expected surface flame lengths would continue to increase and remain above the direct attack threshold for 40 years into the future.

From outputs derived in FVS, it is likely that the overall flame lengths for the current condition would actually be much greater than what is shown in the figure above because a fire would be expected to move into the tree crowns through torching or small crown fire runs through several

trees at a time (the above figure shows 'surface' flame lengths – a fire moving into the crowns would result in greater flame lengths). The following figure shows the trend in overall flame length for all Alternatives.

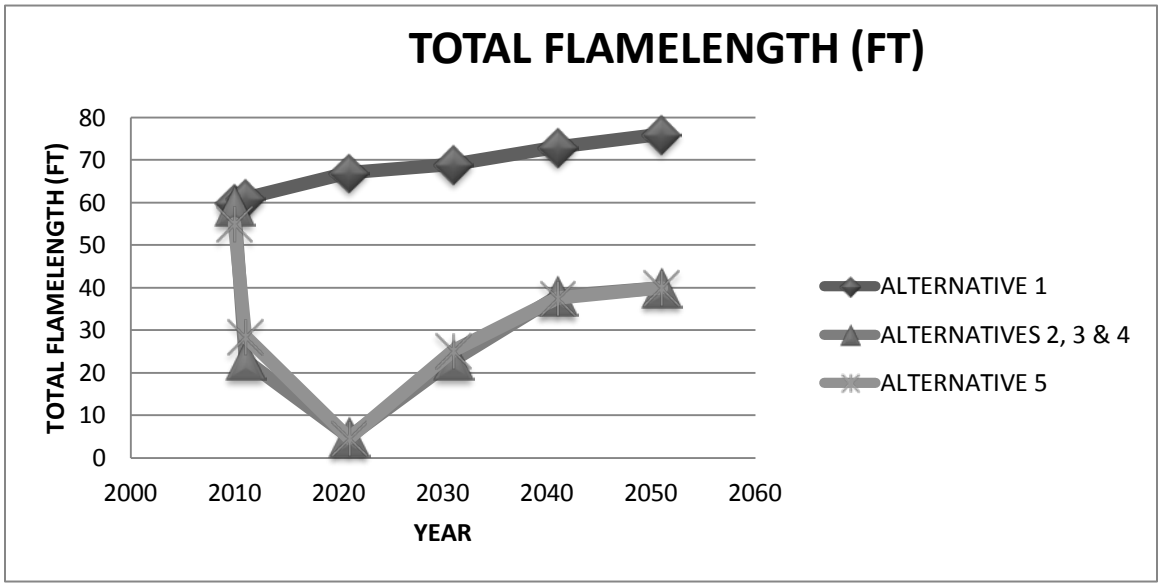


Figure 3-12. Comparison of expected Total Flame Lengths in the proposed treatment areas by Alternatives.

The figure below displays Alternative 1 will have little beneficial effect on the crowning index – it will take winds of approximately 20 mph to sustain crowning into the future. The proposed treatments associated with Alternatives 2, 3, 4, and 5 will focus on spacing the tree crowns to a point where fire spread from one tree to the next becomes virtually impossible, except under the rarest conditions – not just high winds, but sustained high winds of greater than 22 miles/hour. The increase in the crowning index will remain effective for three decades into the future, until regeneration becomes incorporated enough into the overstory as to facilitate fire spread into the tree crowns. It would be at this point to re-visit the stands and determine if another treatment entry would be appropriate.

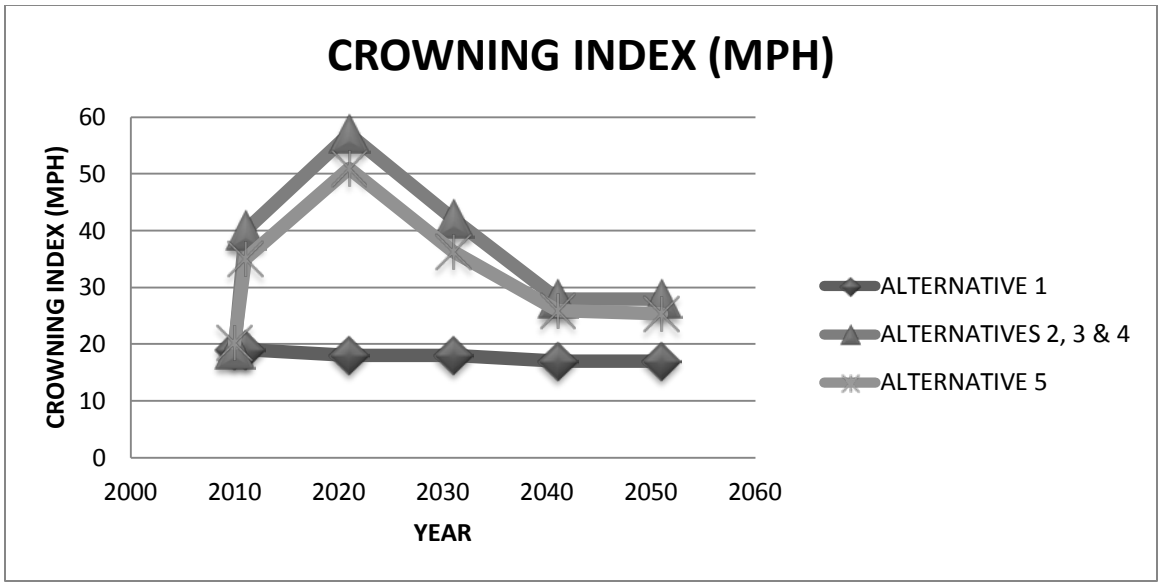


Figure 3-13. Comparison of expected Crowning Index in the proposed treatment areas by Alternative.

Crown characteristics (crown base heights and canopy bulk density specifically) will influence whether or not a surface fire stays on the surface or moves into the canopy (Pollet and Omi 2002).

Increasing the CBH will reduce the risk of a fire moving from the surface to the canopy and reducing the canopy bulk density will reduce the risk of a fire moving from tree to tree. The CBHs remain high following treatment for approximately 15 years. Therefore maintenance treatment would be needed in approximately 15 years for Alternatives 2, 3, 4, and 5.

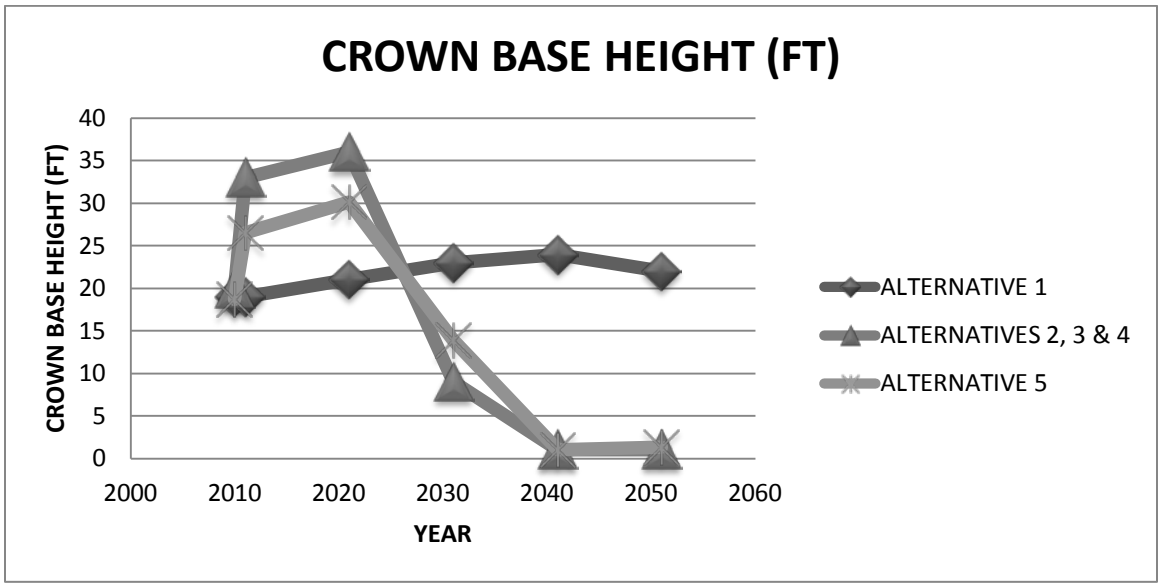
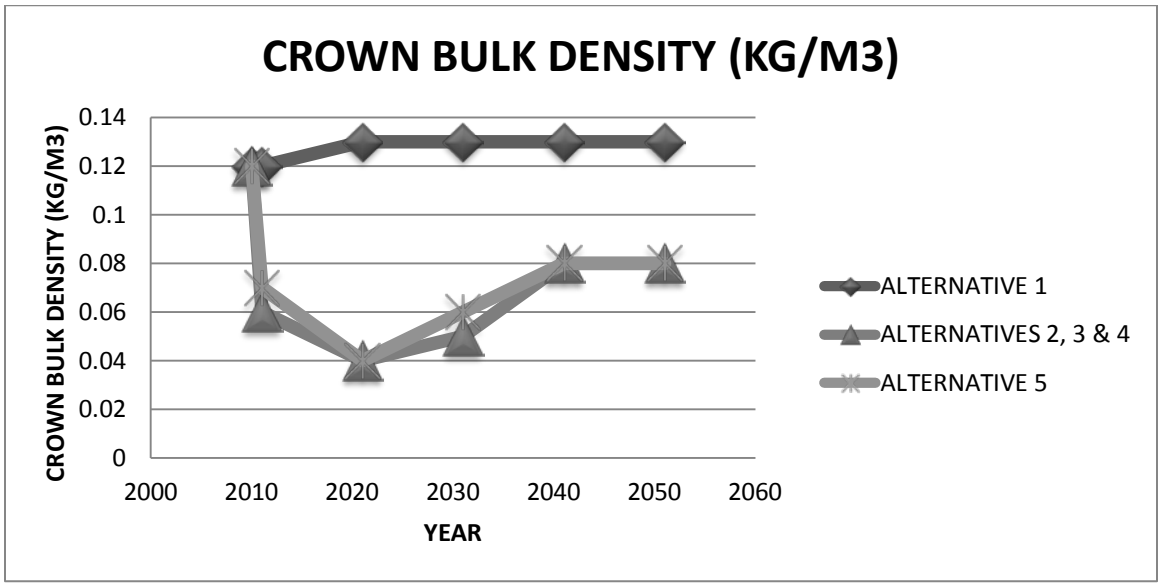


Figure 3-14. Comparison of expected Canopy Base Heights in the proposed treatment areas by Alternative.

The CBD would remain relatively the same for Alternative 1. The CBD would decrease dramatically following treatment with Alternatives 2, 3, 4, and 5. Treatments would remain effective for 40 years. Alternatives 2, 3, 4, and 5 would show the greatest benefit at reducing the risk of a fire moving from tree to tree.



Figures 3-15. Comparison of expected Canopy Bulk Densities in the proposed treatment areas by Alternative.

Effects of Openings Over 40 Acres in Size

The need to create openings over 40 acres in size stemmed from insect and disease activity, not to meet fuels treatment objectives. Units were not designed or positioned to alter landscape level fire effects. Analyzing the data at the stand level indicates the probability of a surface fire transitioning to the crowns and the probability of sustained crown fire would decrease in treated stands post treatment. These treatments would be effective for 15 to 40 years. The primary difference between alternatives, from fuels prospective, is the amount of the project area being treated.

The measurement indicator utilized to determine an acceptable volume of canopy fuel to prevent a crown fire is crown bulk density (CBD). A CBD above .08 kg/m^3 has the probability to sustain a crown fire. While it is not necessary to create stand with an “open” condition (CBD significantly below .08 kg/m^3) to reduce crown fire potential the addition acreage of treatment in alternatives 2, 3 and 4 due to larger unit size results in more fuels reduction on the landscape. These treatments would be effective for approximately 40 years.

The measurement indicator utilized to determine the potential for a surface fire to transition into the crowns is canopy base height (CBH). Increasing CBH reduces the risk of a surface fire transitioning into the crowns. Activity units show an increase in canopy base height following treatment which should be effective for reducing initiation of a crown fire for approximately 15 years following treatment.

Forest Plan and Other Regulatory Direction Consistency by Alternative

Below is a description of how Alternatives 2, 3, 4, and 5 meet the following Forest Plan Goals.

- **Goal 17:** Use prescribed fire to simulate natural ecological processes, prevent excessive natural and activity fuel buildups, create habitat diversity for wildlife, reduce suppression costs, and maintain ecosystems.
- **Goal 24:** Protest Forest users, property, and resources from wildfire.

Alternative 1

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

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

Alternative 2, 3, 4, and 5

Alternatives 2, 3, 4, and 5 would be consistent with the Forest Plan. They propose to use prescribed fire to help meet the goals of the management areas within the project area. The reduction of fuels will assist the initial attack organization meet their suppression objectives because activity fuels will be treated in order to reduce fire intensities that allow for safe direct attack. These alternatives would promote cost-effective fire programs by reducing potential intensities of wildfires and therefore the costs of controlling potential wildfires.

Alternatives 2, 3, 4, and 5 specifically address fuels reduction in the project area, addresses firefighter safety by modifying fuels to reduce fire intensities and the potential for crown fire, and promotes community assistance through utilization of the fuels (biomass) removed as a result of project activities.

Summary

In the project area, there is a risk associated with fire. The primary risk is associated with firefighter safety, capital investments and natural resource values. Fire history tells us that all our Forest has experienced fires and will again at some point. Of all the action alternatives, implementing Alternative 3 would reduce this risk by the largest margin treating a total of 6,080 acres while implementing Alternative 5 would reduce this risk the by least treating a total of 5,196 acres.

Alternatives 2, 3, 4, and 5 propose to treat approximately 69 percent of Fire Regime Group I within the project area. This area has missed at least two fire cycles or fire return intervals.

By modifying fuels to reduce fire behavior effects and returning fire to the ecosystem, Alternatives 2, 3, 4, or 5 would help meet the purpose and need of the project. Alternative 1 would not.

Water Resources

This report summarizes characteristics, processes, and primary issues in the project area relative to water resources. Relevant regulatory frameworks, issues, and assessment methods are also provided accompanied by an interpretation of the findings. The indirect, direct, and cumulative effects of the project alternatives are discussed. Chapters 1 and 2 of the Environmental Assessment have more detail of the project and associated alternative.

Analysis Area

Direct, indirect and cumulative effects of the timber harvest and prescribed burning activities proposed on water resources were analyzed for sixteen 7th code HUC boundaries (Figure 3-16). Direct and indirect effects of the proposed road construction and maintenance activities on water resources were analyzed by the same sixteen 7th code HUC boundaries within the Pilgrim Creek planning area (Figure 3-16). Haul routes for this project include existing roads and proposed new roads exist within the Pilgrim Creek planning area. All activities proposed within the Pilgrim Creek project area and their effects on the water resources will be analyzed in detail.

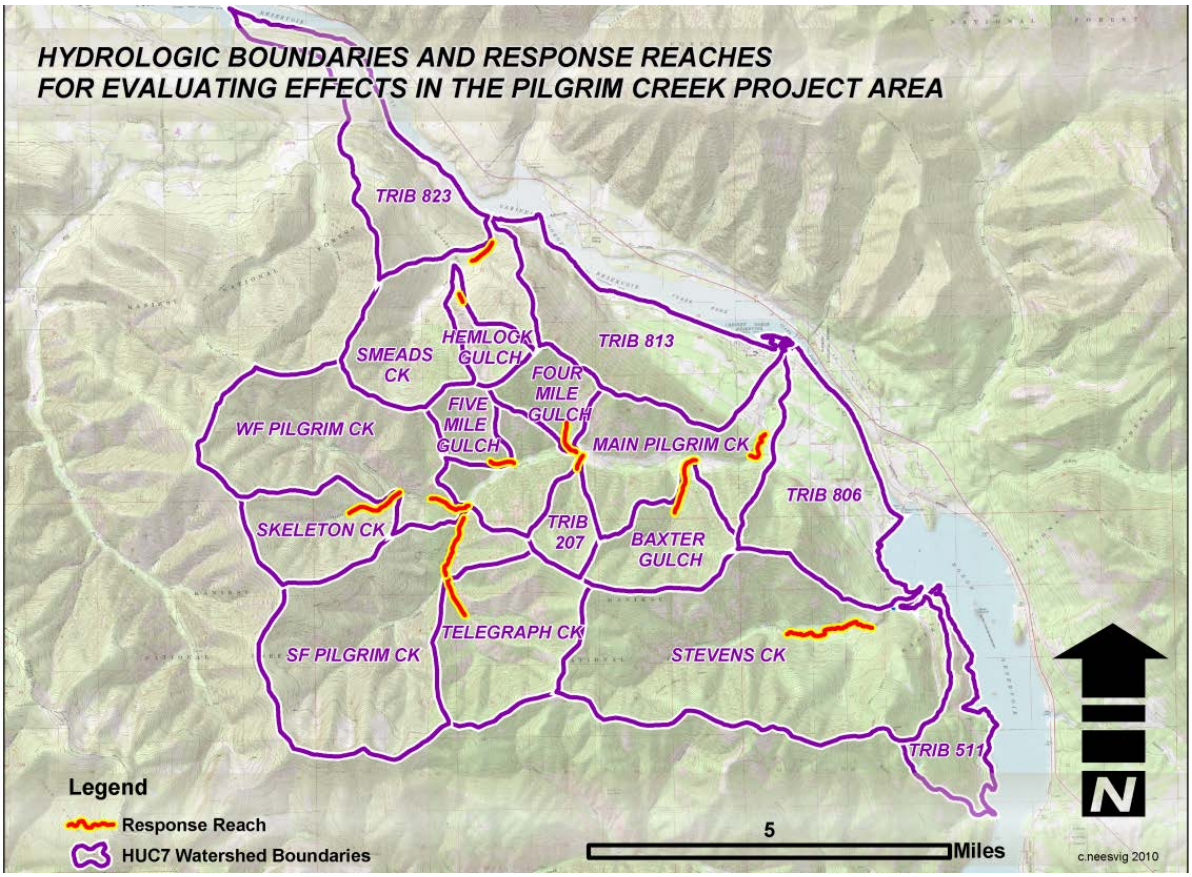


Figure 3-16. Analysis area for water resources in the Pilgrim Creek Project Area.

The response reaches for evaluating the effects of the activities proposed on water resources include: reach 1 of Smeads Creek, reach 1 of Hemlock Gulch, reach 1 of West Fork Pilgrim Creek, reach 1 of Four mile gulch, reach 1 of Five-mile gulch, reach 2 of the mainstem of Pilgrim Creek, reach 1 of Tributary 207, reach 1 of Baxter Gulch, reach 1 of SF Pilgrim Creek, reach 1

of Telegraph Creek, and reach 4 of Stevens Creek. These reaches were chosen due to existing channel conditions and associated sensitivity to disturbance. These response reaches and analysis boundaries encompass all upstream effects from proposed activities.

Regulatory Framework

In a Memorandum of Understanding (MOU) between the State of Montana and the Forest Service, the Forest Service is designated as the management agency responsible for water quality protection on National Forest System lands.

The Clean Water Act (CWA) establishes federal water quality policies. Both the Environmental Protection Agency and individual states have responsibility for implementing the CWA. States are required to designate the beneficial uses of each stream and determine the criteria sufficient to protect these uses. Beneficial uses include human uses such as drinking water, irrigation and recreation, as well as protection of fisheries and aquatic life.

Section 101 of the Clean Water Act (CWA) states that its' objective is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To accomplish this, the US Environmental Protection Agency encourages a holistic, watershed-based approach that places equal emphasis on protecting healthy streams and restoring impaired ones.

The Clean Water Act requires states to identify water quality limited segments still requiring total maximum daily loads (TMDLs) and then to develop TMDLs for those waters (33 U.S.C. Section 1313 (d) and 40 C.F.R. 130.7(b)). Montana law (Montana

Code Annotated Title 75, Chapter 5, Part 7) requires that DEQ develop TMDLs for all threatened and impaired water bodies.

Montana's 1996 303(d) list classified 11 miles of Pilgrim Creek as impaired (DEQ, 1996).The more recent 2002 303(d) list included 7 miles (channel length re-measured in 1999) of Pilgrim Creek from the headwaters to the mouth at Cabinet Gorge Reservoir (DEQ, 2002). Table H-1 includes the levels of beneficial use support for Pilgrim Creek as classified in the 1996 and 2002 303(d) lists.

A water body is considered to be "fully supporting" when it is at its best or most natural condition. When one or more beneficial uses are not fully supported due to human activities the water body may be rated as either "not supporting" or "partially supporting" the affected use or uses. A "threatened" rating indicates that there is evidence that one or more fully supported uses may soon be impaired (State of Montana 1996).

Probable causes of impairment, as identified on the 1996 and 2002 303(d) lists (Table 6-2), include: other habitat alterations and thermal modification. To satisfy the requirements of the court order, each of the (probable) causes identified on the 1996 303(d) list will need to be addressed. In other words, a TMDL must be developed unless documentation can be provided indicating all beneficial uses are fully supported based on DEQ beneficial use support criteria (DEQ 2002). A draft TMDL is currently being reviewed for the mainstem of Pilgrim Creek.

Pilgrim Creek is classified as an A-1 water body. Waters classified A-1 are high quality waters suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality must be suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply (State of Montana 1996).

The CWA also requires states to identify water bodies they believe are not meeting water quality standards and are at risk of not supporting their designated beneficial uses. These water bodies are called Water Quality Limited Segments (WQLS). There is one WQLS water body within the Pilgrim Creek Analysis Area - Pilgrim Creek. With the exception of the Noxon Face tributaries, Stevens Creek and Smeads Creek, the entire analysis area falls within the watershed of this WQLS.

The beneficial use concerns for Pilgrim Creek are identified in Table 3-46, which shows that it has been given a status of Partial Support of aquatic life and coldwater fisheries due to siltation and other habitat alterations. Probable sources of impairments include hydro-modification, channelization, habitat modification (other than hydro-modification), and bank or shoreline modification or destabilization (DEQ 2002).

Table 3-46. Pilgrim Creek Water Quality Limited Segment information

Listed Stream Segment	Beneficial Use Support Status	Pollutant of Concern	Source of Pollutant
Pilgrim Creek - 7 miles, from source to mouth	Aquatic Life Support (Partial) Cold Water Fishery (Partial)	Other habitat alterations, Thermal Modification	Hydro-modification, Channelization, Habitat Modification, Bank or Shoreline Destabilization

A Total Maximum Daily Load (TMDL), for sediment, has been developed for all listed segments in the Lower Clark Fork River watershed. This does not include Pilgrim Creek. Although Pilgrim Creek has been listed as impaired for “alterations in stream-side or littoral vegetative cover”, this is not considered a pollutant and hence does not require a TMDL.

Analysis Methods

The analysis methods used to evaluate the existing condition and potential effects to water resources include; WATSED based water yield modeling, Rosgen based stream channel survey, WEPP based sediment modeling, and GIS based road density analysis.

Peak Flow Increases

Peak Flow Increases (PFIs) are changes in a runoff caused by forest management activities and natural events such as wildfire, usually causing higher and/or longer high-flow periods. These changes in water yield relate to the removal of vegetation (whether by timber harvest or fire) modifying the deposition and melt functions, and building of roads which can intercept and divert flows. These types of disturbances can increase the amount of available water in a snowpack and change the timing in which the runoff from this snow is released. The location in the drainage, and how much of these disturbances have and will take place, determine the direction and magnitude of change of water yield. When the magnitude and duration of higher flow events are increased, there is a higher potential for adverse channel conditions such as bank cutting and channel aggradation or degradation.

The effects of prior land management on the amount, duration, and timing of peak flows in the analysis area were estimated using past R-1 WATSED model runs within surrounding basins. Previous model runs in basins such as Whitepine Creek, Beaver Creek, Elk Creek, Trout Creek and Orr Creek yielded similar relationships between the effects of land management on basin hydrology in the form of Peak Flow Increases (PFI's). A linear regression relationship (Figure 3-17) was then established from these past WATSED model runs. Figure 3-17 diplays the relationship between the amount of Equivalent Clearcut Acres (ECA's) needed to increase PFI's by 1% for a given basin size. ECA's are the percent of an area in a clearcut (100% canopy removal) condition. This includes not only clearcuts but partial harvests, burned areas, and roads. Two relationships were made, one for basins 0 to 7000 acres in size, and one for basins greater than 7000 acres. For example, a sub basin that is approximately 4000 acres needs approximately 60 ECA's to increase the peak flow by 1% at its mouth (Figure 3-17).

The values generated by this model were used along with other information, including field surveys of channel condition and professional judgment, to interpret existing and potential impacts resulting from past and proposed land management activities. These values are not to be considered an absolute measure against other verifiable standards, nor will they, by themselves, provide exact answers of the effects land management activities have on peak flows.

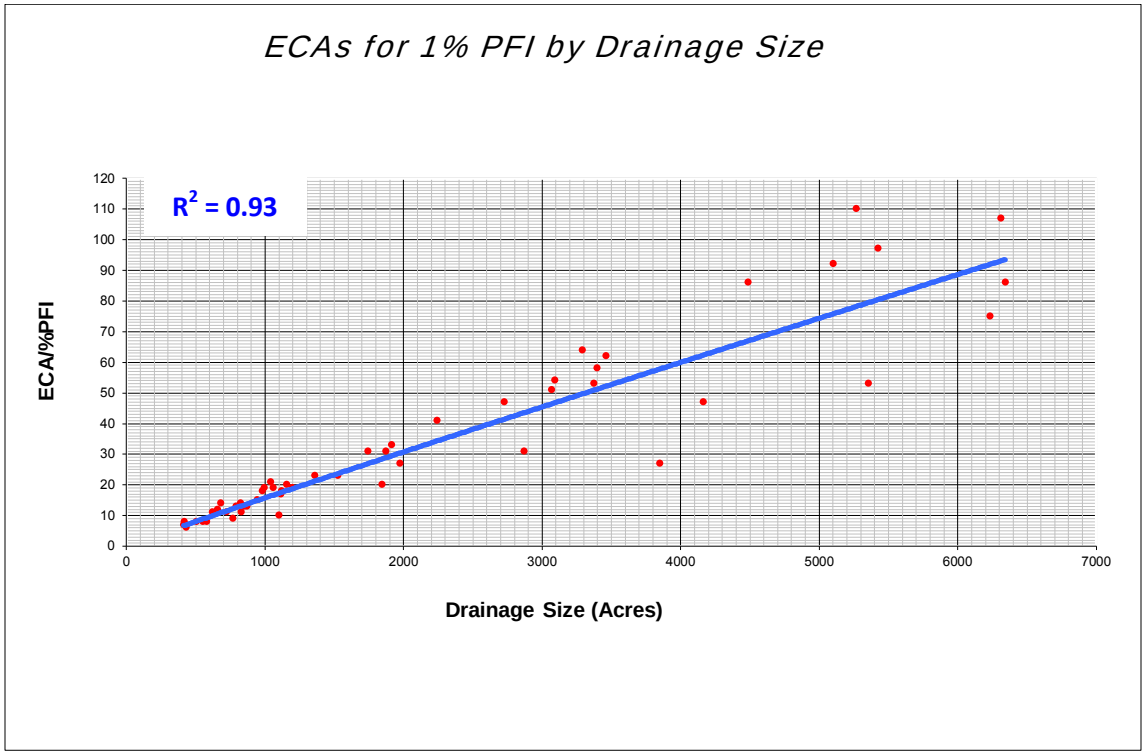


Figure 3-17. Zero to 7000 acres past WATSED ECA/%PFI linear relationship.

Recommended Peak Flow Increases (RPFI's)

Recommended Peak Flow Increases (RPFIs) were determined after existing channel conditions were compared to modeled PFIs associated with past levels of management activities and natural disturbances. The intent of an RPFI is to indicate the level which there is a higher potential for channel damage from peak flows. PFIs at or above the recommended levels need additional modifications or mitigations to protect channel conditions and beneficial uses. The RPFIs are not necessarily static and can change based on the condition or trend of the stream channel. PFIs were set in response to the existing channel type, stability, basin size, riparian integrity, and presence of sensitive soils within the planning area.

RPFIs are also based on monitoring information, stream inventory data collected in 2009, and research conducted on the Kootenai and adjacent Flathead National Forests (MacDonald et. al. 1997). RPFI's were set in the Pilgrim Creek analysis area using the following considerations:

- Existing channel stability and other geomorphic conditions such as dry draw characteristics;
- Stream types present and their sensitivity to disturbance;
- Effects to adjacent private water sources

Stream Channel Processes

The various surveys and data collection procedures used to gather information supporting this analysis included:

- Rosgen stream channel surveys;
- System and non-system road survey

The Rosgen Stream Classification System (Rosgen 1996) was used to describe the processes, functions, and patterns of channels and to help predict channel responses. The Rosgen Level II classification requires field measurements of stream attributes including entrenchment, width-depth ratio (W/D), slope, and sinuosity. These attributes are dependent on topography, geology, and precipitation patterns within the watershed. Dominant instream particle size is added to describe the Rosgen Stream Type.

The Rosgen classification can be used to:

- Predict a stream's behavior;
- Develop specific hydraulic and sediment relations for each given channel type and stability condition;
- Allow comparisons between sites with similar characteristics; and
- Provide a consistent and reproducible frame of reference for streams.

Channel types are related to the shape of the valley where they occur. Some streams are steep and entrenched in narrow-bottomed valleys, while some meander through wide gentle valleys. The channel types found in the Pilgrim Creek project area are listed in Table 3-51(from Rosgen 1996, Table 4-1, p. 4-5).

Table 3-47. Rosgen Channel Types Identified in the Pilgrim Creek Analysis Area

Stream Type	Description	W/D	Sinuosity	Slope	Landform / Features
A	Steep, entrenched, cascading, step-pool, high energy debris transport. Very stable if bedrock or boulder dominated.	< 12	1.0 – 1.2	.04 - .10	High relief. Frequently spaced deep pools in step-pool sequence. May be used for rearing by juvenile fish, if fish are present.
B	Moderately entrenched, moderate gradient, riffle dominated channel with infrequent pools. Stable banks, stable plan and profile.	> 12	> 1.2	.02 - .039	Moderate relief. Moderate entrenchment and W/D. Predominantly rapids with scour pools. Important spawning habitat.
C	Low-gradient, meandering, riffle-pool channels with broad floodplains.	> 12	> 1.4	< 0.02	Broad valleys with terraces. Alluvial soils found on floodplains. Riffle-pool bed morphology. Important fish habitat for varied species.
D	Low-gradient, braided channel with high W/D and very low sinuosity. Very unstable with low sediment transport efficiency.	> 40	> 1.0	< 0.04	Terraced valleys in coarse alluvium. Very high W/D, High bank erosion rates, excessive deposition and annual shifts of the bed locations.
E	Meandering channel with low W/D and very high sinuosity. Very stable with high sediment transport efficiency.	<12	> 1.5	< 0.02	Broad alluvial valleys with well developed floodplains. Low W/D and high meander width ratios. Streambanks composed of materials finer than that of the dominant channel bed material

Different channel types operate under different energy conditions (slopes) and input conditions (type of material delivered to the channel, for example, boulders vs. fine material from eroded banks), they also have different capacities for stability, some of which are noted. The combination of these factors also results in different channel structures that range from waterfalls (Aa+), to step-pools (A), to riffles (B), to riffle-pool (C, and F), to braided (D)(Rosgen, 1996).

A numerical classification is added to the basic Rosgen channel type to characterize the size of the material that makes up the channel bed. Bed material size is important to channel stability and response. Larger materials are usually more difficult to make mobile under average flows and thus more stable from the velocities of flow. These size categories are described in Table 3-48.

Table 3-48. Rosgen Bed Material Size Categories (from Rosgen 1996)

Category	Description	Particle sizes (mm)
1	Bedrock	N/A
2	Boulder	> 256
3	Cobble	64 - 256
4	Gravel	2 - 64
5	Sand	.062 - 2
6	Silt or Clay	< .062

Stream channel types and channel stability were inventoried in the Pilgrim Creek project area by a trained Hydrology crew during the summers of 2004 and 2008. The Rosgen Stream Classification system was used to gather and interpret current channel conditions and departure from natural. The information obtained was then analyzed by the District Hydrologist. Reaches are numbered starting with ‘1’ at the mouth and proceeding upstream. Stream reaches were broken out by channel type or obvious changes in stability. The channel stability ratings in Tables 3.48 and 3.49 are based on the Pfankuch rating (USDA 1975) and take channel type into account (Rosgen 1996, p.6-29 – 6-30). This rating system provides general information about a stream’s capacity to accommodate, adjust and recover from potential changes in flow or sediment yields.

Upland Sediment Survey (Road derived sediment)

Road logs have been generated within the project area to address the need of BMP’s (Best Management Practices) on all established haul routes. Most importantly, BMPS would disconnect ditchwater from stream channels. These logs in addition to WEPP based survey information consisted of a quantitative sample that allowed for the estimate of long-term road stability, the potential for mass failure and road related sediment contributions from roads.

The Water Erosion Prediction Project (WEPP) soil erosion model has been developed by an interagency group of scientists including the USDA's Forest Service, Agricultural Research Service, and Natural Resources Conservation Service, and the Department of Interior's Bureau of Land Management and Geological Survey. Scientists from these agencies throughout the United States have been working since 1985 to develop WEPP to replace the Universal Soil Loss Equation (USLE) (FSWEPP, 1999).

The WEPP model is a complex computer program that describes the processes that lead to erosion. These processes include infiltration and runoff; soil detachment, transport, and deposition; and plant growth, senescence, and residue decomposition. For each day of simulation, WEPP calculates the soil water content in multiple layers and plant growth/decomposition. The effects of tillage processes and soil consolidation are also modeled) (FSWEPP, 1999).

The following data were collected at each stream crossing in the Pilgrim Creek Analysis Area:

- channel bankfull width and gradient
- diameter and length of culvert pipe
- road surface type (native, graveled, chip-sealed, etc.)
- length and slope of road draining directly into crossing on left and right sides of crossing
- length and slope of road draining directly into crossing on each side after proposed BMPs

This data was then used as input information for the WEPP: Road model in order to estimate relative reductions in sediment delivery at each crossing that would be achieved through implementation of the proposed BMPs.

The WEPP model was run for each stream crossing under two conditions: 1) current (existing); and 2) after installation of proposed BMPs. The model output is expressed as the annual average (over the modeled period; in this case, 100 years) of sediment eroded and delivered to the stream. The WEPP Road model was not designed, nor is it used, to develop exact estimates of sediment generated from roads and sediment entering the stream system. The model provides a consistent method of comparing alternatives to each other as well as to modeled natural conditions and/or measured stream conditions. Values generated by the model are not to be considered as an absolute measure, nor by themselves provide an answer in regard to the effects roads have on sedimentation. The relative sediment reductions were used to prioritize the BMP upgrades that will be funded from proposed timber sales and other program sources.

The results from the WEPP Road Model have been used to identify the stream crossings that will benefit the most from application of BMPs. Where the funding sources of road BMP improvements is appropriated funding, the crossings where BMP improvements were shown to achieve the greatest potential sediment reductions would receive priority for treatment.

Total Road Density (TRD)

Road density is defined as a ratio of the length of roads per unit area. Road density was used as an evaluation of current watershed conditions with respect to controllable sediment sources, hydrologic functions (e.g. floodplain accessibility), and possible direct, in-direct, and cumulative impacts. Usually reported in mi/mi^2, road density is a common measure used to assess the relative potential impacts of roads on water quality and quantity and is typically calculated using GIS layers of mapped roads and analysis areas. A multitude of research demonstrates that unpaved forest roads represent a source of sediment (USDA 2000, Ercelawn 1999, Trombulak et al. 1999). Sediment contributed from roads and delivered to streams can affect water quality,

habitat, sediment transport regimes, and channel morphology. Roads and road density are often used as a coarse level descriptor of watershed characteristics and conditions.

Research shows that roads interact with surface and subsurface flow. This interaction may affect the hydrologic response of a watershed, including the timing and magnitude of the hydrograph. Wemple and Jones (2003) found that depending on the nature of storm events, watershed characteristics, and road segment attributes, storm flow response may be more rapid and have greater peaks because of the effect roads have on hill slope flow.

The KNF rates TRD exceeding 3.5 mi/mi^2 as 'High' in watersheds with 20–45 inches of mean annual precipitation (MAP) and TRDs exceeding 3.0 mi/mi^2 as 'High' in watersheds with >40 inches of MAP (KNF, 2003).

Table 3-49. Road Density Classification (KNF, 2003)

Classification	Road Density (miles/mile^2)		
	MAP >40"	***MAP 20-40"***	***MAP <20"***
High	>3.0 Mi/Mi^2	>3.5 Mi/Mi^2	>5.0 Mi/Mi^2
Moderate	1.5 - 3.0 Mi/Mi^2	1.5 – 3.5 Mi/Mi^2	1.5 – 5.0 Mi/Mi^2
Low	<1.5 Mi/Mi^2	<1.5 Mi/Mi^2	<1.5 Mi/Mi^2

Affected Environment

The most prevalent large-scale disturbance in the analysis area over time was wildfire. Stand replacing fires varied in frequency from 150 – 300 years, depending on the Vegetative Response Unit (VRU), with the last large scale high intensity fire being in 1910. Once fire passed through an area, sediment delivery and water yield increased until forest floor and canopy vegetation had sufficiently recovered. During the fire disturbance cycle, large woody debris usually remained within channels and riparian zones which greatly aided the recovery of these areas. It is very likely that increased erosion followed these fires, especially on steep slopes where most vegetation would have been removed. More frequent, low-intensity underburns likely had little effect on these watersheds due to the lower levels of overstory mortality associated with these fires.

Floods and debris slides also occurred. Floods occurred in response to ROS (rain on snow), heavy snow years, or heavy prolonged rain events. The magnitude of these types of floods can be increased for a number of years following severe fire. Channel stability and aquatic habitat can be affected by floods. Steep reaches tend to scour and the material may be deposited in lower gradient reaches. In the case of the Pilgrim Creek Planning area this has lead to a certain level of intermittency and a few discontinuous channels that are indistinguishable in places and can be characterized as dry draws.

Humans have influenced the landscape of the Pilgrim Creek planning area through timber harvest, road building, cattle grazing, rangeland conversion, human induced fire and fire suppression. These actions influenced the local drainage networks flow, quality and timing.

Most timber harvest in the 1950s through the 1980s has vegetatively recovered from the perspective of hydrology. Effects of projects implemented in the area more than 50 years ago have improved due to revegetation and would not contribute to sedimentation or cause changes in channel morphology. Many of the older, abandoned road systems are stable and well vegetated. Some existing open roads have BMPs in place, while other segments lack road surface drainage entirely. The condition of stream crossings and culverts in the drainage vary from being adequately sized to being blocked and undersized (reference road logs/surveys).

Harvest activities in the 1950s thru the 1980s included approximately 3570 acres of harvest, and are responsible for most of the water yield increases noticed today. Peak flows in Pilgrim Creek are currently estimated to be 2% over natural conditions. These types of peak flows are not generally considered excessive. Roads built and used for sale activities in this period were constructed and maintained with a lesser understanding of the importance of surface water management, and are still producing sediment and routing surface flow to channels in some places. Specific treated acres from this period by decade include:

1950s – Approximately 90 acres of regeneration harvest

1960s – Approximately 1000 acres of regeneration and intermediate harvest

1970s – Approximately 800 acres of intermediate harvest

1980s – Approximately 400 acres of regeneration and intermediate harvest

1990s – Approximately 1200 acres of regeneration and intermediate harvest

2000s – Approximately 80 acres of intermediate harvest

Effects from past activities are still evident in some of the stream channels within the Pilgrim Creek project area such as the lack of adequate riparian vegetation, bank destabilization and overwidened conditions.

Riparian zone conversion of forest to rangeland in some areas has played a role in channel stability in perennial sections of Pilgrim Creek. For example, private land clearing and pasture creation have affected siltation and stream stability within the mainstem of Pilgrim Creek.

Typical stream and riparian responses to historical mining disturbance observed in heavy use areas in the Lower Clark Fork area include lack of large woody debris and other woody riparian vegetation, decreased sinuosity, increased stream energy, and disrupted streambeds and banks. In some instances stream stability is compromised. This scenario is not currently occurring in and around the active mining claims in the Pilgrim Creek project area.

There is one active lode claim in the West Fork of Pilgrim Creek, the Holliday mine. Two adits were constructed and last worked in 1971. A 1999 abandoned mines water quality survey suggested that water samples were within water quality standards, but soil samples at the waste dump showed elevated levels of arsenic, cadmium, copper, lead, and zinc.

A collaborative watershed assessment of the Pilgrim Creek drainage (2004) outlined the existing watershed and fisheries condition, prioritized restoration locations, and currently acts as a conceptual planning document for watershed restoration. From 2006 to present approximately 3000 lineal feet of channel has been restored in the mainstem and the West Fork of Pilgrim Creek. More work may be completed in the future upon available funding.

Reference Conditions

Pilgrim Creek is affected by excessive in-channel sediment and continued sediment delivery from bank erosion. Historic and recent sediment delivery to the channel has been linked to natural catastrophic fire and flood events, as well as timber harvest, agriculture, grazing practices, and the forest road network during the twentieth century.

The fires of 1910 burned a wide swath across Idaho and western Montana. Removal of large diameter western red cedars from the riparian zone before and following the fire decreased Pilgrim Creek's resilience to the high magnitude floods that followed in 1916. Floodwater-related erosion delivered a substantial volume of sediment to Pilgrim Creek. Subsequent floods have transported this pulse of sediment downstream, and unstable channel conditions and degraded aquatic habitat have been left as a reminder of the 1910 fires and early harvest activities.

Riparian vegetation and stream-modifying land use activities have further destabilized Pilgrim Creek. Reports of instream bull dozing in the 1970s and mechanical vegetation removal have slowed the recovery of Pilgrim Creek to a more stable condition. Coupled with relatively frequent floods, channel modification measures aggravate bank erosion and simplify aquatic habitat (RDG/USFS 2004).

Desirable hydrologic and aquatic conditions within the Pilgrim Creek planning area include channel characteristics that are currently not present. Natural stream channel stability is achieved by allowing the river to develop a stable dimension, pattern and profile such that, over time, channel features are maintained and the stream system neither aggrades nor degrades (Rosgen, 1996). When a stream laterally migrates, but maintains its bankfull width and width/depth ratio, stability is achieved even though the river is considered to be an "active" and "dynamic" system (Rosgen, 1996). Some stream segments in and around the Pilgrim Creek project area currently display these characteristics while others currently display unstable characteristics.

Existing Conditions

Hydrologic

Pilgrim Creek is located in the northwest corner of the lower Clark Fork River basin. The project area consists of sixteen 7th code hydrologic unit code (HUC) watersheds (Figure 3.8). These watersheds range in size from 505 acres to 6482 acres in size (Table 3.48) and the entire project area is composed of 1st, 2nd and 3rd order drainages. There are two dominant perennial channels in this project area, the mainstem of Pilgrim Creek and the mainstem of Stevens Creek.

Aspects throughout the basins are predominantly high energy, low elevation (generally south, southwest, and northwest). Average upland slopes exceed 60% in headwater cirques and diminish to less than 1% in valley bottoms. Elevations in the area vary from 6,129' to 2,175' at the mouth of Pilgrim Creek.

Smeads Creek and Hemlock Gulch display ephemeral channel characteristics in locations that do not show signs of continuous connectivity and have predominantly dry draw characteristics.

Some small seeps and springs have been identified on Federal land within the project area. One fairly extensive 15 acre marsh exists around the Smeads bench area of the project. This area also exists on Federal land within the project area.

Climatic

Like most of the Kootenai National Forest, the contemporary climatic condition for the project area is a combination of continental and maritime influences. The maritime patterns originate primarily from the flow of warm, moist air masses from the west and the Pacific Ocean. One result is the gentle, steady, "soaking" rains in the fall and winter which are typically accompanied by cloudy skies with small diurnal temperature changes.

The summers are typically warm and dry, with significant cooling at night. The predictable summer drought, usually occurring sometime in July and August, is a defining characteristic of the local, temperate climate. Continental effects are reflected in occasional cold periods in the winter, typically associated with northerly or arctic weather systems, and the hot, dry summer periods associated with high-pressure systems. These overlapping climatic provinces often create "rain-on-snow" events in the late fall and winter, when two to three days of continuous rain falls on a snowpack causing flooding. The precipitation for the Pilgrim Creek project area ranges from 33 to 53 inches annually. At the upper elevations, the majority of this precipitation comes in the form of snow between late October and late March.

The Pilgrim Creek watershed is a third order tributary. Existing channel conditions within the response reaches in the Pilgrim Creek watershed are discussed in detail below. Summaries below are from excerpts taken from the Pilgrim Creek watershed assessment completed in 2004.

Existing Peak Flow Increases

Equivalent Clearcut Area (ECA) and Peak Flow Increase (PFI) analyses have been completed for the Pilgrim Creek planning area. Historical land use practices such as timber harvest, road building, and prescribed and wildland fire have been reviewed for the period of record by each stand within the Pilgrim Creek planning area. The current percent ECA and PFI for each seventh code HUC (hydrologic unit code) within the Pilgrim Creek planning area has been assessed (see Table 3.49) along with current stream survey information, which was used to establish Recommended Peak Flow Increases (RPFIs) and arrive at the Allowable Clearcut Equivalent (ACE).

The existing PFI mostly relates to management induced effects and has not been tremendously influenced from past and current natural events such as wildfire and insects and disease. Most major fire events have long since recovered hydrologically and are currently not producing noticeable effects to the existing PFI in the Pilgrim Creek drainage. Most of the beetle kill areas are in small pockets and the current literature mentioned below supports that this type of scenario doesn’t greatly affect PFIs at the watershed scale.

Current stand conditions in the Pilgrim Creek planning area include spatially intermittent lodgepole pine stands that show potential signs of future pine beetle mortality. This potential directly relates to the noticeable “pitching out” of individual trees. Of the sections in the drainage that appear to have this pine beetle influence, a field survey in 2010 revealed approximately 51% of these areas are composed of live green trees (predominantly lodgepole pine with mixed conifers) with pitch tubes. 10-15% of these areas consist of dead trees with red needles

beginning to fall off, or “red phase” trees, in sporadic clumps that are intermixed with the live mixed conifer trees mentioned above (personal communication, Smith, District Silviculturist).

Recent and ongoing studies around the Pacific Northwest and the high elevation areas of Colorado have attempted to deal with the relationship between pine beetle infestations and the associated impacts on snow accumulation and melt. A British Columbia study has shown that during this red phase, specifically in a 2500 m^2 homogeneous red phase stand, the snowpack was depleted on average 2 days earlier than that of green stands, and ranged from 0 to 3 days in mature (40-120 year) lodgepole stands (Winkler, 2010).

Results from a Colorado study indicated that snowpack depletion was 1 week earlier under red phase stands, and that snow accumulation and the associated Snow Water Equivalent (SWE) was similar under living green and red phase stands. Therefore the net input of water from snowmelt to the soil system in this scenario was unchanged. Snow accumulation under a similar sized seamless “grey” phase (or standing dead stand lacking needles) stand in this study was roughly 15% greater than that under a green live stand and was directly linked to a 6% increase in canopy transmission of solar radiation (Pugh, 2011). Results from an additional watershed scale study in Northern Colorado suggested similar outcomes in terms of increases in snowpack under grey phase stands but stated that peak flow increases were not always associated with increased annual water yields from grey stands and that although an earlier timing of the peak flow was noticed in some areas there was no change in the size of the peak flow (Stednick, 2007).

A study done by Schmid (2007) in Colorado found insignificant differences in net precipitation between smaller sized (5-20 tree groups) infested (grey phase) and noninfested stands (Schmid, 2007).These stand-scale results produced from the mentioned studies can be used to suggest possible watershed-scale response. Given that the Pilgrim Creek watershed harbors a complex of alive, dead and potentially dying stands in small pockets of lodgepole pine throughout the landscape, and not so much of a homogenous seamless red or grey phase stand, it can be assumed that the presence of the pine beetle has not influenced snow accumulation or existing PFIs. Should these areas become a seamless dead (grey phase) stand and not occur in small pockets, the effects to water yield most likely will not affect PFIs. There is a commonality in current research surrounding this topic. Most studies agree that slight changes in runoff timing may be noticed from a seamless dead stand at the landscape level, but there will be no change in the magnitude or duration of the PFI (Lucas, 2010), which is the more prominent driving factor in channel stability.

Other past activities such as trail building are not measurably affecting water yield in the project watersheds. Timber harvest and road building are the main contributors to current Equivalent Clear-cut Acreage (ECA) values in all project watersheds (Table 3-50).

Table 3-50. Water Yield Existing Condition and Established RPFIs

HUC7 Basin	Acres	% Basin in Clearcut Condition	Existing PFI (%)	Max RPFI (above existing)
Noxon Reservoir Tributary 511	1049	4	3	0
Stevens Creek	6482	6	4	4
Cabinet Gorge Tributary 806	2783	0	0	0
Telegraph Creek	2425	3	2	2
South Fork Pilgrim Creek	4399	7	5	2
Skeleton Creek	1419	2	2	10
West Fork Pilgrim Creek	3235	6	4	7
Pilgrim Creek Mainstem	3559	1	1	0
Pilgrim Creek Tributary 207	575	0	0	0
Baxter Gulch	1389	0	0	0
Cabinet Gorge Tributary 813	2881	3	2	0
Fourmile Gulch	773	0	0	0
Fivemile Gulch (Trib 205)	594	0	0	0
Smeads Creek	2339	28	18	0
Hemlock Gulch	505	21	13	6
Cabinet Gorge Tributary 823	2195	18	12	0
Whole South Fork (SF+Telegraph)	6824	6	4	1
Whole West Fork (WF+Skeleton)	4654	5	3	5
Whole Pilgrim	18368	4	2	2

Existing Channel Conditions – Pilgrim Creek Project Area

Response Reach

A response reach is the section of a channel within the basin that warrants the most attention. These areas have the highest potential for effects within the basin and allow the analysis to cover the worst-case scenario. The loss of large diameter trees within areas of Pilgrim Creek mentioned above, both from fires and riparian harvest, has affected the stability these response reaches to some degree. Most response reaches within the Pilgrim creek drainage are composed of gravel and some cobble alluvial banks. Private as well as National Forest land practices on these landtypes have played a role in the stability of these response reach locations.

Response Reach - Mainstem of Pilgrim Creek – Reach 2

Pilgrim Creek on the Riley Creek Lumber property contains both stable and actively migrating areas. Entering the property, Pilgrim Creek braids and a recently formed channel was observed. The new channel, likely formed during the 1997 flood, cut off an outside meander and shortened the channel length. Downstream of the avulsion, Pilgrim Creek returns to a narrow, stable C stream type exhibiting reference characteristics. Some channel widening has occurred due to bank erosion and channel migration (RDG/USFS 2004).

The riparian zone supports an overstory of multi-aged cedars and an understory of alder dogwood, and hawthorn. In general, the riparian community is vigorous and diverse. There are

some reaches with poor vegetative coverage and reaches where the plant community is dominated by knapweed and/or reed canary grass. These sites are more susceptible to bank erosion due to poor rooting depth and root mass area. An eroding terrace towards the bottom of the property has revegetated and appears to now be stable. Near the property boundary Pilgrim Creek returns to“B” stream type morphology (RDG/USFS 2004).

Response Reach – West Fork of Pilgrim Creek – Reach 1

Approaching the confluence with the South Fork of Pilgrim Creek, WFPC experiences a moderate transition as fewer boulders armor the channel margins and stream bed. The low bank rock content and shallowly rooted woody shrubs have resulted in accelerated bank erosion. Continuous raw banks are present throughout the lower portion of the reach to the confluence with the South Fork and reflect the transition to an alluvial valley type. Bank rock content consists predominantly of round gravel 3 inches to 6 inches in diameter. In the vicinity of the mouth of the West Fork, past riparian harvest of large diameter cedar trees has also played a role reducing stream bank integrity. Numerous small mass wasting sites are likely activated during normal high flows, contributing fine sediment to the stream. Aggradation influences stream flow in sections and results in channel dewatering. Lower WFPC transitions between B3 and G3/4 stream types based on degree of vertical incision and entrenchment (RDG/USFS 2004).

Response Reach – Skeleton Creek – Reach 1

The lower portion of Skeleton Creek is characterized as a B4a stream type. The stream channel is moderately entrenched with small mass wasting sites primarily located at outside meanders and constrictions. Skeleton Creek appears to adequately convey peak flows although occasional rain-on-snow events likely affects flow and sediment transport processes. Large woody debris is common throughout this reach and provides for added channel structure and habitat. The cover of devils club and other riparian species in this area indicates that this basin routinely experiences higher annual precipitation than other areas within the Pilgrim Creek Physiographic Area.

Response Reach – South Fork of Pilgrim Creek – Reach 1

The effects of riparian harvest are pronounced downstream of the Telegraph Creek confluence where large diameter cedar stumps line the channel. Where vegetation has been removed, the channel has degraded, widened, and subsequently braided resulting in its current impaired condition. Active bank erosion contributes sediment to the load delivered from upstream SFPC reaches and Telegraph Creek. Poor woody debris recruitment further impairs channel stability and aquatic habitat creation.

As SFPC approaches the confluence with WFPC, the effects of riparian logging, sediment delivery, and woody debris deficiencies are apparent. Infrequent pools suggest pool filling resulting from upstream sediment delivery. Large woody debris accumulations, necessary for scour pool formation and bank protection, are absent. In spite of these problems, the recovery of large woody shrubs has improved bank cohesion and will likely improve the future recruitment of large woody debris to the channel as the riparian corridor recovers from past riparian harvests (RDG/USFS 2004).

Response Reach – Telegraph Creek – Reach 1

Historical aerial photographs from 1947 exhibit the effects of riparian logging that was well underway in Telegraph Creek by the 1940s. Significant channel disturbance appears as high reflectance bed deposits in the aerial photographs. A road system appeared to parallel Telegraph Creek for a substantial portion of the lower and middle watershed. Presently, bedload deposits are frequent and greater than 50 percent of the channel substrate appears to be mobilized on an annual basis. Log sediment traps are virtually non-existent because of the lack of large woody debris throughout this reach. Channel aggradation has resulted in an over-widened channel incapable of conveying the average annual (bankfull) discharge. These conditions result in a more frequent disturbance regime, lower instream shear stress incapable of transporting the sizeable bedload, poor aquatic habitat, and inadequate riparian vegetation recruitment. The existing condition of Telegraph Creek is a reflection of the historic fires of 1910 and human land management. A large proportion of the watershed is treeless, increasing the effects of periodic rain-on-snow events that deliver large volumes of water to Pilgrim Creek over short periods of time, resulting in widespread bank erosion and sediment delivery. Vegetation recovery has secured some of the historical sediment sources, although delivery from the sources continues to impact SFPC and mainstem Pilgrim Creek. No harvest or road building is proposed in the Telegraph Creek drainage.

Dry draws and other intermittent basins

Basins within the project area that exhibit no surface water connectivity to downstream water-bodies include: Smeads Creek, Hemlock Gulch, Four Mile Gulch, Baxter Gulch, Trib 207, and Trib 511. Tribs 806, 823, 813 and 511 are face tributaries to the Noxon Reservoir. The predicted stability of these dry basins have been evaluated by the District Hydrologist. Stability is generally good due to the lack of discernible channel characteristics and subsequent lack of surface water connectivity. These areas will be discussed in terms of the effects of the proposed activities and their potential of creating a newly scoured channel that in turn could transport sediment downstream to adjoining tributaries. Five-mile gulch connects seasonally to the mainstem of Pilgrim Creek and is an intermittent draw.

Response Reach - Smeads Creek – Reach 1

One half mile above the Forest Development Road (FDR) 2706 crossing, Smeads Creek turns into a seasonal wetland that acts as a series of small low gradient overflow channels. These almost indistinguishable waterways route local snow melt to small lowland areas that act as catch basins, which due to the hummocky landform and inadequate drainage pattern, drain in and of itself for eventual percolation through the predominantly silt/clay landtype. None of the seasonal water in this area is noticed to run off of this area as surface drainage, more so as groundwater seepage. The landtype on the lower Smeads terrace (108) has had drainage characteristic similarities, or lack of, in different locations of the Lower Clark Fork drainage, when valley slopes of 0-5% are noticed.

The soils within these lowlands display slightly gleyed and mottled characteristics, and early summer field surveys of an average water year have indicated seasonal wetland qualities. Cedar/hemlock with grand fir is the predominant overstory here with scattered pockets of black cottonwood and water birch in the wet lower elevation areas. These lowlands tend to have higher silt/clay content in the subsurface soils than that of the soils in the hummocks, which is a more productive, relatively undisturbed, gravelly sandy loam with an ash surface layer.

From this point to the mouth no defined stream channel can be distinguished. Changes in slope occur as this dry draw dives off this Lake Missoula terrace at slopes of almost 20% to the Cabinet Gorge reservoir. No active live connectivity exists from the seasonal wetlands mentioned above FDR 2706 to the reservoir below (approximately .75 miles).

Response Reach - Hemlock Gulch – Reach 1

Hemlock gulch acts as a “dry draw” tributary to Smeads Creek. Past harvest and road construction in this small area has not affected channel conditions. Surface water connectivity does not exist between Hemlock Gulch and Smeads Creek. Although intermittent channel characteristics exist mid-basin, the lower half of Hemlock Gulch experiences dry draw characteristics where no channel scour, hydrophilic vegetation or wetland hydrology exist.

Response Reach - Four Mile Gulch – Reach 1

This roadless area exists mid-basin in the Pilgrim Creek watershed. Four-mile gulch is an intermittent stream that connects to the alluvial floodplain of the mainstem but does not currently reach Pilgrim Creek. The majority of reach 1 exists on private land within a hay field. Some instability exists related to lack of bank strength but as mentioned above does not convey surface flow or sediment to the mainstem of Pilgrim. With the exception of prescribed burning, no activities are planned in the Four mile gulch watershed.

Response Reach - Baxter Gulch – Reach 1

Although it was thought to have historically conveyed flows to Pilgrim Creek, Baxter Gulch, an ephemeral stream, currently has no defined channel that connects to the mainstem of Pilgrim Creek (RDG-USDA, 2004). No activities are planned in the Baxter Gulch basin.

Response Reach - Trib 806 – Reach 1

This tributary to Pilgrim Creek is also a roadless basin with dry draw characteristics. With the exception of prescribed burning, no activities are planned in the Trib 806 basin.

Response Reach – Five Mile Gulch – Reach 1

Intermittent channel characteristics persist in this roadless basin and convey flow to the mainstem in the spring months. Channel stability is good within this B4 section of channel. With the exception of prescribed burning, no activities are planned in the Five Mile Gulch watershed.

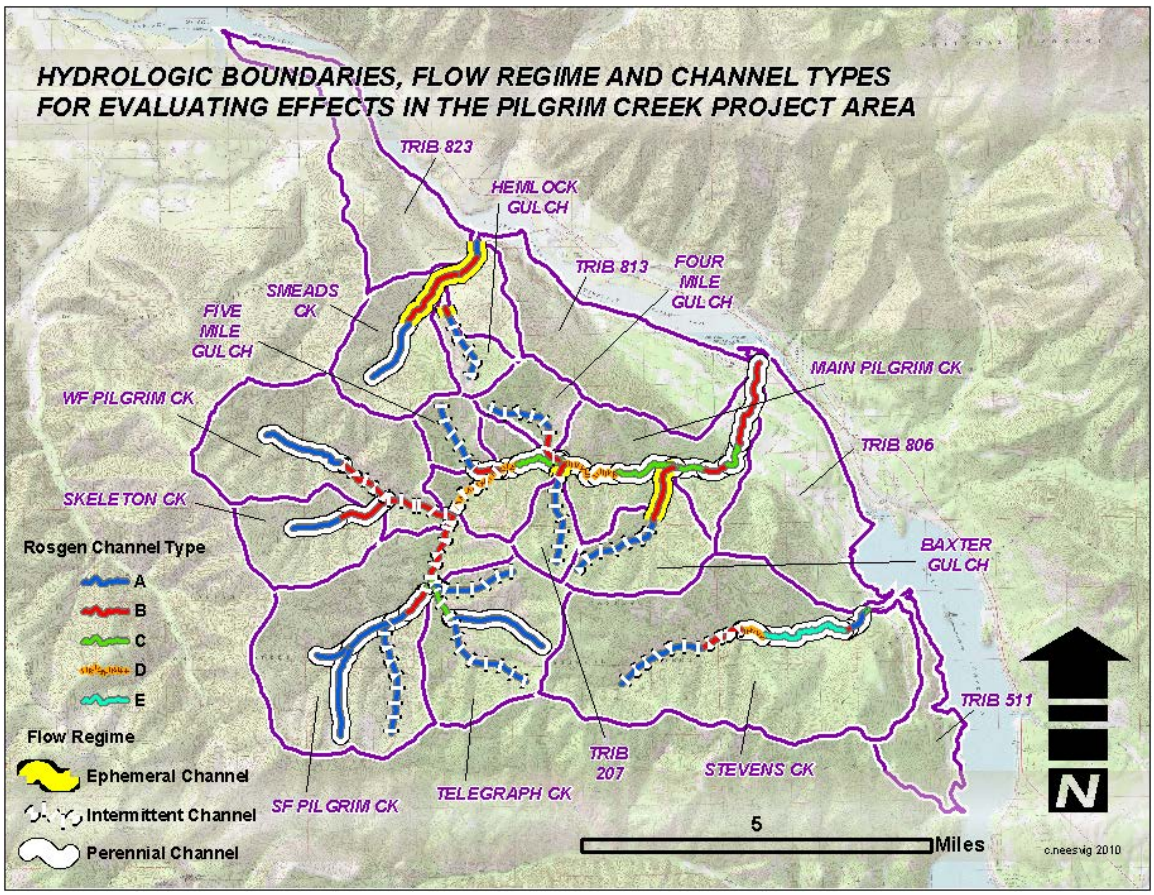


Figure 3-19. Channel types and flow regimes for evaluating effects in the Pilgrim Creek Project Area.

Table 3-51. Channel Conditions in the Pilgrim Creek Project Area. Sensitivity, Recovery, and Bank Erosion Potential taken from Rosgen (1996).

Watershed Name	Response Reach Number	Rosgen Type	Flow Regime	Watershed Acres	Channel W/D (Riffle)	Pilgrim reference W/D (Riffle)	Dimensionless W/D (Channel W/D) / (Reference W/D)	Channel Stability based on Dimensionless W/D	Sensitivity Potential	Recovery Potential	Bank Erosion Potential	Existing Pfankuch Channel Stability
Smeads Creek	1	NA	dry draw	2339	NA	NA	NA	NA	Low	Excellent	Low	good
Hemlock Gulch	1	NA	dry draw	505	NA	NA	NA	NA	Low	Excellent	Low	good
West Fork Pilgrim Creek	1	B4	Intermittent	3235	19	20	0.95	Stable	Mod	Excellent	Low	poor
Five Mile Gulch	1	B4	Intermittent	594	20	20	1.00	Stable	Mod	Excellent	Low	fair
Four Mile Gulch	1	NA	dry draw	773	NA	NA	NA	NA	Low	Excellent	Low	good
Skeleton Creek	1	B4	perennial	1419	24	20	1.20	Mod Unstable	Mod	Excellent	Low	poor
Trib 207	1	NA	dry draw	575	NA	NA	NA	NA	Low	Excellent	Low	good
Baxter Gulch	1	B4	ephemeral	1389	18	20	0.90	Stable	Mod	Excellent	Low	fair
South Fork Pilgrim Creek	1	B4	Intermittent	4399	15	20	0.75	Mod Unstable	Mod	Excellent	Low	poor
Telegraph Creek	1	C4	Intermittent	2425	14	18	0.78	Mod Unstable	VHigh	Good	VHigh	poor
Stevens Creek	4	E6	perennial	6482	9	9	1.00	Stable	VHigh	Good	Mod	fair
Main Pilgrim Creek	2	C4	perennial	18368	21	18	1.17	Stable	VHigh	Good	VHigh	fair

Existing Upland Sediment Contributions

There is an established road network within the project area. These roads have been used over the years for forest management as well as recreational access. Some of these roads are open year round while others have gated closure devices to limit use. Both types of roads have the potential to transport fine sediment to stream channels. Based on road surveys of all the segments within the planning area, and recommendations from the 2004 watershed assessment, sediment modeling focused solely on the proposed haul routes within the planning area.

Table 3-52. Existing annual sediment contributions from proposed haul routes.

Road ID	Sediment Leaving Buffer (tons/yr.)
149	3.1500
2719	0.0005
2746	0.0365
2744	17.6335
2744C	1.3500
2744D	3.0875
2706	1.2800
TOTAL	**26.546**

The road sediment contributed from these current networks has been calculated using the USFS WEPP model. In general the existing condition of the planning area in terms of road derived sediment is considered in relatively good condition. To put the total of 26 tons into context, a single naturally occurring streamside mass wasting site exists within the West Fork of Pilgrim Creek. This site is approximately 50 feet long by 35 feet high and annually contributes approximately 125 tons a year. Several of these types of sites have been surveyed within the project area.

Existing Total Road Density

The project area has a few basins with current road densities that are “High” relative to the findings on the Kootenai National Forest (KNF, 2003).

Table 3-53. TRD Existing Condition

HUC7 Basin	Size (sq mi)	MAP (in)	Miles of road	TRD	Classification
Noxon Reservoir Tributary 511	1.6	38	4.0	2.5	Mod
Stevens Creek	10.1	43	26.1	2.6	Mod
Cabinet Gorge Tributary 806	4.3	38	25.9	5.9	**High**
Telegraph Creek	3.8	48	6.3	1.7	Low
South Fork Pilgrim Creek	6.9	49	39.6	5.8	**High**
Skeleton Creek	2.2	48	2.1	1.0	Low
West Fork Pilgrim Creek	5.1	49	18.5	3.7	**High**
Pilgrim Creek Mainstem	5.6	42	10.9	2.0	Mod
Pilgrim Creek Tributary 207	0.9	45	0.0	0.0	Low
Baxter Gulch	2.2	43	1.8	0.8	Low
Cabinet Gorge Tributary 813	4.5	37	14.6	3.2	Mod
Fourmile Gulch	1.2	43	0.2	0.2	Low
Fivemile Gulch (Trib 205)	0.9	45	0.1	0.1	Low
Smeads Creek	3.7	45	9.6	2.6	Mod
Hemlock Gulch	0.8	48	9.1	11.5	**High**
Cabinet Gorge Tributary 823	3.4	43	10.3	3.0	Mod
Whole South Fork (SF+Telegraph)	10.7	49	45.9	4.3	**High**
Whole West Fork (WF+Skeleton)	7.3	49	20.6	2.8	Mod
Whole Pilgrim	28.7	45	79.5	2.8	Mod

The majority of the roads in the project area are grown-in and no longer have exposed surfaces that contribute sediment to nearby streams. When only drivable roads are considered, open road densities in the project area fall tremendously. These values are closer to more desirable conditions, but even under these considerations the road density still appears high in the Hemlock Gulch drainage. This drainage has a mid-basin intermittent channel that does not support fish and exhibits dry draw characteristics near the mouth. Hemlock Gulch does not allow surface connectivity to any other water course. The other basins with “High” Total Road Densities (TRDs) consist of mostly the grown-in roads mentioned above and have all been field surveyed by a trained hydrology crew. Surveys outlined where problems were occurring and needed road improvements are expected to occur at those sites within this project. Considering these circumstances all TRDs in the project area basins are in compliance with the Kootenai National Forest direction.

Environmental Consequences

Effects are discussed within the context of current research and take into consideration the project assessment indicators for water issues. Potential effects of the treatment activities are discussed considering all management requirements, mitigation measures, and monitoring requirements. Cumulative effects are assessed for the watersheds that are potentially most affected by the proposed actions.

Direct and Indirect Effects

Each of the following will be considered as criteria for measuring effects and be discussed in the context of protection of beneficial uses:

1) **Peak Flow Increases**

2) **Stream channel processes** (descriptive)

3) **Water quality** (sediment reduction potential as measured by % reduction (tons) related to road drainage improvements and changes in total road density).

These discussions will be followed by a summary of how the alternatives comply with the CWA and support beneficial uses.

Peak Flow Increase Discussion

Increases in water yield can result in changes to both peak and base flows. Peak flow increases resulting from forest management activities are important because peak flows provide the maximum energy for erosion, transport, and deposition of sediment in stream channels.

In northwest Montana, increases in peak flows are primarily due to modifications in snow accumulation, road network water routing, snowmelt runoff, and to changes in evapotranspiration rates. Research has shown that similar changes can result from regeneration harvest treatments (Forest Hydrology Part II, 1973).

Spring peak flows in the analysis area normally occur in April and May, and sometimes into June. High flows can occur throughout the year in response to precipitation events. The timing, magnitude, and duration of runoff events may be changed when vegetation is manipulated by management activities or altered by natural disturbance processes.

Stream Channel Processes Discussion

Channel processes will be discussed in terms of the response to increases in water yield and related issues of channel instability. Increases in water yield can affect channel shape, function, and bank stability. Peak flow increases and their relationship with channel processes are important because peak flows provide the maximum energy for erosion, transport, and deposition of substrate in stream channels. These transport relationships can ultimately affect channel function, process and long-term stability.

Water Quality Discussion

As specified in the Clean Water Act of 1972 and subsequent amendments, water quality includes all attributes that affect existing and designated uses of a water body. In the Pilgrim Creek Analysis Area, non-point sources of pollution have the highest potential for degraded water quality. A non-point source of pollution is water pollution from a diffuse source. These can best be controlled through proper soil, water, and land management practices (see USFS Soil and Water Conservation Practices (SWCP's), which meet intent of including Montana State Best Management Practices, or BMPs). Of the types of non-point source pollution in this basin, it has been concluded that fine sediment has been found to be the most important. Field surveys by Forest Service personnel support these results.

Timber harvest activities have the potential to create soil disturbance and increase overland flow, resulting in soil erosion and sediment delivery to streams. Research has shown that the level of sediment production resulting from timber harvest is dependent on the level of implementation planning and attention to site-specific conditions (Chamberlin et al., 1991). Each harvest unit in each alternative has been individually planned and would have site-specific BMPs applied in order to minimize sediment production. BMP effectiveness on the Kootenai has been monitored and is shown to be 95 percent effective in reducing sediment (KNF 2011).

Under all action alternatives, road drainage improvements would be completed on prioritized locations within all haul routes in the planning area. The percent sediment reduction has been modeled through the use of the USDA WEPP erosion model.

Effects of the No-Action Alternative

Peak Flow Increases

Alternative 1 (No Action) would not increase water yield or PFI's as no harvest would result from this alternative. Existing peak flows would moderate as previously harvested units recover from past disturbances. A catastrophic wildfire could potentially halt or reverse this peak flow recovery depending on its severity and distribution. There would be no new road construction and existing roads would continue to collect and route surface flow in the project area.

Stream Channel Processes

Alternative 1 would not implement any of the proposed activities, including timber harvest, and road drainage improvements. Should none of the road drainage improvements be implemented an inherent risk still exists related to the potential road failure at these sites and the related sedimentation from these failures could cause localized negative channel changes such as aggradation, overwidening and channel avulsions. Some BMP work (annual maintenance) is likely and will continue throughout the drainage at a much slower rate due to the lack of funds. Thus no effect on stream channel processes is anticipated under this alternative.

Water Quality

The No Action Alternative would result in no management activity impacts to water quality. There would be no increases in PFIs and no risk of increased bank erosion. Because there would be no harvest activity, there would be no risk of additional erosion on harvested areas. Road improvements would not occur, but road maintenance would continue and sediment contributions from roads would remain about the same as today. Providing a catostophic fire does not consume a majority of these basins the ECAs would continue to moderate as previously harvested units recover vegetatively.

Effects of the Action Alternatives

Common Effects

Numerous studies have shown timber harvest, and related road construction, can alter streamflows (Jones and Grant 1996; King 1989). Harvested areas accumulate more snow, and that snow melts more quickly than in forested areas (Cheng 1989). Roads and skid roads

intercept subsurface and surface water, and redirect runoff more rapidly to stream channels (Megahan 1972; Burroughs and others 1972). These alterations in the watershed's hydrologic processes can change the duration, magnitude, and timing of streamflow as compared to natural flow regimes. Increases in magnitude or duration of peak streamflow can change stream channel conditions. Typical adjustments to increased peak flows are increased channel scour in the steeper reaches, and increased deposition of the resulting sediment in the flatter reaches.

Stream channel conditions are a function of the upland watershed's natural characteristics, changes related to land management activities, the inherent stream channel sensitivity, and the recent stream channel disturbance history. The potential for increased streamflow to cause channel erosion depends on the stream channel type and condition. The relative sensitivity of a channel to disturbance depends on a number of factors including stream gradient, size and shape of substrate, bank stability, and access to floodplain and overflow channels. Sensitivity to erosion varies among stream reaches. Stable channel segments have a higher potential to withstand sizable flood events without a major change in overall condition whereas channels that are in an unstable condition may be measurably degraded by relatively small runoff events.

The potential effect of natural or management induced changes in water yield can be predicted by calculating the equivalent clearcut area (ECA) of a watershed. ECA is the total area within a drainage that exists in an equivalent clearcut condition in a given year (USDA Forest Hydrology Part II, 1973). As ECA increases, peak flow increases, which can cause changes in duration, frequency, timing, and magnitudes of streamflows (King 1989). ECA is used by itself as an indicator for changes in peak flow, and also as input data for water yield models that predict changes in streamflows based on watershed characteristics.

As regeneration occurs after timber harvest or wildfire, ECA and water yield decline. The rate of this decline, or recovery, depends on habitat type. Full recovery periods take 80 to140 years depending on habitat type. However, the bulk of the recovery occurs in the early part of this period. Eighty percent recovery is achieved in 30 to 60 years depending on habitat type. One hundred percent recovery would be achieved in 40 to 75 years and is also habitat dependent. Most of the habitat types in the Pilgrim Creek project area are in the high recovery group.

Thinning results in substantially less ECA than regeneration cuts. For example, a typical thinning with a 40 percent crown removal would only result in a 25 percent increase in ECA. Furthermore, recovery in thinned stands occurs much more rapidly than clearcuts because the remaining trees usually respond to the lack of competition with accelerated growth. A commercial thinning can recover in as little as ten years (Galbraith, 1973).

The ECA of a watershed indicates potential for change in streamflow, but actual effects vary by watershed. Streams in watersheds of the same size, and similar ECA, can have different levels of response. Natural factors such as soils, topography, and geology affect the proportion of surface flow to subsurface flow. Watersheds with a relatively high natural subsurface flow have fewer and less developed scour channels. Since subsurface water takes longer than surface water to reach stream channels, it dampens the effect precipitation events have on streamflow.

The ECA due to more continuous harvest, combined with the increased efficiency of water routing on skid trails and roads, can, at elevated levels, cause a more moderate, longer increase in peak streamflows in a managed watershed. This is in contrast to the historic pulse nature of wildfire-induced increases in ECA that may have been quite dramatic, but then had periods of complete recovery.

Roads related to harvest activities may fail when unstable fill slopes become saturated. Typical causes are ponded water in the ditch or on the roadbed, water running off the road over the fill slope, or water saturating the fill over an undersized or plugged culvert. Failures may result in debris flows that add substantial quantities of sediment to the stream.

Peak Flow Increases

The action alternatives would increase PFIs above existing levels. None of the alternatives are expected to raise peak flows to the point of creating a newly scoured channel or allow connectivity to other water courses in the project area. This is especially important within the dry draws and intermittent basins in the planning area. The projected peak flows are not expected to cause streambanks to erode and lead to sedimentation. Although channels will maintain their existing integrity, some slight effects related to the quantity and timing of runoff may be realized in the perennial sections. A portion of the proposed units exist on aspects that usually hold snowpack later in the spring. Harvest in these areas may increase thermal inputs and allow for a slightly earlier runoff. Should this scenario play out, it could potentially lead to more available water in the spring and less available water later in the summer months. This scenario happens more often with regeneration or clear-cut type harvests. Some of these effects can be expected in the regeneration units, but in the areas with commercial thinning presciptions, these water yield increases would be less likely (Galbraith, 1973).

The response reach in the mainstem of Pilgrim Creek exists below a large beaver dam complex. By the 1983 air photo, formerly irrigated pastures appeared to be more influenced by the rising water table than in earlier photographs. The braided channel condition continued in the 1992 and 1997 photographs as a beaver colony became more established and influenced a larger area. Currently this area acts a large sediment plug to the lower mainstem (RDG-USDA, 2004).

Under the proposed action, PFIs would increase to 5% within this response reach of Pilgrim Creek. This is within the recommended PFIs and with the existing beaver dam complex acting as a sediment plug, the increase of 3% over existing is not expected to affect sediment transport, channel stability, or beneficial uses within this reach. The adequate stability within the channel sections above this plug area can handle this type and magnitude of increase without undue effects. Due to the lack of direct or indirect effects from all action alternatives the activities proposed in the Pilgrim Creek planning area would maintain beneficial uses at existing levels. Table 3-54 displays the RPFIs and the modeled PFIs associated with each alternative in the Pilgrim Creek Analysis Area.

Table 3-54. Predicted changes in peak flows by alternative in the Pilgrim Creek Planning Area

HUC7 Basin	Acres	Existing PFI (%)	Rec. Max PFI (%)	Alt 1 (No Action) PFI (%)	Alt 2 Cum. PFI (%)	Alt 3 Cum. PFI (%)	Alt 4 Cum. PFI (%)	Alt 5 Cum. PFI (%)
Noxon Reservoir Tributary 511	1049	3	12	3	11	6	6	3
Stevens Creek	6482	4	8	4	8	8	7	7
Cabinet Gorge Tributary 806	2783	0	12	0	0	0	0	0

HUC7 Basin	Acres	Existing PFI (%)	Rec. Max PFI (%)	Alt 1 (No Action) PFI (%)	Alt 2 Cum. PFI (%)	Alt 3 Cum. PFI (%)	Alt 4 Cum. PFI (%)	Alt 5 Cum. PFI (%)
Telegraph Creek	2425	2	4	2	2	2	2	2
South Fork Pilgrim Creek	4399	5	8	5	8	7	7	7
Skeleton Creek	1419	2	12	2	5	11	4	2
West Fork Pilgrim Creek	3235	4	11	4	8	10	10	6
Pilgrim Creek Mainstem	3559	1	4	1	1	1	1	1
Pilgrim Creek Tributary 207	575	0	10	0	0	0	0	0
Baxter Gulch	1389	0	10	0	0	0	0	0
Cabinet Gorge Tributary 813	2881	2	3	2	2	2	2	2
Fourmile Gulch	773	0	8	0	0	0	0	0
Fivemile Gulch (Trib 205)	594	0	8	0	0	0	0	0
Smeads Creek	2339	18	23	18	22	23	22	21
Hemlock Gulch	505	13	21	13	14	14	14	14
Cabinet Gorge Tributary 823	2195	12	18	12	12	12	12	12
Whole South Fork (SF+Telegraph)	6824	4	7	4	6	5	5	5
Whole West Fork (WF+Skeleton)	4654	3	11	3	7	11	9	5
Whole Pilgrim	18368	2	5	2	4	5	5	4

- The numbers presented in Table 3-54 assume that all proposed harvest would occur in 2010. In reality, harvest would likely be implemented over a six-year period. Therefore, analysis presents a worst-case-scenario and effects are expected to be less than that discussed.

Under all action alternatives basins would see peak flows ranging from 4 to 23% (Table 3-54). Smeads Creek is the only basin that will see a peak flow over 20%. As mentioned earlier Smeads Creek is a dry draw that does not connect to other tributaries. The majority of the

basins in the planning area are dry draws that exhibit no active channel characteristics or connectivity to perennial or intermittent streams. The predicted stability of these dry basins have been evaluated by the District Hydrologist and is based on other field monitored basins within the Lower Clark Fork valley that display similar dry draw characteristics. These face tributaries would not scour from peak flow increases, and based on the current basin character the proposed peak flow would not likely result in adverse effects.

Reaches with channel types having Sensitivity Potential ratings of High or Very High and channel stability ratings of Fair (see Table 3-51 above) were considered potentially sensitive to increases in water delivery when setting RPFIs, as well as other parameters, and described in the analysis methods of this report. Predicted peakflows in all of the basins of the planning area are at or below established RPFIs.

Hydrologic field surveys were completed throughout the majority of the planning area. Based on the District Hydrologist reviews of these findings and other channel parameters such as width to depth ratio, bank stability, and sediment transport efficiency, it was concluded that these amounts of increases will not negatively affect these parameters and will protect beneficial uses in all basins.

Stream Channel Processes

All action alternatives would incorporate buffer strips where no harvest is allowed around all stream channels and wet areas within the Pilgrim Creek planning area (see table 3-55) below. These areas will also protect the thermal integrity of the wet areas and their surrounding riparian vegetation (Brooks et. al., 1997). The exclusion of heavy equipment and lack of vegetation removal in these areas will maintain channel integrity. However, the riparian areas will be disturbed for two crossing related to proposed new roads (see fisheries section additional analysis).The net decrease in sediment from the proposed BMPs should offset the long-term sediment effects to the West fork drainage from the two new crossings. Culvert upgrades will provide for additional benefits which include the reduction in the potential road failure associated with undersized culverts. Should all proposed BMPs and culvert upgrades be implemented the stream channel processes within the Pilgrim Creek planning area will not be affected by the proposed timber harvest as a result of implementation of any alternative.

Water Quality

When a forested area is harvested, a number of changes occur on a watershed that can change the concentrations of dissolved chemical constituents in streamflow. More logging residue (slash) is left in the harvest units contributing to the amount of decaying litter on the forest floor. Increased short-term nitrogen losses occur when this organic material is oxidized and not utilized by the forest vegetation that harvesting has removed. These nitrates either filter out downslope or leach into the adjacent stream channels or wet draws. Movement of these nitrates has been found to be directly related to the increases in water yield created by timber harvest. In areas that are not harvested, nitrate movement at this rate is not seen. Effects such as these can be expected and may be more noticeable within units with proposed regeneration type harvest than those of commercial thins in the Pilgrim Creek planning area.

Table 3-55. RHCA Default Buffer Widths

Flow Regime	Description	INFS Stream Class	INFS RHCA Width
Perennial	Perennial Fish Bearing Stream	1	300 feet on each side unless extended by ERV or slope
Perennial	Perennial Non-Fish Bearing Stream	2	150 feet on each side unless extended by ERV or slope
Wetlands	Lakes, ponds, and wetlands > 1ac.	3	150 feet on each side unless extended by ERV or slope
Intermittent/Ephemeral & Wetlands	Inter/Ephemeral Non-Fish Bearing Stream & wetlands < 1ac.	4	*50 feet on each side unless extended by ERV or slope

***** Default RHCAs are typically wider then SMZ buffers. However, for intermittent/ephemeral streams with adjacent slopes >35%, the SMZ law requires a buffer 100' or to a road or topographic break between 50' and 100'.
ERV = Edge of Riparian Vegetation

All harvest, fuels treatments and road construction activities would be conducted with strict adherence to all applicable BMPs. BMPs on the Kootenai have been effective 95 percent of the time (KNF 2011). These measures, combined with specified Design Criteria and adherence to INFS Standards and Guidelines within Riparian Habitat Conservation Areas (RHCAs) (USDA Forest Service, 1995), are fully expected to prevent any negative impacts on water quality or beneficial uses.

Studies of erosion and sediment transport in harvest units have shown that the application of BMPs, including the installation of skid trail drainage and riparian buffers, results in sediment retention within the harvest unit and riparian buffer (Croke et al., 1999; Wallbrink and Croke, 2002) and adequately protect streams from sediment and nitrate introduction. District and Forest reviews of BMP implementation and effectiveness support these findings.

Prescribed Burning

Peak Flow Increases

All prescribed burning activities proposed will be conducted within predetermined limits on fuel moisture, wind and other variables to prevent high intensity wildfire and limit incidental mortality to less than 18%. These activities will occur in springtime or late fall when naturally high fuel moistures will preclude high intensity fire occurrence. Mortality rates of 18% or less will be dispersed throughout each burn unit and would not add to the water yield projections related to the harvesting and road building activities. No direct or indirect effects are anticipated from prescribed burning that will influence water yield within the Pilgrim Creek planning area.

Stream Channel Processes

Prescribed burning may increase the risk of slope failures because of changes in soil properties, increased or concentrated runoff, and the lack of root strength. Slide material that reaches streams can scour channels, completely fill in pools, and reduce channel capacity causing bank erosion or overland flow. Fine sediment delivered by slides can adversely affect streams by increasing turbidity, accumulating in pools, and clogging interstitial spaces in gravel/cobble areas. These effects are not expected to occur within the project area. All prescribed burning

activities proposed will avoid direct ignition in RHCA buffers and occur in springtime or late fall when naturally high fuel moistures will preclude high intensity fire occurrence. No direct or indirect effects are anticipated from prescribed burning that will influence the channel processes of streams within the Pilgrim Creek planning area.

Water Quality

Several chemical constituents are likely to result from forest and rangeland burning and could affect surface waters. The primary ones of concern are nitrate (NO3 -1) and nitrite (NO2 -1). Sulfate, pH, total dissolved solids, chloride, iron, turbidity and several other constituents can also be affected, as can color, taste and smell by surface erosion. The potential for increased nitrate in streamflow occurs mainly because of accelerated mineralization and nitrification in soils after burning, as well as reduced plant demand. This effect is short-lived, usually lasting only a year or so (Landsburg, 2000).

Wildfires usually are more severe than prescribed fires, and as a result, they are more likely to produce significant effects on water quantity and quality. Prescribed fires are designed to be less severe and would be expected to have lesser effects. Use of prescribed fire allows the manager the opportunity to control the severity of the fire and to avoid creating large areas burned at high intensity (increased ECA's). The degree of fire severity is also related to the vegetation type. In forested environments, the magnitude of the effects of fire on water quantity and quality will probably be much lower after a prescribed fire than after a wildfire because less fuel is consumed in a prescribed fire.

Fire lines, particularly those that are created by bulldozers and excavators, are important potential sources of sediment and turbidity in streams. Improperly placed fire lines may provide direct channels for sediment into streams. Fire lines may be difficult to stabilize with vegetation because much of the nutrient-rich surface soil is cast aside. Hence, they are likely to be slow to revegetate with perennial vegetation. The proposed burning activities within the planning area will incorporate fire lines into the burn plan for safety purposes within each harvested unit adjacent to private property (see fire report). All of the lines made within the planning area will mostly be excavator dug line with some minimal line dug by hand. All of these lines will adhere to the RHCA guidelines mentioned above and incorporate Best Management Practices. Past studies have demonstrated that seeding fire lines with several species of introduced and native grasses have produced up to 85 percent foliar cover within 2 years (Landsburg, 2000).

With the incorporation of BMP's, RHCA's and the spring burning periods, no direct or indirect effects are anticipated from prescribed burning that will influence the water quality of streams or beneficial uses within the Pilgrim Creek planning area. District and Forest reviews of BMP implementation and effectiveness support these findings (District BMP review records on file and USDA Forest Service, 2002).

Road Construction and Best Management Practices (BMP'S)

Peak Flow Increases

Skid trails and roads reduce infiltration and intercept subsurface flow, converting it to surface flow. Skid trails and roads can become new "tributaries", and as such, route runoff more efficiently to the natural stream channels. Roads cause "interruption of hill slope drainage patterns (which) alter the timing and magnitude of peak flows and changes base stream discharge; and subsurface flows"... Factors that increase the effects of roads on peak flows

include road density, stream density, number of road/stream crossings, location of the roads within the drainage area, road grades, road design, and road conditions (Wemple 1994).

New permanent road construction is planned in the Pilgrim Creek planning area. The new road construction will add to the current ECA's within each basin (Table 3-55 above). The increases in water yield that are anticipated from the planned road construction will not negatively affect stream channels in the Pilgrim Creek project area.

Stream Channel Processes

No temporary roads or skid trails would cross or border any live water channels, wet areas, seeps or springs within the Pilgrim Creek planning area. New road construction would cross two live channels and upgrades to culverts would occur at approximately six locations. Channel processes and sediment delivery would not change due to application of properly sized culverts and road BMPs in these areas that would direct ditch water away from the stream channels. The water crossings would have culverts installed to accommodate the corresponding 100 yr. flow event and road drainage would be such that drain dips would be installed a maximum of 100 feet either side of the crossings. Known wet areas in the planning area have been mitigated for or avoided and routes within treatment areas would be designed to avoid areas discovered during operations. By implementing proper design features, the direct or indirect effects from the building of temporary roads, reconstruction of roads, and the stream crossing improvements would improve the stream channel processes within the Pilgrim Creek planning area.

Water Quality

Effects to water quality typically relate to the construction of temporary roads and reconstruction of permanent roads and their associated water routing characteristics. When located directly adjacent to a stream or stream crossing, fine sediment from the new road surface can affect the water quality of an area. These effects will be ameliorated by a series of BMP's that will provide adequate road surface drainage away from any active channels of water. No temporary roads or skid trails will cross or border any live water channels, wet areas, seeps or springs within the Pilgrim Creek planning area. As a result of avoiding these areas, channel processes and sediment delivery will not change. These measures, combined with specified Design Criteria and adherence to INFS Standards and Guidelines within Riparian Habitat Conservation Areas (RHCAs) (USDA Forest Service, 1995), are fully expected to prevent any negative impacts on water quality or beneficial uses.

Although a few segments of new road are directly connected to tributaries, the locations of the proposed temporary roads are not. The two crossing locations proposed on these new road segments display intermittent channel characteristics that connect to perennial channels, so the risk of sediment delivery to channels is higher. BMPs will minimize long-term contributions but some level of sediment introduction at these locations can be expected.

All temporary roads would be recontoured following use. At a minimum, the road surface would be ripped, the berm would be pulled back, and woody debris would be spread over the exposed soil to limit soil movement. The disturbed areas would be seeded and aid in the recovery of these areas. The success of revegetation efforts would be monitored over time.

Under all action alternatives, road drainage improvements would be completed on all haul routes and newly constructed roads within the planning area. The percent sediment reduction has been modeled through the use of the USDA WEPP erosion model (Table 3-59). Given the

proper design and implementation of BMPs, sedimentation would be minimized at the two new crossings. Overall, the proposed road related activities would benefit water quality in that the reduction in sediment from improvements to existing roads would be greater than the additions from the two new crossings. The units of measure for the effects of road actions on water quality are as follows:

1. **Sediment reductions from proposed BMP's on haul routes**

Road drainage BMPs would focus on preventing water and sediment delivery from the road network, especially ditches, into streams. The primary methods for accomplishing this would be improvements to road surface, ditch relief culverts, and stream culvert replacement (Furniss et al., 1991). The drainage improvements would be implemented in conjunction with the timber sale(s). The proposed work would decrease sediment delivery and water routing through culvert replacement, the installation of rolling surface dips and ditch relief culverts. Only localized short-term increases in fine sediment in crossings are anticipated from construction of these structures. The construction activities would affect water quality in the short-term and yield long-term benefits in sediment reduction.

Table 3-56. Haul Route Sediment reduction by alternative.

Road ID	Alternative 1 (No Action) Sediment Leaving Buffer (tons/yr.)	Alt 1 % Reduction Sediment Leaving Buffer	All Action Alternatives Sediment Leaving Buffer (tons/yr.)	All Action Alternatives % Reduction Sediment Leaving Buffer
149	3.1580	0	0.4027	87
2719	0.0005	0	0.0000	100
2746	0.0365	0	0.0270	26
2744	17.6335	0	0.9296	95
2744C	1.3500	0	0.2131	84
2744D	3.0875	0	0.9471	69
2706	1.2800	0	0.2257	82

Based on the results shown in table 3-56, the action alternatives would improve water quality throughout the analysis area. Application of BMPs for all vegetation management would protect streams from non-channelized sediment inputs.

The road surface drainage improvements that would occur under all alternatives would reduce the risk of road erosion during normal and extreme events in these locations. Even in areas that are not currently eroding, major runoff events could cause enough concentration of flow to initiate road surface gullying, ditch scour, or culvert failure. The BMP improvements in road surface and ditch relief drainage are designed to reduce these risks, disconnect ditchwater from streams, reduce current levels of water surface routing and decrease sediment while maintaining and improving channel function.

2. Changes in Total Road Density (TRD)

Total road density (TRD) is used as an indicator of watershed and riparian integrity. Table 3-57 displays a summary of the effects of road construction on TRD by watershed.

The KNF rates TRD exceeding 3.5 mi/mi^2 as 'High' in watersheds with 20–45 inches of mean annual precipitation (MAP) and TRDs exceeding 3.0 mi/mi^2 as 'High' in watersheds with >40 inches of MAP (KNF, 2003). Values that rate 'High' are displayed in bold within the table below.

Table 3-57. Changes in total road density by alternative.

HUC7 Basin	Size (sq mi)	MAP (in)	Alts 1,4 & 5 Miles of road	Alts 1,4 & 5 TRD	Alt 2 Miles of road	Alt 2 TRD	Alt 3 Miles of road	Alt 3 TRD
Noxon Reservoir Tributary 511	1.6	38	4.0	2.5	4.1	2.5	4.1	2.5
Stevens Creek	10.1	43	26.1	2.6	27.8	2.7	26.7	2.6
Cabinet Gorge Tributary 806	4.3	38	25.9	**5.9**	25.9	**5.9**	25.9	**5.9**
Telegraph Creek	3.8	48	6.3	1.7	6.3	1.7	6.3	1.7
South Fork Pilgrim Creek	6.9	49	39.6	**5.8**	39.6	**5.8**	39.8	**5.8**
Skeleton Creek	2.2	48	2.1	1.0	2.1	1.0	4.2	1.9
West Fork Pilgrim Creek	5.1	49	18.5	**3.7**	18.8	**3.7**	20.0	**4.0**
Pilgrim Creek Mainstem	5.6	42	10.9	2.0	10.9	2.0	10.9	2.0
Pilgrim Creek Tributary 207	0.9	45	0.0	0.0	0.0	0.0	0.0	0.0
Baxter Gulch	2.2	43	1.8	0.8	1.8	0.8	1.8	0.8
Cabinet Gorge Tributary 813	4.5	37	14.6	3.2	14.6	3.2	14.6	3.2
Fourmile Gulch	1.2	43	0.2	0.2	0.2	0.2	0.2	0.2
Fivemile Gulch	0.9	45	0.1	0.1	0.1	0.1	0.1	0.1
Smeads Creek	3.7	45	9.6	2.6	9.8	2.7	9.6	2.6

HUC7 Basin	Size (sq mi)	MAP (in)	Alts 1,4 & 5 Miles of road	Alts 1,4 & 5 TRD	Alt 2 Miles of road	Alt 2 TRD	Alt 3 Miles of road	Alt 3 TRD
Hemlock Gulch	0.8	48	9.1	**11.5**	9.1	**11.5**	9.1	**11.5**
Cabinet Gorge Tributary 823	3.4	43	10.3	3.0	10.3	3.0	10.3	3.0
Whole South Fork (SF+Telegraph)	10.7	49	45.9	**4.3**	45.9	**4.3**	46.2	**4.3**
Whole West Fork (WF+Skeleton)	7.3	49	20.6	2.8	20.9	2.9	24.2	**3.3**
Whole Pilgrim	28.7	45	79.5	2.8	79.8	2.8	83.3	2.9

Changes in TRD are only realized under alternative 3. Should all of the new proposed road construction be completed, an increase in TRD from 2.8 to 2.9 in the entire Pilgrim Creek drainage would occur under this alternative. The whole West Fork of Pilgrim Creek drainage (West Fork + Skeleton) would see an increase in TRD from 2.9 to 3.3. A vast percentage of the new road segments proposed in this drainage exist high in the basin and occur in dry draws with no connectivity to any live surface water channels. These new road segments would not negatively affect watershed integrity with proper application of best management practices on roads..

Only passive road obliteration is proposed in this project. Basins with current high road densities such as Hemlock Gulch will remain as is, and should not affect channel stability due to the ephemeral and dry draw nature of this drainage.

Cumulative Effects Overview

Cumulative effects are the result of all the impacts past, current, and reasonably foreseeable activities have on a resource. Past activities have resulted in the “Existing Condition” described above. The anticipated effects from proposed activities were then added to the existing condition and described in the section titled “Direct and Indirect Effects.” The sum of the existing condition and the direct and indirect effects of proposed actions in combination with current and reasonably foreseeable actions result in the cumulative effects described in this section.

The Analysis Areas for cumulative effects with regard to Water Resources consists of the same watersheds identified earlier in the document. All the watersheds empty into the Clark Fork River (Noxon Reservoir) and are not connected and thus, not measurable.

Water Resources would be protected under the implementation of any of the alternatives. This is based on past monitoring of stream flow, water quality, and channel stability; and all laws, regulations, and policies being met. Below is the rationale for this conclusion.

Past Actions and Their Effects on Current Conditions

Harvest activities in the 1980s and 1990s included approximately 1,600 acres of regeneration harvest and are responsible for most of the water yield increases affecting streams today. Peak flows in Pilgrim Creek are currently estimated to be 2% over natural conditions, generally not considered excessive. A minor amount of stream restoration has also occurred in tributaries to ameliorate some of the effects related to peak flow increases, especially in the West Fork of Pilgrim Creek. Although roads built and used for sale activities in this period were constructed and maintained with a better understanding of the importance of surface water management, many road drainage culverts are functioning but undersized. Some of these roads may be producing sediment and routing surface flow to channels in some places. Some of these are sites that are not proposed to be fixed within this project. Specific sales from this period include:

- Rice Paddy (1980): This sale had a few units located in the headwaters of the West Fork of Pilgrim Creek. No new roads were constructed in the West Fork with this sale. At that time no watershed analysis was completed nor were predictions made regarding increases in peak flow to the West Fork. Although these units alone most likely have not caused the bulk of disturbance to this watershed, cumulatively with other sales in the basin (West Fork Pilgrim, SW Pilgrim) they have compounded effects that have led to the existing poor channel condition towards the mouth of the West Fork.

- Huckleberry Stevens (1988): The majority of this sale was in Stevens Creek with one unit being located in the headwaters of Telegraph Creek. Although portions of existing roads were reconditioned during this sale no new roads were built. Approximately 3% of the Stevens Creek watershed was left in a clearcut condition subsequent the sale. The extent of this sale has added to peak flow increases in both the Stevens Creek and Telegraph Creek drainages, but have not led to unstable channel condition.

- Stevens Blacktail (1990): This sale, which consisted of harvest activities and associated road construction, projected that peak flows would increase by 1% to 4% over natural in Stevens Creek. These predictions were based on the 74 acres of timber harvest planned in the Stevens Creek drainage. Stream surveys of these drainages in 2005 noted stable conditions within the response reach and other downstream reaches in Stevens Creek. Channel conditions in Stevens Creek display sound stability and the drainage has adjusted to these minimal past water yield increases without undue channel effects. Other units were harvested within the dry draw basin labeled Noxon Trib 511. These areas have not scoured new channels or increased downstream sediment from this sale. Constructed roads associated with this sale have not directly contributed sediment to active stream channels.

- Smeads Rice (1992): This sale, located in Smeads Creek, Rice Draw and Deer Creek, projected increases in water and sediment yields in Smeads Creek but predicted no discernible impacts to the mainstem. Descriptions of channel conditions in the EA are similar to those observed in 2004 stream surveys. Units were provided with adequate buffers to protect riparian values. Water yields are still increased over natural in Smeads Creek (18% IPF) but the downstream intermittent and dry draw channel conditions do not appear to be unduly affected by the increase.

- Huckleberry LPP SSTS (1992): This project involved harvest of approximately 10 acres in Stevens Creek. This sale in conjunction with the units from Huckleberry Stevens and

Stevens Blacktail sales left approximately 4% of the drainage in a clearcut condition. This modest percentage has not led to channel instability or an increase in sediment within the mainstem of Stevens Creek.

- Smeads Bottom (2000): This bulk of potential effects from this sale consist of that from a single unit low in the drainage that was commercially thinned on a flat bench. The drainage below this bench and directly adjacent (Smeads Creek) is intermittent in nature and has not widened, downcut or incised from this or other past harvest in the basin. The Smeads Creek drainage has geologic characteristics most other drainages its size does not exhibit. This geology allows for intermittent or dry draw characteristics throughout the majority of the drainage. These characteristics lend themselves to more subsurface flow which in turn can buffer the effects from peak flow increases.

Restoration projects from this period include:

- West Fork Pilgrim Creek Channel Reconstruction (2007): This restoration project focused on sediment reduction related to past peak flow increase effects and the adjacent riparian harvest, both of which led to bank destabilization in this area. Approximately 1100 feet of channel was relocated and reconstructed. Large Woody Debris (LWD) was installed for bank stabilization and fish habitat improvement. The surrounding disturbed areas were seeded and planted with native riparian vegetation. Fine sediment in this portion of the West Fork was reduced by roughly100 tons per year.

Current Versus Historic Management Practices

There are clear differences between past and current land management practices and policies. Improvements in land management practices are due to improvements in science and technology, ongoing monitoring actions, and changing public values.

The earliest harvest methods involved harvesting the biggest, most valuable trees and leaving the remaining trees on-site. Streams were sometimes used to transport logs (i.e., splash dams, skid trails, etc.) causing direct impacts to the stream channel and adjacent riparian areas. Harvest methods in the 1950-70s focused primarily on providing low-cost wood products. Harvest placement often occurred in the highest volume and most easily accessible stands and in riparian areas next to streams. At times equipment was driven through or down streams to skid logs to landings. Logging systems were selected based on economics. The least expensive method to transport trees from the forest to the mill was usually selected. This sometimes involved harvest on steep slopes that created excessive soil disturbance and increased the risk of erosion. In addition to the harvest activities, fuels reduction, and site preparation for natural regeneration or planting often included dozer piling.

During the early to mid 20th century, road construction was focused primarily on the easiest access route to a given area with little thought to road maintenance. As a result, many roads were constructed in river bottoms, floodplains, and adjacent hillsides. The roads efficiently provided access, but frequently constricted streams, reduced the effectiveness of riparian areas, and provided an avenue for erosion and discharge of sediment into streams. Roads were often expanded from existing trails, paths, or abandoned railroad beds to accommodate newer equipment and current land uses. In these cases, the location and design were predetermined from the previous use and era. As time progressed, roads were designed and located to provide

access and haul product at minimum cost. In the decades following World War II (1950s to 1970s), the road network was rapidly expanded to support the domestic need for lumber and recreation.

Over the last twenty years, impacts to soil and Water Resources from logging and road activities have been reduced because of Best Management Practices (BMPs), the Inland Native Fish Strategy (INFS), and other changes based on new science and technology. It is well documented that BMPs and INFS riparian habitat conservation areas (RHCAs) significantly reduce sediment delivery to streams compared with historical practices (USDA Forest Service 1995).

Harvest methods and removal of timber products from the national forest changed substantially over time. Modern timber harvest prescriptions and design emphasize desired conditions of the forest after timber harvest. This often results in the retention of various amounts of trees to address objectives that may include seed production, site sheltering, water quality, soil productivity, wildlife, and/or visuals. Elements of modern harvest prescriptions that address specific resource concerns include retention of snags and down wood for soil nutrition, and maintaining sediment filtering vegetation in riparian areas near lakes and streams. Jammer roads and splash dams are practices no longer used and dozer piling is rarely used. Forest BMPs currently incorporated into timber harvest activities include (refer to the BMP document in the Soil and Water Project File for a complete list of BMPs):

- Maintaining water quality and soil productivity, and reducing erosion and sedimentation through timber harvest unit design. Some examples include avoiding sensitive areas, delineating RHCAs, etc.
- Limiting the operation period of timber sale activities to dry, frozen, or snow covered conditions to minimize soil erosion, sedimentation, and soil productivity.
- Determining the proper log retrieval system for the timber harvest unit slope to protect from degradation of water quality or soil productivity. Tractor skidding is typically on ground less than 40% slope. Skyline and other cable yarding systems are used on steeper slopes.
- Controlling erosion during and after harvest activities to protect water quality and soil productivity. Some examples include ripping and/or water barring skid trails and landings, seeding and fertilizing, spraying for weeds, etc.

Road management activities have also changed significantly over time. With improved land management methods, the need for high road densities in a given area has decreased. Excess roads are decommissioned reducing water and soil impacts and allowing those areas to begin to recover. Existing, reconstructed, and/or new roads currently incorporate the following BMPs (refer to the BMP document in the Soil and Water Project File for a complete list of BMPs):

- Road drainage controls are now incorporated into designs to:
- Reduce water flow in ditches by providing frequent cross-drains to relieve ditch flows;
- Avoid water movement on road surface by dispersing the flow quickly through road surface deflectors, drain dips, or outsloping;
- Disconnect ditch water from streams by discharging storm water runoff onto stable vegetated or armored slopes before it enters waterways; and

- Size new and existing stream crossings to safely pass 100 year flood events and provide for fish passage, where applicable.
- Avoiding highly erosive soils or unstable slopes.
- Locating or relocating roads outside of riparian areas where practical; and minimizing or reducing the number of stream crossings.
- BMP implementation and effectiveness have been monitored and documented on the Kootenai National Forest. Refer to Consistency with Regulatory Framework for a more in-depth discussion of BMP monitoring.

In 1995, the Forest Plan was amended to include INFS management direction (USDA Forest Service 1995). The implementation of INFS gave greater protection to soil and Water Resources in riparian areas adjacent to streams, lakes, and wetlands. INFS gives riparian dependant resources priority over other resources in RHCAs. RHCAs are not totally prohibitive to management. Rather, the primary purpose for management within them is aquatics. Activities that occur in them must either benefit the riparian area and associated aquatic features or, at a minimum, not slow the rate of recovery within the riparian area.

Cumulative impacts result when the effects of an action are added to or interact with other effects from past, present, or reasonably foreseeable actions in a watershed. Table 3.58 displays effects that were considered over a time period since the1950s.

Ongoing and Reasonably Foreseeable Activities

In the following discussion, the effects of past, current, and/or reasonably foreseeable activities are considered cumulatively with activities proposed in this project. The effects were either described as not contributing effects, contributing indiscernible effects, or having a measurable effect on Water Resources. Those actions that may have measureable effects were then analyzed further, by the same indicators used in the Direct and Indirect Effects Section.

Vegetation Management and Fuels Reduction Activities

With the exception of this project there are no current or reasonably foreseeable Forest Service commercial timber sale projects planned within the Analysis Area. Therefore, no additional effects would be contributed from these activities.

It is expected that there would be salvage of blown-down trees within the Analysis Area. Treatment acres are not expected to exceed 20 acres per year over the next 10 years. If salvage were to occur the appropriate analysis would be conducted. Removal of blown-down trees does not affect peak flows and therefore would not contribute additional effects to Water Resources. However, some short-term sediment could be generated from ground disturbance related to mechanized equipment. Such equipment is typically restricted to existing trails, roads, and fire lines, but there are cases where new disturbance is created. It is expected that BMPs, riparian buffers, and design criteria would minimize or eliminate the risk of generated sediments reaching live streams. This assumption is supported through the monitoring data presented above. Therefore, with regard to sediment, the salvage of blown-down trees is expected to contribute indiscernible effects to Water Resources.

Burning associated with post-harvest fuel treatment and wildlife improvement does not result in crown removal that would change water yields and sediment outputs are not measurable. Therefore, burning activities are expected to contribute indiscernible effects to Water Resources.

Pre-commercial thinning is an ongoing and reasonably foreseeable activity. Ongoing and reasonably foreseeable pre-commercial thinning activities within the Analysis Area would contribute indiscernible effects to riparian vegetation and structure, peak flows, sediment delivery, and water quality within the Analysis Area and beneficial uses would be protected. Pre-commercial thinning does not result in measurable crown removals and there is no additional ground disturbance. All thinning projects follow INFS direction.

Christmas trees/boughs can be harvested for individual use or commercially on National Forest land. Each of these activities requires a permit. These activities are both current and are reasonably foreseeable within the Analysis Area for the next ten years. Commercial permits include design criteria (i.e. follow INFS direction) to minimized impacts on associated species. This activity does not remove tree overstory or create additional ground disturbance and therefore would not contribute additional effects to Water Resources.

No heavy equipment is associated with tree planting. Tree planting does not increase PFIs or sedimentation rates. Therefore, tree planting would not contribute additional effects to Water Resources.

Grazing

There is no livestock grazing of NFS lands in the project area. Some incidental grazing occurs on private lands, but there are no large ranches or commercial operations. Minor, local impacts to banks and floodplains may occur but are not likely to markedly alter baseline conditions over time.

Noxious Weed Treatments

The control of noxious weeds on National Forest land is an ongoing activity that normally occurs from late spring to early fall. Most herbicide treatments are conducted along existing roads; some treatments occur in harvest units. The 2007 Kootenai National Forest Invasive Plant Management ROD provides direction for noxious weed control on the District. Noxious weed control is expected to continue over the next ten years.

This activity is expected to contribute indiscernible effects to Water Resources as defined by the Kootenai National Forest Invasive Plant Management Project (USDA Forest Service 2007). Approved application methods and design criteria would be used. Water quality monitoring has shown that no chemical contamination has occurred. Although new weed infestations may occur due to ground disturbance activities, improvements in treatment chemicals and use of Best Management Practices during timber sale and burning operations should minimize the occurrence and effects of new infestations. The level of noxious weed control within the Analysis Area is not expected to increase much over the next ten years. Therefore, no measureable effects are anticipated.

Wildfire and Fire Suppression

The probability of a large fire occurring is extremely difficult to predict. Recent wildfire activity, improved fire detection and suppression techniques, existing transportation system, and recent vegetation management and fuel treatments all play a role. A large fire within the Analysis Area

could have measurable effects on Water Resources in the future. These effects could include higher sedimentation rates and/or higher nutrient levels. However, due to the unpredictable nature of wildfires, cumulative effects from this natural disturbance could not be meaningfully quantified in this document.

Fire suppression activities would occur as needed and may include the construction of fire lines, helispots, and safety zones by hand or equipment. Effects from wildfire suppression would vary with location and size of the fire; suppression activities are expected to follow Forest Plan direction. Retardants would be used outside of RHCAs when feasible. Suppression of small fires would contribute indiscernible effects to Water Resources within the Analysis Area. The suppression of large fires could have measurable effects to Water Resources. These effects could include bank destabilization and/or bank erosion. However, due to the unpredictable nature of wildfires, cumulative effects from future wildfire suppression activities could not be meaningfully quantified in this document.

Road Management

Routine road maintenance would occur as needed primarily on the publicly open NFSR roads in the Analysis Area. This is separate from any road maintenance identified in this project. Maintenance includes road blading, gate repair/replacement, cleaning ditches and culverts, installing culverts, replacing culverts with larger diameter culverts, installing drain dips and surface water deflectors, placing riprap to armor drainage structures, placement of aggregate, brushing, and debris removal. Road maintenance follows BMPs identified in the Soil and Water Conservation Handbook and INFS direction. Ongoing and reasonably foreseeable road maintenance activities within the Analysis Area could contribute measurable effects to Water Resources, primarily short-term sedimentation rates, within the Analysis Area. However in the long-term, road maintenance reduces the risk of road failures that can contribute large quantities of sediment into live channels by disconnecting storm water flows from streams. No significant changes in road maintenance are expected over the next 10 years.

Recreation Maintenance

Routine maintenance will occur on non-motorized trails in the Project Area. Maintenance may include brushing; removing blowdown, debris, and hazard trees; repairing or adding waterbars; repairing treads; repairing or replacing signs; and improving vistas. Routine trail maintenance would have indiscernible effects to Water Resources because trails are individually small, scattered across many watersheds, and activities are not all occurring in the same year.

Special Uses

Outfitter/guides are active during the big-game hunting season on the District, and may be active in the Project Area. This activity would have no effect on Water Resources within the Analysis Area and beneficial uses would be protected. Other special use permits including road access to private property and water lines, have no known concerns with regard to Water Resources. The level of special uses within the Analysis Area is not expected to change much over the next ten years.

Public Uses

Recreational use of the Project Area is expected to include hiking, camping, fishing, hunting, photography, small forest product gathering (berries, mushrooms, cones, and boughs), Christmas tree cutting, firewood gathering, driving for pleasure, mountain biking, sightseeing, wildlife viewing, cross-country skiing, snowshoeing, trapping, and snowmobiling. These

activities are expected to continue over the next ten years. Because of increasing numbers of people moving into the local communities, it is expected that some of these activity levels would increase. Recreational activities would contribute indiscernible effects to Water Resources within the Analysis Area and would protect beneficial uses. This conclusion is based on the fact that these activities are individually small and scattered across many watersheds. In addition, terms of the firewood cutting permit prohibit cutting within 100 feet of a live channel. This ensures stream banks are protected, LWD is available, and minimizes the potential for sediment production.

Off-highway vehicle (OHV) use was left off the list above because it is currently limited only to existing trails and open roads. Therefore, no additional disturbance is expected from OHV use.

Private Property

It is expected that private land will continue to be developed within the Project Area. The construction of roads, clearing of vegetation, construction of residences, and installation of improvements during the development process can create a variety of changes to the landscape. Land development can have varied effects on the aquatic environment depending on the magnitude of the development, the type of development, and the amount of private land on the landscape. Montana State Best Management Practices apply to some of these activities. In consideration of recent trends in land development in the Pilgrim Creek planning area, the activities on private land are not expected to have a measurable effect on Water Resources within the Analysis Area.

Cumulative Effects – Action Alternatives

Peak Flow Increases

Cumulative effects water yield analysis includes ECAs from past, present, proposed, and reasonably foreseeable activities on federal, state timber, and private lands. Effects of timber harvest and road management were incorporated into the cumulative effects analysis of peak flow through consideration of: effects from past, proposed, current, and reasonably foreseeable activities and disturbances; past decisions and analyses; monitoring data; and Forest Plan standards and guidelines. The results of cumulative effects analysis of past, present, proposed, and reasonably foreseeable activities are similar to what was discussed in the direct and indirect effects section of this document due to the percent of USFS land within the project area.

All basins in the Pilgrim Creek Project Area would not exceed threshold limits of channel stability in any alternative. The effects to PFI from all past, present, and reasonably foreseeable activities were included in Table 3-54. The cumulative Peak Flow Increases (PFIs) displayed in table 3-54 will be protective of beneficial uses in this area. All alternatives would have PFIs within historic ranges, meet Forest Plan Standards (identified both in this and previous documents), and would protect beneficial uses. PFIs would remain at or below previous levels of activity. Monitoring has shown these levels have not caused degradation within Pilgrim Creek and the other tributaries in the project area.

Water Quality

Cumulative effects water quality analysis includes ECAs from past, present, proposed, and reasonably foreseeable activities on federal, state timber, and private lands. Effects of timber harvest and road management were incorporated into the cumulative effects analysis of water

quality through consideration of: effects from past, proposed, current, and reasonably foreseeable activities and disturbances; past decisions and analyses; monitoring data; and Forest Plan standards and guidelines. The findings of this assessment conclude that timber harvest within the Analysis Area would cumulatively contribute indiscernible effects to sediment delivery. Road related activities would cause some short-term increases in sedimentation but an overall reduction in long-term sedimentation. Therefore, water quality within the Analysis Area would be maintained or improved and beneficial uses would be protected.

Cumulatively, there is the potential for measurable short-term negative effects and positive long-term positive effects to water quality.

Stream Channel Processes

Stream channel conditions are the culmination of cumulative effects within a watershed. Stream channels are formed and maintained by physical interactions between valley slopes, riparian vegetation, stream flow regime, and channel materials. Over time, stream types can be altered in their pattern and profile by various influences. These influences can affect factors such as stream flow, sediment supply, and channel stability (Rosgen 1996). Activities such as timber harvest, road construction, and livestock grazing are examples of such influences that can alter stream channel processes and lead to changes in channel processes.

The Rosgen Classification provides management interpretations for various stream types based on sensitivity to disturbance (including increases in stream flow magnitude, timing and/or sediment increases), recovery potential (assumes natural recovery once the cause of instability is corrected), sediment supply (including suspended and bed-load from channel derived sources and/or from adjacent slopes), stream bank erosion potential, and vegetation as a controlling influence for stability (vegetation that influences width/depth ratio). These elements suggest the manner in which channels could respond to disturbance.

Harvest of dry draws in combination with a large percentage of the basin left in clearcut condition can sometimes lead to downcutting and the formation of new channels. These types of events are not expected to happen under any alternative. The amount and type of harvest proposed coupled with landtypes and slope is not conducive for gully formation in the Pilgrim Creek project area. The integrity of the dry draw areas and perennial sections of the Pilgrim Creek project area will be protected under all action alternatives.

All action alternatives would not be expected to adversely affect stream channel processes. This conclusion is based on the analysis of direct, indirect, and cumulative effects to sediment delivery, stream flow, riparian condition, and/or channel stability. Stream channel conditions are expected to be maintained or improved throughout implementation and beneficial uses would be protected.

Cumulative Effects – No Action Alternative

Water Yield

With no harvest and/or prescribed burning occurring, overstocked, dead, and dying stands could potentially be a fire hazard under extreme drought. Should stand replacing fires occur, PFI's would rise over existing and could influence many of the streams in the project area. The

amount of fire and associated intensity would dictate how channel conditions would be affected. FSR Road networks would still be used and maintained and thus would still provide the same amount of increase to water yield and sediment delivery. The past harvest in the basin would eventually moderate and PFI's associated with past harvest would ultimately decrease to pre-management conditions. Effects to water yield from timber harvest on private land is minimal due to the lack of a defined channel in these areas. Should adjacent private land burning spill over onto national forest lands the potential for stand replacing wildfire is realistic. This scenario could result in added ECAs and further increase short-term water yield increases in the drainage.

Stream Channel Processes

By not increasing peak flows from existing in these drainages, natural recovery will be allowed to occur throughout the system and should not result in project related increase in instabilities. Channel conditions would remain similar to the existing condition throughout the project area should a stand replacing fire not occur. If a high intensity fire would occur, channel processes may be affected by increases in sediment which could increase aggradation and conversely decrease channel stability.

Water Quality

Should no activities occur within the project area, channel stability would still be affected by existing PFI's and remain as is. Channels and ECA's would slowly recover through natural revegetation. PFI's would reduce as much they could through this natural revegetation while still having ongoing water quality effects from permanent road systems within the planning area. A large fire could potentially cause an increase in available sediment. This increase could be short-term or persist for some time. The amount of sediment related to a stand replacing fire is hard to predict due to the many different variables associated.

Consistency with Forest Plan and Regulatory Framework

Compliance with the Clean Water Act

All alternatives comply with the CWA. Each alternative is expected to maintain or improve stream conditions in the Analysis Area. This expectation is based on: surveys of existing watershed conditions; the conclusion of the Water Yield analysis that PFIs would not exceed recommended levels; the designation of RHCAs, the application of BMPs to all proposed road work, timber harvest and underburning activities; evidence from Forest monitoring results and the literature regarding the effectiveness of BMPs; and the conclusion that the effects of BMP improvements to roads would reduce existing surface water and sediment contributions from the road network and disconnecting ditch water from perennial streams.

This project has been designed to avoid **point source discharges** through implementation of BMPs at road stream crossings. This required BMP work on the proposed timber haul roads would be implemented to disconnect ditch water from the stream network and was designed to avoid the discharge of storm water into waters of the United States from the roads used for haul on this timber sale.

Due to pending litigation and potential regulations changes, it is uncertain at this time whether any NPDES permitting requirements apply, or will apply in the future to stormwater discharges from logging roads. Should it be determined that an NPDES permit is required for this project, the Forest Service will comply with any applicable NPDES permitting requirements.

Compliance with the Protection of Riparian Areas and Wetlands

The Riparian Area Guidelines in Appendix 26 of the Forest Plan (USDA Forest Service 1987b), as amended by the Montana Streamside Management Zone (SMZ) Law and INFS (USDA Forest Service 1995), provide standards and guidelines for activities in riparian areas and wetlands. These regulations would be strictly followed during sale design and layout and any other action resulting from the decision.

Section 404 of the CWA authorizes the Secretary of the Army to issue permits for the discharge of dredged or fill material into wetlands (33 CFR 323). Silvicultural activities are exempt from the 404 permit process, as are associated road construction and maintenance that adhere to BMPs (33 CFR 323.4a). Silvicultural treatment and roadwork near wetlands would be done in accordance with the KNF Riparian Guidelines, as amended by the Montana SMZ Law and INFS.

Compliance with the Forest Plan

Alternative 1 is consistent with Forest Plan standards for water resources. All action alternatives would meet forest plan standards and would protect beneficial uses; therefore, all state and federal water quality regulations would be met. This determination is based on the lack of direct or indirect impacts from proposed Forest Service activities.

Fish Populations and Habitat

Introduction

This section reviews fisheries and aquatic habitat and species population status by sub-watershed within the analysis area that could be affected by the project. Potential impacts to these resources under each of the alternatives are described. Additional information relevant to fish habitat conditions and water quality is found in the Water Resources section.

Regulatory Framework

Endangered Species Act

The Endangered Species Act (ESA) of 1973 declares that *"...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.*" Under the Act, Federal agencies must consult with the Secretary of the Interior whenever an action authorized by such agency is likely to affect a species listed as threatened or endangered. Bull trout and white sturgeon are currently listed as threatened and endangered, respectively, under the ESA. Effective September 30, 2010 the U.S. Fish and Wildlife Service designated critical habitat for bull trout throughout their U.S. range (USFWS 2010). Under the ESA, critical habitat identifies geographic areas that contain features essential for the conservation of a listed species. Critical habitat designations provide extra regulatory protection that may require special management considerations and the habitats are then prioritized for recovery actions. In addition, agencies are required to provide an analysis of effects of proposed actions to primary constituent elements (PCEs) for bull trout critical habitat. No designated critical habitat exist within the analysis area.

National Forest Management Act

Sensitive species are managed under the authority of the National Forest Management Act (NFMA) and are administratively designated by the Regional Forester (FSM 2670.5). FSM 2670.22 requires the maintenance of viable populations of native and desired non-native species and to avoid actions that may cause a species to become threatened or endangered. The NFMA directs the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” [16 U.S.C. 1604(g)(3)(B)]. Providing ecological conditions to support diversity of native plant and animal species in the planning area satisfies the statutory requirements. The Forest Service’s focus for meeting the requirements of NFMA and its implementing regulations is on assessing habitat to provide for diversity of species.

FSM 2672.42 directs the Forest Service to conduct a biological evaluation (BE) to analyze impacts on Sensitive species. If any unmitigated, significant effects are identified in the BE, the Forest Supervisor must make a decision to allow or disallow the impact. If the significant effects would result in a trend toward federal listing, the Forest Supervisor cannot allow the project to proceed. The sensitive species analysis in this document meets the requirements for a BE as outlined in FSM 2672.42. The westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and western pearlshell mussel (*Margaritifera falcata*) are the only sensitive aquatic species identified within the analysis area.

The Kootenai Forest Plan establishes forest-wide objectives, standards, guidelines, and monitoring requirements for Kootenai National Forest (KNF) sensitive species. Forest Plan direction for sensitive species includes determining the status of sensitive species and providing for their environmental needs as necessary to prevent a trend toward federal listing.

Executive Order 12962 mandates disclosure of effects to recreational fishing.

Kootenai Forest Plan

The 1987 Forest Plan established management areas within the forest with different goals and objectives based on the capabilities of lands within this area (USDA Forest Service 1987). The Inland Native Fish Strategy (INFS) amended the Forest Plan in 1995 (USDA Forest Service 1995). INFS established standards and guidelines to protect riparian and aquatic resources on National Forest System lands.

INFS established stream, wetland, and landslide-prone-area protection zones called Riparian Habitat Conservation Areas (RHCAs) on National Forest System lands. RHCAs are broken into four categories (Table 3-58).

Table 3-58. RHCA categories and standard widths.

Stream or Waterbody Category	Standard Width
Fish-bearing streams	Minimum 300 feet each side of the stream
Perennial, non-fish bearing streams	Minimum 150 feet each side of stream
Ponds, lakes, and wetlands greater than 1 acre	Minimum 150 feet from maximum pool elevation
Intermittent and seasonally flowing streams, wetlands less than 1 acre, landslides and landslide prone areas	Minimum 50 feet from edge (except in priority watersheds where the minimum is 100 feet)

Source: USDA Forest Service 1995.

INFS also identifies riparian management objectives (RMOs) for forested systems that include pool frequency, large woody debris (LWD) frequency, width/mean depth ratio, and water temperature (Table 3-59). Bank Stability is also addressed but is not a required RMO for forested systems. Actions that retard attainment of these RMOs, whether existing conditions are better or worse than objective values, are considered to be inconsistent with the Forest Plan.

Table 3-59. Interim Riparian Management Objectives

Wetted Width	Pools/mile	LWD/mile	Bank Stability %	Width/Mean Depth Ratio (Pools)	Water Temperature
< 10 feet	96	20 pieces > 12" diameter and 35' length.	> 80	< 10	No increase, < 59 ° F Adult Habitat
10-20 feet	56				
21-25 feet	47				< 48 ° F Spawning/Rearing Habitat
26-50 feet	26				

Source: USDA Forest Service 1995.

Bounds of Analysis

The fisheries Analysis Area for this project includes the Pilgrim, Smeads, and Stevens Creek drainages and small face tributaries to Cabinet Gorge and Noxon Reservoirs between Smeads and Stevens creeks. Fish species potentially affected by the proposed action utilize habitat within this boundary and effects from the proposed action would be potentially measurable at this scale. Figures 3-18 and 3-19 display native fish distributions within the project area. Nearly all of the mainstem Pilgrim Creek flows through private land.

Cumulative effects were analyzed to the lowest downstream point of effect, individual tributary mouths at the confluence with either Cabinet Gorge or Noxon Reservoir. Effects to fish or aquatic habitat (including bull trout critical habitat) in the reservoirs are not expected to be detectable from any proposed, ongoing, or reasonably foreseeable activities. An analysis of project effects to critical habitat is therefore not required.

The temporal bounds of analysis generally extend approximately ten years from present. This is an adequate time period to evaluate effects from management activities and natural variations in weather patterns. Specific actions may be evaluated and referred to as "long-term" which generally refers to a time period of approximately 30-50 years.

Analysis Methods

Existing conditions were determined through field surveys and review of existing data sources to develop effects analysis for fisheries resources in each watershed.

Fish Species Abundance and Distribution

Available fish species distribution, abundance, and genetic information was used to determine historic and current known fish species distribution and abundance within the project area drainages. Key summary documents included the Pilgrim Creek Watershed Assessment and Conceptual Design Report (RDG and USFS 2004), Lower Clark Fork River Drainage Habitat Problem Assessment (GEI 2005), and Status of bull trout (*Salvelinus confluentus*) in Lake Pend Oreille and the lower Clark Fork River (Pratt and Huston 1993).

Pilgrim Creek quantitative fish population estimates were completed between 1992 and 1994 by a cooperative effort that included WWPC, MFWP, and USFS (WWP 1996). Montana Fish, Wildlife & Parks completed a qualitative electrofishing survey at the mouth of Pilgrim Creek in 1998 (RDG and USFS 2004). A second quantitative fisheries survey was completed by an Avista contractor in 2001 (Chadwick 2002). Avista maintained a fish trap weir at river mile 1.1 from mid-July through the end of October from 2002-2005 (Lockard et al. 2003, 2004, 2005; Weltz et al. 2006). Avista conducted a presence-absence electrofishing survey in Stevens Creek at the trailhead in 2006 (Avista unpublished data in project file). MFWP completed quantitative fish population estimates to evaluate success of a stream restoration project on two reaches in mainstem Pilgrim Creek and on one reach of West Fork Pilgrim Creek near the Holliday Mine during 2005, 2006, and 2007. Additional fish species distribution and relative abundance electrofishing was conducted by USFS personnel in Stevens Creek, South Fork Pilgrim Creek, West Fork Pilgrim Creek unnamed tributary, Skeleton Creek, and a Skeleton Creek unnamed tributary during 2009 and 2010 (Figure 3-18). Genetic samples were collected from one location in lower Pilgrim Creek and one location in upper Pilgrim Creek (WWP 1996; Ardren et al. 2008).

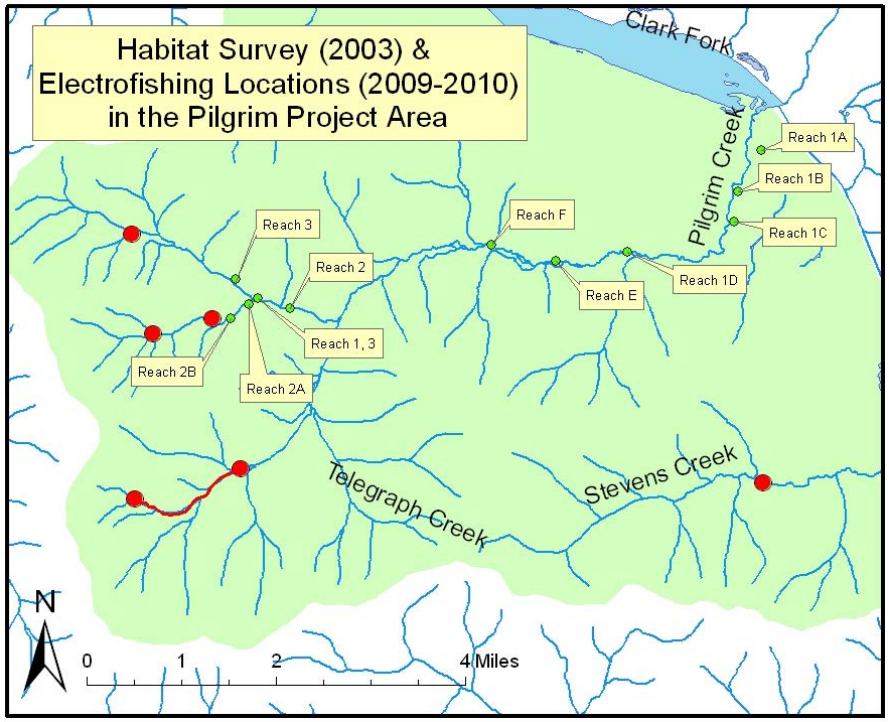


Figure 3-18. Location of USFS 2003 habitat and 2009-2010 electrofishing surveys in the project area. Green dots and yellow call-outs depict lower boundaries of habitat survey

reaches. Red dots depict the downstream location of electrofishing reaches. The red line with dots attached depicts the full length of reach sampled on South Fork Pilgrim Creek.

Fish Habitat

Fish habitat surveys were conducted by USFS personnel during 2003 using the R1/R4 protocol (Overton et al. 1997) (RDG and USFS 2004). Stream temperature data were collected from project area streams during 2010 using Onset® Pendant thermographs programmed to collect data at one hour intervals. R1/R4 and temperature data were utilized to evaluate habitat conditions in Project Area streams relative to INFS RMOs (Table 3-61). RMOs established for forested systems by INFS include pool frequency, large woody debris, temperature, and wetted width to depth ratio. Actions which retard attainment of these RMOs, whether existing conditions are better or worse than objective values, are inconsistent with INFS. In addition to metrics generated to evaluate INFS compliance, “quality” pool frequency or number of pools with > 1.5 foot residual depth per mile, was calculated to permit a relative comparison of quality habitat among surveyed reaches.

Default riparian habitat conservation areas (RHCAs) were delineated on all known streams, ponds, lakes, reservoirs, wetlands, landslides, and landslide-prone areas within the planning area. Riparian Habitat Conservation Areas are portions of watersheds where riparian-dependent resources receive primary emphasis. RHCA widths are defined by whether a stream is fish bearing and/or perennial, and by the size of the water-body. Generally, fish-bearing waters are buffered by 300 feet on either side of the channel, perennial non fish-bearing streams are given 150 foot buffers, and intermittent non fish-bearing channels, small wetlands, and ponds, lakes, and reservoirs are given 50 foot buffers (Table 3-55). Widths of RHCA buffers are based on current scientific literature which supports their ability 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.

Project area existing conditions were documented to evaluate the effects of proposed actions. This baseline includes RMO values; percent fine sediment in spawning areas, road densities, temperature, number of stream crossings, and potential sediment delivery to channels, pool frequency and quality, equivalent clearcut area (ECA) and predicted water yield, existing channel conditions, current fish distribution, and large woody debris frequency. Existing channel conditions were evaluated during the 2004 and 2008 field seasons and are discussed in the Water Resources section.

Measurement Indicators

1.) Effects to fish populations were assessed based on effects to habitat (Qualitative).

2.) Sediment delivery from harvest and road related activity will be used an indicator to evaluate effects to aquatic habitat from project activities (Quantitative). There is no harvest proposed in near-channel areas.

3.) Increases in water yields (peak flow increases- PFI) measured by percent increases over existing condition (Quantitative, discussed in detail in the Water Resources section).

4.) Number of stream crossing replacements, miles of road drainage improvements (Best Management Practices applied), changes in road densities.

Effects to fish populations were assessed based on the lowest downstream point of effect to occupied habitat.

Affected Environment

Fish Population Status

Native fish species within the Pilgrim planning area include westslope cutthroat trout, bull trout, largescale sucker, northern pikeminnow, longnose dace, mountain whitefish, and slimy sculpin (RDG and USFS 2004; GEI 2005). Fish introductions in the Lower Clark Fork River and directly in Pilgrim Creek have increased fish community diversity to the demise of the native species assemblage. Established populations of introduced species, including rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*), have notably affected the native fish assemblage through competition, hybridization, and predation. Brook trout have displaced westslope cutthroat from the middle reaches of Pilgrim Creek while rainbow trout have had similar hybridization and competition effects on westslope cutthroat trout in the lower Pilgrim Creek watershed (Chadwick 2002; Ardren et al. 2008). Similarly, brook trout hybridization with bull trout is also a concern with three bull-brook trout hybrids sampled in the middle watershed (Chadwick 2002; Lockard Personal Communication). Genetically pure westslope cutthroat persist in West Fork Pilgrim Creek and Skeleton Creek and three bull trout have been captured in lower to middle Pilgrim Creek by WWP and Avista in 11 years of sampling (WWP 1996; Chadwick 2002; Lockard et al. 2003-2005; Weltz et al. 2006; Horn and Tholl 2008). Displacement of rainbow/cutthroat hybrids in the middle watershed by brook trout suggests brook trout are expanding their population in the low gradient reach of Pilgrim Creek (Horn and Tholl 2008). Continued expansion of brook trout populations would have negative repercussions for resident and transient bull trout and westslope cutthroat trout inhabiting Pilgrim Creek. Although no westslope were captured in Stevens Creek during USFS sampling in 2009 or Avista sampling in 2006, they may be present in perennial reaches as suggested by GEI (2005) and MFISH (2010).

All fish species present in project area streams are present in Noxon Reservoir as well. In addition, the reservoir supports a variety of other species including native species such as northern pikeminnow, peamouth, redside shiner, largescale and longnose suckers, and mountain whitefish. Non-native species present include smallmouth and largemouth bass, pumpkinseed, northern pike, yellow perch, walleye, black and yellow bullheads, lake whitefish, and lake trout. Walleye may be increasing in Noxon Reservoir (Liermann and Tholl 2005).

Threatened, Endangered, and Proposed Species - Bull Trout

Description of General Population and Habitat Status

Bull trout are native to the upper Columbia River basin in northwest Montana. Bull trout require clean, cold, complex and connected habitat. Bull trout have declined by perhaps more than 50 percent because of land management practices, expansion of introduced fish populations, overharvest by recreational fishing, and loss of habitat connectivity, (Lee et al. 1997; MBTSG

1998). Forest management, mining and dam operations have adversely affected spawning and rearing habitat conditions for bull trout in the lower Clark Fork River area. Current bull trout habitat is also inhabited by non-native brook trout that threaten the persistence of bull trout by hybridization. Competition with other fish species is also a factor in their decline.

The majority of migratory bull trout spawning in Montana occurs in a small percentage of the total stream habitat available. Spawning takes place between late August and early November, principally in third and fourth order streams. Spawning adults use low gradient areas (< 2%) of gravel/cobble substrate with water depths between 0.1 and 0.6 m and velocities from 0.1 to 0.6 m/s. Proximity of cover for the adult fish before and during spawning is an important habitat component. Spawning tends to be concentrated in reaches influenced by groundwater where temperature and flow conditions may be more stable.

Successful incubation of bull trout embryos requires water temperatures below 8°C (46°F), less than 35-40% of sediments smaller than 6.35 mm in diameter, and high gravel permeability. Eggs are deposited as deep as 25.0 cm below the streambed surface and the incubation period varies depending on water temperature. Spawning adults alter streambed characteristics during redd construction to improve survival of embryos, but conditions in redds often degrade during the incubation period. Mortality of eggs or fry can be caused by scouring during high flows, freezing during low flows, superimposition of redds, or deposition of fine sediments or organic materials over redds. A significant inverse relationship exists between the percentage of fine sediment in the incubation environment and bull trout survival to emergence. Entombment, or burial of redds by fines, appeared to be the largest mortality factor in incubation (Weaver and Fraley 1991). Groundwater influence plays a large role in embryo development and survival by mitigating mortality factors.

Rearing habitat requirements for juvenile bull trout include cold summer water temperatures (15 °C (59°F)) provided by sufficient surface and groundwater flows. Warmer temperatures are associated with lower bull trout densities and can increase the risk of invasion by other species that could displace, compete with, or prey on juvenile bull trout. Juvenile bull trout generally forage along the stream bottom, rarely stray from cover, and prefer complex forms of cover. High sediment levels and embeddedness can result in decreased rearing densities. Unembedded cobble/rubble substrate is preferred for cover, feeding and provides invertebrate production. Highly variable stream flow, reduction in large woody debris, bedload movement, and other forms of channel instability can limit the distribution and abundance of juvenile bull trout. Habitat characteristics that are important for juvenile bull trout of migratory populations are also important for stream resident subadults and adults. However, stream resident adults are more strongly associated with deep pool habitats than are migratory juveniles.

Both migratory and stream-resident bull trout move in response to developmental and seasonal habitat requirements. Migratory individuals can move great distances (up to 155 miles) among lakes, rivers, and tributary streams in response to spawning, rearing, and adult habitat needs. Stream-resident bull trout migrate within tributary stream networks for spawning purposes, as well as in response to changes in seasonal habitat requirements and conditions. Open migratory corridors, both within and among tributary streams, larger rivers, and lake systems are critical for maintaining bull trout populations.

Description of the Population within the Analysis Area

Based on oral histories for the period between 1920-1950, bull trout were historically present in lower Stevens Creek and Pilgrim Creek (Pratt and Huston 1993; GEI 2005). The area of

Stevens Creek that likely supported bull trout is currently inundated by Noxon Rapids Reservoir. Stevens Creek currently supports few, if any, salmonids and no bull trout.

Currently, bull trout distribution is limited to middle and lower Pilgrim Creek and there is no evidence to suggest that the project area supports a viable population (Figure 3-19). The presence of three bull - brook trout hybrids suggests migratory bull trout have spawned in the middle watershed (Chadwick, 2002). However, with no juvenile bull trout captured or observed in 4 years of juvenile trapping (Lockard et al. 2003a, 2004, 2005; Weltz et al. 2006), only three subadult/adult bull trout captured in 11 years of sampling, and no redds observed during 2001-2002 spawning surveys, it is questionable whether Pilgrim Creek supports a self sustaining population (Table 3-60). "If a bull trout population exists in Pilgrim Creek, it does so at an exceedingly low (undetectable) level (Moran, Avista, personal communication)."

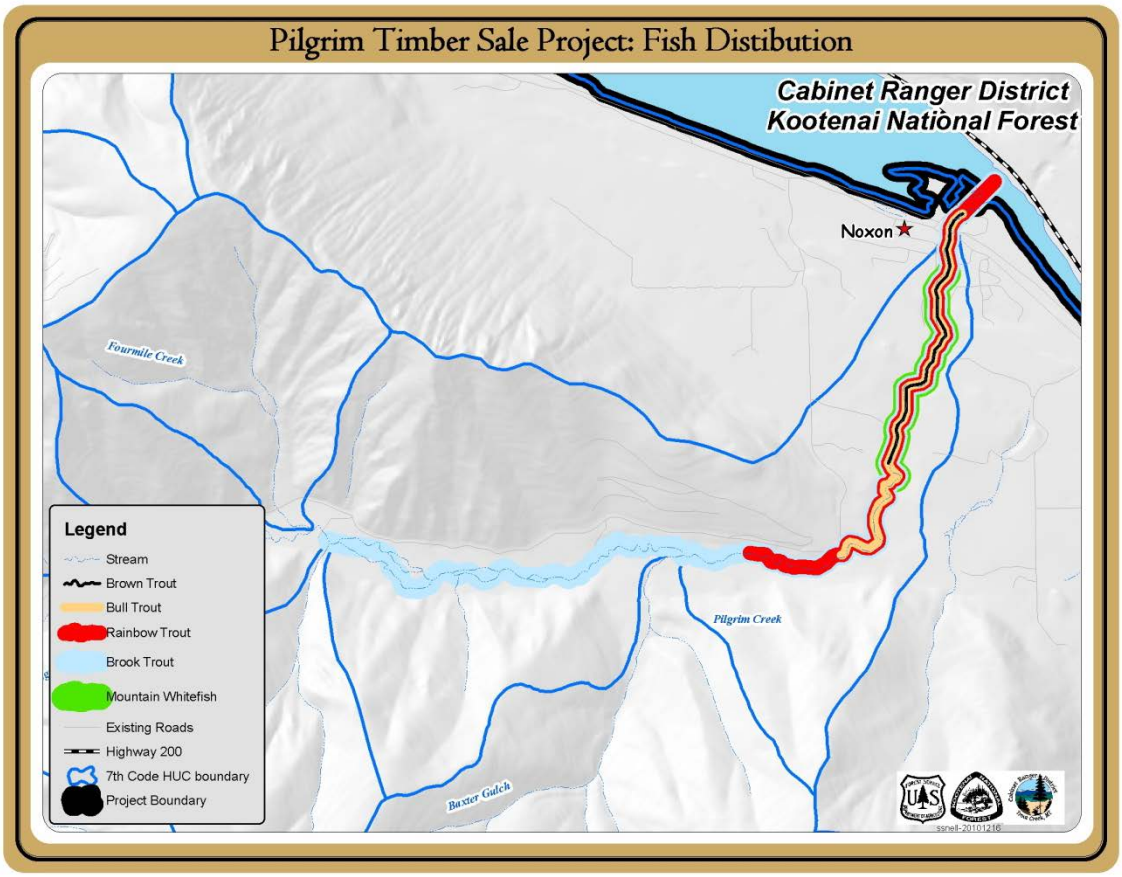


Figure 3-19. Bull trout distribution (peach color) within the Pilgrim project area relative to other salmonid species, not including westslope cutthroat trout. Adapted from GEI (2005).

Currently bull trout are absent in Stevens Creek and Smeads Creek due to intermittency (Pratt and Huston 1993, GEI 2005).

Recent work under Avista Corporation's Settlement Agreement for relicensing of their two hydroelectric facilities has included bull trout passage activities that have increased connectivity between natal streams and rearing habitat in Lake Pend Oreille. Though only one fish passed over the dams has been documented using Pilgrim Creek (Lockard et al. 2003b).

Table 3-60. Summary of fish sampling activities and bull trout observations from 1993 to 2007 in Pilgrim Creek.

Year Sampled	Citaton	Method	Species	Length (inches)	Sex	Age
1993	WWP 1996	e-fishing/snorkeling	None	NA	NA	NA
1994	WWP 1996	e-fishing/snorkeling	**Bull Trout**	**9.5**	NA	NA
1995	WWP 1996	e-fishing/snorkeling	None	NA	NA	NA
2001	Chadwick 2002	e-fishing	Bull Trout Hybrid	7.7	NA	3+
		e-fishing	Bull Trout Hybrid	14.3	NA	5+
		snorkeling	Bull Trout Hybrid	NA	NA	NA
2002	Lockard et al. 2003 a,b	telemetry/weir	**Bull Trout**	**21.7**	F	NA
2003	Lockard et al. 2004	weir	**Bull Trout**	**7.8**	NA	NA
2004	Lockard et al. 2005	weir/e-fishing	Bull Trout Hybrid	17.2	NA	NA
2005	Weltz et al. 2006	weir	None	NA	NA	NA
2005	Horn and Tholl 2008	e-fishing	None	NA	NA	NA
2006		e-fishing	None	NA	NA	NA
2007		e-fishing	None	NA	NA	NA
2007	Ardren et al. 2007	e-fishing	none	NA	NA	NA

Sensitive Species – Westslope Cutthroat Trout

Description of General Population and Habitat Status

The distribution and abundance of westslope cutthroat trout *Oncorhynchus clarki lewisi* has declined from historic levels across its range, which includes western Montana's Clark Fork River drainage (Liknes and Graham 1988; Shepard et al. 2005). Westslope cutthroat trout persist in 27 percent of their historic range in Montana. Due to hybridization, genetically pure populations are present in 2.5 percent of that range (Rieman and Apperson 1989). Introduced species have hybridized or displaced westslope cutthroat trout populations across their range. Repeated backcrossing of hybrid fish (introgression) can result in a substantial loss of genetic purity and fitness in westslope cutthroat trout populations (Muhlfeld et al. 2009). Some of the 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.

Brook trout are believed to have displaced many westslope cutthroat trout populations (Behnke 1992). Where the two species co-exist, westslope cutthroat trout typically predominate in higher gradient reaches and brook trout generally prevail in lower gradient reaches (Griffith 1988). This isolates westslope cutthroat trout populations, further increasing the risk of local extinction from genetic and stochastic factors (McIntyre and Rieman 1995).

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. At present, lower Clark Fork River fish are limited to movements between hydroelectric facilities at Cabinet Gorge, Noxon Rapids, and Thompson Falls. Migratory fish typically rear in their natal streams until their third year, at a length of 7-9 inches, when they migrate to either a larger stream or lake to rear to maturity. Sexual maturity is attained at either age 4 or 5, 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. Resident fish are significantly smaller than their migratory counterparts. 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 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, westslope cutthroat trout (WCT) were likely distributed throughout perennial reaches of Pilgrim Creek from its mouth to the South Fork and West Fork Pilgrim Creek/Skeleton Creek headwaters and in lower Stevens Creek (GEI 2005). It is unlikely that historic flow conditions in Smeads Creek would have supported fish.

The current westslope cutthroat trout population within the planning area is composed of a resident component which resides in Pilgrim Creek, West Fork Pilgrim (Ardren 2008), the lower quarter mile of the West Fork Pilgrim unnamed tributary near the Holliday Mine, and Skeleton Creek (Figure 3-20). Westslope presence in Stevens Creek is questionable as no fish were observed or captured during 2006 Avista or 2009 USFS electrofishing surveys. Westslope are not present in Smeads Creek or South Fork Pilgrim Creek due to flow limitations (Chadwick

2002; GEI 2005; USFS 2010 unpublished data). The population in lower Pilgrim Creek is hybridized.

Sampling in mainstem Pilgrim Creek has revealed that major displacement of westslope cutthroat trout has occurred since the mid 1990s. Chadwick (2002) compared fish densities in mainstem Pilgrim Creek from 1992-1994 WWP (1996) sampling to their own density estimates by sampled reach. Cutthroat-rainbow hybrids declined substantially in all three reaches of mainstem Pilgrim Creek from 1994 to 2001 and were completely replaced by brook trout in middle to upper mainstem Pilgrim Creek where along with rainbow trout, they were previously the dominant species. Continued sampling of this reach by MFWP from 2005 to 2007 found that cutthroat trout were not present and that brook trout density estimates more than tripled from 2006 to 2007 (Horn and Tholl 2008).

Despite near replacement of westslope cutthroat by nonnative fish in mainstem Pilgrim Creek, Horn and Tholl (2008) found that densities of westslope cutthroat trout steadily increased in West Fork Pilgrim Creek. Densities increased from 47 fish/100 m in 2005 to 80 fish/100m in 2007. An intermittent reach and a culvert with a perched outlet have thus far served as isolating mechanisms that have prevented nonnative fish invasion and subsequent hybridization and displacement in West Fork Pilgrim Creek. Limited habitat, lack of life history diversity, and no connectivity to other populations may limit the long-term persistence of this population (Fausch et al. 2006). Case studies reviewed by Fausch et al. (2006) indicate that at least 6.2 miles of suitable stream habitat must be present for a population to maintain genetic diversity and persist for 25 to 50 years.

Displacement of rainbow/cutthroat hybrids in the middle watershed by brook trout suggests brook trout are expanding their population in the low gradient reach of Pilgrim Creek. If individuals are able to negotiate upstream migration barriers during periods of ideal flow conditions, the long-term persistence of westslope cutthroat trout in the Pilgrim Creek drainage could be compromised.

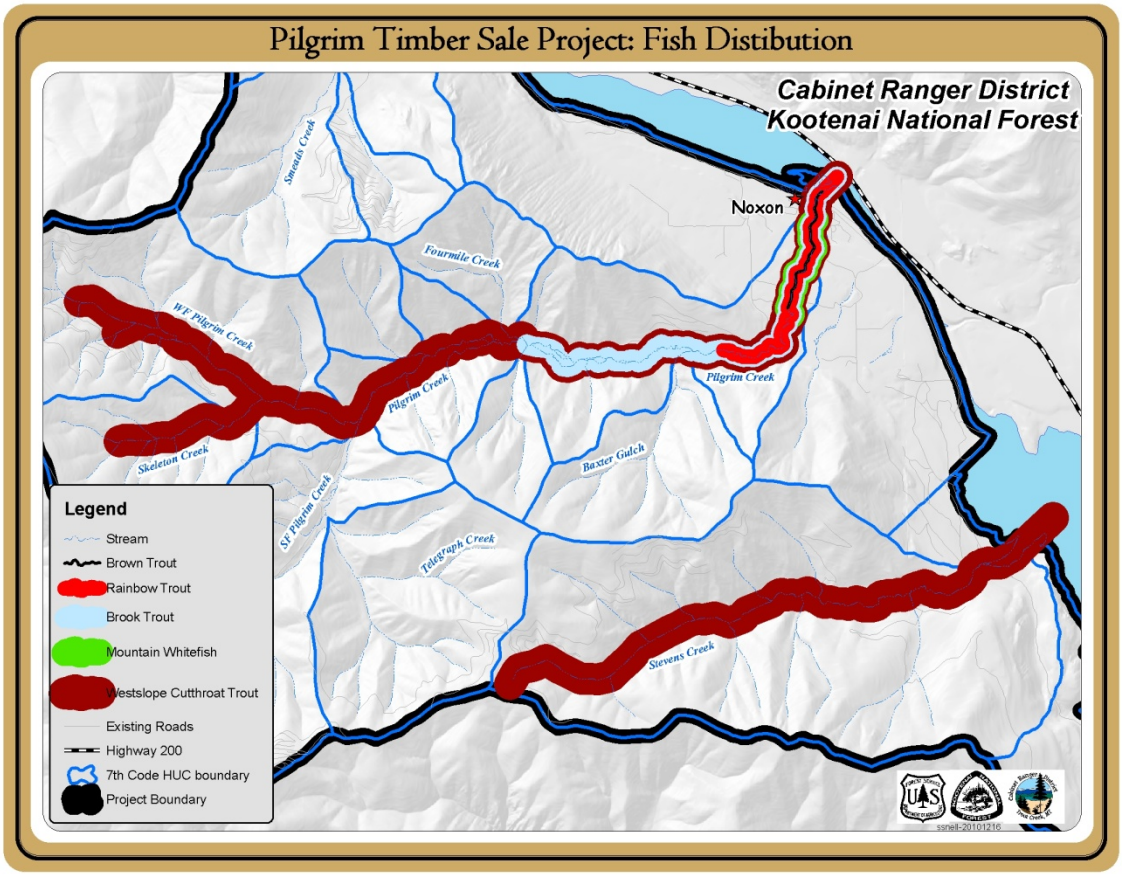


Figure 3-20 Maximum distribution of westslope cutthroat (rust color) within the Pilgrim project area relative to other salmonid species, not including bull trout. Distribution of westslope in upper Pilgrim Creek, Lower West Fork Pilgrim Creek, and middle-to upper Stevens Creek is limited from that shown by seasonal dewatering. Westslope cutthroat presence in Stevens Creek was not confirmed by 2006 and 2009 electrofishing surveys and is unlikely. Adapted from GEI (2005).

Sensitive Species – Western Pearlshell Mussel

Description of General Population and Habitat Status

The following description of species requirements and habitat status was adapted from Stagliano (2010). The western pearlshell mussel is found in stable, cool-coldwater, streams and rivers of low to moderate gradient (1-2%) and > 2m in width with stable gravel and pebble substrate characteristic of the Rosgen Class C4 stream channel type. However, the species can occur in sand or gravel in moderate to higher gradient larger rivers especially if cobble or boulders are present to shelter mussel beds from scour during flood events. Stream velocities affect habitat selection with stream gradients of 1.4% containing mussels and those averaging 2.4% typically absent of mussels. Mussels are not found in streams where substrate is disturbed by torrents (Toy 1998). Unlike *M. margaritifera, M. falcata* is found in hard as well as soft water (Clarke 1981). The larval life stage (glochidium) must briefly parasitize a vertebrate host (usually a fish) in order to complete its development. Glochidia of *M. falcata* are highly host specific (Bauer 1987) and are generally restricted to the salmonid family of fishes.

Although, the western pearlshell are widespread in western Montana, viability of individual populations is questionable. Stagliano (2010) documented only 14 western pearlshell populations from 8 streams statewide that are ranked A-viability (excellent) using Nature Serve criteria. In a viability analysis, only 15 sites had young mussels present out of 32 living populations evaluated with quadrat sampling. With relatively few viable populations present in Montana, the western pearlshell mussel will be added to the Forest Service R1 sensitive species list in May 2011 and has been ranked as a Montana Species of Concern (S2), since 2008.

Specific threats to M. falcata populations, include damming and diversion of rivers for irrigation, hydroelectric, and water supply projects. Nutrient enhancement (eutrophication), siltation, unstable substrate, or similar impacts can extirpate populations. Any anthropogencic activites which generate fine sediment or cause channel instability can degrade M. falcate habitat and may compromise viability of individual populations.

Description of the Population within the Project Area

A standardized mussel distribution survey conducted by the Montana Natural Heritage Program (Stagliano 2010) on August 27, 2008 documented the presence of western pearlshell mussel in lower Pilgrim Creek. However, population viability was classified as “not viable, extirpated within 25 years.” Suitable habitat (Rosgen Class C stream channel type) is only present in lower Pilgrim Creek adjacent to and downstream from the Four Mile Gulch Confluence.

Existing Condition

Bull trout, westslope cutthroat trout, and western pearlshell mussel are the only potentially affected threatened and sensitive species, respectively, in the Pilgrim Project Area. This analysis will center on their habitat needs. Bull trout distribution and suitable pearlshell mussel habitat is limited to the lower to middle reaches of mainstem Pilgrim Creek. Westslope Cutthroat trout occur from the mouth of Pilgrim Creek to the headwaters Skeleton and West Fork Pilgrim Creek and potentially in lower Stevens Creek.

This section complements the existing condition narrative in the watershed and soils sections of this document. In an effort to minimize repetition, only select watershed condition information is summarized as it relates directly to the local fish populations. For a thorough review of the existing hydrologic condition, the reader is referred to the Water Resources section.

Stream habitat survey data were collected during 2003 by reach type in Pilgrim Creek, Westfork Pilgrim Creek, and Skeleton Creek (RDG and USFS 2004). These are areas of known bull trout and/or westslope cutthroat trout occupied habitat as well as the areas most likely to be directly affected by the proposed action. The data for each stream (Table 3-61) were compared to the INFS Interim RMOs (Table 3-59).

Pilgrim Creek

Fish habitat conditions in mainstem Pilgrim Creek are highly variable by reach. The entirety of Pilgrim Creek below its confluence with the West Fork Pilgrim Creek lies on private land where forest plan standards do not apply. Pool frequency in lower Pilgrim Creek is below the RMO standard and quality pools are limited. However, pool frequency in middle reaches (R1E and R1F) exceeds the RMO standard and quality pools are relatively abundant. Pools are generally wide relative to their depth and on average do not meet the RMO width/depth standard (<10) for any survey reach. LWD is relatively lacking and meets the RMO standard in only one reach in

lower and one reach in middle Pilgrim Creek. Stream temperature data indicate that lower Pilgrim Creek is warm relative to the INFS RMO standard and not suitable for native fish spawning, rearing or adult holding. However, suitable habitat for western pearlshell is present only in lower Pilgrim Creek where the Rosgen C channel type exists.

Skeleton Creek

In comparison to mainstem Pilgrim Creek fish habitat in Skeleton Creek is more optimal. Pool frequency exceeded the RMO value in two of three reaches surveyed, and LWD frequency was above the RMO standard for all reaches. Pools were generally deeper in Skeleton Creek relative to their width than Pilgrim Creek, even though quality pools were limited and width/depth ratio did not meet the RMO standard. Stream maximum summer water temperature met the RMO for adult holding habitat but exceeded the 48°F threshold for spawning and rearing. Channel type in Skeleton Creek precludes western pearlshell.

West Fork Pilgrim Creek

Fish habitat quality in West Fork Pilgrim Creek is similar to Skeleton Creek with respect to limited quality pools, high width/depth ratios, abundant LWD, and relatively cool maximum stream temperature. However, the two streams differ in that pool frequencies in West Fork Pilgrim are relatively low and the RMO standard was met for only reach 3.

Close proximity of the Holliday Mine lower adit waste rock dump to West Fork Pilgrim Creek has resulted in erosion of the face of the dump (Hargrave et al. 1999) and sediment delivery to the stream channel. Water sampling in 1993 found the chronic aquatic life standard for lead was exceeded in the upstream and downstream samples but aquatic life criteria were not exceeded in more recent sampling (Hargrave et al. 1999). An abandoned log bridge which crosses West Fork Pilgrim Creek a short distance upstream from the lower adit is accumulating LWD and bedload upstream of the bridge.

The lower NFSR 2744A West Fork Pilgrim Creek culvert has a perched outlet that likely impairs fish passage. The drop from the culvert outlet to the plunge pool surface is anywhere from 10” to 18” depending on flow conditions. This drop may be a partial barrier preventing nonnative fish invasion. Channel type and conditions in West Fork Pilgrim Creek preclude western pearlshell mussel.

West Fork Pilgrim Creek Unnamed Tributary (Adjacent to Holliday Mine)

No quantitative fish habitat data were collected in the West Fork Pilgrim Creek unnamed tributary inhabited by westslope cutthroat trout. Habitat quality was documented incidental to the 2010 electrofishing survey. Pool depth, pool frequency, bank stability, and width/to depth ratio appear suboptimal and fish are not abundant.

An abandoned riparian road parallels the southeast side of the tributary. Near the abandoned road, a mining diversion structure (identified along with a nearby sluice box) continues to obstruct flow and is causing upstream channel aggradation. Further upstream, NFSR 2744A crosses the unnamed tributary. Here the outlet of the 18-24” culvert is perched by approximately 12” above the substrate below. No fish were captured during electrofishing 120 feet of channel above the crossing confirms that the culvert is an upstream barrier to fish passage. Aggradation at the inlet of the culvert indicates that it is undersized.

Above the NFSR 2744A crossing lays the upper Holliday Mine adit and waste rock dump. This dump is located approximately 30 feet from the unnamed tributary. No fish are present here and tailed frogs occur in low densities. Channel type in this tributary preclude western pearlshell mussel.

Table 3-61. Summary of fish habitat characteristics of project area streams by reach.

Stream	Reach	Avg. Wetted Width (feet)	Pools Per Mile	Quality Pools Per Mile	Avg. Pool Width/ Depth Ratio	Total LWD Per Mile	LWD RMO	Max Temp °F
Pilgrim Cr	R1A Lower	21	41	7	20	504	**22***	61.4
Pilgrim Cr	R1B Lower	19	47	0	22	638	3	
Pilgrim Cr	R1C Lower	19	26	7	19	470	7	
Pilgrim Cr	R1D Middle	17	44	40	14	278	3	
Pilgrim Cr	R1E Middle	18	**58***	26	23	1513	**43***	
Pilgrim Cr	R1F Middle	18	**90***	60	17	0	0	
Skeleton Cr	R1	7	**143***	0	15	2847	**165***	**52.2***
Skeleton Cr	R2A	8	**109***	8	14	6576	**179***	
Skeleton Cr	R2B	8	26	0	13	1406	**145***	
W. Fk. Pilgrim Cr	R2	11	53	0	18	1494	17	**50.0***
W. Fk. Pilgrim Cr	R3	11	**75***	0	21	3130	**64***	
W. Fk. Pilgrim Cr	R4	8	54	4	13	1494	**30***	

Asterisks and bold numbers depict values meeting INFS RMO standards. Stream temperature is evaluated relative to the INFS 59°F RMO temperature standard for adult holding habitat. Adapted from RDG and USFS (2004).

Past Actions and their Effects on Current Conditions

Historical accounts of Lower Clark Fork River tributaries discuss the shift from perennial flowing streams to waterbodies experiencing seasonal dewatering, channel aggradation, and poor aquatic habitat quality. Many of these changes were attributed to the fires of 1910 and the floods that followed (Pratt and Huston, 1993). Seasonal dewatering is common among streams within the Pilgrim Creek planning area. This includes the upper two miles of Stevens Creek (potentially excluding the headwaters), all or most of Smeads Creek, Pilgrim Creek above Fourmile Gulch (river mile 4.8), lower West Fork Pilgrim Creek, all but the headwaters of South Fork Pilgrim Creek, and Telegraph Creek with its headwaters potentially being an exception (GEI 2005).

Silvicultural practices, agriculture, and grazing on private land have altered Pilgrim Creek. These practices effectively degraded the water quality and aquatic habitat conditions, transitioning Pilgrim Creek and some tributary reaches from likely historical cedar-dominated, shaded stream characterized by abundant large woody debris, diverse riparian corridors, and cool stream temperatures to unstable channels devoid of large woody debris and a simplified riparian zone. Habitat conditions impairing fish habitat for individual stream reaches within the Pilgrim Creek planning area are summarized from RDG and USFS (2004) in Table 3-62. Effects from mining in West Fork Pilgrim Creek and its unnamed tributary adjacent to the Holliday Mine are summarized by drainage above.

Table 3-62. Conditions affecting fish/aquatic habitat in the Pilgrim Creek Planning Area

		Habitat Features Impairing Fish/Aquatic Habitat					
Stream	**Reach**	**Dewatering**	**Channel or Bank Instability**	**Mass Wasting**	**Fine Sediment**	**Insufficient LWD**	**Lack of Riparian Veg.**
Pilgrim Creek	USFS/ Upper King	x	x		x	x	x
West Fork Pilgrim Creek							
	Head						
	Upper	x	x	x		x	
	Lower Middle						
	Lower	x	x	x		x	x
South Fork Pilgrim Creek							
	Upper						
	Middle	x	x		x	x	x
	Lower	x	x		x		x
Skeleton Creek							
	Upper Reach						
	Lower Reach		x	x	x	x	
Telegraph Creek	Head	?	x	x	x	x	x
	Other	x	x	x	x	x	x
Stevens Creek	Head	?					
	Middle						
	Lower	x					x

adapted from RDG USFS (2004).

Desired Condition

Desired Future conditions in the Pilgrim Creek watershed are those, similar to reference conditions, necessary for promoting the long-term persistence of bull trout, westslope cutthroat trout, and western pearlshell mussel. These include interconnected streams with perennial flow, cool summer temperatures, stable channels, and complex habitat with deep pools, overhead cover, and abundant LWD. To ensure the long-term persistence of bull trout and westslope cutthroat trout, management actions would be necessary to suppress or eliminate nonnative brook and rainbow trout in Pilgrim Creek and its tributaries.

Environmental Consequences (Direct, Indirect, Cumulative Effects)

Alternative 1- No Action

Direct and Indirect Effects

Vegetation in previously harvested units has matured over time resulting in gradually decreasing water yield for all watersheds. This recovery should continue to improve watershed and fish habitat conditions over time. Some areas in Skeleton and West Fork Pilgrim creeks have large areas of dead lodgepole pine killed by pine beetles that no longer functions as live vegetation. This will result in increased flows from headwater streams and have some impact on fish habitat. If wildfires are suppressed and no prescribed burning occurs, fuel loadings would continue to increase, especially in areas dominated by lodgepole pine. Dead and dying lodgepole left on site will result in increased risk of high intensity fires which would have more intense adverse effects on watershed conditions and isolated fish populations in Skeleton and West Fork Pilgrim Creek. Existing roads would continue to channel surface flow and sediment to the streams. Peak flow increases will never fully recover to a natural condition with the existing road system in place. These conditions would continue to contribute to habitat degradation.

Effects Common to all Action Alternatives

Direct and Indirect Effects

The action alternatives do not differ markedly with respect to their anticipated effects to fisheries or fish habitat. Alternatives 2, 3, 4, and 5 propose the same type activities in fish bearing watersheds, differing only in that alternatives 4 and 5 do not propose any new road construction. All action alternatives propose the same locations and acreages for ecosystem burning. Based on the low level of effect anticipated from this burning, and the similarity of the majority of the proposal, the action alternatives are discussed together.

Recreational Fishing

The affected watersheds provide a moderate level of recreational fishing on National Forest system lands. Most fishable streams in the analysis area lie on private property and do not provide high levels of recreational opportunity for fishing due to limited access. Large, stream dwelling fish are only seasonally available, primarily brown trout

in late fall, though some fish may use Pilgrim Creek at other times, primarily summer, as a cool water refugia from warm summer water temperatures in Cabinet Gorge Reservoir. None of the alternatives decreases access to fishing areas. There are no other known potential effects to recreational fishing.

Timber Harvest and Associated Activities

All action alternatives propose some level of timber harvest and burning in areas that drain directly into Cabinet Gorge Reservoir including Smeads Creek and several small unnamed face tributaries. None of these drainages contain fish and would not generate any effects in the Reservoir; they will not be discussed further as activities in those watersheds have no effect to fish or fish habitat.

Timber harvest and burning proposed in fish-bearing watersheds would include Pilgrim Creek, Skeleton Creek, West Fork Pilgrim Creek, Unnamed West Fork Pilgrim Creek tributary, and Stevens Creek.

Timber harvest activities can impact fish and their respective habitat by increasing peak flow. The projected increases in peak flows in fish-bearing watersheds (Table 3-63; see also Water Resources section) would remain within recommended ranges for preventing channel instability and associated effects to fish habitat. Under alternative 3, a 15% cumulative peak flow increase in has been modeled in Skeleton Creek which indicates there is a potential to see increased flows in normal water years. Because flows are intermittent in West Fork Pilgrim Creek downstream from the Skeleton Creek confluence, increased PFIs in Skeleton Creek would not affect West Fork Pilgrim Creek. Cumulative PFI in mainstem Pilgrim Creek would only be 4 to 5 % and would not be sufficient to affect bull trout habitat or western pearlshell mussel.

Table 3-63. Comparison of predicted peak flow increase (PFI) for fish bearing watersheds among alternatives.

HUC	Alt 1 (No Action) PFI (%)	Alt 2 Cumulative PFI (%)	Alt 3 Cumulative PFI (%)	Alt 4 Cumulative PFI (%)	Alt 5 Cumulative PFI (%)
Stevens Cr.	4	8	8	7	7
Skeleton Cr.	2	5	15	4	2
WF Pilgrim	3	7	12	9	6
Pilgrim Cr.	2	4	5	5	4

**Face tributaries contribute to total peak flow increases but are not calculated for smaller tributaries that comprise the larger hydrologic unit*.

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. The density of salmonids in rearing habitat

has been shown to be inversely proportional to the level of fine sediment (Bjornn and Reiser 1991). Fine sediment can greatly reduce the capability of winter and summer rearing habitats and when levels reach 30 percent or more, survival to emergence is significantly reduced (Shepard et al. 1984). Fine sediment may have the greatest impact on winter rearing habitat for juvenile salmonids. Fine sediments can cap or fill interstitial spaces of streambed cobbles. When interstitial rearing space is unavailable, juvenile salmonids migrate until suitable wintering habitat can be found (Hillman et al. 1987). Fine sediment has also been shown to cause alterations in abundance and diversity of macroinvertebrates which fish forage upon.

Riparian habitat conservation areas (RHCAs) would protect fish-bearing streams from non-channelized sediment inputs. A review associated with INFS (USDA Forest Service 1995) concluded that non-channelized sediment flow rarely travels more than 300 feet and 200-300 foot riparian buffers are generally effective at protecting streams from sediment from non-channelized flow (Belt et al. 1992). Additionally, all action alternatives propose BMP implementation on existing roads to decrease sediment and surface flow routing to channels. Effects to fish habitat from road construction, reconstruction, and BMPs are discussed in detail below.

Typically, there is a three to four year increase in nitrogen and phosphorus in streams draining a newly harvested area. This brief increase in the two nutrients critical to stream productivity results from the breakdown of logging slash, the flushing of some soil nutrients normally taken up by trees, and in some cases due to slash burning. These short-term indirect water quality effects do not generally extend very far downstream because of mitigation by instream sediments and uptake by plants and animals (Murphy and Meehan 1991). However, these nutrients are generally in short supply in the affected area and the potentially affected waters downstream would increase aquatic productivity for a short time.

Timber harvest in riparian areas can decrease recruitment of large woody debris to stream channels essential for creating and maintaining complex fish habitat. Moreover, Beschta (1997) indicates that riparian canopy removal can reduce stream shading thus increasing stream temperatures and according to Delong and Brusven (1994) removal of riparian climax vegetation can reduce delivery of allochthonous (terrestrially derived) organic matter and nutrients to aquatic habitats. RHCAs would preserve important riparian characteristics within the project area. Water temperatures, the recruitment of large woody debris, and nutrient delivery from riparian areas would not be affected from timber harvest. New road construction would require one and two new stream crossings in Alternative 2 and Alternative 3 respectively. These crossings would cross an unnamed tributary to West Fork Pilgrim Creek.

Road Construction, Reconstruction, and BMPs

Forest roads can cause substantial degradation of salmonid habitats in streams (Furniss et al. 1991). Roads directly affect natural sediment and hydrologic regimes by altering streamflow, 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.

The type and quantity of road related disturbance in fish-bearing watersheds (Stevens, Skeleton, West Fork Pilgrim, and Pilgrim), varies among action alternatives with the primary difference being no new or temp road construction in alternative 4 (Table 3-64). Alternatives 2 and 3 vary only slightly with respect to the amount of new and temp road construction proposed. All action alternatives propose spot reconstruction and BMP implementation on existing haul roads (12.7 miles) to improve surface drainage and reduce sediment delivery to stream channels.

Table 3-64. Miles of road reconstruction, new construction, and BMP upgraded road in Fish-bearing drainages within the Project Area.

Drainage	Alt 2 road miles			Alt 3 road miles			Alt 4 road miles			Alt 5 road miles		
	New	Temp	BMP	New	Temp	BMP	New	Temp	BMP	New	Temp	BMP
Stevens Cr	1.73	0	8.92	0.63	0.66	8.92	0	0	8.92	0	0	8.92
Skeleton Cr	0	1.11	1.84	2.1	0.48	1.84	0	0	1.84	0	0	0.97
WF Pilgrim Cr	0.31	0	12.72	1.45	0	12.77	0	0	12.77	0	0	9.01
Pilgrim Cr Mainstem	0	0	5.19	0	0	5.19	0	0	5.19	0	0	5.19
Total	**2.04**	**1.11**	**28.67**	**4.18**	**1.14**	**28.72**	**0**	**0**	**28.72**	**0**	**0**	

With two exceptions, new road construction in fish bearing watersheds would be located well away from live water and would generally occur on or near ridges. These proposed locations would have no potential to deliver sediment to streams or draws and would not affect sediment loading in Stevens Creek, Skeleton Creek, WF Pilgrim, or mainstem Pilgrim Creek. Implementation of new road construction under Alternatives 2 and 3 would require one and two new stream/RHCA crossings of an unnamed tributary to West Fork Pilgrim Creek, respectively. Westslope cutthroat trout are present in the unnamed tributary approximately 0.3 miles downstream from the lowest proposed crossing (Alternative 3). The channel at the proposed crossing locations is intermittent with a seasonal hydraulic connection to the downstream perennial reach occupied by westslope cutthroat trout. Small potential exists for sediment generated from road crossing construction and the completed road prism to be delivered to and deposited in downstream westslope cutthroat trout habitat. Channel dewatering or constructing the two crossings when the channel is dry, installing culverts designed to pass a 100-year flow event, and implementing maximum BMPs will minimize their short and long-term sediment contributions to the unnamed tributary and West Fork Pilgrim Creek, but some

level of sediment delivery to occupied westslope cutthroat trout habitat can be expected (see Water Resources section). With these design criteria, sediment loads are not expected to increase significantly. Thus road construction activities are not expected to increase fine or coarse sediment levels to the extent that fish habitat or survival would be measurably affected. The two new proposed crossings would cause little impact as the channel is dry during warm summer months, and because the amount of riparian vegetation affected will be relatively small, there would be no measurable change to stream temperature, LWD recruitment, or other riparian values in the unnamed tributary to West Fork Pilgrim Creek.

The surface flow and sediment that is channeled to streams by roads would be reduced with BMP work. This would accelerate hydrologic recovery of affected watersheds and reduce the potential for further habitat degradation. The drainage network would be substantially restored and the likelihood of sediment introduction from failed culverts would also be reduced. As part of this proposal to reconstruct existing roads, up to 24 undersized culverts could be replaced, depending on funding availability, with larger culverts capable of passing 100 year flood flows. For fish bearing watersheds, 14 culvert replacements could occur in the West Fork Pilgrim Creek drainage, three in the Pilgrim Creek drainage, one in the Skeleton Creek drainage, and three in the Stevens Creek drainage.

Westslope cutthroat are the only species present in the upper watershed and would be present in the vicinity of some culvert installations. Timing restrictions would minimize the potential sediment related impacts to spawning fish and incubating eggs and fry. All road work within RHCAs, including culvert replacements, would occur after July 15th to protect spawning and rearing westslope cutthroat trout in the upper watershed and before September 1st to protect bull trout spawning in the lower watershed. The Sept 1st end date for construction may be extended if the middle reach of Pilgrim Creek is dry. In addition to these timing restrictions, all channels in the West Fork Pilgrim Creek watershed, with the exception of the Skeleton Creek 2744 crossing, would be dewatered prior to culvert replacement activities if channels are not already dry. The NFSR 2744 Skeleton Creek crossing is the largest of all potential crossing replacements and has the greatest flow. Dewatering this crossing may not be effective in which case the best practicable alternative for minimizing downstream sediment delivery would be implemented.

Some suspended sediment would likely be detectable during activities, but monitoring of past culvert replacements has shown that clear water margins are typically available for fish if turbidity exceeds tolerable levels in main channel areas. In the mainstem of Pilgrim Creek, dry channel will separate the proposed culvert replacements in the upper watershed from bull trout habitat. A half mile long beaver complex located approximately 0.4 miles downstream from the eruption of perennial flow, and two miles above bull trout occupied habitat, would likely trap most sediment mobilized during runoff the following spring. The nearest culvert proposed for replacement is 3.7 miles upstream from potential bull trout spawning and rearing habitat identified in the Lower Clark Fork Habitat Problem Assessment (GEI 2005). Due to the distance above occupied habitat, the presence of beaver ponds, dry channel separating the two areas, and limiting work to times outside of the spawning period or when the mainstem is dry, there is little chance of affecting bull trout or their habitat. 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

westslope cutthroat trout. 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 1999). Associated sediment transport is also very limited. The long-term benefits of replacing undersize culverts and associated reductions in sediment input and restored fish passage outweigh the short-term effects of roadwork and over time would accelerate recovery of conditions in the Pilgrim Creek project area.

Sediment inputs were estimated for main haul roads in fish-bearing watersheds using the USDA WEPP erosion model (Table 3-65; see also Water Resources section). While the values generated do not represent actual sediment contributions, they are useful for displaying the approximate magnitude of relative change possible with proper surface water management and application of BMPs. An estimated 25.27 tons per year are being delivered from the main road system in the Pilgrim and Stevens Creek watersheds based on modeling and field measurements. Of the 25.23 tons delivered to the Pilgrim Creek drainage, 21.75 tons (86%) are contributed from West Fork Pilgrim Creek. With application of BMPs, this figure is projected to decrease by 90.6% to an estimated 2.05 tons per year. Reductions in other tributaries would be similar in magnitude with a 89.9% reduction over all watersheds that either have fish present or are tributary to fish bearing watersheds.

Application of BMPs would result in a net decrease in annual sediment delivery to the unnamed tributary to West Fork Pilgrim Creek under all action alternatives. This assumes that the proposed two new NFSR 2744C and D road segments would be designed with surface drainage on either side of the two crossings and that both had a similar sediment contribution as the downstream NFSR 2744 crossing (0.13 tons per year after BMPs). Application of BMPs over the four existing crossings is modeled to result in a net decrease of 9.16 tons of sediment per year (94% decrease). If the two new crossings each were to produce 0.13 tons of sediment per year (assuming the same modeled sediment contribution as the NFSR 2744 crossing), there would be a net reduction of 9.03 tons per year under alternative 2 and 8.90 tons per year under alternative 3.

Table 3-65. Comparison of sediment contribution to stream channels for fish bearing watersheds from haul road segments adjacent to crossings between no action and action alternatives before and after implementation of BMP's.

Stream	Number Crossings	Alt 1 (No Action) Sediment Leaving Buffer (tons/yr.)	Alt 1 % Reduction Sediment Leaving Buffer	All Action Alts Sediment Leaving Buffer (tons/yr.)	All Action Alts % Reduction Sediment Leaving Buffer
WF Pilgrim Cr	16	21.75	0	2.05	90.6
WF Pilgrim Unnamed Trib	4	9.71	0	0.55	94.4

Stream	Number Crossings	Alt 1 (No Action) Sediment Leaving Buffer (tons/yr.)	Alt 1 % Reduction Sediment Leaving Buffer	All Action Alts Sediment Leaving Buffer (tons/yr.)	All Action Alts % Reduction Sediment Leaving Buffer
Skeleton Cr	1	0.32	0	0.08	75.1
Pilgrim Cr Mainstem	3	3.16	0	0.4	87.2
Pilgrim Total	21	25.23	0	2.53	352.9
Stevens Cr	3	0.04	0	0.03	23.4
Grand Total	24	25.27	0	2.56	376.3

Non-existing proposed new road segments in West Fork Pilgrim Creek unnamed tributary not included.

Fuel Treatment without Timber Harvest

Ecosystem burning (including slashing) would occur in numerous drainages across the project area (Table 3-66). A total of 4,564 acres is proposed for burning in the project area with locations and acreages being identical among all three action alternatives. Of this total, approximately 2,165.8 acres (47%) would occur in drainages supporting fisheries. This burning is generally proposed to occur under conditions in which a low intensity ground fire would result and is projected to result in only minor changes to canopy coverage with no corresponding increase in projected peak flows or indirect effects to fish habitat. Spring burns comprise the majority of the proposed burn acreage and would have minimal offsite effects. This would protect soils and retain some duff layer component due to the high soil moisture present. As a result sediment production from the burned areas would be minimal. All the prescribed burning units are concentrated on ridges and south and west facing slopes, thereby avoiding most riparian areas. No fires would be ignited in riparian areas. Incidental inclusion of RHCA's in burns will likely be of low intensity due to the moist habitat during spring burning. 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 proximal to 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 a negligible 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.

Past experience with this type of burning on the Cabinet Ranger District has demonstrated that activities of this nature can be done without adverse effects to riparian areas or channel banks. Typically, fuel continuity is low and the resulting burn is patchy, and many areas where fire will not carry. Reduction in canopy cover is not expected to exceed 20% (see Fuels report) as the primary objective is to create small openings to enhance wildlife habitat. ECAs are not projected to increase due to the minor reduction in overstory canopy. Due to the generally rocky nature of many of the areas proposed for burning, it is felt that burning in the Pilgrim Creek area can be accomplished without adverse impacts to riparian areas, channel banks, or fish habitat. Low fire intensities within riparian areas, and minimal changes in forest openings in upland areas, would mean no stream temperature effects.

The proposed burning would not result in an increase in equivalent clearcut area, temperature, or peak flows, therefore its effect to fisheries habitat would be negligible.

Table 3-66. Proposed ecosystem burn acres by 7th code HUC in the Pilgrim Creek Project Area.

Drainage	Alternatives 2, 3 4, & 5		
	burn	slash/burn	Total
Baxter Gulch	90.86	1.06	91.91
Cabinet Gorge R	19.85	0.00	19.85
Fourmile Gulch	462.12	0.00	462.12
Hemlock Gulch	2.97	0.00	2.97
Pilgrim Cr	**606.86**	**0.00**	**606.86**
Pilgrim Cr SF	290.03	204.68	494.71
Pilgrim Cr Trib	514.20	0.00	514.20
Pilgrim Cr WF	**403.32**	**2.34**	**405.66**
Skeleton Cr	**2.47**	**244.68**	**247.16**
Smeads Cr	146.55	0.00	146.55
Stevens Cr	**549.12**	**357.00**	**906.12**
Telegraph Cr	665.07	0.00	665.07
Total	*3,753.41*	*809.77*	*4,563.18*
Total Fish-Bearing	***1,561.77***	***604.03***	***2,165.80***

Bold letters depict fish-bearing watersheds.

Summary of Anticipated Effects

Timber Harvest- Peak flow increases would be minor and maintain channel conditions in fish bearing watersheds, with some potential for increased flow in lower Skeleton Creek in Alternative 3. No overland sediment delivery is expected based on unit location and application of RHCA buffers. No direct or indirect effects to fish or aquatic habitat are expected.

Road Construction- Overall, based on location of roads (high on the slope) or outside of RHCAs, there is little potential for sediment increases in fish-bearing stream reaches. Roads would be designed to avoid carrying water long distances and delivering it to draws, so water routing to stream channels or draws is not expected. New road construction on NFSR 2744C and 2744D under alternatives 2 and 3 could result in short and long term sediment contributions to occupied westslope cutthroat trout habitat. Design criteria would minimize the quantity of sediment delivered to the stream channel at these crossings to the extent that there would be no measurable effect to fish habitat. No direct or indirect effects to fish or fish habitat are expected.

Road Reconstruction (BMP work)- Improved surface water management would reduce water and sediment routing from existing roads and crossings. Peak flow response time would be improved, incrementally improving the resiliency of the watershed to rapid melt and heavy rain events. Culvert replacements would take place when the upper reaches of mainstem Pilgrim Creek are dry. Some sediment would be delivered to Stevens, Skeleton, and West Fork Pilgrim Creeks during culvert replacement activities but would be of short duration and should not result in adverse impacts to cutthroat populations. Downstream impacts to bull trout and western pearlshell mussel in lower mainstem Pilgrim Creek would be undetectable due to 1) distance from the nearest sediment source to occupied habitat (≥ 3.7 miles); 2) the presence of a half mile long beaver complex in upper Pilgrim Creek (sediment trap); 3) dry channel seasonally isolating bull trout and mussel habitat from upstream sediment sources; and 4) limiting work to times outside of the spawning period or when the mainstem is dry.

Natural Fuels Burning- would have no impacts to fish and aquatic habitat. Areas proposed for burning are south and west facing slopes that generally do not include riparian areas. Filtration of sediment should be adequate to preclude overland sediment delivery to channels.

Cumulative Effects

Past actions and their effects on current conditions-

Large fires in 1880's and 1910 affected a large proportion of the project area. Much of the fire was fairly intense but skipped portions of the upper South Fork of Pilgrim. Many tributaries appeared to be heavily affected by fire, including streamside areas. Intense fire in riparian areas likely contributed to bank sloughing and channel instability due to the loss of vegetation and increased water yields associated with removal of most vegetative cover in the watershed. A large flood event in 1916 is thought to have contributed substantial amounts of coarse and fine sediment from tributaries to main drainages. It is possible that legacy effects of this large sediment pulse are lingering but it is difficult to say with a high degree of certainty that this is the case. Effects to fish are

difficult to estimate over one hundred years post-fire. Fish habitat was likely affected for at least a short time by sediment loading that simplified habitat and possibly contributed to the dewatering of middle reaches that is seen today. Stream temperatures were likely warmer in the summer and colder in the winter. Vegetative recovery probably ameliorated effects to water yields and temperatures by about 1940. Past timber harvest and road construction impacted the watersheds and fisheries within the project area mainly through increased sedimentation and water yield. Stream segments on private land are located lower in the drainage and provide higher quality fish habitat due to larger stream size and perennial water availability. Early land clearing and riparian conversion in Pilgrim Creek likely had the single greatest impact to fish and fish habitat in the project area. Grazing and other agricultural impacts likely negatively affected riparian conditions in the past and may contribute lingering effects but current grazing levels are very low.

Records of timber harvest on NFS lands in the area date to the 1950s, and harvesting became more active in the 1960s. Some riparian harvesting occurred on NFS lands in the 1960s and 70s but later timber harvest utilized riparian buffers and was more protective of stream banks and near-channel areas. Most timber harvest in the 1950s and 1960s has vegetatively recovered to the point that, based on hydrologic recovery rates applicable to the analysis area, effects of other projects implemented in the area more than 30 years ago have revegetated and would not contribute to sedimentation or cause changes in channel morphology. Some roads constructed for timber harvest in this time period are still producing and delivering sediment and routing water to channels. Many of these older roads are stable and well vegetated. Some still route surface flow to channels but many do not.

Most harvest from the 1970s has recovered in terms of water yield and is no longer influencing timing or magnitude of runoff or storm response, and most roads from this period that are no longer in use are well vegetated and affecting water and sediment routing similar to roads discussed above.

Harvest activities in the 1980s and 1990s included approximately 1231 acres of regeneration harvest that are responsible for most of the water yield increases seen today. Peak flows in Pilgrim Creek are currently estimated to be 2% over natural conditions which is not generally considered excessive. Roads built and used for sale activities in this period were constructed and maintained with a better understanding of the importance of surface water management, but still may be producing sediment and routing surface flow to channels in some places. Specific sales from this period include:

- Rice Paddy (1980): This sale in the headwaters of the West Fork of Pilgrim Creek had 54 acres of regeneration harvest and 16 acres of intermediate harvest. No new roads were constructed in the West Fork with this sale. At that time no watershed analysis was completed nor were predictions made regarding increases in peak flow to the West Fork.

- Huckleberry Stevens (1988): The majority of this 101 acre sale was in Stevens Creek with one unit being located in the headwaters of Telegraph Creek. Although portions of existing roads were reconditioned during this sale no new roads were built. Approximately 3% of the Stevens Creek watershed was left in a clearcut condition as a result of this sale. Water yield increases in both the Stevens Creek and Telegraph Creek continue to persist as a result of this sale,

but have not led to unstable channel conditions and had and continue to have little to no effect to fish habitat in either drainage.

- Stevens Blacktail (1990): This sale, which included 240 acres of regeneration harvest and associated road construction, projected that peak flows would increase by 1% to 4% over natural in Stevens Creek. These predictions were based on the 74 acres of timber harvest planned in the Stevens Creek drainage. Stream surveys of these drainages in 2005 noted stable conditions within the response reach and other downstream reaches in Stevens Creek. Channel conditions in Stevens Creek indicate that the channel has adjusted to these minimal past water yield increases without undue channel effects. Other units were harvested within the dry draw basin labeled Noxon Trib 511. These areas have not scoured newly formed channels or increased downstream sediment from this previous sale. Constructed roads associated with this sale have not contributed direct sediment to active stream channels and likely had no impacts to fish habitat in Stevens Creek due to unit location and lack of fish populations in the upper watershed.

- Smeads Rice (1992): This sale, located in Smeads Creek, Rice Draw and Deer Creek, projected increases in water and sediment yields in Smeads Creek but predicted no discernible impacts to the mainstem. Descriptions of channel conditions in the EA are similar to those observed in 2004 stream surveys. Units were provided with adequate buffers to protect riparian values. Water yields are still increased over natural in Smeads Creek (18% IPF) but the downstream intermittent and dry draw channel conditions do not appear to be unduly affected by the increase. Smeads Creek is fishless, but the consistency between predicted channel conditions and those observed in 2004 are instructive.

- Huckleberry LPP SSTS (1992): This project involved harvest of approximately 10 acres in Stevens Creek. This sale in conjunction with the units from Huckleberry Stevens and Stevens Blacktail sales left approximately 4% of the drainage in a clearcut condition. This modest percentage has not led to channel instability or an increase in sediment in Stevens Creek. There are no fish in upper Stevens Creek and no effects would have been expected from this sale.

- Smeads Bottom (2000): This bulk of potential effects from this sale consist of that from a single unit low in the drainage that was commercially thinned on a flat bench. The drainage below this bench and directly adjacent (Smeads Creek) is intermittent in nature and has not widened, downcut or incised from this or other past harvest in the basin. There is no fish habitat in Smeads Creek and no connectivity with the reservoir. The environmental analysis for that project predicted no effects to fisheries from implementation and it appears to be accurate.

Past actions have shaped the project area and are instructive in the sense that they provide an indication on how the area will respond to disturbance.

Cumulative Effects of the No-Action Alternative

Cumulative effects in the project area include past management, ongoing activities, and reasonably foreseeable actions on both public and private lands. The "Discussion of Past Actions and their Effect on Current Conditions" section above frames the existing condition relative to past actions.

Activities on private property would probably continue to increase within the analysis area, as subdivision of private parcels in Pilgrim Creek is anticipated. Home sites will likely be developed on some of these parcels over time. These activities include private development for homes, recreational sites, and various scales of timber management. This level of activity would add to the 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. Additional activities that are likely to occur include wood cutting, dispersed recreation, continued road maintenance, recreational fishing, hunting, berry picking, and weed spraying. These activities would incrementally affect aquatic habitat and fish / mussel populations.

Cumulative Effects of the Action Alternatives

Under all action alternatives, the maximum ECA with the proposed activities would result in only minor increases in predicted peak flows in the project area. Culvert replacements and BMPs proposed would result in a net improvement in channel conditions and aquatic habitat under all alternatives.

Prescribed fire would help to reduce fuel loadings in specific areas within the project area. The overall effects of this burning would be minimal since the burns would be done in spring when fuel moistures are high. This would reduce the likelihood of excessive crown reduction and will stimulate grass and shrub growth. Peak flows are not expected to measurably increase as a result of prescribed burning. Site preparation associated with regeneration units would not occur near any RHCA.

Implementation of Alternatives 2, 3, 4, and 5 in conjunction with the current activities in the project area, which include past, ongoing, and reasonably foreseeable actions would not measurably affect aquatic habitat. Although fish habitat conditions measured during the 2003 field season did not meet INFS standards for pool frequency and width/depth ratio in a majority of surveyed reaches, ongoing and proposed activities would not retard attainment of INFS RMO's. Fish habitat would be maintained and would not decrease viability of bull trout, westslope cutthroat trout, or western pearlshell populations within the project area.

Peak flow increases are not projected to result in measurable changes in water yield. Home site development may occur but would be unlikely to affect channel conditions in the short term. Septic installation could increase the amount of nutrients delivered to near-channel areas. Excess nutrients are not currently a concern in Pilgrim Creek at this time.

Road maintenance activities including brushing and blading would continue.

General recreational use will continue at or near current levels in the foreseeable future and includes hunting, hiking, recreational fishing, camping, berry picking, driving for pleasure, bird watching, snowmobiling, firewood gathering, and similar activities.

Recreational fishing is regulated by the State of Montana and because bull trout are only known to occur on private land at extremely low densities, has the potential to impact very few bull trout. Angling specifically for bull trout is prohibited and all bull trout incidentally caught must be released.

Precommercial thinning of previously harvested stands is likely to occur but is not part of this proposal. Stands are generally thinned to promote and maintain growth of the residual stand, and fully stocked stands are maintained. Generally, no change in peak flow increase is predicted and thinned stands continue to mature. It is not expected to change the scope or magnitude of effect anticipated from this proposal.

Statement of Findings/Forest Plan Consistency of the No-Action Alternative

The no action alternative is consistent with INFS because natural vegetative recovery would continue to occur, improving riparian conditions over time and moderating existing water yield increases. Large woody debris abundance in Pilgrim, Skeleton, and Westfork Pilgrim Creek would remain low until natural succession replaces lost riparian forest. Road maintenance and replacement of undersized culverts would likely occur at some point in the future but exact timing cannot be forecast.

Forest Plan Consistency of all Action Alternatives

The proposed activities implement INFS RHCAs to protect riparian resources and function. None of the action alternatives propose harvest or burning in RHCAs nor will there be a significant increase in peak flows within the project area. This would not retard the attainment of Riparian Management Objectives within the project area. Based on these factors it is determined that action alternatives are consistent with the Forest Plan as amended.

Statement of Findings - Threatened, Endangered and Sensitive Species

Based on the analysis above, the effects determination for bull trout is that the action alternatives would have **No Effect** on bull trout or designated critical bull trout habitat This determination is based on: a) minimal cumulative PFI in mainstem Pilgrim Creek; b) the distance of sediment generating activities from occupied habitat; c) seasonal isolation from sediment generating activities (dry reach and timing restriction); and d) a half-mile long beaver dam complex sediment trap upstream from occupied habitat.

Alternatives 2, 3, 4, and 5 would have **No Impact** on western pearlshell mussel. This determination is based on: a) minimal cumulative PFI in mainstem Pilgrim Creek; b) the distance of sediment generating activities from occupied habitat; c) seasonal isolation from sediment generating activities (dry reach and timing restriction); and d) a half-mile long beaver dam complex sediment trap upstream from occupied habitat. This assessment constitutes the biological evaluation for western pearlshell mussel.

Alternatives 2, 3, 4, and 5 May Impact Individuals or Habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species for westslope cutthroat trout. This determination is based on the effects from the proposed culvert replacements, peak flow increase in lower Skeleton Creek, and new road/crossing construction activities in the West Fork Pilgrim Creek unnamed tributary

and their potential impacts to habitat. Alternative 1 would have no impact on westslope cutthroat trout. This assessment constitutes the biological evaluation for westslope cutthroat trout

Soils

INTRODUCTION

This section discloses the results of the soils resource analysis in the Pilgrim Project Area on soil productivity. Field surveys for this project were conducted in 2010 using the R1 Soils Protocol.

Regulatory Framework

The regulatory framework pertaining to soils is summarized below. For additional information, please refer to the Soil and Water Regulatory Framework in the Soil and Water Project File.

STATE AND FEDERAL LAWS AND REGULATIONS

The regulatory framework providing direction for protecting a site's inherent capacity to grow vegetation comes from the following principle sources:

- *The Multiple Use-Sustained Yield Act of 1960 – Federal law*
- *The National Forest Management Act of 1976 (NFMA)- Federal law*
- *The Forest Plan and Regional Soil Quality standards (2554.03-R1 Suppl. 2500-99-1)*
- *Soil and Water Conservation Practices Handbook (FSH 2509.22 R-1/R-4 Ammendment No. 1 Effective 5/88)*
- *The Kootenai Forest Plan*

The Multiple Use-Sustained Yield Act of 1960 directs the Forest Service to achieve and maintain outputs of various renewable resources in perpetuity without permanent impairment of the land's productivity.

Section 6 of the National Forest Management Act of 1976 (NFMA) – Section 6(g)(3) states that harvest shall be “carried out in a manner that is consistent with the protection of soil resources” and that “soil, slope, or other watershed conditions will not be irreversibly damaged”. To comply with NFMA, the Chief of the Forest Service has charged each Forest Service Region with developing soil quality standards for detecting soil disturbance and indicating a loss in long-term productive potential.

The Regional Soil Quality Standards (R-1 Supplement 2500-99-1) provides soil quality standards to assure the statutory requirements of NFMA are met. Manual direction recommends maintaining 85% of an activity area’s soil at an acceptable productivity potential with respect to detrimental impacts, including the effects of compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movement. This recommendation is based on research indicating that a decline in productivity would have to be at least 15% to be detectable (Powers, 1990). In areas where more than 15 percent detrimental soil conditions exists from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality. These standards do not apply to intensively developed sites such as permanent roads/landings, mines, developed recreation and administrative sites.

The Forest Plan states that soil and water conservation practices (SWCPs) as outlines in Water Conservation Practices Handbook R-1/R-4 Amendment No. 1 (FSH 2509.22) will be incorporated into all land use and project plans as a principle mechanism for controlling non-point pollution sources and meeting soil and water conservation practices or State standards will brought into compliance, modified, or stopped (Volume 1 p II-23). Best Management Practices consist of state-of-the art practices that fulfill Forest Plan objectives and are designated to minimize soil disturbance during harvest and road construction activities.

The Kootenai Forest Plan states that effects on soil productivity will be evaluated for all projects involving heavy equipment and that the total area allocated to concentrated equipment travel should be minimized.

ANALYSIS AREA AND METHODS

SOILS ANALYSIS AREA

The direct and indirect effects of the alternatives will focus on individual soils analysis areas as defined by the Forest Service Manual (R-1 Supplement No. 2500-99-1):

> "**Analysis Area:** A soils analysis area is a discrete land area affected by management activity to which soil quality standards are applied. Activity areas must be feasible to monitor and include harvest units within timber sale areas, prescribed burn areas, and grazing areas or pastures with range allotments. All proposed temporary roads, landings and skid trails associated with proposed harvest areas are included within the analysis area.

The proposed soil analysis area for this project involves stand improvements, timber harvest. Piling, fuel treatments, fire line construction, skid trails, landings, weed spraying, both new and temporary road construction, and road decommissioning and storage, and post-harvest activities. System roads are not a part of the soils analysis areas.

ANALYSIS METHODS

Existing Condition

Existing condition for the soils resource were determined using timber stand records, aerial photography, GIS data, and on-the ground visits. Landtypes and hazard ratings were gathered from landtype descriptions and characteristics found in the Soil Survey of Kootenai National Forest Area, Montana and Idaho (Kuennen and Gerhardt 1995).

All units containing evidence of existing soil disturbance related to past management activities received a full qualitative field survey using R1 Soil Survey Procedures. Field soil surveys consisted of random stratified transect/sample point methods with confidence intervals at or above 80% ± 5% with the majority of surveys being 95% ± 5%. Completed soil surveys can be found in the Soil Project File and/or District Files. Existing detrimental soil disturbance numbers are a result of all currently measureable effects of past actions in each activity area, including but not limited to: timber harvest (trails and landings), temporary road construction, management related burns, grazing, off highway vehicles, natural disturbances, firewood gathering, etc. These methods provide data that is used in the analysis to determine if Forest Plan and Regional Soil Quality Standards would be met.

Field Sampling Procedure

In order to determine the severity and aerial extent of existing soil disturbance from previous forest management activities, randomly selected soil transects were conducted across representative portions of the proposed activity areas (proposed harvest polygons, temporary roads, and landings). Every other step is considered a sample location and sampled using common tile spade shovel to determine the resistance of penetrating into the soil. Physical resistance to penetration was found to correlate quite well with altered soil conditions related with past management activity. In areas displaying the strongest properties of past management activities the shovel blade is only capable of penetrating a short distance into the soil and with great effort.

Field sampled transect points were placed in one of three categories: 1) no disturbance; 2) disturbance present but not detrimental; and 3) detrimental soil disturbance (DSD). The detrimental disturbance category is considered detrimental as defined in FSM 2550 and Region 1 Supplement 2500-99-1. As a result, DSD is defined as the proportion of an activity area that may be subject to displacement, compaction, rutting, erosion, or severe burning due to past management activity (such as harvest, fuels treatment, or temporary road construction), exclusive of dedicated resources (such as system roads).

Detrimental Soil Disturbance (DSD)

The soils in an activity area are considered detrimentally disturbed at a given sample point when one or a combination of any of the attributes listed below is present due to past Forest Management activities:

a. *Compaction: a 15% increase in natural bulk density. Soil compaction reduces the supply of air, water, and nutrients to plants. Roading, ground based yarding, dozer and grapple piling activities are the major contributors to compaction.*
b. *Soil ruts: Machine-generated soil displacement having smeared the soil surface in a rut. Wheel ruts at least 2 inches deep in wet soils.*
c. *Displacement: removal of one inch or more surface soil continuous area greater than 100 sq. feet which often consists of the O and A soil horizons. Displacement removes the most productive part of the soil resource. Temporary roads, skid trails, ground-based yarding, dozer piling and cable corridors are the major contributors to displacement.*
d. *Surface erosion: Indicated by rills, gullies, pedestals, and localized soil deposition.*
e. *Severely burned soils: Physical and biological changes to the soil resulting from high-intensity burns of long duration as described in the Burned Area Emergency Rehabilitation Handbook (FSH 2509.13).*
f. *Soil mass movement: any soil mass movement caused by management activity.*

Detrimental Soil Disturbance

Direct and Indirect Effects

The potential detrimental soil disturbance (DSD) values were calculated based on a summation of past monitoring of soil productivity (KNF 1988-present date) within the Kootenai National Forest (Table 3-1). The percentage were developed as an average soil disturbance level and equated to harvest equipment type, fuel treatment methods, and season of operation. Timber removal had always occurred prior to the “post-harvest field surveys” and includes mechanical

fuel abatement activities such as excavator piling activity if present. The end DSD figure is a composition of all disturbances and does not separate each category of disturbance values where present within each unit. Thus, the value of 8% DSD for summer tractor is a "statistical summary" which takes into account not only the skid trails but temporary roads, mechanized piling, and fire lines if present within the units being surveyed at that time and date. New temporary roads are considered 100% detrimentally disturbed through removal of organic matter, displacement, and/or compaction while re-opening of an existing temporary road prism is considered to have 0% additional detrimental disturbance as such roads are considered to be disturbed for greater than 50 years. Temporary roads yield an average of 2 acres of DSD per mile of road. Refer to Table 3-67.

Table 3-67. Monitoring Results of Detrimental Soil Disturbance from Management Activities on the Kootenai National Forest (Kuennen 2007)

Category	Season of Operation	Detrimental Disturbance Coefficients (%) [2]
Skyline	NA	1
Tractor	Summer	8
Tractor	Winter	4
Forwarder	Summer	4
Forwarder	Winter	2
Feller Buncher	NA	2
Helicopter	NA	0
Excavator Piling [1]	NA	2
Fire line Construction [1] [4]	NA	1
Grazing [1]	NA	2
Tractor 2ndary entry	Summer	4[5]
Tractor 2ndary entry	Winter	2[5]
Forwarder 2ndary entry	Summer	2[5]
Forwarder 2ndary entry	Winter	1[5]

[1] DSD percent is not necessarily additive to other activities. This is because the percentages presented for each management activity included some units with excavator piling, fire line construction, and/or grazing in the data set. In addition, disturbance from these activities within harvest units usually overlaps at least a portion of the skidding disturbance.

[2] The numbers for this document were based on percentages from the last five years. Previous documents have used eighteen year averages. Typically the larger data set is more accurate, but because the eighteen year data set included practices that are not used anymore (i.e. dozer piling) it was deemed more appropriate to use the more accurate information pertaining to modern harvest and slash disposal methods.

[3] Feller buncher must be operated straight up and down the fall line on slopes not exceeding 50%. Where such activities occur on skyline harvest units an additional 2% DSD is expected to occur.

[4] Fire line construction prior to 1995 included dozer activity while data collected following 1995 generally included handline construction or excavator bucket-width activity. As a result there has been a significant reduction of fire line disturbance in a given unit.

[5] In proposed secondary entry harvest units which currently are equivalent or exceed 8% current DSD the proposed ground based harvest activities are proposed as having approximately a 50% disturbance value compared to similar harvest activities in currently undisturbed soils (Louis Kuennen pers. comm. 2011). This reduction in the anticipated DSD

values only applies to ground based harvest operations. It is assumed that units containing less than 8% DSD are more historic in nature and are on a recovery trend as displayed by revegetation of historic skid trails and second-growth stand conditions. As a result the reduction in secondary entry values will not apply to such stands.

Generally, detrimental effects on soils are not permanent and depend primarily on soil texture, parent material, aspect, and level of disturbance, i.e. compaction. Recovery begins once activities cease on the site. However, vegetative recovery time may take approximately 30 to 70 years as the second growth timber becomes established in and around the disturbed areas (Dykstra and Curran 2002; Froehlich and McNabb 1983; Froehlich and others 1983 and 1985). In areas where soil displacement mixes or moves the volcanic ash surface layer and reduces moisture holding capacity and productivity may continue to be impacted far beyond the 70 year timeframe.

Indirect effects may include the reduction of site productivity due to the removal of vegetation and nutrients. Large woody debris (woody residue >3" diameter) and finer organic material are essential for maintenance of sufficient microorganism populations and long-term site productivity. Design features (see Design Criteria) are incorporated into the activities to manage large woody debris and organic matter as detailed in the research guidelines contained in Graham and others (1994). Where feasible, smaller woody material such as tree tops, foliage, and branches would be left to over-winter before fuels treatment, which allows nutrients to leach out of these materials and into the soil.

Cumulative Effects

Cumulative effects include the combination of direct and indirect effects from past, present, and reasonably foreseeable activities. Direct, indirect, and cumulative effects on soils are measured within each activity area. Existing system roads and designated landings on the National Forest transportation system are considered dedicated lands and are not part of the cumulative effects.

ASSUMPTIONS AND LIMITATIONS

The potential detrimental disturbance numbers for each proposed harvest unit are based on empirically derived coefficients that were obtained and averaged from numerous monitored sites throughout the Kootenai National Forest (Kuennen 2003; Kuennen 2007). The assumptions are limited to the harvest and slash disposal methods for which coefficients have been determined, and its coefficients assume that Best Management Practices (BMPs) will be implemented. The predicted values do not account for changes in soil type, the recovery of soils over time, or existing conditions.

Evaluation of cumulative effects to soil productivity are analyzed for activity areas as opposed to the integrated "watershed scale" because that is not considered an appropriate geographic area. Soil conditions are site-specific. Loss of soil productivity in one treatment unit will not lead to a loss in soil productivity in an adjacent stand. Soil productivity can vary from one square foot to the next with each area functioning independently. Thus, the highly variable and independent nature of soil productivity requires site-specific analyses to maintain the proper context. Assessments of cumulative effects on soil productivity is retained at the site specific boundary scale since analysis at the watershed scale for soils misrepresent management activity effects by masking and/or diluting site-specific effects across a larger area. In contrast, soil processes such as erosion regime and hydrologic functions occur at a watershed scale and can be analyzed as such in Water Resource Reports.

SCIENTIFIC UNCERTAINTY AND CONTROVERSY

Soil productivity relies on complex chemical, physical, and climatic factors that interact within a biological framework. For any given site and soil, a change in a key soil variable (i.e. bulk density, soil loss, nutrient availability, etc.) can lead to changes in potential soil productivity. The intent is to prevent extensive detrimental soil disturbance that would result in a measurable decline in timber productivity for a site. The Region 1 supplement requires that detrimental soil disturbance should be limited to 15% of an activity area. The value of 15% is based on the assumption that soil quality and productivity will be maintained if less than 15% of an activity area is detrimentally impacted after disturbance (Page-Dumroese et al. 2000).

Currently the effects of soil disturbance on soil quality are being studied across North America by a cooperative research project called the North American Long Term Soil Productivity Study (LTSP). The study began in 1990 and is currently ongoing in order to provide the best available science to forest managers. Results over the past ten years indicate that there is little evidence of adverse effects of surface organic removal or soil compaction on productivity as measured by total biomass production, and the growth and vigor of planted trees (Powers et al. 2004).

Additional controversy surrounds the use of the term 'irreversible' in NFMA. NFMA has guidelines that "insure that timber will be harvested from NFS lands only where soil, slope, or other watershed conditions will not be irreversibly damaged." The detrimental soil disturbance described in this analysis does not necessarily result in permanent or irreversible damage. Detrimental soil damage is reversible if the processes (organic matter, moisture, top soil retention, soil organisms) are in place and time is allowed for recovery.

AFFECTED ENVIRONMENT

SOIL REFERENCE CONDITIONS

The bedrock underlying the project area is composed mostly of metamorphosed sediments of ancient sea beds from the Precambrian era (0.8-1.4 billion years before present), referred to as the Belt Supergroup. The major structural feature is the Hope Fault, which parallels the Clark Fork valley, and several large northwest-trending faults that are perpendicular to the drainage.

The project area is composed of an erosional landscape modified by some alpine glaciation (approximately the upper 1/4 of the drainage). The landform is very steep, except for the valley floor adjacent to the Clark Fork River. The lower elevations were impacted by episodic Glacial Lake Missoula ice daming activities which came down the Purcell Trench from the north, and extended eastward up the Clark Fork valley. This large glacial lake reached an average water line level of 4,200 feet.

Most soils in Pilgrim are residual which means that they were not affected by glaciation and developed "in place" rather than by glacial activities. The amount of rock present in residual soils is much higher than that associated with glacial till or Cordilleran Ice Sheet soils and rock shape is strongly angular.

Approximately 7,700 years ago (Zdanowicz and others 1999) Mt. Mazama erupted in southwest Oregon and deposited a layer of volcanic ash-influenced loess over northwestern Montana forming a topsoil horizon in many local areas. This layer is
present on all northerly and easterly aspects and the higher elevations of the southerly and westerly aspects and is important since it increases soil productivity and provides the best rooting environment within the soil profile. The ash cap is light and feathery and has a yellowish

to reddish brown color and ranges from four to 14 inches thick. The uppermost ash is usually enriched with organic matter and has been incorporated into the local soil system. Such soils have a high water-nutrient holding capacity and are important for soil productivity. Generally speaking the sub-soil horizons are not nearly as fertile as the surface horizons.

Between the eruption of Mt. Mazama to the early 1900s, the soils were relatively undisturbed. Naturally occurring surface erosion and small-scale landslides probably occurred on occasion, but the overall magnitude would have been insignificant in terms of long-term soil productivity. Soil recovery in such areas was attained when the slope reached a stable angle and/or the area was revegetated. Soil productivity was maintained over the long-term as vegetative matter slowly decomposed or burned in low intensity natural wildfires.

Historically, the most prevalent large-scale disturbance in the project area was wildfire. Stand replacing fires varied in frequency from 50-350 years, depending on vegetation type and location. Once fire passed through an area, erosion increased, especially on steep slopes and in headwater swales where most vegetation was removed, until sufficient forest floor and canopy vegetation had recovered. More frequent, low-intensity underburns likely had little effect on soils due to the short contact time and lower temperatures associated with these fires.

EXISTING CONDITION

Existing condition is the result of the past management activities (temporary road construction, timber harvest, prescribed burning, etc.) and natural events (wildfire, floods, landslides, etc.) that occurred in the Analysis Area. These activities and events provide baseline conditions for the affected environment in the Analysis Area.

Soils are the basic support system of forest ecosystems, providing nutrients, water, oxygen, heat, and mechanical support to vegetation. Any environmental stressor that alters the natural function of the soil has the potential to influence the productivity, species composition, and hydrology of forest systems. Maintenance of soil quality is dependent upon the protection of surface layers from erosion, displacement, and compaction, as well as the continual cycling of nutrients and organic material. Soil quality refers to the capacity of a soil to function within ecosystem and land use boundaries, to sustain biological productivity, maintain environmental quality, and promote plant and animal health. Various factors influence soil quality. Although management activities do not affect factors such as climate and soil parent material, they can affect physical, chemical, biologic, and hydrologic soil properties.

Three criteria were used to assess existing condition in the Analysis Area for soil resources:

- Kootenai National Forest **Landtypes**;
- Identification of **Sensitive Soils**; and
- **Coarse Woody Debris**

LANDTYPES

There are 50 recognized landtypes on the KNF. This classification of landtypes is based on: *landforms, geology, soils, vegetation, climate, and drainage type*. They describe inherent conditions and do not change as a result of management. The landtypes were compiled in Kuennen and Nielson-Gerhardt (1984), and published in Soil Survey of Kootenai National Forest Area, Montana and Idaho (Kuennen and Nielson-Gerhardt 1995). Landtype classification helps determine suitability, equipment operating limitations, and the production potential of the landscape. It is an important tool for protecting soils during resource management activities.

Refer to Figure 3-21: Landtypes in the Pilgrim Creek Analysis Area. The landtype map is generally quite accurate; however, field verification may indicate some site variability. The landtypes were broken down into five generalized groupings or series which include the following:

- **Water influenced Landtypes (100 Series):** Located in very low relief topography which is highly water influenced.
- **Steep topography Landtypes (200 Series):** Exists in very steep topographic lands (60% plus). Such landform areas are usually rocky slopes and may be convex or linear in shape.
- **Glaciated Landtypes (300 Series):** Located in areas of past glacial deposits and shaped through time by several glacial advances that occurred throughout the Kootenai National Forest. The most recent, the Cordilleran Ice Sheet, retreated from the area several thousand years before present. These landtypes included glaciated slopes, drumlins, and moraines.
- **Alpine till Landtypes (400 Series):** Such landtypes exist in very steep alpine or subalpine locations and consist of glacial cirque headwalls and trough walls.
- **Mid-elevation Landtypes (500 series):** Such landtypes are residual in nature and developed on site and are typically mid-slope in elevation.

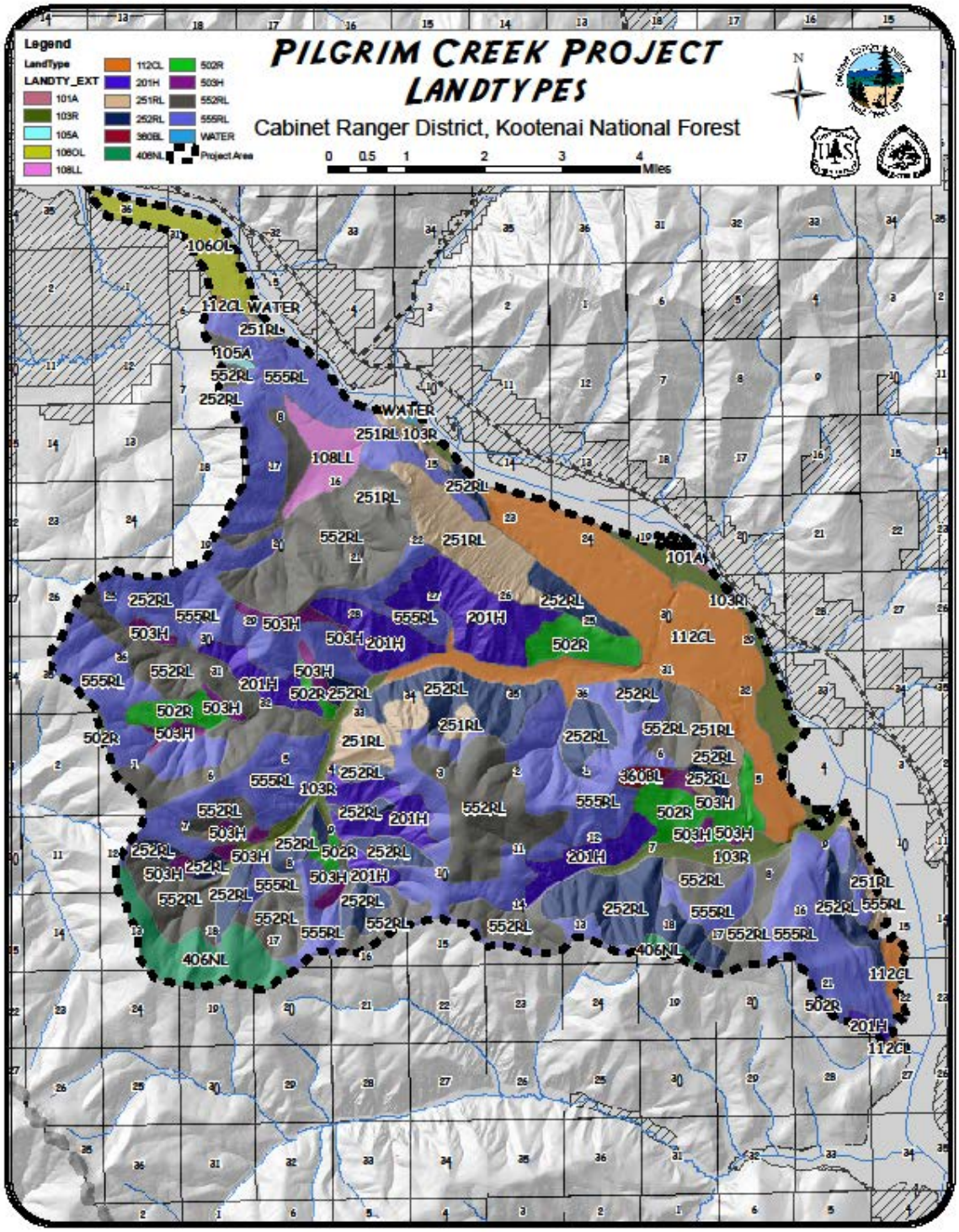


Figure 3-21. Landtypes of the Pilgrim Creek Analysis Area

Of the 50 recognized landtypes on the KNF fifteen of these landtypes are found in the Pilgrim Creek Project Area (Figure 3-21, Table 3-68). Within these landtypes, only nine have proposed harvest and/or fuel activities under at least one of the action Alternatives Management activities

on each landtype are designed to be comparable to the risk associated with the landtype. The landtypes in the Analysis Area and their implications are displayed in Table 3-68. The following information provides a general description of all landtypes found in the Pilgrim Creek Analysis Area.

Table 3-68. Landtypes in the Analysis Area (Kuennen and Gerhardt 1995)

Landtype	Acres	Timber Management		Road Construction/Maintenance		
		Tractor Operations	Sediment Hazard	Cut and Fill Slopes	Native Surface Material	Sediment Hazard
101	75	Soil Damage	Severe	None	Erosion	Severe
103	1,451	Soil Damage	Severe	None	Erosion	Severe
105	34	N/A[1]	N/A[1]	None	None	Moderate
106	604	Soil Damage	Moderate	None	Erosion	Moderate
108	473	Soil Damage	Moderate	None	Rutting/Erosion	Severe/ Moderate
112	3,577	Soil Damage	Moderate	Cutbank Soughing	Rutting	Severe
201	2,926	N/A[1]	N/A[1]	None	Large Stones	Moderate
251	1,990	Slope, Rock	Severe	None	Large Stones	Moderate
252	4,153	Slope	Severe	None	Rock Fall	Moderate
360	90	Rock	Slight	None	Large Stones	Slight
406	934	Slope	Moderate	Raveling	None	Slight
502	1,483	Slope	Slight	None	None	Slight
503	772	Slope, Rock	Slight	None	Large Stones	Slight
552	7,264	Slope[1]	Moderate[1]	None	None	Severe
555	10,739	Complex slope, Soil Damage, Rock	Moderate	None	Large Stones	Slight
999	37					

[1] Not applicable because landtype has only scattered stands of trees.

SENSITIVE SOILS

Sensitive Soils are identified based on one of three characteristics: 1) landtypes of concern, 2) riparian/wetland areas; and 3) low productivity soils. Sensitive soils comprise 6,593 acres or 18 percent of the entire Project Area. Sensitive soils are best addressed through avoidance, Best Management Practices (BMPs), buffers, and/or through design criteria.

Landtypes of Concern

There are seven designated “landtypes of concern” on the KNF that should be given additional consideration prior to the introduction of management activities. These are landtypes 102, 112, 325, 351, 365, 370, and 520 (Kuennen 2007). When viewed at the Project Area level only

landtype 112 is found to be present and consists of 3,577 acres or 10% of the entire acreage. However, when viewed at the discreet proposed unit-specific scale landtype 112 does not occur in any of the proposed harvest units.

Riparian/Wetland Areas

There are scattered riparian corridors and small patches of wetland areas in the project area. Riparian and wetland soils are considered sensitive because their moisture levels are high all or most of the year, and moist soils are more prone to compaction, displacement, rutting, and puddling. Harvest and road construction activities will avoid timber activity in wetland areas.

Low Productivity Soils

Soil productivity as defined by Brady and Weil (2002) is "the capacity of a soil for producing a specific plant or sequence of plants under a specified system of management." The most productive part of the soil occurs near the surface, at the contact between the forest litter and the mineral soil. Here the litter has been decomposed into an organic rich layer containing most of the soil nitrogen, potassium, and mycorrhizae that must be present for a site to be productive. However, this is also the part of the soil that is easiest to disturb by management activities.

Soil productivity levels for each landtype on the KNF are classified as low, moderate, or high in Kuennen and Gerhardt (1995). It is important to look at soil productivity to properly assess the effects of potential actions on a specific area. For instance, if timber harvest is proposed on a given area of land that was considered as having low soil productivity, additional actions may need to be taken to insure a fully stocked stand after harvest. Table 3-69 displays the soil productivity by landtype in the Project Area.

Table 3-69. Soil Productivity in the Pilgrim Creek Project Area (Kuennen and Gerhardt, 1984)

Landtype	Acres	Forest Vegetation Group	Relative Productivity
101	75	Moist, Mixed Forest	High
103[2]	1,451	Moist, Mixed Forest	High
105	34	Non-Forested	N/A[1]
106	604	Moist, Mixed Forest	High
108[2]	473	Moist, Mixed Forest	Moderate
112	3,577	Moist, Mixed Forest	High
201[2]	2,926	Rocky Subalpine to Dry Mixed Forest	Low
251[2]	1,990	Open-grown Forest	Moderate
252[2]	4,153	Moist, Mixed Forest	High
360[2]	90	Sub-alpine Forest	Low
406	934	Sub-alpine Forest	Moderate
502[2]	1,483	Sub-alpine Forest	Moderate
503[2]	772	Sub-alpine Forest	High
552[2]	7,264	Moist, Mixed Forest	High
555[1 2]	10,739	N/A	High
999	37	N/A	Null
Total	**36,602**		

1 Not applicable due to landtype having only scattered stands of trees

2 Landtypes present in the Soils Analysis Area scale

Of the fifteen landtypes within the Project Area, ten have proposed harvest and/or prescription burn activities under at least one of the action Alternatives and are thus included as being in the Soils Analysis Area. The majority of the Project Area has moderate to high soil productivity. Both landtypes 201 and 360 are rated as having low soil productivity and are located in the Soils Analysis Area. This equates to 3,016 acres or 8 percent of the Soils Project Area being identified as having low soil productivity. These landtypes only have prescribed burn prescriptions which does not involve heavy equipment activities. Such activities are targeted to improve stand conditions. Application of appropriate management precautions (BMP's) such as avoiding timber harvest in wet seasons, maintaining buffer zones below open slopes, and skidding over snow or frozen ground will decrease the potential negative impacts to soil productivity regardless of landtype conditions.

SITE CONDITIONS IN THE ACTIVITY AREAS

Site conditions are considered for each activity area in the effects analysis portion of this assessment. Past activities affecting soils include, but are not limited to, road construction, timber harvest (including skid trails and landings), prescribed or natural wildfire, firewood gathering, and off-road vehicle use. Percent detrimental soil disturbance is defined by agency directives for Soil Quality Monitoring found in FSM R-1 Supplement No. 2500-99-1. The following are the categories of determining disturbed soils identified in FSM R-1 Supplement No. 2500-99-1: Compaction, Rutting, Displacement, Surface Erosion, Severely Burned Soils, and Mass Movement (Landslides). All types of detrimental soil disturbance will be considered in the examination of the existing condition and analysis of the environmental effects.

The three factors which have created the most impacts to soil conditions associated with the Analysis Area are:

- Road Construction
- Timber Harvest
- Fire

Road Construction

Common impacts to soils from road construction are displacement, compaction, and erosion (road-related runoff). Road construction affects soils by displacing topsoil layers from the road prism and compacting the road surface and shoulders. The road surface will not support trees and other forest vegetation as long as the road is used and maintained. Trees and shrubs will grow along the road bank, but site productivity is less than in unaffected soils in similar productivity zones.

Roads also disrupt hydrologic processes that occur within the soil profile. The cut slope intercepts subsurface flow and the compacted road surface reduces precipitation infiltration. As long as roads remain on the landscape, the impacts to soils persist. When road use ceases, soils gradually begin to recover. Implementation of BMPs reduces erosion and the rerouting of water associated with roads.

Roads are categorized as "National Forest System Roads" (NFSR) (dedicated under the area transportation plan) or "Undetermined" (non-dedicated roads, which are not considered to be a current part of the Access Travel Management Plan). It should be recalled that the road miles which fall into the category of being dedicated roads (FS, State, and Private) are not calculated as contributing to soil disturbance as these are "permanent structures" and therefore have no relation to the 15% detrimental soil disturbance. This is due to the road system not being

considered part of the suitable timber land base. However, the proposed temporary roads, excavated skid trails, and landings do contribute toward the 15% standard. Implementation of BMPs reduces erosion associated with such roads.

There are approximately 176 total miles of road in the Project Area. Of the total, 115 miles are Forest Service Roads, 31 miles are privately owned and 30 miles are County roads. Of the 115 miles of Forest Service Roads, 71 are NFSR and 44 miles are Undetermined Road miles. Of the 71 miles of NFSR, 27 miles are restricted yearlong, 34 miles are open yearlong, and 10 miles are seasonally restricted. Refer to the Project File and the Hydrology Report for more detailed information about specific road conditions.

Timber Harvest

Early harvest activities on FS lands included hand-fall and dozer skidding harvest activities in lower relief land areas while later in time harvest activities was altered to skyline and rubber tire skidders and handfall/clipper cutting in land areas further up the drainage systems. Two of the more important impacts to soils are detrimental soil disturbance (compaction, displacement, rutting, etc.) and removal of organic matter. Soil disturbance as a result of timber harvest and fuels reduction is usually associated with mechanized activity. Timber harvest activities can physically alter soils and reduce soil organic matter, which can lead to reduced site quality and soil productivity. Detrimental soil disturbance is defined in FSM 2500-99-1 and typically is the result of compaction, displacement, and rutting. Soil compaction results from the packing together of soil particles due to increased pressure on the soil surface. Compaction associated with equipment is often accompanied with formation of ruts, which collect and concentrate runoff, thus increasing erosion. The loss of surface organic matter through mechanical removal or burning can cause nutrient and carbon cycle deficits and negatively affect physical and biological soil conditions.

Soil compaction impacts recover over time due to freeze/thaw activity, burrowing by animals, plant root growth, wetting/drying, and the action of soil microbes. Soil erosion and displacement are impacts that require a longer timeframe to recover since the rate of soil formation is very slow. Long-term soil processes are influenced by fire, mass wasting, wind-deposition, and weathering of parent material at the rate of one inch of topsoil formed every 300-1000 years (Thurow 1991). To date a total of 1,769 regeneration harvest and 1,856 intermediate harvest are recorded for a sum of 3,625 acres within the Project Area on FS lands between 1950's-2010.

Fire

Wildfire is a natural component in forest watersheds and has influenced forest soils for thousands of years. Records of historic wildfires enforce that the potential for future wildfire remains, especially if a fire ignites in untreated areas under dry weather conditions. The largest fire on record in the Project Area occurred in 1989 and impacted the entire project area (36,602 acres) while the 1910 fire impacted nearly 98% of the project area (36,000 acres). Between 1940-2010 less than 20 acres have burned due to fire activities. This involves 75 total fires of which 65 were less than ¼ acre in size and 10 were less than nine acres in size. Of the 1940-2010 fires, 58% resulted from lightning and 42% were human caused. In summary, the smaller spot fires (1940-2010) are believed to have only impacted very small areas of land upon occurrence.

Many fire effects on soil are not observable with the naked eye. Severe deteriorating effects that wildfires have on soils include loss of organics and nutrients and a reduction of water infiltration (Wells et al. 1979). Burns that create very high soil surface temperatures, particularly

when soil moisture content is low, may result in an almost complete loss of soil microbial populations, woody debris, and the protective duff and litter layer over mineral soil. Since erosion increases following fire activity are often directly proportional to fire intensity (Megahan 1990), the removal of ash-capped surface soils as related to soil disturbance could reduce soil productivity. As a result, many of the nutrients present in surface organics and large woody debris can also be lost to the atmosphere through volatilization and removed from the site in ash-fly (DeBano 1991; Amaranthus 1989).

Depending on fire severity and activity characteristics, many plants will survive and re-initiate growth soon after a fire. However, the ability of surviving plants to reestablish, thrive, and reseed in subsequent years is greatly affected by the presence of invasive plants and weeds (Goodwin and Sheley 2001). Burned areas can contain high initial nutrient levels, exposed ground surfaces, and low shade with high light conditions which all directly favor colonization of invasive plant species. Invasive plant survival coupled with fire disturbance can cause rapid expansion of invasive plant growth. As a result, values such as wildlife habitat, watershed stability, and water quality often deteriorate.

The scenario of a wildfire occurring on sites with accumulated fuels could result in areas of high burn severity and hydrophobicity (water repellant soils). This impact is greatly amplified by increased burn severity (Huffman et al 2001). The heat of a fire vaporizes hydrophobic compounds in the organic matter and moves them into the soil layer where they condense and form a water repellant coating on the soil particles. Soil hydrophobicity usually returns to pre-burn conditions in no more than six years (DeBano 1981; Dyrness 1976) and other studies have documented a much more rapid recovery of one to three years (Huffman et al 2001). However, before water infiltration rates improve, increased overland runoff and sediment movement may occur. The primary risks for erosion and mass failure during this timeframe is related to roads, especially where stream crossings are located. It should be noted that soils within the Analysis Area currently do not display hydrophobic concerns.

Disturbance of soils from fire suppression is usually limited to hand tools. Such activities have only minor (insignificant) impacts to the soil resource. During fire suppression, closed roads may be reopened for access and incorporated as fire lines. As part of the post-fire work, the areas of disturbance are rehabilitated and the roads returned to the previous conditions in most cases.

ENVIRONMENTAL CONSEQUENCES

DIRECT AND INDIRECT EFFECTS

MEASUREMENT INDICATORS

No significant issues were identified for Soil Resources during the scoping process. Therefore, law regulation, and policy drive the effects analysis, specifically:

- Compliance with NFMA; and
- Compliance with Forest Plan Standards

Effects of the Alternatives on soil resources will be analyzed in terms of:

1. Activities on **Sensitive Soils**;
2. **Detrimental Soil Disturbance** and the 15% Standard;
3. **Prescribed Fuels Treatments**; and
4. Changes in **Nutrient Cycling**.

SENSITIVE SOILS

Table 3-70 displays the acres of management activities on sensitive soils by alternative.

Table 3-70. Unit Acres on Sensitive Soils

Sensitive Soils	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Total Acres of Proposed Harvest	0	1,411	1,434	1,290	632
Harvest Acres on Landtypes of Concern Landtype (112)	0	0	0	0	0
% of Proposed Harvest Acres on Landtypes of Concern	0%	0%	0%	0%	0%
Proposed Harvest Acres on Low Productivity Soils (201 and 360)	0	0	0	0	0
% of Harvest Activities on Low Productivity Landtypes (201 and 360)	0%	0%	0%	0%	0%
Proposed Non-Harvest Burn Prescription Units	0	4,564	4,564	4,564	4,564
Total Acres of Non-Harvest on Landtypes of Concern Landtype (112)	0	0	0	0	0
Total Acres Proposed Non-Harvest Burn Prescription Units on Low Productivity Soils (201 and 360)	0	1,791	1,791	1,791	1,791
% of Proposed Non-Harvest Burn Prescription Units on Low Productivity Soils (201 and 360)	0	39%	39%	39%	39%

Effects of the No Action Alternative 1 - Sensitive Soils

Alternative 1 does not propose any new management activities on sensitive soils. Therefore, no direct, indirect, or cumulative effects to sensitive soils would result from Alternative 1.

Direct and Indirect Effects of the Action Alternatives – Sensitive Soils

Landtype 112 is considered as being a landtype of concern, however; under Alternatives 2, 3, 4, and 5 no harvest activities are planned to occur on this landtype. As a result no direct or indirect impacts are related to this factor. It should be noted however that other landforms not listed as one of the seven landtypes of concern may contain concerns that have been considered when designing the harvest procedures and what types of equipment should be allowed based on slopes and soil conditions.

Landtypes 201 and 360 are both considered as being low productivity soils; however, the only proposed management activity on such landtypes are in the burn-only prescriptions associated with Units 602, 604, 606, 607, 609, 610, 612, 613, 616, and 618 which do not contain proposed harvest activity. Under Alternatives 2, 3 4, and 5 a total of 1,791 acres (39%) of proposed burn prescriptions is located on combined landtypes 201 and 360 (Table 3-70). Such activities are expected to open these stands of dead or dying trees due to root disease to become regenerated with a healthy second growth stock. This would allow for a continuous input of nutrients through needle-cast and coarse woody debris and would maintain soil productivity. Potential indirect effects of proposed burn only units on low productivity soils may include a slower vegetative return associated with reductions in nutrient cycling capabilities (discussed in more detail later in document).

No harvest activities are proposed in riparian areas or wetlands with Alternatives 2, 3, 4, and 5. Riparian and wetland areas are protected under INFS RHCA's (USDA Forest Service, 1995). RHCAs are based on direction laid out by INFS and include areas of specified widths that surround stream channels, riparian areas, and wetlands. By definition, RHCAs are more extensive than the riparian and wetland features they protect (see "Water Resources" Section). RHCAs cannot be reduced to less than the SMZ boundary width required by law. As a result, one indirect effect to riparian areas and wetlands could be an increase in blow down trees or additional large woody debris from opening the stands in and around wet areas.

Detrimental Soils Disturbance (DSD)

Management activities including, but not limited to, road construction, off-highway vehicle use, timber harvest (trails and landings), mechanical fuel treatments, firewood gathering, and grazing are considered to be potential sources of detrimental soil disturbance. Refer to the Soil Project File for spatial representation of past harvests.

Table 3-71 displays existing, proposed, and cumulative DSD for each activity area. Existing disturbance is based on field surveys. Predicting detrimental and foreseeable activity disturbance is based on information from Kuennen 2003 and 2007, which includes a summary of all Kootenai Forest Soils Monitoring to date with recommendations for analysis based on field results. The cumulative percent is derived by adding the percentage of disturbance expected from proposed activities and reasonably foreseeable activities to the existing disturbance percentage. All harvest activities, prescribed burning, skid trails, landings, fire lines, excavator piling, and temporary roads are included in this analysis. Best Management Practices (BMPs) would be followed (Appendix D of the EIS), and additional design criteria have been specified in order to minimize disturbance (refer to the Management Requirements in Chapter II of the EIS). Complete soils survey data can be found in the Soil project file at the Cabinet Ranger District.

Table 3-71. Existing, During and Cumulative DSD in Each Proposed Harvest Unit for Alternatives 1, 2, 3 4, and 5.

Unit #	Activity Area (acres) Alts 2/3/4/5	Existing Detrimental Soil Disturbance DSD (%)[10]	Alternatives 1/2/3/4/5		
			Potential DSD		
			Predicted Temp Road DSD%[11]	Predicted Harvest DSD%[12]	Cumulative DSD% Post-Harvest
1	28/26/26/26	1	0/0/0/0/0	0/8/8/8/8	1/9/9/9/9
2	68/68/68/68	0	0/0/0/0/0	0/8/8/8/8	0/8/8/8/8
3	87/69/69/69	1	0/0/0/0/0	0/8/8/8/8	1/9/9/9/9
4	24/35/35/24	6	0/0/0/0/0	0/1/1/1/1	6/7/7/7/7
5	41/14/46/0	0	0/0/0/0/0	0/3/3/3/0	0/3/3/3/0
6	12/8/8/0	2	0/0/0/0/0	0/3/3/3/0	2/5/5/5/2
8	32/62/0/32	0	0/0/0/0/0	0/3/3/0/3	0/3/3/0/3
8S*	0/0/118/0	0	0/0/0/0/0	0/0/0/1/0	0/0/0/1/0
8T*	0/0/64/0	0	0/0/0/0/0	0/0/0/8/0	0/0/0/8/0
9^	13/0/0/0	0	0/0/0/0/0	0/1/0/0/0	0/1/0/0/0
10	43/0/86/40	0	0/0/0/0/0	0/1/0/1/1	0/1/0/1/1
10T~	0/18/0/0	0	0/0/0/0/0	0/0/8/0/0	0/0/8/0/0
10S~	0/61/0/0	0	0/0/0/0/0	0/0/1/0/0	0/0/1/0/0
10B~	0/75/0/0	0	0/0/0/0/0	0/0/1/0/0	0/0/1/0/0
11^	30/0/0/0	0	0/4/0/0/0	0/1/0/0/0	0/5/0/0/0

Unit #	Activity Area (acres) Alts 2/3/4/5	Existing Detrimental Soil Disturbance DSD (%)[10]	Alternatives 1/2/3/4/5 Potential DSD		
			Predicted Temp Road DSD%[11]	Predicted Harvest DSD%[12]	Cumulative DSD% Post-Harvest
11B~	0/25/0/0	0	0/0/0/0/0	0/0/1/0/0	0/0/1/0/0
12	31/171/100/0	0	0/4/0/0/0	0/3/8/8/0	0/7/8/8/0
12B~	0/75/0/0	0	0/0/0/0/0	0/0/1/0/0	0/0/1/0/0
12S	0/10/0/10	0	0/0/0/0/0	0/0/1/0/1	0/0/1/0/1
13	19/0/0/19	0	0/0/0/0/0	0/8/0/0/8	0/8/0/0/8
14^	17/0/0/0	0	0/4/0/0/0	0/8/0/0/0	0/12/0/0/0
15^	41/0/0/0	0	0/0/0/0/0	0/8/0/0/0	0/8/0/0/0
16	20/8/8/0	0	0/0/0/0/0	0/1/1/1/0	0/1/1/1/0
17^	19/0/0/0	0	0/0/0/0/0	0/8/0/0/0	0/8/0/0/0
18	30/26/26/26	0	0/0/0/0/0	0/1/1/1/1	0/1/1/1/1
19	32/26/26/26	0	0/0/0/0/0	0/1/1/1/1	0/1/1/1/1
20	32/0/0/32	Ocular 2%[13]	0/0/0/0/0	0/1/0/0/1	2/3/2/2/3
21^	28/0/0/0	Ocular 2%[13]	0/0/0/0/0	0/1/0/0/0	2/3/2/2/2
21A	0/31/15/0	0	0/0/0/0/0	0/0/1/1/0	0/0/1/1/0
21B	0/30/47/30	0	0/0/0/0/0	0/0/8/8/8	0/0/8/8/8
23	11/4/4/0	4	0/0/0/0/0	0/8/8/8/0	4/12/12/12/4
23B	0/18/18/0	0	0/0/0/0/0	0/0/8/8/0	0/0/8/8/0
24	21/21/21/21	1	0/0/0/0/0	0/1/1/1/1	1/2/2/2/2
25	33/30/30/30	0	0/0/0/0/0	0/1/1/1/1	0/1/1/1/1
26	56/57/0/0	0	0/0/0/0/0	0/1/1/0/0	0/1/1/0/0
27	32/30/30/0	0	0/0/0/0/0	0/1/1/1/0	0/1/1/1/0
28	32/20/20/20	0	0/0/0/0/0	0/1/1/1/1	0/1/1/1/1
28A	0/3/3/3	0	0/0/0/0/0	0/0/8/8/8	0/0/8/8/8
29	11/16/16/16	0	0/0/0/0/0	0/8/8/8/8	0/8/8/8/8
30	9/10/10/8	0	0/0/0/0/0	0/8/8/8/8	0/8/8/8/8
31	30/30/30/30	5	0/0/0/0/0	0/1/1/1/1	5/6/6/6/6
32	10/10/10/10	5	0/0/0/0/0	0/1/8/8/8	5/6/13/13/13
33^	43/0/0/0	Ocular 2%[13]	0/0/0/0/0	0/1/0/0/0	2/3/2/2/2
34	29/27/29/27	0	0/0/0/0/0	0/1/1/1/1	0/1/1/1/1
34A	0/26/26/26	0	0/0/0/0/0	0/0/1/1/1	0/0/1/1/1
35	27/56/49/39	0	0/0/<1/0/0	0/1/1/1/1	0/1/1/1/1
36	82/34/0/0	0	0/0/0/0/0	0/8/1/0/0	0/8/1/0/0
37	171/34/0/0	0	0/0/0/0/0	0/1/1/0/0	0/1/1/0/0
38^	19/0/0/0	0	0/0/0/0/0	0/8/0/0/0	0/8/0/0/0
39	20/20/20/0	0	0/0/0/0/0	0/8/8/8/0	0/8/8/8/0
39A	0/36/62/0	0	0/0/0/0/0	0/0/8/8/0	0/0/8/8/0
39B	0/33/33/0	0	0/0/1/0/0	0/0/8/8/0	0/0/9/8/0
40	93/35/137/0	0	0/0/0/0/0	0/1/1/1/0	0/1/1/1/0
40B~	0/27/0/0	0	0/0/1/0/0	0/0/1/0/0	0/0/2/0/0
40C~	0/19/0/0	3	0/0/1/0/0	0/0/8/0/0	3/3/12/3/3
41^	35/0/0/0	4	0/0/0/0/0	0/1/0/0/0	4/5/4/4/4
Total Fuels for all action Alts	4564 acres	Not Sampled	0/0/0/0/0	0/0/0/0/0	0/0/0/0/0

Unit #	Activity Area (acres) Alts 2/3/4/5	Existing Detrimental Soil Disturbance DSD (%)[10]	Alternatives 1/2/3/4/5		
			Potential DSD		
			Predicted Temp Road DSD%[11]	Predicted Harvest DSD%[12]	Cumulative DSD% Post-Harvest
Total all acres by Alt	5,975[1] 5,998[2] 5,854[3] 5,196[4]				

^Units proposed for harvest only under Alternative 2.
~Units proposed for harvest only under Alternative 3.
*Units proposed for harvest only under Alternative 4.

[1]The sum of proposed vegetative treatments under Alternative 2.

[2]The sum of proposed vegetative treatments under Alternative 3.

[3]The sum of proposed vegetative treatments under Alternative 4.

[4]The sum of proposed vegetative treatments under Alternative 5.

[5]Total of all operations including burn for Alternative 2.

[6]Total of all operations including burn for Alternative 3.

[7]Total of all operations including burn for Alternative 4.

[8]Total of all operations including burn for Alternative 5.

[10]The Pilgrim Creek soil survey was conducted using the new Region 1 Soil Sampling Protocol which meets the R1 definition of detrimental soil disturbance, and therefore the Pilgrim Creek pre-activity conditions meet the R1 definitions. Field forms are present in the Pilgrim Creek Soil files.

[11]For determining temporary road soil disturbance an average width of 12' has been applied for calculating area of DSD. Following harvest all temp roads and landings used for harvest activities will be scarified at least 6-12" based on the depth. Such temp roads only refer to proposed Units 11, 12, and 14 for Alternative 2 and Units 35, 39B, 40B and 40C for Alternative 3. The same temporary road to Unit 40B also provides access to Unit 40C.

[12]Predicted DSD has been calculated based on historical soil monitoring data collected in the field in post-harvest timber sale units. (Kuennen, 2007). In units with combined tractor/skyline harvest activity the anticipated DSD was calculated as related to the overall acreage of potential disturbance by harvest activity.

[13]Occular estimations of 2% were provided to Units 20, 21 and 33 which only contain past firewood collection or an existing hiking trail. No harvest other than public firewood collection has occurred in these proposed harvest units.

Note: An existing condition of 0% can mean either: 1) No disturbance is present or 2) there is some disturbance present but does not amount to 1%.

Effects of the No Action Alternative 1 – DSD

Under Alternative 1 timber harvest and other activities proposed with this project would occur. However, natural changes in climate and vegetation would continue to occur. Vegetation regeneration and stand growth activities would continue to slowly recover over time on existing harvest units resulting in lower compaction values due to tree root growth, freeze-thaw activities, and increased soil nutrients from the decomposition of forest litter and CWD. Therefore, no direct, indirect, or cumulative DSD would result from Alternative 1.

Direct and Indirect Effects of the Action Alternatives – DSD

The percent detrimental soil disturbance (DSD) is the measurement indicator of soil compaction for this analysis. Direct impacts on soils from management activities could include compaction, rutting, and displacement. Typically these impacts take place as a result of vehicles/equipment traversing areas within proposed units such as skid trails, landings, and temporary roads. Soil compaction is most common where heavy equipment makes repeated passes over the same ground, particularly during times of high soil moisture. Soil compaction is most common where heavy equipment makes repeated passes over the same ground, particularly during times of high soil moisture (Kuennen 2003). Soil compaction can change slope hydrology and lead to overland flow of water during precipitation or snowmelt events. Compacted soils can also reduce soil productivity. These are some general direct effects that can occur with all timber harvest activities. Table 3-71 identifies the extent of these impacts for each unit for Alternatives 2, 3, 4, and 5.

The construction of a fire line directly impacts soils by removing (displacing) the organic layer down to mineral soil for 2-3 feet wide around the perimeter of the units. Some compaction along the fire line could occur if created using heavy equipment. The effects of fire line construction are included in Table 3-71 and applies only to those units where machinery may be involved in such activities.

Fuels treatments may also include mechanical piling. The effects of mechanical piling are included in the figures identified in Table 3-71. The direct effects of mechanical piling with heavy equipment operations are discussed above. Because mechanical piling is reducing the amount of woody material within a unit, it can also affect nutrient cycling. Nutrient cycling is discussed in depth below.

Clear-cut with reserves harvest activities would not result in multiple entries to reach the desired silvicultural objectives over time. Related post-harvest unit entry over time would be for thinning and scheduled to occur several decades later. Regeneration harvest activities such as shelterwood and seedtree harvest prescriptions would require one entry to reach the target vegetative goal. This being said, units proposed with intermediate harvest prescription and commercial thinning would yield more subjective to higher detrimental soil disturbance than that of a regeneration prescription.

Indirect impacts from management activities could include erosion from surface water runoff being channeled into ruts, fire lines, and/or along temporary roads within units. With less vegetation a conversion from a drier soil environment to a slightly moister site would occur. Less vegetation would mean a thinner canopy and more soil interception from rainfall above. These impacts would be minimized by implementing BMPs (Appendix D of the EIS) and the following specific management requirements and design criteria to the extent possible.

In units where existing historical skid trails already exist these will be used to the extent feasible to minimize additional DSD. However, new skid trails may be required in areas where the existing skid trail network does not fit the current operations. Effects of temporary roads and skid trails will be temporary due to planned ripping and seeding following harvest activities in areas used for harvest operations to remedy compaction. Such activities will help offset disturbance related to harvest activities to soil productivity by allowing previously disturbed soils to re-establish as a productive area capable of producing future natural vegetative cover which in turn may one day be harvested again. Based on this analysis, while some increase in DSD is expected with proposed management activities, all activity areas are expected to remain at/or below the 15% soil quality standards. Recall that in proposed ground based secondary entry harvest units currently exceeding 8% DSD the analysis of this project assumes that 50 percent of the historic skid trails in ground based units will be reused during proposed harvest operations.

Permanent Roads

Regarding soil disturbance it should be noted that authorized Forest Roads as defined in 36 CFR 212.1 are not considered part of the productive land base. As a result, these features do not count toward the 15% soil quality standard (FSM 2500-2009-1). Under Alternative 1 no new road construction will occur. Under Alternative 2 approximately 2.42 miles of new road construction of permanent roads is scheduled to reach units 5, 26, 33, 35, 36, and 37 while Alternative 3 will involve 4.65 miles of new permanent road construction to reach units 26, 36, 37, 10T, 10B, 11B, 12, and 12B. No new road construction is planned under both Alternatives 4 and 5.

Temporary Roads

No existing roads are planned to be decommissioned or placed into intermittent stored service under any of the alternatives. All new temporary roads and skid trails are considered 100% detrimentally disturbed through removal of organic matter and compaction. Indirect effects from the action alternatives include the temporary erosion related to exposure of mineral soil. Without a protective mat of vegetation and stable soil profile these areas are more susceptible to erosive forces of wind, water and dynamic temperature changes (frost heaves) sometimes seen in and around the Pilgrim Analysis Area. These localized effects are typically short-term (5-10 years) due to the warmer wet climate found in the SW portion of the KNF. Should Alternative 1 be selected no acres of temporary road construction and closure would occur. Should Alternative 2 be selected approximately 1.7 miles of temporary road will be constructed while Alternative 3 proposes approximately 0.8 miles of temporary road construction. Both Alternatives 4 and 5 do not propose any new temporary road construction. The temporary road planned to access units 40B and 40C under Alternative 3 already exists. As a result very minimal new road construction is anticipated to occur to access these two units and the temporary road proposed for Unit 40B will also be used for Unit 40C in Alternative 3. An average 2 acres per mile has been used below to calculate DSD values.

Table 3-72. Calculated DSD related to temp road construction for Alternatives 2 and 3

Unit ID*	Unit acres	Temp Rd Length (mi)	Road DSD by unit (ac)	% DSD related to temp road by Unit
11	30/Null	0.6/Null	1.2/Null	4/Null
12	31/Null	0.7/Null	1.4/Null	4/Null
14	17/Null	0.4/Null	0.8/Null	4/Null
35	Null/56	Null/0.1	Null/0.2	Null/<1
39B	Null/33	Null/0.2	Null/0.4	Null/1
40B and 40C	Null/46	Null/0.5	Null/1.0	Null/2
Sub-totals		**1.7/0.8**	**3.4/1.6**	

*Only those Units where temporary road construction is proposed are listed above
^Units 40B and 40C will be accessed from same temporary road prism

All temporary roads and landings for the sale would be agreed upon by the FS and purchaser. These areas would be constructed and used in adherence with BMPs and RHCAs to minimize their impacts to soils. After use, all temporary roads would receive the following rehabilitation treatments: roads and landing surface would be ripped or scarified (6-12”) to remedy soil compaction, seeding, and woody debris would be spread to stabilize soil from movement and to provide organic material on the road prism and water bars installed as appropriate to reduce water routing. Such activities will help offset the harvest impacts to soil productivity by allowing previously disturbed soils to re-establish as a productive area capable of producing future natural vegetative cover which in turn may one day be harvested again. Based on this analysis, while some increase in DSD is expected with propose management activities, all activity areas are expected to remain at/or below the 15% soil quality standard.

FUELS TREATMENTS

Due to the suppression of wildfires over the last century, fuels have accumulated in many areas throughout the Analysis Area. The intent of fuels treatments is to reduce fuel levels and meet vegetation management objectives. Table 3-73 displays the fuels treatment proposed with this project by each Alternative.

Table 3-73. Types and Amount of Fuels Treatments by Alternative

Activities	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Proposed harvest with Lop and Scatter Fuels Treatments	0	407	355	470	115
Proposed harvest and Fuels Treatments	0	1,004	1,079	820	517
Proposed harvest by Alternative	0	1,411	1,434	1,290	632
Fuels Treatments only No harvest	0	4,564	4,564	4,564	4,564

Effects of the No Action Alternative 2 – Fuels Treatments
Alternative 1 does not propose any fuels treatments. Therefore, no direct, indirect, or cumulative effects to soils would occur from Alternative 1. Alternative 1 would also not reduce fuel loading in the Analysis Area. As a result, there would be a greater risk of indirect effects caused by high intensity wildfire and greater potential for damaging soil heating (Keane et al 2002). The potential effects include alteration of soil structure, impacts to soil invertebrates, reduced nitrogen, and loss of soluble nutrients (Kuennen 2000). However, past experience with wildfires on Kootenai National Forest indicate that there is a very low risk of these effects even with high intensity fire.

Direct and Indirect Effects of the Action Alternatives – Fuels Treatments
Alternatives 2, 3, 4, and 5 include prescribed burn activities such as underburning, slash and hand pile, jackpot burning, broadcast burning, and slash with excavator pile with and without timber harvest or lop and scatter activities. Alternative 2 includes burn activities except units 4, 5, 6, 8, 9, 16, 28, 35, 37, and 41 for a total of 407 acres lop and scatter (no burn) treatments and 1,004 acres proposed harvest with fuel treatments. Under Alternative 3 all units involve burn activities except units 4, 5, 6, 8, 16, 26, 28, 35, 36, 37, and 40B which would result in a total of 335 acres lop and scatter (no burn) treatments and 1,079 acres proposed harvest with fuel treatments. Under Alternative 4 all units involve burn activities except units 4, 5, 6, 8S, 8T, 16, 28, 35, 39, and 40 which would result in 470 acres lop and scatter (no burn) treatments and 820 acres proposed harvest with fuel treatments. Under Alternative 5 all units involve burn activities except units 4, 8, 24, and 35 which would result in 517 acres harvest with fuels treatments and 115 acres lop and scatter (no burn) treatments following harvest activities. It should be noted that such acreage sums may vary slightly with time based on what is found in the field as being physically capable of completing without resulting in negative impacts that may outweigh the overall benefits to the local soil ecology.

The burning prescriptions in each action alternative were designed to provide only the fire intensity needed to achieve the vegetative management objectives. Direct effects resulting from burn activities such as underburning can result in soil heating and associated soil impacts such as loss of organic matter, impacts to soil organisms, and creation of water repellency. The potential for these impacts are minimized because the burning prescriptions for this project were designed for low to moderate fire intensity and would be implemented when soil moisture levels are high. Typically, burning is scheduled when the moisture in the lower duff layers is high enough so that the fire does not consume those layers, which insulate the soil from surface heating (DeBano 2000). When soils have adequate moisture conditions to retain their biological, chemical, and physical integrity, effects from the loss of forest floor can be minimized (Barnett 1989; Frandsen and Ryan 1985; Hungerford et al 1991; McNabb and Cromack 1990). Prescribed pile burning could potentially remove woody debris that would otherwise provide nutrient to the soil as the decay process occurs (Page-Dumroese et al 2006). Hence, burning when soil moisture content is high helps to maintain coarse woody debris requirements. This is typically completed in early spring or late fall on the KNF.

Although a small portion of the nutrients would be lost through leaching, most of the nutrients would remain attached to or between the soil particles on-site. The re-introduction of fire in the Analysis Area is consistent with the ecological understanding of these forest types (Arno 1996). Positive impacts may result in a short-term (1 to 2 years) increase in plant-available nutrients (Choromanska and Deluca 2001; Hart et al 2005; Certini 2005). Additionally, MacKenzie et al (2006) found that light to moderate fire effects may maintain higher nutrient availability in the long-term with the positive influences from charcoal. Therefore, implementation of an action alternative containing post-harvest burns is not expected to adversely impact nutrient cycling in

the Analysis Area. This is supported by Forest Soil Productivity Monitoring (refer to the Soil Project File).

NUTRIENT CYCLING

Forest ecosystems have evolved with a continual flux of coarse woody debris (CWD). Coarse woody material on a forest floor greater than 3.0 inches in diameter, and is derived from tree limbs, boles, and roots greater than three inches in diameter and in various stages of decay (Graham et al. 1994; Brown et al. 2003). CWD performs many physical, chemical, and biological functions in the forest ecosystems. Physically it protects the forest floor and mineral soil from erosion and mechanical disturbances. CWD disrupts airflow and provides shade, which insulates and protects new forest growth and also has significant water holding capacity, making it an important source of moisture for vegetation during dry periods. This decaying woody debris provides nutrients, especially sulfur, phosphorus, and nitrogen, necessary for new plant growth. CWD also hosts ectomycorrhize, micro-organisms that play an important role in the uptake of nutrients and water by woody plants (Graham et al 1994).

Retaining coarse woody debris and organic matter is important to maintaining the soils most productive layer. The importance of soil organic matter (duff layer) is indispensable to productivity and the ecological function of soils (Brady and Weil 2002). This organic component contains a large reserve of nutrients and carbon, and typically includes the majority of microbial activity within the soil column. Forest soil organic matter influences many critical ecosystem processes such as the formation of soil structure, which in turn influences soil water infiltration rates and soil water holding capacity. Soil organic matter is also the primary location of nutrient recycling and humus formation, which enhances soil cation exchange and overall fertility.

Effects of the No Action Alternative 1 – Nutrient Cycling

Alternative 2 does not propose any new management activities. Therefore, no direct, indirect, or cumulative effects to nutrient cycling could result from Alternative 1. Nutrient cycling would continue at present rates until a natural disturbance occurs.

Direct and Indirect Effects of the Action Alternatives – Nutrient Cycling

A direct impact from management activities in Alternatives 2, 3, 4, and 5 would be the removal of woody material from proposed timber harvest units. The removal of all or most of the organic material (both duff layers and CWD) from a site can cause temporary nutrient deficits that may affect physical and biological soil conditions (Brady and Weil 2002; Graham et al 1994; Brown et al 2003). To avoid this, it is important to maintain both fine and CWD on managed sites, especially regeneration harvest units where most of the organic matter is removed (Graham et al 1994; Brown et al 2003). Allowing the accumulation and decomposition of a range of sizes of woody debris maintains both short-term and long-term soil productivity. The different decomposition rates provide for the slow, continual release of nutrients.

This project was designed to provide for a continuous supply of woody material based on recommendations from Graham et al (1994) and Brown et al (2003). In harvest stands, where more of the overstory is being removed, each activity area has been assigned a habitat-specific retention level for CWD (Table 3-74). In both regeneration and commercial thin units with underburn, broadcast burn, or jackpot pile activities, post-harvest stands would remain fully stocked, which would provide for yearly nutrient inputs through litter fall (Brady and Weil 2002) and long-term CWD as a result of future blow-down and decadence. Therefore, these units would meet the CWD requirements left on the ground following harvest activity. It should be

noted that currently under the KNF Forest Plan the required CWD tons per acre to be retained for harvest units only applies to regeneration harvest activities.

Table 3-74. Recommended Levels of CWD (> 3' diameter) for proposed regeneration timber treatment Units

Tons Acre^	VRU(s)	Forest Type	Unit(s)*
10-20	1 – 3	Warm Dry	4, 10B, and 18
15-30	4 – 6	Warm Moist / Cool Moist	1, 5, 6, 10B, 20, 21, 23, 23B, 25, 27, 30, 31, 32, 33, 37, 38, 39, 39A, 39B, 40, 40B, and 40C
9-15	7-11	Subalpine	8, 8S, 8T, 9, 10, 10B, 10T, 10S, 11, 11B, 12, 12B, 12S, 14, 15, 17, and 18

*****Some units may be listed under more than one Forest Type based on multiple habitat types being present in the unit and/or varying harvest prescriptions based on the proposed Alternatives.
^It should be noted that the VRU CWD values should be looked at as a local estimation and are dependent on local precipitation levels and vary across the KNF from north to south.

Coarse wood provides micro-sites for microbial activity, retains carbon on-site, and moderates soil moisture (Graham et al 1994; Brown et al 2003). Alternatives 2, 3, 4, and 5 propose the removal of vegetation through timber harvest and burning. Soil productivity would be maintained through retention of CWD at levels recommended in Graham et al (1994) and Brown et al (2003). Maintaining CWD at the levels identified in these guidelines would ensure that both short-term and long-term soil productivity is maintained. Therefore, implementation of any of the action alternatives is not expected to adversely impact nutrient cycling in the Analysis Area.

CUMULATIVE EFFECTS

Cumulative effects are the result of all the impacts that past, current, and reasonably foreseeable activities have on a resource. A summary of activities are listed in Chapter 3. The results of past activities have resulted in the "Existing Condition" described above. The anticipated effects from proposed activities were then added to the existing condition and described in the section titled "Direct and Indirect Effects." The sum of the existing condition (including past actions) and the direct and indirect effects of proposed actions combined with current and reasonably foreseeable actions result in the cumulative effects described in this section.

The spatial scale or geographic bounds for consideration of cumulative effects consists of the same activity areas analyzed used in existing condition, direct, and indirect effects. This is appropriate because soil productivity is spatially static and productivity in one location does not affect productivity in another location. The activity areas are delineated as directed by Forest Service Manual R-1 Supplement No. 2500-99-1.

The temporal scale is dependent on the issue being addressed with no one scale being appropriate for all issues. The analysis may need to evaluate the effects of proposed management over all seasons for several days, years, and even decades. This is complicated by data constraints that require constant monitoring to detect change – though data is often insufficient to identify even trends or trajectories of change until the impact is large enough or has been occurring for some time. Furthermore, there is often a lag between some actions and the observed effect. This is particularly true for Soils. This analysis strives toward an integrated

approach to soil processes and function to project future trends in response to proposed management options to the best abilities.

CURRENT VERSUS HISTORIC MANAGEMENT PRACTICES

There are marked differences between past and current land management practices and policies. The evolution that has taken place with regard to land management practices is the result of science, technology, ongoing monitoring actions, and changing public values.

Prior to around 1990, the harvest methods focused primarily on providing low-cost wood products. Logging systems were selected primarily by the least expensive method to transport trees from the forest to the mill. Tractor skidding was typically used and trails and landings were not minimized. Harvest on steeper slopes, at times, involved stair-step excavated trails (i.e. jammer roads, which became less common in the 1970s). In addition to harvest activities, fuels reduction and site preparation for natural regeneration or planting many times consisted of dozer piling. Many of these practices led to excess soil disturbance and increased the risk of erosion

Over the last twenty years, impacts to soil and water resources from logging activities have been reduced because of Best Management Practices (BMPs), the Inland Native Fish Strategy (INFS), and changes in science, technology, etc. Based on research studies, current BMPs and INFS riparian habitat conservation areas (RHCAs) can reduce sediment delivery to streams compared with historical practices (Lee et al 1997; USDA Forest Service 1995). Harvest methods and removal of timber products from the national forest changed substantially over time. Modern timber harvest prescriptions and design emphasize desired conditions of the forest after timber harvest. This often results in the retention of various amounts of trees in a post-harvest stand to address objectives that may include seed production, shelter for the site, watershed objectives, soil productivity, wildlife, and others. Elements of modern harvest prescriptions that address specific resource concerns include retention of snags and down wood for soil nutrition, minimizing the number of skid trails, and maintaining sediment filtering vegetation in riparian areas near lakes and streams. Jammer roads and dozer piling rarely occurs. Forest BMPs currently incorporated into timber harvest activities include some of the following:

- Avoid sensitive soils.
- Use excavator for mechanized slash piling and fire line construction.
- Operate equipment over a slash mat where feasible.
- Limit logging to dry conditions (less than 18% soil moisture) or during winter when the ground is frozen.
- Use existing skid trails and landings where feasible.
- Avoid skidding on unstable slopes and slopes that exceed 40% unless not causing excessive erosion (State of Montana BMPS Section IV.B).
- Rehabilitate and re-seed project areas deemed necessary upon completion.
- Space skid trails 75 to 125 feet apart.
- Ensure that enough coarse woody debris is left to sustain long term soil productivity while still meeting fuel reduction objectives.
- Removal of slash to the landing using whole tree yarding
- Using excavators instead of dozers for slash piling
- Reducing erosion and sedimentation through timber harvest unit design
- Excluding RHCAs from harvest and equipment entry

- Limit operations during high moisture conditions
- Controlling erosion during and after harvest activities to protect water quality and soil productivity. Some examples include ripping and/or water barring skid trails and landings, seeding and fertilizing, spraying for weeds, etc.
- Light intensity burns following harvest operations

In 1995, the forest plan was amended to include INFS management direction (USDA Forest Service 1995). The implementation of INFS gave greater protection to soil and water resources in riparian areas adjacent to streams, lakes, and wetlands. INFS gives riparian dependent resources priority over other resources in RHCAs. RHCAs are not “lock out” zones, activities that occur in them either benefit the riparian area and associated aquatic features or, at a minimum, do not slow the rate of recovery within the riparian area.

ONGOING AND REASONABLY FORESEEABLE ACTIONS

In the following discussion, the effects of past, current, and/or reasonably foreseeable activities are considered cumulatively with activities proposed with this project. The effects were either described as not contributing effects, contributing indiscernible effects, or having measureable effects on water resources.

Vegetation Management and Fuel Reduction Activities

There are no current or reasonably foreseeable Forest Service commercial timber sale projects planned within the Analysis Area. Therefore, no additional effects would be contributed from these activities.

Approximately 5,691 acres of natural and activity fuels burning is expected to be implemented in the next five years (2012-2017). Light, short-duration burning that does not consume the entire duff layer does not strongly affect soils. Duff acts as an insulator, protecting the soil from excessive heating (Hartford and Frandsen 1992). Effects of this type of burning are generally short-lived (Neary et al 1999). Therefore, burning activities are expected to contribute indiscernible effects to water resources.

No pre-commercial thinning is currently expected to occur in the ongoing and reasonably foreseeable future. It is expected that very minimal if any acres would be thinned within the Analysis Area over the next ten years. Should such activities occur, it is expected that pre-commercial thinning would contribute indiscernible effects to soils within the Analysis Area. This is because pre-commercial thinning is done by hand and therefore no additional ground disturbance will occur. In addition, trees removed during thinning projects are left on-site.

It is expected that personal firewood collection will occur throughout the Activity Area. Neither of these activities create additional ground disturbance or remove enough vegetation to affect soil productivity and therefore would not contribute additional effects to soil resources.
In the five years following timber harvest approximately 75-80% of the stand is expected to be fully stocked. Depending on the Alternative selected between approximately 600-950 acres of harvest will require stocking. No heavy equipment is associated with tree planting. Tree planting does not create detrimental soil disturbance or increase sedimentation rates. Therefore, regardless of the Alternative selected, tree planting would not contribute additional effects to soil resources.

Road Maintenance

Routine road maintenance and/or road reconstruction work would occur as needed on roads in the Activity Area and would follow BMPs and INFS guidelines in order to minimize effects on soil resources and meet the approved management objectives (RMO's). Such activities include road blading, gate repair/replacement, cleaning and constructing ditches, cleaning culverts, installing culverts, replacing culverts with larger diameter culverts, installing drain dips and surface water deflectors, placing riprap to armor drainage structures, placement of aggregate, brushing, debris removal, and surface grading to restore drainage efficiency. Such activities are schedules to occur from FS boundaries to the top of the drainage basins to improve surface water management BMPs.

Road Construction

Under Alternative 2 approximately 1 mile of new road construction of permanent roads is scheduled to occur while Alternative 3 will involve 3 miles of new permanent road construction. No new road construction is planned under Alternative 4. A special use permit will be required to haul on County-owned lands. The use of joint cost share roads within the Pilgrim Project Area is related to Northern Region Road Right of Way Construction and Use Agreement of January 13, 2003 (refer to Water Resource Report for a more in-depth discussion).

Proposed road re-construction and maintenance may increase short-term sediment movement from road surface runoff initially but should be minimal, especially at road locations higher on the slope that are relatively low gradient and provide for sufficient buffer zones. Road maintenance includes culvert installation, blading, and brushing, and typically improves drainages and decreases erosion from water channeling down the road surface in the long run.

Road management of Authorized Forest Roads as defined in 36 CFR 212.1 are not considered a part of the productive land base. As a result, these features do not count toward the 15% soil quality standard (FSM 2500-2009-1). In addition these areas are already disturbed and no additional road construction is proposed. As a result, road management would have no cumulative effect on soils in the analysis areas because soil productivity effects are spatially static and productivity in one location does not affect productivity in another location.

Temporary Roads and Landings

Temporary roads and landings constructed for the sale would be agreed upon by the FS and purchaser on a unit by unit basis. These areas would be constructed and used in adherence to BMPs and RHCAs to minimize their impacts to soils. After use, these areas would receive the following rehabilitation treatments: the road or landing surface would be ripped to remedy compaction, the berm would be pulled back (on roads), woody debris would be spread to stabilize soil from movement and to provide organic material, and all disturbed areas would be seeded. Such activities would help to offset the harvest activities to soil productivity by allowing previously disturbed soils to re-establish as a productive area capable of producing future natural vegetative cover which in turn may one day be harvested again. This activity would beneficially impact approximately 3 acres under Alternatives 2 and approximately 2 acres under Alternative 3. No acres of temporary road construction and closure would occur under Alternatives 1 or 4. For a detailed analysis and information on roads and related issues, please see Specialist's Report on Engineering and Hydrology.

Due to the fact that the proposed units located within the Pilgrim Creek activity area are all of lower anticipated soil compaction values (Table 3-71) it is not expected that these units have the potential to exceed the 15% standard when analyzed cumulatively. To meet Regional

Standards, the skid trails within these units would be ripped and/or recontoured and covered with slash and CWD (refer to the Management Requirements and Design Criteria, II-20). As a result, cumulative effects of prior management and the proposed harvest activity are not expected to exceed the threshold of 15 percent for detrimental soil disturbance in any activity area.

Fire Suppression

Fire suppression activities would occur as needed. Effects from wildfire suppression would vary with location and size of the fire; however suppression activities are expected to follow Forest Plan direction. Suppression of wildfires could have measurable effects to soils within the Analysis Area. These effects could include soil compaction, displacement, and erosion. Due to the unpredictable nature of wildfires, cumulative effects from future wildfire suppression activities could not be meaningfully quantified in this document.

Grazing

Historically livetock grazing on NFS lands by sheep occurred widespread on NFS lands and it is likely that some sheep grazing did occur between the 1920s-1930s in the project area. No livestock grazing is currently authorized and none is expected to occur in the near future. As a result, Grazing activities on private lands would have no effect on soils in the Project Area because soil productivity effects are spatially static and productivity in one location does not affect productivity in another location.

Noxious Weed Treatments

The control of noxious weeds on National Forest land is an ongoing activity that normally occurs within the summer months. The Kootenai National Forest Invasive Plant Management ROD (2007) provides direction for noxious weed control on the District. Noxious weed control is expected to continue over the next ten years. Most herbicide weed treatments are conducted along existing roads with very few treatments occurring in timber harvest units.

Effects of noxious weed control were incorporated into the cumulative effects analysis through consideration of the effects disclosed in the Herbicide Weed Control EA, a review of the project database, and professional judgment and personal knowledge of noxious weed control. The findings of this assessment conclude that ongoing and reasonably foreseeable noxious weed control within the Analysis Area would cumulatively contribute indiscernible effects to the soils resource. The level of noxious weed control within the Analysis Area is not expected to increase much over the next ten years. Most future applications would likely be focused along open or restricted roads. All activities will follow approved application methods as analyzed in the Kootenai National Forest Invasive Plant Management ROD (2007); therefore no adverse cumulative effects would occur.

Recreation Maintenance

Routine maintenance will occur on approximately 23 miles of non-motorized trails in the Project Area. Maintenance may include brushing; removing blowdown, debris, and hazard trees; repairing or adding waterbars; repairing treads; repairing or replacing signs; and improving vistas. Routine trail maintenance would have no effect on soils in the activity areas identified. Administrative sites and trails do not count toward the 15% standard. In addition, the trails are individually small, scattered across many watersheds, and not all work would occur in the same year.

Special Uses
Ten to twelve outfitter/guides are active during the big-game hunting season on the District, and may be active in the Project Area on any given day during the hunting season. No permitted camps or trail construction associated with activities. Other activities include snowmobile activities in the winter time and minerals exploration. Although there are several active mining claims within the Project Area none of these mines seem to be very active and none are anticipated to occur in the future. Therefore, these activities would not add detrimental disturbance to the amounts listed in Table 3-71. The level of special uses within the Analysis Area is not expected to change much over the next ten years.

Public Uses
Recreational use of the Project Area is expected to include hiking, camping, fishing, hunting, photography, small forest product gathering (berries, mushrooms, cones, and boughs), Christmas tree cutting, firewood gathering, driving for pleasure, mountain biking, sightseeing, wildlife viewing, cross-country skiing, snowshoeing, trapping, and snowmobiling. These activities are expected to continue over the next ten years. Because of increasing numbers of people moving into the local communities, it is expected that some of these activity levels would increase. Recreational activities would contribute indiscernible effects to soils. This conclusion is based on the fact that these activities are individually small and scattered across many watersheds.

Off-highway vehicle (OHV) use was left off the list above because it is currently limited only to existing trails and open roads (OHV Record of Decision and Plan Amendment for Montana, North Dakota, and Portions of South Dakota, 2001). Therefore, no additional disturbance is expected from OHV use because soil productivity effects are spatially static and productivity in one location does not affect productivity in another location.

Private Property
Activities on private lands would have no effect on soils in the Project Area because soil productivity effects are spatially static and productivity in one location does not affect productivity in another location.

State Land Activities
Activities on state and provincial lands would have no effect on soils in the Project Area because soil productivity effects are spatially static and productivity in one location does not affect productivity in another location.

CONSISTENCY WITH REGULATORY FRAMEWORK

STATE AND FEDERAL LAWS AND REGULATIONS
The National Forest Management Act (NFMA) requires that all lands be managed to ensure maintenance of long-term soil productivity, hydrologic function, and ecosystem health. All activities proposed are consistent with this direction. Having a fully stocked stand left on-site to contribute needle-cast and/or trending toward the CWD guidelines contained in Graham et al (1994) and Brown et al (2003) would assure long-term soil productivity. All activity areas would remain below 15 percent detrimentally disturbed soils, RHCAs would be delineated where appropriate, design criteria would be followed, and all applicable BMPs would be implemented.

FOREST PLAN DIRECTION

The Forest Plan states that project plans for activities requiring the use of ground-based equipment will establish standards for the area allocated to skid trails, landings, temporary roads, or similar areas of concentrated equipment use (USDA Forest Service 1987a). Forest Service Manual 2500-99-1 establishes guidelines that limit detrimental soil disturbance to no more than 15 percent of an activity area. Forest Plan soil productivity monitoring results were reviewed throughout this project (Kuennen 2007; Kuennen 2003; USDA Forest Service 2003; and USDA Forest Service 1998). The BMP implementation and effectiveness have been monitored and documented since 1988. The five-year results from 1992–1997 found less than one percent of the acres surveyed were above the 15 percent threshold, with 77 percent of surveyed areas having less than 10 percent detrimental disturbance. From 1998–2005, none of the areas surveyed were above the threshold. Kuennen (2003 and 2007) compiled all monitoring data to date, which was used as the basis for soils analysis and specifying design criteria for this project. All proposed activities are expected to remain below the 15 percent threshold. All management activities would follow the BMPs outlined in Soil and Water Project File and would be consistent with Forest Plan Standards. The 2011 KNF Monitoring Summary (USDA Forest Service 2011) states that monitoring between 1991 and 2011 shows that 95 percent of the BMPs implemented during that time were effective.

The proposed project is consistent with the goals, objectives, and standards for soil and water resources set forth in the Kootenai Forest Plan because project design criteria and BMPs have been included to protect soil and water resources. The BMPs include Soil and Water Conservation Practices at a minimum to control non-point source pollution and protect soil and water resources from permanent damage. All proposed treatment units where harvest equipment may disturb existing soil conditions were field reviewed except proposed units 20, 21, and 33. None of the harvest units would exceed the Regional Soil Quality Standards for detrimentally disturbed soils.

SCENIC RESOURCES

REGULATORY FRAMEWORK

The Kootenai Forest Plan lists as Goal 14: “Maintain a natural appearing landscape adjacent to major travel corridors, around local communities, and around popular destinations such as campgrounds” (USDA Forest Service, 1987a, II-2). It also sets objectives for Visual Resources: “The visual resource will be inventoried, evaluated, and managed throughout all management activities. Consideration for the visual resource will guide all activities seen from major travel corridors and local communities. Other activities will consider landscape management to a degree dependent on the visual sensitivity of the area and its compatibility with the primary goals of the individual Management Areas” (USDA Forest Service, 1987a, II-5). Standards for each Management Area (MA) list the Visual Quality Objective (VQO) allowed or desired for each MA. Projects are then analyzed to determine the effect on the scenic resource for each MA.

Analysis Area

The area analyzed for potential effects of the activities on Scenic Resources is all National Forest land within the Pilgrim Creek Project Area. The Tuscor face area was farther identified as meeting Forest Plan Goal 14 criteria as a visual sensitive area visible from major travel corridors and around local communities that has potential effects from proposed harvest activities.

DESCRIPTION OF MEASUREMENT INDICATORS

The Kootenai National Forest (KNF) visual resources management method was updated in 1995 from the Visual Management System (VMS) (USDA Forest Service, 1974) to the Scenery Management System (SMS). This new system is presented in Landscape Aesthetics, A Handbook for Scenery Management. This system is a tool for “integrating the benefits, values, desires, and preferences regarding aesthetics and scenery for all levels of land management planning” (USDA Forest Service, 1995c).

Desired levels of scenic quality in the KNF Forest Plan are expressed in VMS terminology as Visual Quality Objectives (VQOs). The Forest Plan (USDA Forest Service, 1987a, VI-23) definitions for VQOs are described in table 3-75.

TABLE 3-75. VQO DESCRIPTIONS.

VQO's-Scenic Integrity objectives	Description
Retention (R) – High	Refers to landscapes where the valued landscape character "appears" natural. Changes may be present but must repeat form, line, color, texture and pattern common to the character so completely that they are not evident.
Partial Retention (PR) - Moderate	Refers to landscapes where the valued landscape character, "appears slightly altered." Noticeable changes must remain visually subordinate to the landscape character being viewed.

VQO's-Scenic Integrity objectives	Description
Modification (M)-Low	Refers to landscapes which “appear moderately altered”. Changes begin to dominate the viewed area, but they borrow attributes such as size, shape, edge effect and the pattern of natural openings. They should be compatible or compliment the landscape character.
Maximum Modification (MM)	Refers to landscapes which “appear altered”. Changes dominate the viewed area. When viewed as background they must borrow attributes such as size, shape, edge effect and the pattern of natural openings. When viewed as foreground or middleground they may not appear to completely borrow from naturally established form, line, color or texture.

The analysis looks at the existing scenic condition for the portions of the project area with proposed management activities to determine whether or not the existing condition meets Visual Quality Objectives (VQO’s) for the affected Management area (MA). It then addresses how the action would modify the scenic condition and whether or not the resulting landscape would meet the VQO for the same area. The criteria used to evaluate each alternative are the Forest Plan VQO definitions.

The Tuscor Face was evaluated using Visual Nature Studio (v2.53, 3D Nature, LLC) to create photorealistic images of the landscape with several proposed harvest treatments as well as an existing condition with which to compare. Viewpoints chosen for this evaluation were: #1, Highway 200 Scenic Viewpoint and #2, Swamp Creek Road 1728. Figure 3-22 is the Alternative 2 map displaying the viewpoint locations. Alternatives 2, 3, 4, and 5 maps are included in Appendix A. A variety of different treatments was evaluated to determine a preferred course of action for minimizing visual effects of proposed treatment areas and is included in the project file. The preferred approach was approximated by Alternative 3 and a visual approximation is included in Appendix E . along with an actual photograph from each viewpoint.

Table 3-76 shows the units by alternative, treatment prescription, VQO, what area they are in, and visibility rating. Proposed harvest units were selected for in-depth analysis fall into the Tuscor face area; units 33 thru 41. These are visible from the Scenic Viewpoint and Swamp Creek Road, which are viewpoints from a major corridor, Highway 200. The remainder of the treatment units, including natural fuels, are in the distant background and generally only seen from forest roads within the Pilgrim Creek drainage.

Generally, snow cover exaggerates the appearance of regeneration harvests and road construction so the visual simulations for all alternatives have been done with some snow cover to highlight possible effects on the visual resource.

Table 3-76. Unit Treatment Prescriptions, VQO and viewpoints from which they are visible.

Alt.	Unit	Prescription (Alternative)	VQO	Scenery Comments
2,3, 4 & 5	1	Coppice	PR	Smeads Bench, FSR # 2706B, low visibility
2,3, 4 & 5	2	CT	PR	Smeads Bench, FSR # 2706B, low visibility
2,3, 4 & 5	3	CT	M	Smeads Bench, FSR # 2706B, low visibility
2,3, 4 & 5	4	SW	M	Smeads Bench, FSR # 2706B, low visibility
2,3, & 4	5	CT	M	Smeads Bench, FSR # 2706B, low visibility
2,3, & 4	6	CT	M	Smeads Bench, FSR # 2706B, low visibility
2 3 & 5	8	SW	PR	Lone Cliff, FSR #2744, moderate visibility-ridge line
4	8S	SW	PR	Lone Cliff, FSR #2744, moderate visibility-ridge line
4	8T	SW	M	Lone Cliff, FSR #2744D, low visibility- below ridge line
2	9	SW	PR	Lone Cliff, FSR #2744, moderate visibility-ridge line
2 4 & 5	10	ST	PR	Lone Cliff, FSR #2744, moderate visibility-ridge line
3	10T	ST	M	Lone Cliff, new road, low visibility- below ridge line
3 & 5	10S	ST	PR	Lone Cliff, FSR #2744 & new road, moderate visibility-ridge line
3	10B	ST	M	Lone Cliff, FSR #2744 & new road, low visibility- below ridge line
2	11	ST	M	Lone Cliff, temp road, low visibility- below ridge line
3	11B	ST	M	Lone Cliff, alt 2-temp road, alt 3-new road, low visibility-below ridge line
2,3, &4	12	ST	PR	Lone Cliff, alt 2-FSR #149 &2744, new & temp road, Alt 3-temp road, Alt 4- FSR #2719, mod visibility- ridge line
3 & 5	12S	ST	PR	Lone Cliff, FSR #2744, moderate visibility-ridge line
3	12B	SW	M	Lone Cliff, new road, low visibility- below ridge line
2 & 5	13	CT	M	Upper Skeleton Creek, new road, low visibility

Alt.	Unit	Prescription (Alternative)	VQO	Scenery Comments
2	14	ST	M	Upper Skeleton Creek, temp road, low visibility
2	15	SW	M	Upper Skeleton Creek, FSR #2719, temp road, low visibility
2,3, &4	16	CT	M	Upper Skeleton Creek, FSR #2719& #149, low visibility
2	17	ST	PR	Upper Skeleton Creek, FSR #2719, temp road, low visibility
2,3, 4 & 5	18	SW	PR	Upper Skeleton Creek, FSR # 149, low visibility
2,3, 4 & 5	19	CT	PR	Upper Skeleton Creek, FSR # 149, low visibility
2,3, 4 & 5	20	ST	PR	Upper Skeleton Creek, FSR # 149, mod visibility
2	21	ST	PR	Upper Skeleton Creek, FSR # 149, mod viability
3&4	21A	CT	M	Upper Skeleton Creek, FSR # 149, low viability
3, 4 & 5	21B	CT	PR	Upper Skeleton Creek, FSR # 149, low viability
2,3, &4	23	ST	M	Upper Skeleton Creek, FSR # 149, low visibility
3&4	23B	CT	M	Upper Skeleton Creek, FSR # 149, low visibility
2,3, 4 & 5	24	CT	PR	WF Pilgrim Creek, FSR # 2744, mod visibility
2,3, 4 & 5	25	CT(2)SW(3,4 &5)	PR	WF Pilgrim Creek, FSR # 2744, mod visibility
2 &3	26	CT	M	WF Pilgrim Creek, FSR # 2744, new road, mod visibility
2,3, &4	27	ST	M	WF Pilgrim Creek, FSR # 2744, #2744C, #2744D, mod visibility
2,3, 4 & 5	28	CT	PR	Stevens Creek, FSR #2214, mod visibility
3&4	28A	CT	PR	Stevens Creek, FSR #2214, mod visibility
2,3, 4 & 5	29	CT	PR	Stevens Creek, FSR #2214, mod visibility
2,3, 4 & 5	30	ST	PR	Stevens Creek, FSR #2214 & #2710, mod visibility
2,3, 4 & 5	31	ST	M	Stevens Creek, FSR #2214 & #2710, low visibility

Alt.	Unit	Prescription (Alternative)	VQO	Scenery Comments
2,3, 4 & 5	32	ST	M	Stevens Creek, FSR #2214 & #2710, low visibility
2	33	SW	M	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, moderate visibility.
2,3, 4 & 5	34	CT	M	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, moderate visibility.
3, 4 & 5	34a	CT	M	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, moderate visibility.
2,3, 4 & 5	35	CT	M	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, moderate to high visibility.
2 & 3	36	CT	M	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, moderate to high visibility.
3 & 3	37	CT(2) SW(3)	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
2	38	SW	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
2,3 & 4	39	CT(2) SW(3&4)	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
3 & 4	39a	SW	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
3 & 4	39b	ST	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
2, 3 & 4	40	ST(3)-SW(2,4)	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
3	40b	SW	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
3	40c	SW	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.
2	41	CT	PR	Tuscor Area, Scenic Viewpoint #1, Swamp Creek Road #2, high visibility.

AFFECTED ENVIRONMENT

Historical condition

Vegetation patterns 2,500 years ago were likely different from the present conditions due to wildfires at the turn of the 20th century, and more recent fire suppression and other management activities. Historically, mid-elevation south and west-facing slopes with their hot, dry rocky slopes had open, park-like stands of mature fire-resistant ponderosa pine, with grasses and forbs growing underneath. In the draws and slightly moister areas, the trees grew closer together with more of a contiguous canopy. By contrast the mid-elevation north and east-facing slopes (warm, moist habitat) were mixed conifer stands dominated by fire-resistant western larch, as opposed to today's Douglas-fir. Although they formed a continuous canopy, stands of trees were more open than the thick stands of today.

The high elevation habitats were probably similar to the present conditions due to the generally lower intensity fires with longer return intervals. These areas likely contained a mix of mountain hemlock, Engelmann spruce, and lodgepole pine. In contrast to the present vegetation patterns, small openings generally near the ridgetops would probably be seen. These would have been created by small surface fires occasionally burning into the crown layer. All of this most likely created a landscape character with much greater variety in form, line, color, and texture than we see today.

Historically there was a greater percentage of small to medium sized openings in the canopy across the landscape and a thinner canopy. In addition there was more diversity in the age classes due to various stages of regrowth occurring in the many openings. Existing vegetation patterns and composition are the result of more recent ecological disturbance processes, and more recent exclusion of fire and management activities over decades of time.

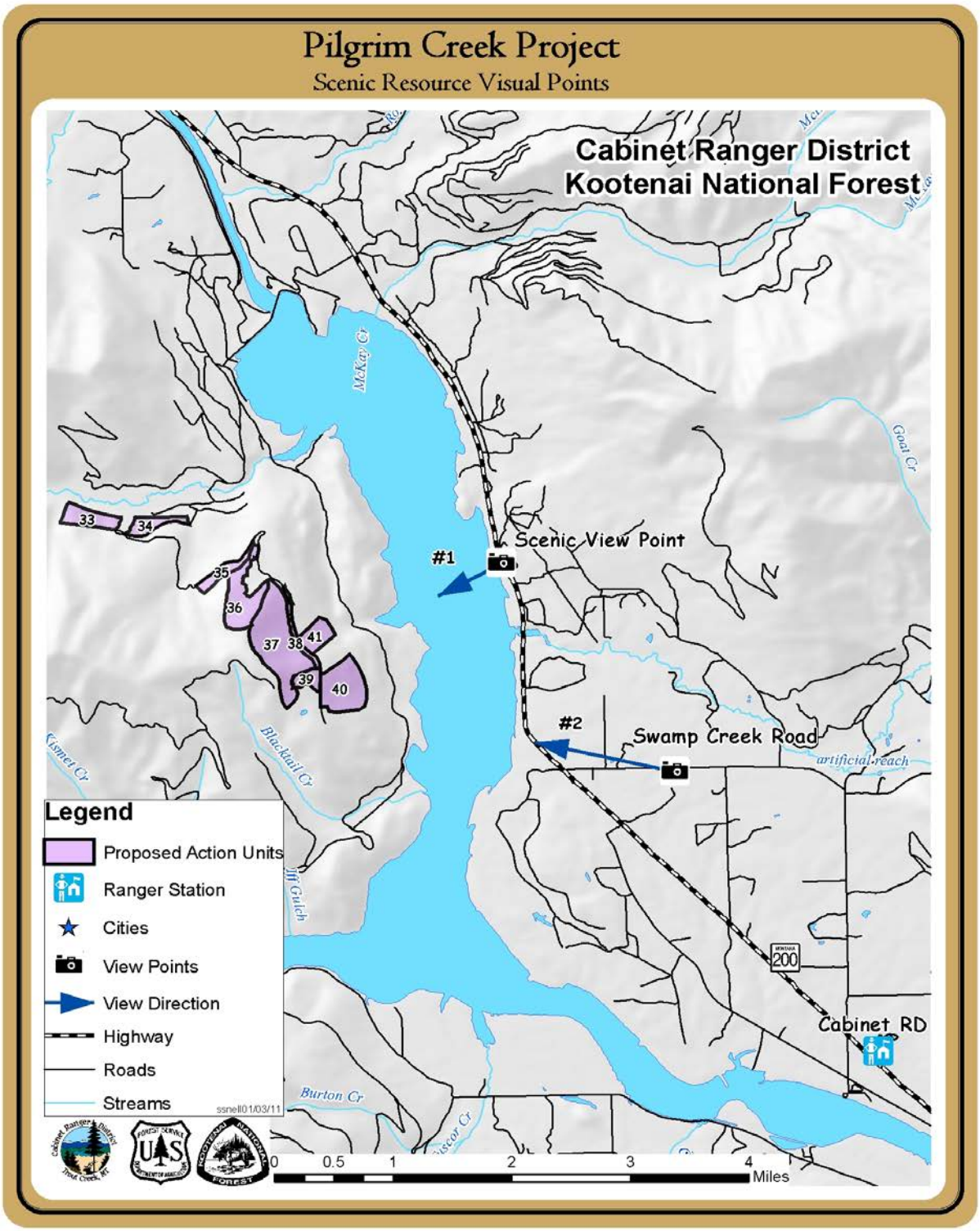


Figure 3-22. Scenic Resource Visual Points, Alt 2 Map

Existing condition

The major defining ecological event for the vegetation we see today in the project area was the fires at the turn of the 20th century including 1889 and 1910 fires, which burned 98% of the project area, resulting in large areas of even aged, homogenous appearing stands of Douglas Fir and lodgepole pine. Fire and the exclusion of fire since the 1940's have created the vegetation pattern we see in today's landscape. Due to fire suppression, insect and disease outbreaks have become the most common natural disturbance processes modifying the vegetation in today's landscapes.

Some of the past vegetation management activities do not meet the scenery management objectives of the Forest Plan. A number of geometric-shaped harvest openings scattered over the slopes appear unnatural due to the high degree of contrast of form, line, color, and texture with the adjacent non-harvested areas. These are evident from several viewpoints, most notable from Swamp Creek Road #2 showing areas harvested in 1985 with the Tuscor Pilgrim Timber Sale covering 293 acres. From the Swamp Creek Road you can also see the results of the Stevens Blacktail Timber Sale in 1996 that covered 343 acres. Swamp Creek Road viewpoint #2 also shows the results of logging on private lands in the Stevens Creek area. The stark contrast in these areas is especially apparent during the winter months when snow highlights the contrast. These patterns do not meet the Forest Plan goal of maintaining a natural appearing landscape through patch size and shapes.

The Marten Creek project is ongoing and has planned and completed some harvest units and natural fuels units in the Blacktail Creek area near Marten Creek Bay. Helicopter units were not harvested due to cost. The location of the units and harvest design, makes it difficult to see them from HYW 200. Natural fuel treatments are ongoing, but are designed to mimic natural fire in a controlled manner maintaining the natural appearance on the landscape.

The existing natural landscape character of the Pilgrim Creek study area is in a slightly fragmented state, with 37% of the landscape defined as *Moderate* or *Slightly Altered* and 38% defined as *High* or *Natural Appearing*. There are areas where that character has been defined as *Low* (26% of the landscape is classified as *Moderately Altered* and/or *Modified Pastoral Character)*. This impact is lessened by the fact that the entire altered area cannot be seen from any one sensitive viewpoint. Other areas may be fully seen but only from roads within the project area so they are seen by relatively few people.

The Forest Plan direction for Scenic Resources in MAs 10, 11, and 12 provides a range of VQO standards. This leaves the determination of the appropriate VQO as a choice dependent upon the visual significance of the specific area being affected. In MA 11 and 12 the range of standards can still be overridden if meeting them would conflict with accomplishing the overall goal of the MAs. In MA 10 the range of standards should be maintained or be trending towards the Forest Plan standard.

Table 3-77 shows the acres of Natrual Fuels treatment by MA. All action alternatives are the same for natural fuels. Forest Plan direction for Scenic Resources in MA 5 is Retention and for MAs 10,11, 12, 18,19,and 24 the range of VQO is varied dependent on the visual significance.

Table 3-77. Natural Fuels Treatments by Management Area

MA	Old Growth	5	10	11	12	18	19	24	Total
Acres	529	18	2634	115	903	229	127	9	4564

Environmental Consequences

Direct and indirect effects on scenic resources are described below for proposed activities identified in Chapter 2. Cumulative effects were considered for all past, proposed, current, and reasonably foreseeable activities, which are described at the end of this section.

Tables 3-78, 3-79, 3-80, and 3-81 show the breakdown of proposed harvest treatment acres by MA.

Table 3-78. Acres of Harvest Treatment by MA – Alternative 2

Prescription	MA 10	MA 11	MA 12	Total Acres
Seed Tree	0	2	290	292
Shelterwood	15	47	253	295
Commercial Thin & Coppice	0	30	766 (28)	796 (28)
Total Acres	15	79	1,317	1,411

Table 3-79. Acres of Harvest Treatment by MA – Alternative 3

Prescription	MA 10	MA 11	MA 12	Total Acres
Seed Tree	0	15	497	512
Shelterwood	0	28	358	386
Commercial Thin & Coppice	0	0	510 (26)	510 (26)
Total Acres	0	43	1,391	1,434

Table 3-80. Acres of Harvest Treatment by MA – Alternative 4

Prescription	MA 10	MA 11	MA 12	Total Acres
Seed Tree	0	4	299	303
Shelterwood	6	87	417	510
Commercial Thin& Coppice	0	0	451 (26)	451 (26)
Total Acres	6	91	1,193	1,290

Table 3-81. Acres of Harvest Treatment by MA – Alternative 5

Prescription	MA 10	MA 11	MA 12	Total Acres
Seed Tree	0	3	127	130
Shelterwood	0	0	131	131
Commercial Thin& Coppice	0	0	371	371
Total Acres	0	0	629	632

DIRECT AND INDIRECT EFFECTS

Alternative 1 – No Action

The visual conditions of the area would generally remain as it is and continue to not meet Forest Plan goals until the trees in the existing openings grow tall enough to blend in with the surrounding vegetation. Slowly, over time, the growth of the harvest units would start to blend the unnatural straight lines that currently exist from past treatments. Current natural openings would have trees encroaching around the edges changing the shape and size. Natural processes such as insects, disease, wind, and fire would contribute to the visual landscape. The severity of a fire event would be dependent upon these other natural processes. With no harvest or natural fuels treatments, the fuel loading in the analysis area would, at the least, remain the same and most likely increase. Increases in fuel loading equates to an increase in fire severity, which could result in a greater visual change than the proposed units themselves. Root disease and insects would also begin to make a bigger impact on the landscape due to the density of susceptible species like Douglas-fir and lodge pole pine.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

The acreage of the different harvest treatments varies by alternative and is listed below. These harvest treatments would be beneficial to the scenic resource of the Pilgrim Creek Project Area by helping to merge the existing harvest units into the landscape. Utilizing naturally established form, line, color and texture to soften the edges of existing openings the proposed treatments will create more of a blended mosaic rather than a patchwork of straight edged openings. In areas where there are no existing openings, variable leave tree densities and irregular boundaries will be utilized to lessen visual impacts on the landscape. Long term effects from treatments would provide diversity in age class and species that will help blend openings into the surrounding forest, which can contribute to the visual desired conditions in the area. Table 3-82 shows the number of acres of harvest treatment types by alternative for the Pilgrim project area.

Table 3-82. Acres of Harvest Treatment by Alternative

Alternative	Seed Tree	Shelterwood	Commercial Thin	Total Acres Treated
2	292	295	824	1,411
3	513	386	536	1,434
4	303	510	477	1,290
5	130	131	371	632

The majority of the natural fuels units are in the background and designed to mimic natural fire events under controlled conditions. Not all of the units would be burned in one year or nor is it expected that every acre in these units would be burnt. In the short term, Natural fuels and activity fuels treatments could potentially cause short-term visual effects from scorched or killed trees which would be within the range of acceptability for the VQO's of the area. Burning on naturally open slopes will have similar effects of scorching of shrubs and trees along the edges. These effects would be very short term, one to two years, and maintain or improve the visual quality of the long term.

EFFECTS BY ACTION ALTERNATIVE for the Tuscor Face Area

Alternative 2

Tuscor Face area was identified as a sensitive viewing area and contains harvest activities using commercial thinning and shelterwood prescriptions on 519 acres. Alternative 2 also proposes 1.91 miles of new road to access units 33, 35, 36, and 37. Nine proposed harvest units, 33 thru 41 are in MAs 10, 11, and 12, and range from moderate to high for visual sensitivity as they are visible from major travel corridors.

Implementation of Alternative 2 would also create two openings over 40 acres in size. These openings can be created in several ways; 1) the regeneration harvest unit alone is greater than 40 acres, 2) multiple regeneration harvest units within 600 feet of each other and combine to greater than 40 acres, and 3) the regeneration harvest is within 600 feet of an existing opening that when combined are greater than 40 acres. Unit 33 is 43 acres and adjacent to a six acre existing opening from past harvest, which would total 49 acres. The second opening is a combination of unit 39 (19 acres), unit 40 (93 acres) and three existing openings from past harvest (24 acres) for a total of 136 acres.

The greater than 40 acre opening associated with unit 33 is in MA 12 and rated as modified for scenic integrity. This area may be difficult to see from the viewpoints as it is lower on the hillside and up drainage. Shelterwood harvest prescription for this unit will leave some residual clumps and individual trees that will help to blend the unit boundaries into the surrounding forest. This area would retain a modified landscape, which will appear moderately altered until vegetation begins to recover and blend into the surrounding landscape.

The second greater than 40 opening is associated with Units 38 and 40 in MA10, MA11, and MA12, and rated as partial retention for scenic integrity because the area can be seen from both viewpoints. Units 38 and 40 are shelterwood prescriptions that will break up edges and blend the existing openings from previous harvests into the landscape. Short term impacts would reduce the scenic condition to modified due to harvest related activities. Over the long term, vegetation would recover, evidence of skid trails would diminish, and the harvest units would blend into the landscape.

Unit 34 is rated as modified for scenic integrity, and is near Unit 33. The prescription for Unit 34 is a commercial thin, and it is also located on the lower portion of the hillside and farther up the drainage. The unit may appear more open after harvest than the surrounding forest, but because of location and design it will have a lower impact on the scenic resource. A modified scenic condition would be maintained following harvest activities, and over the long term, trend towards partial retention.

Units 35, 36, and most of unit 37 can be seen from the Scenic Viewpoint #1 and to a lesser extent from the Swamp Creek view point #2. There is a ridge line and bench that divides the units between modified and partial retention for scenic visual objectives. Prescription for these units is commercial thin; three acres are in MA11 and the remainder is in MA12. Portions of the new road to access units 35 and 36 will be visible from viewpoint #1. The forest would appear more open after harvest, but using design criteria to feather edges, leaving some clumps, and other scenic mitigation measures will minimize impacts. The scenic integrity objective for these units would diminish in the short term to modified in areas of partial retention and maintain the modified rating in the remaining area. Long term the area would trend towards the scenic objective goals of partial retention.

Unit 41 can be seen from both view points and is rated as partial retention. There have been previous harvest activities in this area utilizing regeneration methods that created openings with straight-line edges on the landscape. Unit 41 is a commercial thin prescription in MAs 11 and 12 and is designed to break up edges and openings. The proposed harvest unit would create a more open appearance of the forested landscape and eliminate some of the straight lines of the existing openings from previous harvest. The current road system runs along the top edge of the unit and may be more visible. This area does not currently meet the goal for partial retention and would continue to be a more modified status in the short term, but over the long term it would trend toward the scenic objective goals for partial retention.

In general, the combination of these units and roads would have moderate effect on the scenic resource, and have the potential to change the VQO from Partial Retention to a Modified status in some areas, while maintaining the Modified status for the areas with that current rating. The Kootenai Forest Plan allows for change when meeting other management area goals in these MAs. Over the long term as vegetation recovers, the effects from harvest activities, fire, and roads, will begin to blend into the landscape and be compatible or compliment the landscape character. The area would trend towards Forest Plan goal of Partial Retention, but attaining the goal may be difficult within one or two decades.

Alternative 3

Alternative 3 proposes a larger number of shelterwood and seed tree harvest units in the Tuscor Face area than alternative 2, and reduces the total acres of harvest to 349 aces. There are 11 harvest units, 34 thru 40C in MAs 11, and 12. Alternative 3 also proposes 0.81 miles of new road and 1.08 miles of temporary road to access units 33, 36, 37, 40b, and 40c. Unit boundaries and roads were redesigned from alternative 2 to create more irregular naturally appearing

edges, provide for more wildlife movement corridors, and reduce impacts from harvest and roads to the scenic resource. Harvest prescriptions will create a more open canopy from current conditions and some openings will be visible but the irregular edges and variable spacing of the leave trees will make them appear natural in the landscape.

Implementation of Alternative 3 would also create two openings over 40 acres in size in the Tuscor Face area. Unit 39 is 20 acres, unit 40 is 35 acres and they are adjacent to a 32 acre existing opening from past harvest, which would total 87 acres. The second opening is a combination of unit 37 (34ac) 39A (36ac), 39B (33ac), 40B (29ac), 40C (19 ac), and a 36 acre existing opening from past harvest for a total of 187 acres.

The first greater than 40 opening is in MA 11 and 12, and is mostly rated as partial retention for scenic integrity objectives. This area is best seen from Swamp Creek viewpoint #2. Prescriptions for the two units are shelterwood in unit 39 and seed tree in unit 40. Unit 40 was reduced in size based on concerns for visual impacts. The two proposed units are separated by an existing road. The shelterwood harvest prescription in unit 39 will leave some residual clumps and individual trees that will help to blend the unit boundaries into the surrounding forest and existing opening, as well as buffer the existing road. Seed tree harvest in unit 40 will appear more open, but feathering and irregular boundaries will blend the unit into the surrounding forest. This type of harvest will also help to blend skyline skid trails. The effects of treating these units will shift the scenic objectives towards a modified landscape, in the short term, but over time, the area will recover and trend towards a partial retention goal.

The second greater than 40 opening is associated with Units 37, 39A, 39B, 40B, and 40C in MA11 and MA12, and rated as partial retention for scenic integrity objectives. The majority of the area is easily seen from both viewpoints. Prescriptions vary between seed tree and shelterwood harvest and will use similar design criteria as above to break up edges and blend the existing opening from previous harvests into the landscape. Two segments of temporary road on an existing prism would be needed to access these units; 0.76 miles into 40B and 40C, and 0.19 miles into 39B. The temporary roads would be ripped, seeded and water-barred following harvest activities. Short term impacts could reduce the scenic objectives to modified due to harvest related activities and the existing road along the Tuscor Face. Over the long term, vegetation would recover, evidence of skid trails and temporary roads would diminish, and the harvest units would blend into the landscape.

One new road segment for access to units 36 and 37 may be seen from the viewpoints. The combination of prescriptions and design criteria for these two units and road would have an effect on the scenic resource, but by treating more of the straight edged existing openings and buffering the road, those impacts would be minimized and continue to meet the VQO of partial retention.

Implementing Alternative 3 with the combination of these units and roads would have moderate effect on the scenic resource in the short term, and have the potential to change the VQO from Partial Retention to a Modified status in some areas, while maintaining the Modified status for the areas with that current rating. Roads, unit layout, and prescriptions were designed to minimize effects to the scenic resources by blending in old harvest units and using scenic mitigation measures where possible. The Kootenai Forest Plan allows for change when meeting other management area goals in these MAs. Over the long term as vegetation recovers, the effects from harvest activities, fire, and roads, will blend into the landscape and be compatible or compliment the landscape character in the Pilgrim Creek project area. The goal of Partial Retention could be attained within one or two decades following harvest.

Alternative 4

Alternative 4 is similar to alternative 3, and reduces the total acres of harvest from alternative 2 to 356 aces. There are seven harvest units, 34 thru 40 in MAs 10, 11, and 12. Unit boundaries were redesigned from alternative 2 and 3 to utilize only existing roads; therefore alternative 4 proposes no new road or temporary roads. The unit prescriptions and design are intended to create irregular naturally appearing edges, provide for wildlife movement corridors, and reduce impacts to the scenic resource. Openings will be visible but the irregular edges and variable spacing of the leave trees will make them appear natural in the landscape. The units proposed in this alternative treat less of the straight edged existing openings.

Alternative 4 would also create one opening over 40 acres in size as describe above; Units 39 (20ac), 39A (62ac), 39B (33ac), 40 (137ac) and existing opening of 68 acres for a total of 294 acres. These units are in MAs 10, 11, and 12 and rated as partial retention as the area can be seen from both viewpoints. The prescriptions vary between seed tree and shelterwood harvest, which will leave clumps and individual trees within the units. Following harvest, the forest will appear more open and the existing road may be more visible. Design criteria mentioned above will be used where possible to soften the impacts from harvest activities and blend units into the surrounding landscape. Short term impacts could reduce the scenic objectives to modified due to harvest related activities and the existing road along the Tuscor Face. Over the long term, vegetation would recover, evidence of skid trails would diminish, and the harvest units would blend into the landscape.

Units 34, 34A, and 35 are hidden to some extent from the view points and rated as modified for Scenic resources. The prescription for these units is commercial thin and will leave a more open forest in the short term. Design criteria will help blend the edges into the surrounding forest and proved some buffers along the existing road. The effects would be minimal to scenic resources and the modified condition would be maintained.

An existing road extends through this area and segments may become more visible in areas where harvest is proposed, particularly along the Tuscor Face. Units 39 and 39B are above the road and will help to break a straight line effect from the road prism. Buffering along the road would also help blend the road into the landscape.

Implementing alternative 4 with these units and roads would have moderate effect on the scenic resource in the short term, and have the potential to change the visual quality from partial retention to a modified status in some areas, while maintaining the modified status for the areas with that current rating. Roads, unit layout, and prescriptions were designed to minimize effects to the scenic resources by blending in old harvest units and using scenic mitigation measures where possible. The Kootenai Forest Plan allows for change when meeting other management area goals in these MAs. Over the long term the landscape in the area would trend towards the goal of partial retention as vegetation recovers. The effects from harvest activities, fire, and roads, will blend into the landscape over time and be compatible or complement the landscape character in the Pilgrim Creek project area.

Alternative 5

Alternative 5 was developed to meet Forest Plan standards with no openings over 40 acres and no roads. Units 34, 34A, and 35 are proposed for harvest from existing roads for a total 92 acres. These Units are hidden to some extent from the view points and rated as modified for Scenic resources. The prescription for these units is commercial thin and will leave a more open forest in the short term. Design criteria will help blend the edges into the surrounding forest and

proved some buffers along the existing road. The effects would be minimal to scenic resources and the modified visual quality status would be maintained.

Comparison of the alternatives.

As stated in the effects common to all, the harvest units would be beneficial by helping merge the existing harvest units into the landscape by softening the edges and creating more of a blended mosaic rather than a patchwork of straight edged openings. For the Tuscor Face area, Alternative 2 provides the least effective mitigation for the existing straight edged openings because of the new roads proposed to access harvest units. Alternative 3 will treat more of the existing openings as well as addressing resource needs by using more of a mosaic harvest design that will blend the harvest units and roads with the surrounding landscape. New road construct would be reduced by 1.1 miles and 0.8 miles temporary roads for access to harvest units as compared to 1.91 miles of new roads-proposed in Alternative 2. Alternatives 4 and 5 would be less effective in treating existing straight edged openings as fewer units are being proposed in those areas of previous harvest activities. Alternative 4 would have overall similar short term effects as alternative 3, but both alternatives will trend towards Forest Plan goals over the long term. Alternative 5 would have a negligible effect as proposed activities are in moderate to low visibility, no new roads are proposed, and no areas exceed 40 acre openings.

Alternatives 3, 4, and 5 will continue to meet or improve the VQO objectives in the long term for the management areas involved, while Alternative 2 has the potential to change the VQO from Partial Retention to a Modified status in some areas.

CUMULATIVE EFFECTS COMMON TO ALL ALTERNATIVES

The effects of logging and road building completed in the past three decades are still visible today in the Pilgrim Project area. These impacts, and the impacts from the proposed activities, would have a cumulative effect on the scenic resource. With time, the units from the past harvest will blend into the surrounding landscape and compliment the scenic values. Because of the extent of past harvesting, the proposed treatments will not likely alter the current “managed” appearance of the hillside but will trend the landscape in the direction of meeting Forest Plan VQO’s. All of the action alternatives will serve to partially blend some previous regeneration units into the landscape to some degree.

The proposed activities are anticipated to have an improved effect on Scenic Resources by softening the effects of some of the straight-line edges of existing openings and striving to meet Forest Plan VQO’s in the long term.

CONSISTENCY WITH REGULATORY FRAMEWORK

All alternatives would be consistent with the Forest Plan for Scenic Resources by maintaning or improving the VQO objectives with some exceptions in Alternative 2 Activities may diminish the visiual rating in some units in MA 12 where changing the scenic resource is allowed to meet other resource goals.

INVENTORIED ROADLESS AREAS

INTRODUCTION

Inventoried Roadless Areas (IRAs) are those areas identified in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November, 2000, which are held at the National headquarters of the Forest Service, with any update, correction, or revision of those maps.

The project area boundary encompasses all or part of two IRAs; Huckleberry Mountain and Lone Cliff Smeads, which totals approximately 14,000 acres. There are an additional three IRA's adjacent or in close proximity to the project area.

This section displays the effects of the proposed activities (prescribed burning, harvest, road building) on Inventoried Roadless Areas.

Analysis Area

The analysis area for effects to the roadless resource are the IRAs within, or adjacent to the project area. The area selected for analysis is of a scale suitable for the recognition of cumulative effects on the resource.

The two IRAs within the project area, and three IRA's adjacent or in close proximity to the project area are displayed in Table 3-83.

Table 3-83. Inventoried Roadless Areas

IRA Name	IRA#	Acres	87 Forest Plan IRA	99 Evaluation	2000 Inventoried Roadless Area	
Huckleberry Mountain	699	8,959	NO	Yes	Yes	In project area
Lone Cliff Smeads	674	5,115	Yes	Yes	Yes	In project area
Devils Gap	698	5,349	NO	Yes	Yes	Adjacent, outside of project area
Lone Cliff West	674a	5,311	NO	Yes	Yes	Adjacent, outside of project area
East Fork Elk	678	6,766	Yes	Yes	Yes	One mile outside of project area

Inventory of roadless areas is an ongoing process. Initial inventories started with RARE I and RARE II. The 1987 Kootenai National Forest Plan included two of the above five areas as IRA's; Lone Cliff Smeads and East Fork Elk. Neither of these IRAs were recommended as wilderness in the1987 Forest Plan.

In 1999 as part of Forest Planning, IRA boundaries and adjacent areas were re-evaluated for roadless characteristics. An additional three areas in or near the project area were included in this evaluation, and brought forward in the 2000 as Inventoried Roadless Areas. These were; Huckleberry Moutain, Devils Gap, and Lone Cliff West.

Analysis Methods

FSM 1923 directs evaluation of inventoried roadless areas for recommendation as potential wilderness. The inventory criteria are described in FSH 1909.12 (72.1). The capability of a potential wilderness is the degree to which that area contains the basic characteristics that make it suitable for wilderness recommendation.

Activities that could affect or have affected potential wilderness attributes (Table 3-84) of the IRAs are analyzed. Generally, those activities include miles of road, and acres of timber harvest or ecosystem burning. The analysis covers the next 5-10 years for direct, indirect, and cumulative effects.

Table 3-84 Wilderness Attributes and Descriptions

Wilderness Attributes	Description
Natural Integrity	The extent to which long-term ecological processes are intact and operating. Impacts to natural integrity are measure by the presence and magnitude of human-induced changes such as physical development (e.g. roads, utility and railroad rights-of-way, fences, lookouts, and cabins), recreation developments, domestic livestock grazing, mineral developments, wildlife/fisheries management activities, vegetative manipulation, and fire-suppression activities. Such developments are scaled as to their presence, effect on natural integrity, size of area impacted, potential separability from the rest of the area, duration of impact if uncorrected, and feasibility of correcting.
Apparent Naturalness	Degree that the environment looks “natural” to most people using the area. It is a measure of the importance of visitors’ perceptions of human impacts to the area.
Remoteness	A perceived condition of being secluded, inaccessible, and out of the way. The physical factors, which can contribute to “remote” settings, include topography, vegetative screening, distance from human impacts such as roads and logging operations, and difficulty of travel. A user’s sense of remoteness is also influenced by the presence or absence of roads, their condition, and whether they are open to motorized vehicles.
Solitude	A subjective value defined as “isolation from the sights, sounds, and presence of others, and the developments of man.”
Special Features	Unique geological, ecological, cultural, or scenic features which may be located in roadless areas. Unique fish and wildlife species, plants or plant communities, potential Research Natural Areas, outstanding landscape features such as rock formations, and significant cultural resource

Wilderness Attributes	Description
	sites are some of the items that should be considered when analyzing this element.
Manageability/Boundaries	A measure of the Forest Service's ability to manage an area to meet size criteria and the five elements discussed above. Changes in the shape of the roadless areas and the locations of other proposed projects outside the area are also factors that should be considered. Boundary management impacts relate to such features as the need to change boundaries to terrain features that can be easily located, and the provision for access to the remainder of the roadless area.

Affected Environment

The Huckleberry Mountain IRA contains approximately 9,000 acres and is within the project area with the exception of about 300 acres on the south side. The IRA is a U-shape that is connected by a neck and nearly divided by complex road systems. It is located south of Pilgrim Creek and north of Stevens Ridge. This IRA has varying, but generally steep terrain, and is managed within MAs 10, 11, 12, 13, 14, and 24. Descriptions of the MAs are found in the project file.

The Lone Cliff Smeads IRA contains 5114 acres, all located within the project area. This IRA lies north of Pilgrim Creek and south of trail #1070. The IRA contains Loveland Peak and the terrain is mostly very steep and rugged. The IRA is managed under the Forest Plan as MA 10, 11, 13, 14, and 18. Descriptions of the MAs are found in the project file.

Both the natural integrity and apparent naturalness within these two IRAs are high, with little evidence of man's activities within the IRAs' boundaries. Opportunities for solitude in both IRA's are moderate. Remoteness is low in Huckleberry Mountain and Lone Cliff Smeads. There is only a small area on the north side of the Huckleberry Mountain IRA where a person can get over 1 mile from road, and there is no location in the Lone Cliff Smeads IRA in the project area where a person can get more than 1 mile from an existing road. Backcountry hunting is the primary recreation opportunity offered by the areas. Neither IRA has any special features compared to the surrounding landscape.

Manageability/boundary of the Huckleberry Mountain IRA is rated low due to the re-regular shape, proximity to other land ownerships, and on-going activities adjacent to the area. Lone Cliff Smeads IRA is rated as low for manageability/boundaries as the boundary is irregularly shaped and impacted by adjacent land ownerships and activities similar to the Huckleberry Mountain IRA.

ENVIRONMENTAL CONSEQUENCES

Direct and Indirect Effects

Alternative 1 does not proposed management activities in any of the IRAs. There would be no effects to the wilderness attributes and roadless characteristics of these areas.

Effects Common to All Action Alternatives

Ecosystem burning is the only activity proposed in the IRAs. In **Alternatives 2, 3, 4, and 5,** approximately 3252 acres have been identified as potential sites that could be treated with fire to improve wildlife habitat or to readapt sites to more historical fire regimes.

Natural integrity and apparent naturalness would be affected to a very small degree by ecosystem burning, but only in the context that fire would be intentionally used. Some visitors could feel that prescribed fire affects the "naturalness" of the IRAs, while other visitors could feel that it enhances the naturalness. Short term effects of prescribed fire include a reduction in solitude and a reduction in air quality during burning operations. Long term effects include a change in the vegetative component, with the degree of change dependent on the intensity of the prescribed fire. This activity would have no effect on the natural integrity and apparent naturalness characteristics.

Logging and associated activities outside of the IRAs boundary could reduce the feeling of remoteness due to sights and sounds when these activities are ongoing. Scenic values may be decreased to minor degree as some treatment units may be visible from areas within the IRAs. Solitude would remain moderate, and remoteness remains low.

Special features would not be affected. There would be no change in boundaries. There are no activities proposed which would change any of the wilderness attributes of these IRAs.

CUMULATIVE EFFECTS

The Current and Reasonably Foreseeable Actions listed in the beginning of Chapter 3 were considered for cumulative effects. Timber harvest, road building, watershed restoration, and wildfire suppression are a few of the activities that have occurred in the project area. All of these activities, with the exception of fire suppression, occurred outside, adjacent or within short distances of boundaries of Inventoried Roadless Areas. The effects of past management have diminished over time and current conditions meet the natural, undeveloped, opportunity for solitude, special features, and manageability characteristics.

UNROADED AREAS EFFECTS SUMMARY

INTRODUCTION

During scoping concerns were raised about unroaded areas located outside of Inventoried Roadless Areas (IRAs). Two separate areas outside of IRA's were identified within the Pilgrim Creek project area which do not contain National Forest System roads, Skeleton Creek and South Fork Pilgrim Creek areas. The Skeleton Creek area has temporary and permanent road construction proposed in alternatives 2 and 3, and none in alternatives 1, 4 or 5. South Fork Pilgrim area has no road construction proposed in any of the alternatives. Vegetation management (including prescribed fire) and ecosystem burning is proposed in both areas under Alternatives 2, 3, 4 and 5.

Regulatory Framework

Forest Plan - Management direction for these two areas is located in Management Area prescriptions (MA) found in the Kootenai National Forest Plan (Project file). Current MA prescriptions for these areas, where vegetation management and road construction are proposed, would occur in MA 12. MA 12 is suitable for timber harvest production and road construction is allowed. Prescribed fire and ecosystem burning in these areas is proposed in MAs 10, 12, 13, and18, and is allowed to treat fuels and enhance wildlife forage.

There are no Forest Service regulations or laws that prohibit development of National Forest System lands in areas where the Forest Plan allows such use. The Skeleton Creek and South Fork Pilgrim Creek areas are not located within or adjacent to a wilderness area, wilderness study area, National Recreation Area, or research natural area. They are adjacent but not contiguous with Lone Cliff West, Lone Cliff Smeads, and Huckleberry Mountain IRAs.

Bounds of Analysis

The Pilgrim Creek project area is used for this analysis and is located on the west side of the Clark Fork valley, including Stevens Creek that drains into the Noxon Reservoir and Pilgrim and Smeads Creeks that drain into the Cabinet Gorge Reservoir. It is bounded on the east by Noxon and Cabinet Gorge Reservoirs, the south by Stevens Ridge Road, FSR #2214 the west by FSR #149, and natural features along Rice Draw to the north. The entire analysis area is located on the Cabinet Ranger District. See Appendix F.

Analysis Methods

Although the Skeleton Creek and South Fork Pilgrim Creek areas are not designated as wilderness or located within an Inventoried Roadless Area, in response to public comments the effects of the Pilgrim Project on these two areas will be assessed using the wilderness attributes identified in FSH 1909.12 and the 1964 Wilderness Act. In addition, Forest Service Manual 1923 directs evaluation of inventoried roadless areas for recommendation as potential wilderness. The capability of a potential wilderness is the degree to which that area contains the basic characteristics that make it suitable for wilderness recommendation.

To provide clarity for this analysis, Table 3-85 provides a crosswalk between the wilderness attributes identified in Forest Service Handbook 1909.12, the 1964 Wilderness Act; and the roadless area characteristics defined in the 2001 Roadless Area Conservation Rule (36 CFR Subpart B 294.11).

The Wilderness Act of 1964 defines wilderness as “as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of

sufficient size to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geographical, or other features of scientific, educational, scenic, or historical value."

Table 3-85. Crosswalk between Wilderness Attributes[1] and Roadless Area Characteristics[2]

Wilderness Attributes	Roadless Area Characteristics
Natural (ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature)	• High quality or undisturbed soil, water, and air; • Sources of public drinking water: • Diversity of plant and animal communities; • Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; • Reference landscapes
Undeveloped (degree to which the area is without permanent improvements or human habitation)	Natural appearing landscapes with high scenic quality
Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation • Solitude: opportunity to experience isolation from the sights, sounds, and presence of others from the developments and evidence of humans • Primitive and unconfined recreation: opportunity to experience isolation from the evidence of humans, to feel a part of nature, to have a vastness of scale, and a degree of challenge and risk while using outdoor skills.	Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation

Wilderness Attributes	Roadless Area Characteristics
Special Features and Values (capability of the area to provide other values such as those with geologic, scientific, educational, scenic, historical, or cultural significance)	• Traditional cultural properties and sacred sites; and • Other locally identified unique characteristics.
Manageability (the ability of the Forest Service to manage an area to meet size criteria and the elements of wilderness)	No criteria

[1]Wilderness attributes identified in Forest Service Handbook 1909.12, Chapter 70 that describe the basic characteristics that make an area suitable for wilderness recommendation. These principal wilderness characteristics originate from the definition of wilderness in the 1964 Wilderness Act.

[2] Roadless area characteristics defined in the 2001 Roadless Area Conservation Rule (36 CFR Subpart B 294.11)

Affected Environment

Background

The major defining ecological events for the vegetative landscape we see today in the Pilgrim Creek project area were the fires at the turn of the 20th century (1889 and 1910) which burned 98% of the project area, resulting in large areas of even aged, homogenous appearing stands of Douglas fir, Western Larch and Lodge pole Pine. Fire and the exclusion of fire since the 1940's has created the vegetation pattern in today's landscape. Due to fire suppression, however, insect and disease outbreaks have become the most common natural disturbance processes modifying today's vegetation.

The existing natural landscape character of the Pilgrim Creek study area is in a slightly fragmented state, with 62% of the landscape defined as *Moderate* or *Slightly Altered.* Previous management activities on National Forest lands, as well as on adjacent private property have contributed to the altered character in the Pilgrim Creek landscape.

Historical mine sites, timber harvest areas, and associated roads that occurred prior to and after the 1910 fire can be still found within and adjacent to the unroaded areas.

Unroaded areas

Skeleton Creek Area

The Skeleton Creek area, where temporary and new road construction is proposed, is approximately 1846 acres and is surrounded by National Forest System roads that are open yearlong and dissected on the northern side by a motorized trail. The area is separated from the Lone Cliff West IRA by FSR # 2744 along the ridge top and is approximately ¼ to ½ mile from either Lone Cliff Smeads or Huckleberry Mountain IRA at it closest points. As stated above, the

majority of this area where harvest activities are proposed is allocated in the Forest Plan to Management Area 12, where road construction and vegetation management is allowed. Prescribed fire and ecosystem burning is proposed in MAs 10, 12, 13, and 18, and is allowed to treat fuels and enhance wildlife forage.

Natural and Undeveloped

Some evidence of historic logging activities may be found that include stumps, skid roads, and haul roads, but due to vegetative growth these features are relatively unnoticed. A motorized trail, #1076, bisects the northern side of the area, and more recent timber harvest activities and fire wood gathering is obvious around the edges and near the current road systems. The interior of the area would appear natural and undeveloped with some remnants of past wildfire.

Solitude and Primitive Recreation

This area does not offer outstanding opportunities for solitude or a primitive and unconfined type of recreation as described in the Wilderness Act. The sense of solitude is limited within this relatively small block of land. A person may find a sense of isolation from other humans within the interior of the Skeleton Creek area, however, the noise from intermittent vehicle traffic on the surrounding roads still can be heard. In some portions of this area, the surrounding roads can be seen.

Opportunities for challenge and adventure are relatively low due to the small size of the area. A person could walk across this area (from road to road) in about an hour or less.

Special Features and Values

The area contains no special features or values. There are no outstanding scenic qualities or unique geologic features. The area is comprised of forested slopes that contain dead and dying lodgepole pine with a mix of western larch and other tree species, similar to many other areas on the Cabinet Ranger District.

Manageability

The ability of the Forest Service to manage this area to meet the size criteria and the elements of wilderness is extremely low. The area is of relatively small size (about 1846 acres), irregularly-shaped and is surrounded by existing roads. The main Lone Cliff Creek Road (#2744), which is open yearlong to public motorized, wraps around about most of the area (east, north, and west sides). The southern portion of the area is bounded by the main Pilgrim Creek road (#149), which is open yearlong to public motorized. In addition to the motorized trail, other roads in the surrounding area are gated yearlong to public motorized travel but are drivable and used for administrative access. This area is not contiguous with any wilderness or Inventoried Roadless Area and is separated by undesignated Forest lands that contain existing roads.

South Fork Pilgrim Creek Area

The South Fork Pilgrim Creek area is approximately 1717 acres and nearly surrounded by National Forest System roads that are open yearlong for motorized use. No temporary or new road construction is proposed for this area. The area is separated from the Lone Cliff West IRA by FSR # 149 along the ridge top and is less than ¼ mile from either Lone Cliff Smeads or Huckleberry Mountain IRA at it closest points. The majority of this area is allocated in the Forest Plan to Management Area 12, with small portions in MAs 10, 10og, 13, and 18. Timber harvest is proposed in MA 12 where vegetation management is allowed. Prescribed fire and ecosystem

burning is proposed in MAs 10, 12, 13, and 18, and is allowed to treat fuels and enhance wildlife forage.

Natural and Undeveloped

Some evidence of historic logging activities may be found that would include stumps, skid roads, and haul roads, but due to vegetative growth these features are relatively unnoticed. A motorized trail, #1084, bisects the eastern 1/3 of the area, and more recent timber harvest activities and fire wood gathering is obvious around the edges of the area near the current road systems. The interior of the area may appear natural and undeveloped in some portions with some remnants of past wildfire.

Solitude and Primitive Recreation

This area does not offer outstanding opportunities for solitude or a primitive and unconfined type of recreation as described in the Wilderness Act. The sense of solitude is limited within this relatively small block of land. A person could have a sense of isolation from other humans within the interior of the Skeleton Creek area; however, the noise from intermittent vehicle traffic on the surrounding roads and trails still can be heard. In some portions of this area, the surrounding roads can be seen.

Opportunities for challenge and adventure are relatively low due to the small size of the area. A person could walk across this area (from road to road) in about an hour or less.

Special Features and Values

The area contains no special features or values. There are no outstanding scenic qualities or unique geologic features. The area is comprised of forested slopes that contain dead and dying lodgepole pine with a mix of western larch and other tree species, similar to many other areas on the Cabinet Ranger District.

Manageability

The ability of the Forest Service to manage this area to meet the size criteria and the elements of wilderness is extremely low. The area is of relatively small size (about 1717 acres), irregularly-shaped and is surrounded by existing roads. The main Pilgrim Creek Road (#149), which is open yearlong to public motorized, wraps around about most of the area (south, north, and west sides). The eastern portion of the area is bounded by FSR #2711. A motorized trail (#1084), which is open yearlong to the public bisects the bottom 1/3 of the area. In addition, this area is not contiguous with any wilderness or Inventoried Roadless Area and is separated by undesignated Forest lands that contain existing roads.

ENVIRONMENTAL CONSEQUENCES

The Past, Current and Reasonably Foreseeable Actions listed in Chapter 3 were considered for cumulative effects.

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

Alternative 1 does not propose management activities in the Pilgrim Creek project area including the Skeleton Creek and Pilgrim Creek areas described above. Therefore, there is no

effect on the roadless characteristics of these areas, they do not meet inventoried roadless areas.

Direct Indirect and Cumulative Effects Common to Alternative 2, 3, 4, and 5

Ecosystem (Natural Fuels) burning is proposed on approximately 708 acres in these areas for all the action alternatives. The purpose is to reduce fuels, enhance big game forage, and restore the natural fire regime (see fuels report). The ecosystem burning would likely reduce the potential for severe wildfires, which in turn could reduce effects on wildlife species, including TES species. Short term effects from burning would be human activities and smoke that may detract from the wilderness attributes, but those would be limited in duration. Long term effects would be unnoticed compared to any natural fire event.

Therefore, there is no effect on the roadless characteristics of these areas from ecosystem burning.

Direct, Indirect and Cumulative Effects of Alternatives 2, 3, 4, and 5

Skeleton Creek Area

Alternative 2 proposes1.38 miles of temporary road from FSR #149 to access units 11, 12, and 13, and 0.3 miles of new permanent road that would extend FSR #2744D to access unit 26. Harvest prescriptions are for seed tree and commercial thin on 136 acres in MA 12. The 0.3 miles of new road would be constructed to access treatment area 26 and provide long-term administrative access to continue management in the future. The temporary road would be obliterated following harvest activities and the long term road would continue to be gated yearlong to restrict public motorized access. The new long term road would extend an existing road (#2744) about 0.3 miles along north edge of the area near the motorized trail. Road construction and harvest activities would affect <2% of this 1846 acres parcel of land that currently doesn't contain any National Forest System roads.

Short term effects from harvest activities would be the sights and sounds related activities, including increased traffic on system roads. Scenic values may be diminished for a period of time because of the skid trails, roads and harvest units near the ridge line. Because of the heavy infestation of mountain pine beetle, the effects to wilderness values are more related to skid trails, stumps, and roads which may be more apparent but will blend into the landscape over time as vegetation becomes reestablished.

Long term effects of road development and vegetation management activities would slightly reduce the current level of the area's natural and undeveloped characteristics and the existing sense of solitude. There would be no effect on the existing condition for manageability or special features. However, because the area currently does not meet the criteria for inventoried roadless area designation, it would remain unsuitable after project implementation.

Alternative 3 proposes 3.01 miles of new road that would extend FSR #2719 to access units 10b,11b 12, and 12b, and 0.83 miles to extend two spurs of FSR #2744 to unit 26. Timber harvest (commercial thin and seed tree) and related fuels work which would occur on 301 acres in MA12.

The extension of FSR #2719 would cross about 2.8 miles of the upper portion of the Skeleton Creek area and the two spurs extensions of FSR #2744; 0.46 and 0.37 miles are on the northern edge of the area. Long term roads would continue to be gated yearlong to restrict public motorized access. These roads would affect <25% of this 1846-acres parcel of land that

currently does not contain any National Forest System roads. Road construction would reduce the existing level of natural and undeveloped character on approximately 400 acres of the area. However, it would not notably reduce the existing level of manageability or special features of this area, which are currently low.

Short term effects from harvest activities would be the sights and sounds related activities, including increased traffic on system roads. Scenic values may be diminished for a period of time because of the skid trails, roads and harvest units near the ridge line. Because of the heavy infestation of mountain pine beetle, the effects to wilderness values are more related to skid trails, and stumps, which may be more apparent, but will blend into the landscape over time as vegetation becomes reestablished.

Long term effects of road development and vegetation management activities would reduce the current level of the area's natural and undeveloped characteristics and the existing sense of solitude. There would be an effect on the existing condition of the wilderness attributes of manageability as the size reduced. Special features would not be affected. However, because the area currently does not meet the criteria for inventoried roadless area designation, it would remain unsuitable after project implementation.

Alternatives 4 and 5 propose no road construction in either of these areas. Approximately 43 acres of timber harvest activities (seed tree) in portions of units 10 and 12 are in MA 12 and access is from current forest system roads. Short term effects would be less than alternatives 2 or 3 due to no road construction and less timber harvest as described in above. About 2% of the 1856-acres would be harvested along the edges of the area.

Long term effects from vegetation management activities would not reduce the current level of the area's natural and undeveloped characteristics and the existing sense of solitude. There would be no effect on the existing condition of the wilderness attributes of manageability or special features. However, because the area currently does not meet the criteria for inventoried roadless area designation, it would remain unsuitable after project implementation.

South Fork Pilgrim Creek Area

No temporary or long term roads are proposed for this area under any alternative. Harvest units and prescriptions for all action alternatives are the same. Prescriptions are for commercial thin and shelter wood in MA 12. Both units, 18 and 19 are skyline harvest systems accessed from the Pilgrim Creek Road, FSR #149. The only differences between alternatives are the number of acres of proposed harvest:

Alternative 2 includes approximately 62 acres of timber harvest activities in units 18 and 19.

Alternatives 3, 4, and 5 includes approximately 52 acres of timber harvest activities in units 18 and 19.

Short term effects from harvest activities would be the sights and sounds related activities, including increased traffic on system roads. Long term effects from vegetation management activities would not reduce the current level of the area's natural and undeveloped characteristics and the existing sense of solitude. There would be no effect on the existing condition of the wilderness attributes of manageability or special features. However, because the area currently does not meet the criteria for inventoried roadless area designation, it would remain unsuitable after project implementation.

Consistency with the Forest Plan

Forest Plan management allocations for these areas are MA 10, MA 10og, MA 12, MA 13, and MA 18. As summarized above these MA allocations are focused primarily on big game habitat and timber production. The alternatives are consistent with this direction.

The existing capability of these areas to be suitable for future wilderness recommendation is low. Action alternatives would have little effect on this capability. After project implementation, the wilderness capability of this area would still be low.

OTHER RESOURCES

Introduction

This section looks at other resource areas including recreation, minerals, range, and special uses.

Regulatory Framework

Guidance for these resources can be found in the Kootenai Forest Plan. In general, the Plan calls for providing for recreational opportunities while minimizing impacts to wildlife, allowing responsible development of mineral resources, meeting domestic livestock grazing needs where feasible, and providing for legitimate special needs on National Forest land.

Bounds of Analysis

The Pilgrim Creek project area was chosen for the bounds of analysis discussion. The area selected for analysis is of a scale suitable for the recognition of cumulative effects on the resource.

ANALYSIS METHODS

The Recreational Opportunity Spectrum (ROS) is used to describe settings and recreational opportunities associated with each setting (Table 3-86). The setting and opportunities often overlap and intermix. The ROS is used as a guideline to help managers and users describe these recreational activities. ROS classes for the project area include Roaded Natural (RN) and Roaded Modified (RM) settings. RN and RM areas are generally within ½ mile of a road. If the analysis area were to be delineated at a finer level, the interior portions of the Huckleberry Mountain (#699) and Devils Gap (# 698) Inventoried Roadless Areas could potentially be classified as Semi Primitive Non-Motorized. ROS provides a framework of settings and experiences in each class (ROS Book - 1986).

Measurement indicators of effects to recreation include changes in how lands are categorized within the Recreational Opportunity Spectrum, changes in miles of road available for motorized access, and miles of trail affected by harvesting, road building, or prescribed fire. Effects to special uses are measured by the number and type of use that could be affected. Effects to the range resource are measured by qualitative change in forage values, and minerals effects are measured by the number of mineral claims that would be affected by activities. The analysis covers the next 5-10 years for direct and indirect effects, and in addition, known past activities for cumulative effects.

Affected Environment

Recreation

Recreational use in the Pilgrim Creek project area includes but is not limited to hunting, camping, hiking, fishing, snowmobiling, sightseeing, and huckleberry picking. There are no developed recreation sites in the Pilgrim Creek project area, but camping does occur at a number of dispersed sites.

Roads that are currently open to motorized use facilitate the majority of the recreational use. Huckleberry picking, firewood gathering, driving for pleasure, and most camping activities are directly tied to roads with motorized access. Hiking and hunting are not as dependent on motorized access; however open roads are important for providing initial access for these pursuits.

Table 3-86. Recreation Opportunity Spectrum

ATTRIBUTE	SEMI-PRIMITIVE NON-MOTORIZED RECREATION	SEMI-PRIMITIVE MOTORIZED RECREATION	ROADED NATURAL	ROADED MODIFIED	RURAL
Interaction between Users	**Low**	**Low**	**Moderate**	**Little evidence or interaction of camp sites**	**Moderate to High**
Evidence of Other Users	**Some**	**Predominately natural appearing environment**	**Mostly natural appearing**	**Substantially modified environment**	**Agricultural**
Access and Travel	**Non-motorized trails & primitive roads**	**Motorized, involves challenge and risk**	**Little challenge and risk. Conventional motorized access.**	**Roads may be evident but generally have restricted access.**	**Well roaded**
Vegetation Alterations	**Widely dispersed, not evident**	**Small & widely dispersed.**	**Maintain desired visual & recreational characteristics**	**Slash & debris may be evident.**	**Agricultural in nature**
Activities &	**Rustic &**	**Rustic &**	**Rustic,**	**Signing at**	**Private**

ATTRIBUTE	SEMI-PRIMITIVE NON-MOTORIZED RECREATION	SEMI-PRIMITIVE MOTORIZED RECREATION	ROADED NATURAL	ROADED MODIFIED	RURAL
Facilities	**rudimentary. Minimum on-site controls**	**rudimentary. No evidence of synthetic materials. Minimum on-site controls**	**provides some comfort and site protection. Some obvious on-site controls.**	**major road junctions.**	**residences, farms**
Interpretation Guides	**Self-discovery, maps, brochures & guidebooks**	**Very limited on-site facilities, maps, guidebooks & brochures**	**Simple wayside exhibits**	**Simple wayside signs.**	**Directional signs**

Dispersed recreation use is generally light except during the general hunting season. Most dispersed camping areas are in use during the general hunting season. Hunting outfitter use is moderate, but no outfitter camps are authorized in the project area. Use during the first two weeks of the general hunting season could be categorized as moderate to heavy. Big game hunting is important economically to the local community and the State. It is also important socially as a family tradition, for providing meat, and as a form of recreation.

Recreational trails in the Pilgrim Creek Project area include South Fork Pilgrim (#1084), Smeads Bench (#1077), Stevens Creek (#1099), Stevens ridge (#1083), and Skeleton Creek (#1078). The trails are usually maintained every two years for foot and horse traffic, and are in satisfactory condition. Motorized use is allowed on these trails, although motorized use is relatively minor because existing trail design makes most motorized use fairly difficult. These are popular hiking trails that have a moderate to heavy level of use, particularly during the fall hunting season.

Range

No livestock grazing is currently authorized in the project area, primarily because of the lack of suitable range and available forage. Historic records show that in the 1915 to 1925 era, bands of sheep and cattle were allowed to trail through the area and probably grazed. The grazing was largely a response to available forage after the 1910 fire.

Minerals

Mineral exploration historical took place at many locations in the Pilgrim Creek drainage. There are several historic mining locations in the project area, which have been identified and recorded. As of February 2011, Active mining claims in the project area include the Holliday mine complex (eight claims) located in the West Fork Pilgrim Creek; the Thanksgiving claim located north of the lower Pilgrim Creek road in Section 26; and the Shalkako claim located between Pilgrim Creek and Stevens Creek in Section 2. The mines have not been in operation since the 1960s. Annual assessments are being done, but more extensive operations are unlikely in the near future. The District archeologist has recorded the Holliday mine site and details can be found in the district files. There are no patented claims within the Forest boundary in the project area.

Special Uses

Three major power lines are permitted within the project area. These are the Noxon/Pine Creek 230 Kv line, Cabinet/Noxon 230Kv line, and the Noxon/Hot Springs 230 Kv line. There are two domestic use water transmission systems in Smeads Bench area that also authorized under special use permits. Snowmobile grooming is authorized on all or portions of FSRs #149, #2710, #2229, #2214, and #2213.

Environmental Consequences

Direct and Indirect Effects of Alternative 1 – No Action

Natural processes would continue in the Pilgrim Creek project area. Recreational use and recreational settings in this area are not expected to change with primary use occurring on the roads and dispersed sites. Recreational use is expected to slowly increase and continue to be dispersed and varied. Special uses and minerals would not be affected. Forage availability for livestock would slowly continue to decline as vegetation becomes thicker in the absence of timber harvest or ecosystem burning.

Direct and Indirect Effects of Alternative 2 – Proposed Action

The recreational setting, as described in the ROS, would not change to any measurable degree. Road construction, ecosystem burning, and timber harvest activities would occur in areas that are in roaded natural or roaded modified settings. Alternative 2 proposes 2.42 miles of new permanent road, 1.64 miles of temporary road, 1,411 acres of harvest activities, and 4,564 acres of prescribed fire. The new and reopened roads would have restricted access for recreational use during and after project implementation. Intermittent stored service treatment of these reopened and new roads would initially improve walk-in access and the road prism could be used as a trail. Temporary roads would be needed for harvest access and would be decommissioned upon completion of project activities.

Opportunities for dispersed recreation would still be available. Road management would not materially change hunting opportunities from the current situation. Over the short term, foot access would be improved in some areas by construction/reconstruction of roads and clearing from timber harvest. Over the long term, foot access on closed or decommissioned roads would decrease as roads or existing road prisms revegetated. General ROS designations would remain unchanged.

Sights and sounds of harvest activities would be apparent to forest visitors over the short term. Recreational users may be temporarily displaced in areas where activities are occurring but these would be short-term effects. There is a potential for recreational drivers to conflict with harvest-related traffic. Upon completion of the harvest activities, recreational use would continue to be varied and dispersed. Burning activities would not affect the recreation opportunities in the area over the long term. Over the short term, dispersed recreation users might avoid areas that have been treated with fire, while some users such as hunters might seek out these areas.

No effects to special uses other than snowmobile grooming are expected, since no activities are planned within the right of ways of these uses. Snowmobile grooming may be effected should any winter harvest activities take place. This would be a short term effect during project implementation and may be minimized by using approved alternate routes or grooming schedule. Ecosystem or prescribed burning has the potential to impact mining claim corners in the project area. If and when burning occurs in this area, claimants will be notified that they may need to re-monument their corners if claims are still active. Livestock forage values are expected to increase because of burning and timber harvest, but not to the point where restocking of any allotments could be expected.

Direct and Indirect Effects of Alternative 3

Alternative 3 proposes 4.65 miles of new permanent road, 1.56 miles of temporary road, 1,437acres of harvest activities, and 4,564 acres of prescribed fire. Effects of this alternative to recreation resources are similar to those identified under Alternative 2, except that more miles of road would be built and additional acres harvested. There would be a slight increase in conflicts during harvest activities, and an increase in foot access on new roads. Effects to minerals, range, and special uses would be the same as addressed under Alternative 2.

Direct and Indirect Effects of Alternative 4

Alternative 4 proposes no new roads, 1,290 acres of harvest activities, and 4,564 acres of prescribed fire. Effects of alternative 4 to recreation resources are less than to those identified under Alternative 2, because no new roads would be built, which would reduce easier foot access to some of the project area. Additionally, fewer acres would be harvested, so there would be slightly reduced conflicts during harvest activities. Effects to minerals, range, and special uses would be the same as addressed under Alternative 2.

Direct and Indirect Effects of Alternative 5

Alternative 5 proposes no new roads, 632 acres of harvest activities, and 4,564 acres of prescribed fire. Effects of alternative 5 to recreation resources are less than those identified under Alternative 2, because no new roads would be built, which would reduce easier foot access to some of the project area. Additionally, fewer acres would be harvested, so there would be reduced conflicts during harvest activities. Effects to minerals, range, and special uses would be the same as addressed under Alternative 2.

Cumulative Effects of Alternative 1

Past actions in the project area have included timber harvest and associated activities, road building and maintenance. There would continue to be recreational use of this area. There are no cumulative effects to range, special uses, or minerals.

Cumulative Effects of Alternative 2, 3, 4, and 5

There are no reasonably foreseeable actions or activities planned or other ongoing activities that would add to the effects from the action alternatives. No mineral, grazing, or additional special use activity is reasonably foreseeable. Past actions in this area have included timber harvest and associated activities, road construction and maintenance, and trail maintenance. There would continue to be recreational use of this area and use is expected to increase at levels projected in the Forest Plan.

Regulatory Consistency

Forest Plan

All Alternatives are consistent with the Forest Plan standard that states, "*All recreation activities and management will be based on the Recreation Opportunity Spectrum (ROS) inventory*" (USDA Forest Service, 1987a, II-21). The environmental consequences from the alternatives on the other resources (special uses, range, and minerals) would be consistent with goals, objectives and standards of the Forest Plan.

NOXIOUS WEEDS

Introduction

Invasive noxious weeds are a serious threat on the Kootenai National Forest and they are increasing and expanding their range. (USDA, Forest Service, 2007). Noxious weeds and invasive species are threats to wildlife habitat quality, impact soil and water resources, have substantial economic impacts, and impact species diversity and native plant habitat (Duncan, 1997). The threat of weeds is real; invasive species have been recognized as being second only to land development in the loss of biodiversity (Mantas, 2003). Invasive and noxious weeds are usually associated with disturbance factors, but the reality is that all plant communities are at risk to invasion (Larson et. al.1997).

Regulatory framework

Legally, a noxious weed is any plant designated by a government entity that is injurious to public health, agriculture, recreation, wildlife, or any public or private property. The Forest Service defines noxious weeds as "Those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official". Forest Service Manual (section 2080.5) defines noxious weeds as species that "generally possess one or more of the following characteristics: aggressive and difficult to manage; poisonous; toxic; parasitic; a carrier or host of serious insects or disease; and generally non-native or new to or not common to the United States or parts thereof" (USDA 1995).

Most of the weeds invading U.S. rangelands originated in Europe and Asia and were introduced in the nineteenth century. However, new weed species are introduced continually and they can become successful invaders because they do not have the control agents found in their ecosystem of origin. Thus, they can out-compete the native plant communities (Shely and Petroff, 1999).

The Forest Service Manual directs the National Forests to conform to the Federal Noxious Weed Act of 1974, as amended. Accordingly, Forest Service policy has been enacted for the development and coordination of a noxious weed program for the management and control of noxious weeds. The basic goals for noxious weed management on the Kootenai NF are to comply with Forest Service policy and manage weeds in order to protect forests, rangelands, wildlands, and adjacent farmlands, and to cooperate with private individuals and county and state agencies concerned with managing noxious weeds (USDA Forest Service, 2007).

Noxious Weed Control

The Kootenai NF works under the 2007 Final Environmental Impact Statement, Kootenai National Forest Invasive Plant Management and Record of Decision. In 2001, a weed control program was started on the Cabinet Ranger District when the district obtained a spray truck. The goal of the program is to slow the spread of established weeds along roads (vectors for weed spread/invasion) and to eradicate new invader or 1b category species. Main roads on the Cabinet Ranger District are prioritized and put on a four to five year spray rotation schedule. The main roads in the project area have been treated at least twice over the past eight years. The knapweed root weevil (*Cyphocleonus achates)* was released at one site on lower Pilgrim Creek, but the weevil apparently did not survive as annual monitoring has not found any adults. This document addresses the environmental consequences of weed infestations in the project

area. The KNF Invasive Plant Mgt. EIS addresses the environmental effects of invasive plant treatments and authorizes control including chemical and biological control.

Bounds of Analysis

The Pilgrim Creek project area will serve as the geographic area for noxious weeds/invasive species analysis discussion. The entire project area was selected for discussion of direct, indirect and cumulative effects. The area exhibits invasive species populations and trends common on the Cabinet Ranger District. Areas of potential effects are the harvest treatments, road building, fuel treatments, hauling, and other project activities in the proposed action that would create ground disturbance. The time span for looking at effects of the action alternative is over the next 5 to 10 years.

Analysis Methods and Measurement Indicators

Detrimental disturbance soil acres, calculated from the soils report, were chosen for the measurement indicator. Soil disturbance is one of, if not the most, significant factor contributing to the invasion of noxious weeds and invasive species. Detrimental soil disturbance was chosen as a measurement indicator of the proposed units because it provides an ideal potential habitat for noxious weeds. Detrimental disturbance includes the effects of compaction, displacement, rutting, severe burning, surface erosion, loss of organic matter, and mass soil movement (see Soils analysis disclosure). The “cumulative percentage” was used to calculate detrimental soil disturbance acres for the action alternatives. These acres then were summed up for each action alternative to give a total of detrimentally disturbed soil acres. The cumulative percentage number includes all harvest activities, piling activities, prescribed burning, skid trails, landings, fire lines, and temporary roads.

Existing Condition

Spotted knapweed *(Centaurea maculosa)* and St. Johns-wort *(Hypericum perforatum)* are the most widespread weeds within the project area. These two noxious weed species found on the roads and in the open, drier habitats within the analysis area. Oxeye daisy *(Chrysanthemum leucantheumum)*, sulfur cinquefoil *(Potentilla recta)*, hawkweeds *(Hieracium spp.)*, toadflax (*Linaria spp.*) are also relatively common within the analysis area.

Spotted knapweed *(Centaurea maculosa)* is the most widespread weed species in the Pilgrim Creek project area as well as the Cabinet RD. This perennial forb reproduces almost entirely by seed and forms a soil seedbank. Knapweed seeds are known for their longevity and durability and have the potential to germinate shortly after maturity. Spring and fall seedlings are common. In western Montana, knapweed success increases with site disturbance and soil moisture stress. This species readily occupies disturbed sites but also invades pristine grassland and open-canopy forest sites (Rice et. al. 1997). Once established, spotted knapweed is able to form monotypic stands because its age class hierarchy allows it to occupy all available niches.

St. John’s-wort, or goatweed *(Hypericum perforatum)* is a perennial herbaceous plant with many flowers. Seed production averages between 15,000-34,000 seeds per plant and the seeds can persist in the seedbank for many years. The species also reproduces asexually. Commonly, it is found in pastures, open grasslands, and disturbed places; populations can be found on all slopes and aspects. In the project area, this species is found on roads and on the open, drier slopes but was also noted scattered about in most inventoried harvest units.

There are two active population of rush skeletonweed *(Chondrilla juncea)* within the project area. A second active population was located in September, 2012 and is on a road that would be used during logging operations. Plants were pulled, the area clearly flagged and then treated with herbicide. The other active population was found three years ago behind a gated road that would not be used in any of the proposed actions. Apparently, this population was well established several years before it was located. This population was also aggressively treated. Treatment has significantly reduced this population but annual monitoring still finds a few plants at this site. When plants are found, they are pulled and the immediate area spot sprayed. This site will be closely monitored and treated as needed. The goal is to eradicate these populations and monitor for several years after to insure the sites are inactive. There is also an inactive (~10years) population of rush skeletonweed adjacent to FS Rd. 2744, (West Fork of Pilgrim Creek) that is also monitored annually.

Rush skeletonweed is classified as "1b" on the KNF, i.e. the plant is considered "new invader species". New invaders are weeds that have small populations, at limited sites, and have a high probability of causing severe economic or environmental damage. The Forests' goal is eradication of these species.

Other known noxious weed or invasive species scattered throughout the project area include Speedwells (*Veronica spp*.), common tansy (*Tanacetum vulgare*), Canada thistle (*Cirsium arvense*), chicory, (*Cichorum intybus*), blueweed (*Echium vulgare*), cheatgrass (*Bromus tectorum*), mullein (*Verbascum thapsus*) and common burdock (*Arctium minus*).

Environmental Consequences

Direct and indirect effects on noxious weeds are described below for proposed activities identified in Chapter 2. Cumulative effects were considered for all past, proposed, current and reasonably foreseeable activities listed and described in Chapter 2.

Direct and Indirect Effects of Alternative 1 – No Action

There would be no ground-disturbing activities, no harvest units, no temporary road construction and no road reconstruction. Weed populations would remain more or less stable and fluctuate annually. Further invasion into relatively pristine areas would continue. Weed populations adjacent to roads would persist, but could be managed with periodic herbicide treatments. The area is a popular destination for hunters, wood cutters, huckleberry pickers, snowmobilers and other visitors. Summer and fall are the primary months of visitor activity. It is likely a new invader noxious weed species or a new invasive species will eventually invade the analysis area. A majority of the project area is not accessible by wheeled vehicles in the winter and spring months because roads are snowed in.

An indirect effect of the No Action or no management alternative is increased fuel accumulation and the concomitant increase or likelihood of wildfires; in particular, intense wildfires. A few generalizations about weed response to wildfires can be made (October 2012, Monthly Weed Post, MSU Extension, Bozeman MT)

- Weeds may increase following fire, but in many cases do not result in long-term persistence.

- As fire severity and frequency increase, so does the risk of invasion.
- Risk of invasion varies by plant community type.
- Weed invasion can be more pronounced in areas that were highly disturbed prior to fire.
- Activities related to fire management can create disturbance and introduce seeds of new weeds.
- Annual grasses (e.g. cheatgrass or *Bromus tectorum*), forbs capable of long-distance dispersal, and resprouting perennial forbs are most likely to increase following wildfire.
- As fire severity and pre-fire cover of weeds increases, the need for revegetation after fire increases.

This list illustrates that wildfires and especially intense wildfires magnifies the negative impacts of weeds.

Cumulative Effects of Alternative 1

The No Action alternative would not accelerate the spread of noxious weeds and other invasive species in the project area, especially in the absence of severe wildfire. The potential of a new, serious invader species is always a threat to impact the project area. Ideally, roadside herbicide treatment may continue but this practice is largely budget driven and annual budgets to allow herbicide treatment are impossible to predict.

Direct and Indirect Effects-Action Alternatives 2-5

Table 3-87 lists actions and their associated estimated acres of detrimental soil disturbance for the four proposed action alternatives. Disturbed soil is a direct effect of timber harvest activities and the potential for noxious weed/invasive species invasion into these habitats is an indirect effect.

Table 3-87. Disturbance Levels – Comparison of Alternatives

Alternative	2	3	4	5
Detrimental Soil Disturbance acres per alternative (harvest)	57.8	60.3	56.8	28.3
Acres of Temporary/new Road Construction (miles X 4 rounded to nearest acre)	16.24	22.92	0	0
TOTAL DISTURBANCE ACRES	74.04	83.22	56.8	28.3

Timber harvest and new or temporary road construction activities provide potential habitat for noxious weeds and invasive species. Soil disturbance coupled with canopy removal provide the greatest potential for weed establishment. This is particularly true for spotted knapweed. Overall, spotted knapweed success was correlated with degree of disturbance and moisture-stressed environments (Mooers and Willard 1989). There are several factors that contribute to the success of noxious weeds invading a new area. These factors can be species specific, but soil disturbance coupled with canopy removal combine to create a “niche” for the weed to occupy. Soil disturbance provides a foothold or space for the weed to establish whereas canopy removal results in increased sunlight and increased soil surface temperatures. In light of this, the proposed project activities, from highest to lowest potential to create potential weed habitat

are road construction, followed by regeneration timber harvest and intermediate timber harvest. In terms of actual acres disturbed, timber harvest activities would create the most potential for weed invasion.

Different timber harvest methods create different levels of disturbance. A regeneration harvest removes 90-95% of the canopy cover whereas an intermediate harvest removes about 50% of the canopy. Likewise, logging systems create different levels of disturbance. The project proposes tractor and skyline logging systems. Of these two systems, tractor logging has the higher potential for soil disturbance. Tractor logging utilizes more machinery such as skidders, grapplers, forwarders, etc., each a potential vector to bring in noxious weed and invasive species seed into the harvest unit. Table 3.66 displays the number of acres, by alternative, of harvest systems and logging systems.

Table 3-88. Acres of Harvest by Prescription and Logging Systems

Alternative	2	3	4	5
Regeneration Harvest acres (90-95% canopy removal)	587	898	813	261
Intermediate Harvest acres (ca. 50% canopy removal)	824	536	477	371
Total timber harvest	1411	1434	1290	632
Tractor Logging system - acres	431	551	550	249
Skyline Logging system - acres	980	883	740	383

In general, ecosystem burning is an activity that would not promote the spread of noxious weeds. All the action alternatives have 4564 acres of slash/prescribed burning. Ecosystem burning would normally occur in the spring before most plants come out of winter dormancy or they are just breaking dormancy. These are normally low duration/low intensity surface fires. Sometimes, native understory vegetation may suffer some mortality, but usually burning only consumes the surface fuels. Besides reducing fuel loading, ecosystem burning rejuvenates much of the native vegetation and hence, increases vigor and promotes desirable vegetation. Rice (2005) had found that low severity spring burning did not affect weed abundances. If anything, prescribed fire would favor Bromus tectorum, where present, and this species would "replace" a noxious weed species. Keley's study showed that once cheatgrass had become established in open ponderosa pine forests, low-intensity prescribed burning favored its continued persistence. In Rice's study, their spring burns did not affect cheatgrass abundance in ponderosa pine forests/drier Douglas-fir communities. Cheatgrass has invaded the Cabinet RD, but is very uncommon in the project area and appears restricted to road sides and mostly in areas adjacent to private lands. As previously mentioned, cheatgrass is not recognized as a noxious weed but a regulated weed; this species has very limited and insignificant populations within the activity areas. If botanical surveys reveal the species has significant infestations in any of the areas scheduled for fuel treatments, the burn plans may have to be modified. However, for noxious weed species, ecosystem burning will not be considered an action that would have any significant adverse effect on the spread on noxious weeds.

To summarize, different methods and logging systems create different levels of soil disturbance. Detrimental soil disturbance acres are highest in alternative 3 and lowest in alternative 5 and the same holds true for total acres harvested. Alternative 5 is the only alternative really different

than the other three action alternatives. Detrimental soil disturbance acres would have a higher risk of noxious weed invasion but all disturbed areas with reduced canopy cover offer potential habitat for noxious weeds. New noxious weeds as well as new invasive species would be the most serious threat but the expansion of existing weed populations would also occur.

The action alternatives will contribute to the spread and abundance of noxious weeds and invasive species. Roads are an obvious vector for spreading these species but roads are also easy to treat and monitor. Some of the design criteria employed to reduce or minimize the spread of noxious weeds will include washing vehicles and equipment, treating existing access roads, as needed prior to activities, spraying new roads/landings and seeding landings post-harvest. Also, gravel pits should be checked and/or treated before any road material is transported into the project area. Weeds are a perpetual problem but monitoring and treatment would minimize the threat of noxious weeds, in particular new invader species and other invasive species.

Cumulative Effects-Action Alternatives 2-5

The Cumulative Effects catalog lists past, current, and reasonably foreseeable activities. Past activities, as well as current activities in the Pilgrim Creek Project area affecte the spread and impact of weeds.

Past Actions and their Effects on Current Conditions: Past activities throughout the Pilgrim Creek analysis area have affected the spread of weeds. Some road building occurred in Pilgrim Creek prior to formation of the Forest Service (1907) and continued for many decades after. Records from the KNF, Cabinet Raner District, Roads Analysis Report, Pilgrim Planning Area, (05/11/2006) document most road construction occurred in the 1940s (59 miles). Undoubtedly, roads were constructed prior to 1940, but records are apparently not available to quantify. The following table gives the approximate miles of road construction, by decade in the Pilgrim Creek Analysis area.

Table 3-89. Road Construction by Decade

1940s	**59 miles**
1950s	**35 miles**
1960s	**37.5 miles**
1970s	**26 miles**
1980s	**14.5 miles**

State and Sanders County also have constructed and maintained roads. The net result was increased vehicle travel into the analysis area. Road access has also resulted in increased land development and a change in land use, particularly in the 1990s and past decade. As land was developed, more homes and cabins were built in areas that did not have past access. Higher population density has resulted in increased the potential for noxious weed infestations from sources as vehicles, equipment, livestock, livestock feed and planting of non-native species. Roads also increase recreational use. All these activities directly contributed to weed spread by providing a source of weed seeds/weed propagules, or by increasing the number of vectoring agents, i.e. vehicles, people and animals into the Pilgrim Creek analysis area.

Commercial timber harvesting, and subsequent road building peaked in the 1960s and 1990s. Undoubtedly there was some timber harvest after the 1910 fire and after on National Forest lands, but there is no or limited historical documentation before 1950. Commercial logging occurred on private lands within the analysis area during this time period. Past timber harvest methods were largely ground-based systems that resulted in large areas of ground disturbance. It is unknown which invasive species were present but probably the wide spread invasion of spotted knapweed resulted from these timber harvest methods.

Other past activities that facilitated weed spread include the use pack animals, sheep grazing after the 1910 fire, many years of incidental livestock grazing along Pilgrim Creek, firewood cutting, prescribed fire, and the general increase of recreational use of National Forest System Lands (NFSL).

Contrasting Effects of Proposed Actions with Past Actions: Before the mid-1990s, there were few, if any noxious weed prevention measures in place. The Kootenai National Forest adopted preventive measures to avoid weed spread and introduction of new invasive species with the 1997 Kootenai NF Herbicide Weed Control Plan. This authorized integrated pest management strategies including the use of certain herbicides. Contractual provisions included washing of equipment to remove weed seeds/propagules prior to entry onto NFSL, contactor herbicide spraying of haul routes and use of weed-free seed grass to re-vegetate disturbed ground. These weed control measures have been included with timber harvest, road building and fire suppression activities to reduce the risk of invasive species. The Cabinet Ranger District first treated Pilgrim Creek project roads with herbicides in 2001 and has more or less treated the main roads on a 4-5 year rotation or as needed. The Pilgrim Creek project has been in the planning stage for several years, and the District has treated the roads to minimize the impact of weeds prior to project initiation. The first major timber sale that required equipment washing and seeding of skid trails by the contractor was the White Pine EIS (June 2002). The Marten Creek Project (2008) also required off-road equipment washed and inspected prior to entering the project area and all haul roads of the Martens Devil timber sale were treated with herbicides (8-10-2011) after harvest. These measures have been standard practices for all major timber harvest activities and have been successful. The FY 2004 KNF Monitoring and Evaluation Report states “The KNF has used herbicides to control noxious weeds with success. Spraying of roadsides, administrative sites, and gravel pits has visibly reduced weed populations in many areas and prevented weeds from spreading to un-infested areas.” The Pilgrim Creek Project would require these provisions plus additional measures to insure the rush skeletonweed population is eradicated and not allowed to invade further.

Effects of Ongoing and Reasonably Foreseeable Actions: Some future activities that have the potential to contribute to the spread of weeds are routine road maintenance, increased recreational use with ATVs and UTVs, etc., continued recreational activities by forest visitors, private land development and large scale canopy gaps as result of disease (pine beetle, root diseases, etc.).

Combined Effects from Pat, Proposed, Ongoing and Foreseeable Actions: The combined effects resulting from the Pilgrim Creek Project would increase the risk of weed invasions because of soil disturbance, along with other factors (increased soil temperature, light, etc.); however design features are included in Chapter 2 and monitoring post project would help minimize this risk.

Regulatory **Consistency**

As mentioned, Forest Service policy directs the National Forests to conform to the Federal Noxious Weed Act of 1974. Accordingly, the Kootenai NF established weed management direction with the 1987 Forest Plan. The Forest Plan addresses noxious weed species under the Forest-wide management direction and states in its goals that we will *attempt to stop the spread and suppress the existing levels of noxious weeds through land management and weed suppression activities* (USDA Forest Service, 1987a).

The Pilgrim Creek project is consistent with Forest Plan direction because of design criteria, contract provisions, as well as Forest and District weed control policy.

This project is consistent with the Final Environmental Impact Statement, Kootenai National Forest Invasive Plant Management and Record of Decision (2007). These documents authorizes specific herbicides to control noxious weeds along with treatment methods and

CULTURAL RESOURCES

Introduction

Cultural and heritage resources include both archaeological sites and historic structures that reflect past human interactions as well as human use of the landscape and its resources. These historic properties have value for their association with important events or people in our history, their distinctive historical style, or their potential to provide information about our past. Cultural resources that are determined to be eligible to the National Register of Historic Places (NRHP) are considered historic properties that are managed to avoid or mitigate impacts to their integrity.

Regulatory Framework

The Forest Service and other Federal Agencies are required to manage historic properties in the United States under several statutes, most notably the National Historic Preservation Act of 1966 (NHPA). These requirements are regulated through 36CFR800 and are carried forward in the Forest Plan standards (Forest Plan, Volume 2, Appendix 19).

Historic properties are identified by a cultural resource inventory and are determined as eligible to the National Register of Historic Places based on their ability to yield information about the past or their relation to important events, persons or historical styles. Cultural resource inventories must be completed prior to road construction, timber harvest, or any other ground-disturbing activities that may have the potential to impact historic properties. Historic properties are managed to either protect them in-place or to mitigate adverse project effects. The State Historic Preservation Office (SHPO) reviews eligibility and management provisions and provides comments about project effects on cultural resources. The process of consultation with SHPO must take place prior to impacts on the ground unless the inventory results fall within a scope of a memorandum of understanding between the KNF and SHPO that streamlines consultation.

The location of cultural resource sites is exempt from public disclosure as described in FSH 6209.13 11.2 & 11.22. The exemption protects sites from harm and retains confidentiality of sites culturally significant to American Indian Tribes.

Analysis Area

The Pilgrim Creek project area encompasses approximately 30,602 acres; 29,987 acres are National Forest System Lands. The project area encompasses three watersheds: Pilgrim, Smeads, and Stevens Creeks. Areas of potential effects to cultural resources include the harvest units, prescribed ecosystem burning areas, and any new and existing roads used to access these areas.

Methodology Used to Collect Data and Make Scientific Findings

Analysis of cultural resources within the Pilgrim project area began with a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the project and surrounding areas. This information is both from background historic information and prehistoric research as well as from many years of Forest Service heritage resource inventories within and adjacent to the project area. Our information on previously documented

sites also allowed some idea of the type, frequency and location of sites likely to be found within the analysis area.

This synthesis of past data was then used during field inventories of the proposed areas of potential effect and adjacent areas of high probability for sites. These inventories included both pedestrian surveys and subsurface testing, with the method of survey adjusted according to the probability of historic or prehistoric materials being recovered in the area. Information from past KNF inventories was used to cover a current area of potential effect if upon review it met current inventory standards. Additional inventory was then conducted of the APE in areas where no previous inventory was conducted, where previous inventory was not adequate or around known sites to relocate and verify their location.

Areas of low, medium and high probability for the occurrence of cultural resources within proposed areas of activity were identified on a map prior to the undertaking of inventories. High probability areas for both historic and prehistoric properties, such as ridges and terraces adjacent to stream bottoms, were chosen for more intensive inventory and were selectively shovel tested for subsurface artifacts, as well. Harvest units and areas planned for “ecosystem burning,” on the other hand, are generally steep and will have a low probability for prehistoric sites. These areas are most likely to contain historic mining or logging properties, which can often be previously identified in historic records. Therefore such areas were generally not subsurface tested, but covered with pedestrian transects.

Once inventory is complete, identified cultural resources within the project’s area of potential effect are analyzed to determine their eligibility to the National Register of Historic Places. For those considered eligible, the potential effects of the project on that historic property is analyzed. Where adverse effects may occur to a historic property, measures are designed to mitigate these effects. The State Historic Preservation Office is consulted for concurrence on each of these three steps. The consultation on all three steps is usually conducted simultaneously.

Measurement Indicators

Indicators for heritage resources are measured in terms of beneficial or adverse effects to historic properties eligible to the National Register of Historic Places.

Beneficial effects could include stabilizing a historic property by controlling erosion of an archaeological site, restoring and maintaining a historic building, or reducing fuel concentrations around a historic property. Beneficial effects are designed and agreed upon through consultation conducted under Section 106 of the NHPA with the SHPO. In some cases where a beneficial action is possible, a no action determination that does not implement the beneficial action could be adverse if it allows greater degradation or deterioration of the historic property.

Adverse effects are impacts to the integrity of the property which destroy a portion or all of the property and the information it could yield. A direct adverse impact occurs during an activity itself, such as when a road is built through a historic property and the construction process destroys or damages the site. Indirect adverse impacts are a side effect of the activity or occur after the activity is complete, like when runoff from a road eventually erodes a historic property adjacent to it. In some cases where a beneficial action is possible, a no action determination that does not implement the beneficial action could be adverse if it allows greater degradation or deterioration of the historic property.

This planning process allows adverse impacts to be avoided altogether through project design or mitigated through scientific investigation so that there are no adverse impacts to eligible historic properties. These avoidance or mitigation measures are agreed to in consultation conducted under Section 106 of the NHPA with the Montana SHPO and allow the project to proceed in compliance with the National Historic Preservation Act.

Affected Environment

The Clark Fork River Valley was part of a prehistoric thoroughfare between the Great Plains, on the east, and the Columbia River Plateau on the west, providing a river-level gateway through much of the Northern Rocky Mountains. There were also considerable movements over the mountain passes throughout this region, with prehistoric peoples making use of high elevation areas as well as valley bottoms (Malouf 1982).

The lower Clark Fork Valley was not inhabited until around 8000 BP, after Glacial Lake Missoula had drained. These early native inhabitants were foraging peoples, whose hunting and gathering lifestyle meant that they were highly mobile and lived most of the year in small groups. They moved camps to take seasonal advantage of fish runs, animal migrations, and seasonal plants. In 1811, David Thompson noted all tributaries of the lower Clark Fork had Indian weirs or fish traps on them, which is a striking illustration of the importance of fish in native life during the later periods of prehistory. Base camps, where groups would remain for longer periods of time, were often located on river or stream terraces, where plants, animals and fish were both harvested and processed for storage. Native peoples also used special purpose camps, which are smaller sites that were exploited for a specific purpose and a shorter period of time. From these camps they hunted, collected particular plants and gathered raw tool materials such as argillite and quartzite. The archaeological remnants of these prehistoric native peoples are found in campsites, in rock art, in trees peeled for their bark, in stone hunting blinds, and any number of other types of sites. These early inhabitants of the lower Clark Fork were ancestral to the Salish and Kootenai tribes. Other tribes also used the area, including the Upper Pend Oreille, Coeur d'Alene and Kalispel people.

One previously-unknown site related to prehistoric resource procurement has been discovered through survey for this project. It is within the boundary of a burn unit, but mitigation measures are being taken to protect the site from project activities.

In the early 1800s early fur trappers entered northwest Montana, including the lower Clark Fork River Valley. The Northwest Fur Company was responsible for early, scattered settlements of Europeans in the area, and in the 1860s the trappers began to give way to miners. Much of the activity associated with the lower Clark Fork through this time was miners passing through the area on their way to other strikes. Completion of the Northern Pacific Railway in 1883 forever changed the lower Clark Fork Valley by ending its geographic isolation and opening it up for settlement. The railroad also provided opportunities for agricultural development as well as transportation for the region's natural resources (Historic Overview of the Kootenai National Forest, 1994). Among these resources were cedar shingles, milled 50,000 a day by the Montana Improvement Co. from 1884-1885. Both this mill and another shingle mill at Smeads shipped their production to other towns on the railroad. Agricultural products were either shipped out on rail or consumed by the towns that sprung up along the railroad, many of which either died out or were inundated by the Noxon and Cabinet Gorge Reservoirs (early 1950s). The 1910 fires had a profound influence on the area as a whole because of their intensity and the immense area they covered. Most of the forest in the project area is a product of this fire.

Pilgrim Creek has several known prehistoric and historic sites within the project area. Many of these sites, notably those that are prehistoric, are adjacent to the Clark Fork River (now the Cabinet Gorge and Noxon reservoirs) and now on private property or beneath the reservoir itself. Higher up on the mountain slopes, several historic mines exist in the project area that were in operation in the early 1900s, including the Holliday Mine, Miller Mines, Jackson Mine, Pigrim (Holbert) and White Star Mines. Of these, the Holliday and Jackson Mines are recorded as sites. One standing lookout, Gem Peak, and one former lookout site, Lone Cliff, are in the project area, as well. Several other sites in the area have to do with early logging activity, including the Noxon Sawmill and the McKay Logging Flume. Several significant historic roads and trails are in the project area, too, as are a number of historic and potentially prehistoric rock cairns. Three historic trails intersect cutting units designated by the project, and the project has been designed to avoid damage to any features (blaze trees, walls, etc.) of these trails.

The evidence of these past occupations can be diminished in value by any change in their historical, architectural, archaeological, or cultural character. Adverse impacts to cultural resource sites can result in their damage or complete destruction, the effects of which are irreversible. In cases of partial damage, the undisturbed portion of the site may still yield valuable information. The Forest Plan, in accordance with Section 106 of the NHPA, requires integration of cultural resource management into the overall multiple resource management effort in order to avoid adverse impacts. In addition, the Forest must work closely with the appropriate scientific community and American Indian Tribes concerning this resource.

Environmental Consequences

Direct and Indirect Effects Alternative 1 – No Action

Under this alternative, no actions are proposed and any previously recorded or as yet undiscovered sites would remain undisturbed. Historic properties would be subject to natural deterioration and decay.

Direct and Indirect Effects Common to all Action Alternatives

There will be no adverse or beneficial effects to historic properties under the action alternatives. No known NRHP eligible sites will be impacted by any of the action alternatives.

If additional sites are encountered in the course of further inventory or project implementation, Forest Archaeologists or Heritage Specialists would consult with the State Historic Preservation Office, as required by law, to determine the significance of the discovery and the effects of the project upon them. The Confederated Salish and Kootenai Tribes would be included in discussions concerning .properties with aboriginal affiliation. Mitigation designed and reviewed by the Montana State Historic Preservation Office may include avoidance of sites, protection or scientific investigation.

Cumulative Effects – All Alternatives

The cumulative effects geographic analysis area for historic properties is the Pilgrim Creek project area and temporally we are analyzing for the present, meaning that this cumulative effects analysis operates under the condition that prehistoric and historic sites exist in the project area.

Past Actions and Their Effects on Current Conditions: Before the National Historic Preservation Act (NHPA) of 1966 was implemented, project planning did not consider impacts to cultural resources. Projects such as timber harvest, road building, fire suppression, or any other ground disturbing activity prior to NHPA had the potential to adversely impact cultural resources, and many of these projects occurred in areas considered high probability for cultural materials and so probably did impact cultural sites. Conversely, the remains of some of these activities that took place longer than 50 years ago may now be considered historic properties, and so have added to the historic record. While past actions may have affected cultural resources, no ongoing effects are known to be occurring currently from those past actions.

Contrasting Effects of Proposed Actions with Past Actions: Since implementation of NHPA, cultural resource inventories have been conducted to locate cultural resources prior to project implementation. Known sites found during earlier inventories, and the refinement of the inventory process to locate properties during current inventories, allows impacts from projects to be avoided or mitigated. While natural deterioration of the resources is ongoing (processes include weathering, decay, and erosion) the current condition and trend of the historic record is that historic properties are being protected from project impacts. Knowledge of the location and condition of historic properties allows the potential for management action to abate or mitigate those natural processes that can adversely affect the historic record.

As described in the direct and indirect effects section, there will be no significant adverse or beneficial effects to historic properties from the action alternatives. Locating and documenting historic properties allows their protection from proposed undertakings.

Effects of Ongoing and Reasonably Foreseeable Actions: Ongoing and foreseeable activities were considered in this analysis. Fire suppression activities can impact historic properties through the construction of fire line, the movement of equipment and people, etc. Appendix 3 of the Northern Region Programmatic Agreement regarding Cultural Resources Management on National Forests in the State of Montana sets guidelines to limit impacts fire suppression activities may have on historic properties.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions: There will be no cumulative effects to historic properties from the Pilgrim Creek project. The post-project condition and trend will continue the current condition and trend, which protects historic properties through inventory and project design so no historic properties are impacted by project implementation.

Regulatory Consistency

The guidelines of the Forest Plan and that of other jurisdictions were recognized in the development of all alternatives. In addition, the laws and policies that govern cultural resource management on Federal lands are coordinated with the State Historic Preservation Officer (SHPO) of Montana, who serves in an advisory capacity. The policies of the Forest Service and the SHPOs are consistent. All alternatives would be consistent with the Forest Plan and applicable regulations and laws regarding historic properties.

THREATENED, ENDANGERED AND SENSITIVE PLANTS

Introduction

Fifty-five Threatened and Sensitive plant species are on the December, 2011 KNF plant list. Only one is listed as a threatened species under the Endangered Species Act, *Silene spaldingii* (Spalding's Catchfly). *Howellia aquatilis* (Water Howellia) was previously listed as potentially occurring on the KNF but has recently been removed. The remaining 53 species are identified as sensitive species in the latest Region 1 sensitive plant list (Montana & Idaho) and also the latest Montana Natural Heritage Plant Species of Potential Concern list. To date, no threatened species have been confirmed on the Cabinet Ranger District (KNF Sensitive Plant Field Guide, 2005). Of the 53 sensitive species, 11 have been found on the district.

Activities proposed in the Pilgrim Creek Project have the potential to adversely impact populations or potential habitat of proposed threatened, endangered and sensitive (PTES) plant species. The purpose of this document is to analyze potential effects of this project to PTES plants occurring or potentially occurring with the project area.

Regulatory Framework

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

Sensitive species are administratively designated by the Regional Forester (FSM 2670.5) and managed under the authority of the National Forest Management Act. Forest Service Manual (2670.5 Section 19) defines sensitive species as "those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by:

a. Significant current or predicted downward trends in population numbers or density.

b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution".

The Kootenai's Forest Plan establishes forest-wide goals, objectives, standards, guidelines, and monitoring requirements. Direction for sensitive species includes determining the status of sensitive species and providing for their environmental needs as necessary to prevent them from becoming endangered (Forest Plan II-1).

Analysis Area

The Pilgrim Creek project activity areas were chosen for the bounds of analysis discussion related to potential direct and indirect effects. This analysis area includes all treatment units and roads with activities in the proposed project. These areas were selected for analysis of a scale suitable for the recognition of direct and indirect effects.

Cumulative effects on PTES plant populations will be analyzed at the project level. The Pilgrim Creek project area is an area broadly similar in forest processes, vegetation type patterns, soil types, elevation, growing season, and other environmental variables that indicate reasonable bounds for analysis. The analysis area for species viability is range-wide of each PTES plant species.

Existing Condition

The Pilgrim Creek project area includes bottomlands on the Clark Fork River but all activity area elevations range from about 2900-5400 feet. The project area includes a number of habitat types but in general current vegetation is dominated by Douglas-fir with grand fir, western larch, and lodgepole pine. In more moist sites there are true firs, western hemlock, and western redcedar. Above 4,000 foot elevation there are more lodgepole pine dominated stands with some of these stands almost pure lodgepole. Over 98% of the Pilgrim Creek project area was burned over in the 1889 and 1910 fires and these fire events are responsible for the landscape we see today.

Most soils are residual i.e. they developed in place and have a surface volcanic ash-influenced deposit. This ash layer is important because it increases soil productivity and provides the best rooting environment. Soils of the Clark Fork valley contain a large amount of clay with little rock. Steep slopes in the project area have exposed bedrock and are shallow. Higher elevation soils subjected to alpine glaciations are sandy textured and are shallow to deep (1-10 ft.).

There is one recognized Special Interest Area (SIA) in the project area. The Smeads Bench Fen SIA occupies 68 acres in the project area and has aquatic and botanical habitats that set it apart from other places on the KNF. SIAs are protected and managed to protect the unique habitats. The Smeads Bench Fen SIA is not in any proposed activity area. There are no other unique habitats as moist open meadows, rich marshes, or subalpine ridge tops (>7,000ft) in the project area. However many Sensitive Plant species only have a generic habitat description and all activity areas will be inventoried prior to project implementation.

Livestock grazing has occurred for some time in the Pilgrim Creek riparian zone; a vast majority of this is private but NFS lands border this zone. An area from about Fourmile Gulch and upstream to NFS lands near Telegraph Creek had been grazed until recently (~10 yrs.) and the impact on the riparian zone is obvious. Adjacent NFS lands were grazed incidentally because cattle wandered up the roads and draws in search of forage.

Noxious weeds and other invasive species are within the analysis area. *Centaurea maculosa* (spotted knapweed) and *Hypericum perforatum* (St. John's-wort) are the two most abundant species. However, a population of *Chondrilla juncea* (rush skeletonweed)

exists on a gated road and is currently being treated and monitored. The first population was found in the early 1990s, adjacent to the West Fork of Pilgrim Creek road (#2744) and was aggressively treated. The weed site has since been annually monitored and has been inactive for at least eight years. Roads in the project area have been treated for noxious weeds beginning in 2001.

The Pilgrim Creek analysis area contains habitat considered suitable for R1 Sensitive plant species. Three sensitive species are known to occur and several others have varying degrees of potential habitat.

Methodology Used to Collect Data and Make Scientific Findings

Suitable habitats for each Sensitive species known or suspected of occurring on the Forest were identified by consultation with Sensitive plant field guides (Montana Natural Heritage Program), various conservation strategies, published and unpublished literature on Sensitive plants as well as through extensive field experience. Suitable habitat for specific plants was reevaluated in 2012 with the updated KNF sensitive plant list.

Probability of occurrence of Sensitive species was estimated, including both historic and existing conditions. The species included in this assessment are those with a moderate to high probability of occurrence in the analysis area. The probability analyses took into consideration numerous factors, including:

- past disturbance
- locations of known populations
- results of past field surveys
- ecological requirements of the individual species (*e.g.*, elevation, potential vegetation, land type, lithology, shade and moisture regimes)

The Pilgrim Creek project area covers many acres and many diverse habitats. All 53 sensitive species were assigned a potential, based on their habitat, of occurring within the analysis (attachment). Only sensitive plant species known to occur in the project area or with a medium to high probability of occurrence within or near the activity areas were focused on. The Smeads Bench Fen SIA was excluded from this analysis because it is a protected area. Sensitive Plant species with a moderate probability include *Allium acuminatum* (tatertip onion), *Botrychium spp*. (moonworts), *Clarkia rhomboidea* (common clarkia), *Collema curtisporum* (jelly lichen), *Cypripedium fasciculatum* (clustered ladyslipper) and *Mimulus clivicola* (bank monkey-flower) (see attachment).

Three Sensitive plant species have known populations in the project area. They are *Grimmia brittoniae* (mouse moss), *Heterocodon rariflorum* (western pearl flower) and *Psilocarphus brevissimus* (dwarf woolyheads). The 11 species with a moderate probability of occurring and the 3 confirmed species are listed in Table 3-90.

Four new Sensitive plant species were added to the Kootenai Sensitive plant list in the late summer of 2011. These species *are Allium acuminatum* (tapertip onion), *Mimulus ampliatus* (Washington monkeyflower), *M. clivocola* (bank monkeyflower) and *Pinus albicaulis* (whitebark pine). The onion and bank monkeyflower have been identified on other KNF districts and on the adjacent Plains/Thompson Falls Ranger district, Lolo NF; potential habitat exists on the Cabinet RD and these species will be searched for in the upcoming field season. Seasonal timing is critical for identifying these species. *Mimulus ampliatus* has been identified on the KNF; the species requires vernal moisture but other

habitat requirements are not understood. This species was given a low potential to occur in the analysis area. No whitebark pine populations are known in any of the activity areas, but some potential habitat exists within the Pilgrim Creek analysis area.

TABLE 3-90 – Known and Suspected Sensitive Plant Species in Pilgrim Creek Project Area

COMMON NAME	SCIENTIFIC NAME	STATUS	POTENTIAL/FOOTNOTE
Tapertip onion	*Allium acuminatum*	Suspected	Moderate
Upswept moonwort	*Botrychium ascendens*	Suspected	Moderate
Wavy moonwort	*Botrychium crenulatum*	Suspected	Moderate
Western moonwort	*Botrychium hesperium*	Suspected	Moderate
Peculiar moonwort	*Botrychium paradoxum*	Suspected	Moderate
Stalked moonwort	*Botrychium pedunculosum*	Suspected	Moderate
Common clarkia	*Clarkia rhomboidea*	Suspected	Moderate
Jelly lichen	*Collema curtisporum*	Suspected	Moderate
Clustered Lady's slipper	*Cypripedium fasciculatum*	Suspected	Moderate
Britton's dry rock moss	*Grimmia brittoniae*	Known	High
Western pearl-flower	*Heterocodon rariflorum*	Known	High
Bank monkey-flower	*Mimulus clivicola*	Suspected	Moderate
Whitebark pine	*Pinus albicaulis*	Suspected	Moderate
Dwarf woolyheads	*Psilocarphus brevissimus*	Known	High

Design Features

The finding of any additional sensitive plant populations in activity areas may result in additional mitigation requirements.

PTES PLANT SPECIES BIOLOGICAL ASSESSMENT/EVALUATION

CONSULTATION REQUIREMENTS FOR THREATENED AND ENDANGERED SPECIES

In accordance with the Endangered Species Act, its implementing regulations, and FSM 2671.4, the Kootenai National Forest is not required to initiate formal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding the determination of no effects to the threatened Spalding's catchfly; nor is it required to request written concurrence from the USFWS with respect to the determination of "no effect".

Table 3-91 summarizes the biological assessment/evaluation for the 14 plant species considered in this analysis.

Table 3-91—Summary of Effects to Known and Suspected Sensitive Species

Common Name	Scientific Name	Conclusion	Rationale
Tapertip onion	*Allium acuminatum*	May Impact**	MI 2
Moonworts	*Botrychium spp.(5)*	May Impact**	MI 2
Common clarkia	*Clarkia rhomboidea*	May Impact**	MI 2
Jelly lichen	*Collema curtisporum*	No Impact*	N1
Clustered ladyslipper	*Cypripedium fasciculatum*	May impact**	MI 2
Mouse moss	*Grimmia brittoniae*	No Impact*	N1
Western pearl flower	*Heterocodon rariflorum*	May Impact**	MI 2
Bank monkeyflower	*Mimulus clivicola*	May Impact**	MI 2
Whitebark pine	*Pinus albicaulis*	No impact*	N1
Dwarf woolyheads	*Psilocarphus brevissimus*	May Impact**	MI 2

***No Impact expected**

N1 no activities proposed in potential habitat

****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 2 Moderate potential for occurrence: Proposed activities may impact potential habitat or individuals not detected in surveys.

Direct and indirect effects on sensitive plant species are described below for proposed activities identified in Chapter 2. Cumulative effects were considered for all past, proposed, current and reasonably foreseeable actions listed and described in the beginning of Chapter 3 and are described at the end of this section.

The following effects analysis will focus on 1) measurable effects to sensitive plant habitat and

2) effects on known populations. Habitats with moderate to high probability of occurrence of sensitive plants are considered. For the documented sensitive plants, population trends are used as a measure for this analysis**.**

Environmental Consequences

Direct and Indirect Effects of Alternative 1 – No Action

This alternative proposes no ground disturbing activity and hence no direct effects would result from this alternative. The response of each of the sensitive plant species to management activity varies by species, and in some cases, is not fully known. We do know that these plants, as well as all native vegetation of the KNF evolved with and are adapted to the climate, soils, and natural processes that took place prior to settlement to this area by Europeans. Any management or lack of management that causes these natural processes to be altered may have a negative or sometimes a positive impact on native vegetation, including sensitive plants.

Cumulative Effects of Alternative 1

The No Action alternative will have no cumulative effects upon known Sensitive Plant populations. Natural plant succession most likely will reduce or eliminate habitat of the western pearl flower and dwarf wooly head populations. These two annual species are usually found in habitats with plenty of sunlight, low surrounding vegetation and areas that have been disturbed. A vast majority of their populations are found adjacent to or along roads (open and closed). As vegetation grows in along roads and canopy closure increases, sunlight will be reduced to the soil surface, which could reduce the available suitable habitat.

The No Action alternative also would increase fuel loads in the project area and increase the risk of a catastrophic fire which may damage populations and reduce suitable habitat.

Direct and Indirect Effects of the action alternatives 2-5

No sensitive plant species are known to exist in any of the harvest units or areas of any proposed activity; hence there will be no direct effects to any population. An indirect effect would be the creation of potential or suitable habitat for the two annual species, western pearl flowers and dwarf woolyheads. Habitat for these two species is described as “vernally moist” soils or grasslands.

Western pearl flower occurs almost exclusively on or along roads on the Cabinet Ranger District. Many of these populations were on more or less abandoned roadbeds that receive ample sunlight. A “natural” population has been located on a well-used game trail. If there are populations on an existing road, they may be directly affected by localized road improvements and maintenance. However, these activities are compatible with those that originally created suitable habitat for this species. Temporary road construction in alternatives 2 and 3 would create suitable habitat for this species. Alternative 4, the no new roads proposal, could also create potential habitat on existing roads because areas along existing roads would be opened up by timber harvest activities.

Dwarf woolyheads habitat is described as drying mud of ponds and other vernally wet soil in the valleys and on the plains. The few District populations known of this species have been found in low spots (mud holes) on more or less abandoned roads. This species is known in the analysis area but activities associated with timber harvest are compatible with those that originally created suitable habitat for this species. Alternatives 2-4 could also create potential habitat for this species.

Mouse moss, *Grimmia brittoniae*, is only found on calcareous cliffs where calcium has precipitated to form a crust over the rock. The one location of this species in the project area is actually on private land. Therefore, there will be no direct or indirect effects from any of the action alternatives. If there are populations in the activity areas, it is very doubtful there would be any impacts to this species given its’ habitat. However, if additional populations of this moss are located, precautions will be taken to protect this moss.

Collema curtisporum, or jelly lichen, has several scattered populations on the Cabinet RD. It is found almost exclusively on the bark of black cottonwood trees, in moist riparian forests, often in sheltered valleys. Hutchinson and McCune studied the species in north Idaho and found black cottonwood was part of all stands with jelly lichen populations; the trees were primarily in mid-seral growth form. They also found an association with river flood plains on both sides of the stream. They speculated the association was due to the fact these rivers have a greater presence of cottonwoods or because the microclimate found in riparian forests on broad floodplains is moister and the species is most successful in moist microclimates. On the Cabinet RD, their habitat includes larger black cottonwoods found in narrow, moist riparian stream or river canyons. This species may have potential habitat on the upper reaches of Pilgrim and Stevens creek and also in the Skeleton Creek watershed. Habitat would most likely be microclimate “pockets” on these streams. This project would have no direct or indirect effects to this species or potential habitat. The species was not located in any surveys and potential habitat is well away from any activity areas to avoid or minimize any indirect effects.

The only known population on the Cabinet RD of *Cypripedium fasiculatum* is in the Little Beaver Creek watershed. This orchid is also found on the adjacent Plains/Thompson Falls RD, Lolo NF. The species is globally ranked G4 (apparently secure, though it may be quite rare in parts of its range, especially in the periphery) and ranked S2 in Montana (imperiled because of rarity or because other factors make it especially vulnerable to extirpation). The species is easily identified, even in the vegetative state. Action alternatives would create potential suitable habitat with the regeneration harvest.

In the Montana portion of its range, *Cypripedium fasciculatum* is most commonly found in moderately warm and dry mid-seral forest habitat types; a majority of occurrences are

in *Pseudotsuga menziesii/Physocarpus malvaceus* habitat type (H.T.), *Abies grandis/ P. malvaceus* H.T. or in transition zone between these types (Clearwater NF, 2002). The action alternatives have the potential to add warm and dry potential habitat. The following information is from *Cypripedium fasciculatum,* Conservation Assessment, USDA Forest Service, Region 1, by Jack Greenlee, December 1997. "The distribution of *Cypripedium fasciculatum* in Douglas fir/ninebark (Pseudotsuga menziesii/Physocarpus malvaceus) habitat types in Region 1 is probably best described as a metapopulation, or a "set of populations…that are interdependent of ecological time" (Harrison *et al.* 1988) and which are linked by recurrent extinctions and recolonizations. Historically, *Cypripedium fasciculatum* in such habitat types probably "followed" patches of suitable habitat on the landscape as disturbances and successional changes occurred; the landscape was composed of a shifting mosaic of occupied and unoccupied suitable habitats. In order to maintain a viable metapopulation of clustered lady's-slipper in the drier Douglas fir habitat types, we need to maintain occupied habitats even as some occupied and unoccupied habitats are treated with silvicultural prescriptions that mimic natural processes. While such treatments will probably cause local declines in subpopulations of clustered lady's-slipper, over the long term they will be creating patches of suitable habitat".

Botrychiums or moonworts are inconspicuous, perennial ferns with an above ground frond (leaf). They occupy different habitats on the KNF and certain species are associated with certain habitats. In NW Montana, they are most common at low elevations, which have a cool, maritime influenced habitat.

Ferriel (2001) recognized eight habitats occupied by sensitive species of *Botrychiums* in the KNF. There are three characteristics common to their habitat: lack of slope, abundant moisture and mesophitic plant species. Surface water was usually close by. There is some potential habitat in the project area and this potential habitat was searched specifically for moonworts. Direct and indirect effects would be minimal to potential populations and habitat because harvest units are not close to the more moist habitats this species inhabits. However, if any populations are found, appropriate measures to protect their habitat would be taken (USDA FS 2003).

As mentioned, *Pinus albicaulis (*whitebark pine) was officially added to the R1 Sensitive Plant list in December, 2011. There are no known populations of this species within the analysis area and potential habitat is limited and marginal. There will be no direct or indirect effects to this species in the Pilgrim Creek analysis area.

Three other species with potential habitat in the project area are *Allium acuminatum*, (tapertip onion), *Clarkia rhomboidea*, (common clarkia) and *Mimulus clivicola* (bank monkey-flower). Collectively, these species would occupy similar habitat in the analysis area. Tapertip onion and common clarkia are found on dry, open forest slopes, and grasslands in the montane zone. Bank monkey-flower is almost found exclusively on southern aspects in xeric habitat types. However, an important factor to this species appears to be the availability of spring moisture. Plants are typically found growing in pockets of moist, exposed mineral soil caused by natural or human-caused disturbances. Several associated species are commonly found growing with bank monkey-flower but *Clarkia pulchella* (pink-fairies) and *Collomia linearis* (narrow-leafed collomia) proved to be excellent indicators for identifying potential habitat. *Collomia linearis* is a common species in the Pilgrim Creek analysis area but *Clarkia pulchella,* nor *Clarkia rhomboidea* have not been found in the analysis area. All three species are annualsl and seasonal timing is an important factor in locating populations of these

plants. If present, harvest activities could directly impact these species by damaging or destroying plants, but indirectly, ground disturbance could create some potential habitat in the dryer montane zones of the project area.

If any individual or populations of Sensitive plants are located in areas proposed for management activities, they would be protected under the provisions of the timber sale contract. Timber Sale Contract C(T) 6.251# would be applied to modify the activity so that adverse effects would be avoided (See Design Criteria, Table 2-14

Cumulative Effects of the Action Alternatives 2-5

Past Actions and their Effects on Current Conditions: Past effects to sensitive plant species in the project area may have occurred due to soils disturbance, overstory removal, fire suppression, mining and the recent introduction of noxious weeds and other invasive species.

No known PTES plant populations have been impacted by any of the past timber sale projects. However, there is the possibility that some populations were never identified and may have been inadvertently impacted.

Past wildfires in the project area may have impacted sensitive plant species. No known sensitive plant populations have been impacted by past wildfires but it is likely that populations were affected by these fires. The great fires of 1889 and 1910 undoubtedly impacted sensitive plants as well as all vegetation in the project area. These fires are responsible for current vegetation in the project area because native plants, including sensitive plants, have evolved with the influence of wildfires. Wildfires after 1940 affected less than 20 acres in the project area and impacts would be minimal, if any, on sensitive plant species/populations.

The introduction on non-native species (eg.Orchard grass, *Dactylis glomerata*) and invasive/noxious weeds through the years may also have impacted sensitive plant species. No known populations have been impacted by these non-native species, but it is generally agreed that noxious weeds and invasive species potentially are the biggest threat to plant communities (Larson et. al. 1997).These species are even invading native, pristine environments.

Contrasting Effects of Proposed Action with Past Actions: The Pilgrim Creek project activities are designed to avoid impacts to any known or newly discovered populations of sensitive plants. *Heterocodon rariflorum* (western pearl flower) and *Psilocarphus brevissimus* (dwarf woolyheads) are two annual species where project activities are compatible with those that originally created suitable habitat for this species. *Grimmia brittoniae* is on private property, and will be avoided. Contract clauses are included which allow operational changes if any sensitive plants are found during project implementation.

Effects of Ongoing and Reasonably Foreseeable Actions: Foreseeable activities include road maintenance, herbicide applications, fire suppression, mining and recreation/firewood gathering. These activities may impact plants through toxicity, ground disturbance, and canopy removal. Proposed ground disturbing activities will be evaluated through surveys and biological assessments/evaluations as to their impact on PTES plant species.

Combined Effects of Past, Proposed, and Foreseeable Actions: This project will have no affect on PTES plant species and hence, no cumulative effect.

Regulatory Consistency

The Kootenai NF Forest Plan (USDA Forest Service, 1987a) addresses Sensitive species under its Forest-wide management direction. In its goals it states that we will "determine the status of Sensitive species and provide for their environmental needs as necessary to prevent them from becoming Threatened and Endangered" (USDA Forest Service, 1987a, p. II-1).The plan also supports the protection and maintenance of important riparian zone features, marshes and water bodies, where Sensitive plants often occur (USDA Forest Service, 1987, p. II-28, 29). In terms of Sensitive plants, all alternatives are consistent with the Kootenai NF Forest Plan.

There is no significant physical or biological connection between the analysis area and known populations or critical habitat of Endangered, Threatened or Proposed plant species. As such, all alternatives comply with the Endangered Species Act.

Attachment - POTENTIAL SPECIES FOR PROJECT-LEVEL CONSIDERATION

Spalding's catchfly *(Silene spaldingii*) is federally listed as threatened and suspected on the KNF. Spalding's catchfly has been found on the Tobacco Plains near Eureka and on the Flathead Indian Reservation in Sanders County but not on KNF lands.

Table 3-92. Findings for Threatened and Endangered plant species.

SPECIES	HABITAT	CONCLUSION	JUSTIFICATION
Silene spaldingii Spalding's catchfly	Open grasslands in valleys and foothills; deep soils	**No Effect**	No habitat in PA and very unlikely any on the Cabinet RD

Table 3-93. Sensitive Plant Species of the Kootenai National Forest and Status in the Pilgrim Creek Project Area

Common Name	Scientific Name	Status	Potential/Footnote
Tapertip onion	***Allium acuminatum***	**Suspected**	**Moderate**
Round-leaved orchis	***Amerorchis rotundifolia***	**Not Suspected**	**NS5**
Water marigold	***Bidens beckii***	**Not Suspected**	**NS1**
Deer fern	***Blechnum spicant***	**Not Suspected**	**Very Low**
Upswept moonwort	***Botrychium ascendens***	**Suspected**	**Moderate**
Wavy moonwort	***Botrychium crenulatum***	**Suspected**	**Moderate**
Western moonwort	***Botrychium hesperium***	**Suspected**	**Moderate**

Common Name	Scientific Name	Status	Potential/Footnote
Peculiar moonwort	*Botrychium paradoxum*	Suspected	Moderate
Stalked moonwort	*Botrychium pedunculosum*	Suspected	Moderate
Watershield	*Brasenia schreberi*	NotSuspected	NS1
Big-leaf sedge	*Carex amplifolia*	Not Suspected	Low
Creeping sedge	*Carex chordorrhiza*	Not Suspected	NS2
Prairie sedge	*Carex prairea*	Not Suspected	NS2
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
Jelly lichen	*Collema curtisporum*	Suspected	Moderate
Pink corydalis	*Corydalis sempervirens*	Suspected	Low
Clustered lady's-slipper	*Cypripedium fasciculatum*	Suspected	Moderate
Small yellow lady's-slipper	*Cypripedium parviflorum*	Not Suspected	NS2
Sparrow's egg lady's-slipper	*Cypripedium passerinum*	Suspected	Very 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
Thinleaf cottonsedge	*Eriophorum viridicarinatum***	Not suspected	NS2
Western boneset	*Eupatorium occidentale*	Suspected	Very low
Hiker's gentian	*Gentianopsis simplex*	Not Suspected	NS2
Mouse moss	*Grimmia brittoniae*	Known	High
Howell's gumweed	*Grindelia howellii*	Not suspected	NS8
Western pearlflower	*Heterocodon rariflorum*	Known	High

Common Name	Scientific Name	Status	Potential/Footnote
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
Stalked leaved monkeyflower	*Mimulus ampliatus*	Suspected	Low
Short-flowered monkeyflower	*Mimulus breviflorus*	Suspected	Low
Bank monkey-flower	*Mimulus clivicola*	Suspected	Moderate
Lichen	*Nodobryoria subdivergens*	Not suspected	NS7
Northern adder's-tongue	*Ophioglossum pusillum*	Not suspected	NS2
Northern beechfern	*Phegopteris connectilis*	suspected	Low
Whitebark Pine	*Pinus albicaulis*	Suspected	Moderate
Dwarf wooly heads	*Psilocarphus brevissimus*	Known	High
Pod grass	*Scheuchzeria palustris*	Not suspected	NS2
Water bulrush	*Schoenoplectus subterminalis*	Not suspected	NS2
Moss	*Scorpidium scorpioides*	Not suspected	NS2
Tufted bulrush	*Trichophorum cespitosus*	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 not suspected or with low or very low probability of occurrence in the project area will not be considered further in this analysis.

TABLE 3-94 – Known and Suspected Sensitive Plant Species in Pilgrim Creek Project Area

COMMON NAME	SCIENTIFIC NAME	STATUS	POTENTIAL/FOOTNOTE
Tapertip onion	*Allium acuminatum*	Suspected	Moderate
Upswept moonwort	*Botrychium ascendens*	Suspected	Moderate
Wavy moonwort	*Botrychium crenulatum*	Suspected	Moderate
Western moonwort	*Botrychium hesperium*	Suspected	Moderate
Peculiar moonwort	*Botrychium paradoxum*	Suspected	Moderate
Stalked moonwort	*Botrychium pedunculosum*	Suspected	Moderate
Common clarkia	*Clarkia rhomboidea*	Suspected	Moderate
Jelly lichen	*Collema curtisporum*	Suspected	Moderate
Clustered Lady's slipper	*Cypripedium fasciculatum*	Suspected	Moderate
Britton's dry rock moss	*Grimmia brittoniae*	Known	High
Western pearl-flower	*Heterocodon rariflorum*	Known	High
Bank monkey-flower	*Mimulus clivicola*	Suspected	Moderate
Whitebark pine	*Pinus albicaulis*	Suspected	Moderate
Dwarf woolyheads	*Psilocarphus brevissimus*	Known	High

AIR QUALITY

Introduction

This analysis discloses potential effects to air quality from implementing an alternative, providing the decision maker with a means of comparison. The analysis of alternatives include the effects of wildfire smoke, prescribed fire smoke and fugitive dust.

Wildfires produce smoke that can adversely impact air quality. For a thirty-year period, the area including the Kootenai, Flathead, Idaho Panhandle, and Lolo National Forests averaged approximately 480 lightning caused fires per year (Barrows, Sandberg, and Hart, 1977). The size, intensity, and occurrence of wildfires depend directly on variables such as meteorological conditions, the type of vegetation present, the moisture content of both live and dead fuel, topography and the total weight of consumable material available. Under the extreme condition of heavy fuel, drought, and hot, dry weather nearly all forest fuels are available for consumption. Ward (et al 1976) estimated that smoke emissions created by wildfires are approximately three times greater than that produced by prescribed burning. The impacts to air quality are relative to the amount of smoke produced. Smoke produced varies with burning conditions and duration. During extreme burning conditions large volumes of smoke are produced for an extended duration.

Smoke produced from prescribed burning can have an adverse effect on air quality. The quantity of smoke produced is influenced by the same factors influencing smoke production by wildfires. Increased utilization of forest residue during timber harvest reduces available fuel in turn reducing smoke production. Smoke production is also influenced by the timing of the burn and weather conditions. Other methods of slash treatment and site preparation are available. However, most alternatives require costly equipment, and can cause excessive soil disturbance.

Fugitive dust produced by vehicular traffic on native surface roads affects air quality Factors that affect dust production include: silt content of the road surface, the distance traveled, the weight and speed of the vehicle, and weather conditions. Mitigation measures including watering or dust suppressants are effective. Utilizing standard timber sale contract mitigation measures fugitive dust is not expected to increase (and may decrease) during implementation of an alternative.

This analysis includes the direct effects (effects resulting from the implementation of an alternative that occur at the same place and time), indirect effects (effects resulting from the implementation of an alternative that occur later in time or are further removed in distance but are reasonably foreseeable), and cumulative effects (effects resulting from the incremental impacts of past, present and reasonably foreseeable future actions regardless of who is responsible).

Regulatory Framework

Under the 1977 Clean Air Act amendments (42 U.S.C. 7401 et seq), areas of the country were designated as belonging to Class I, II, or III Airsheds for Prevention of Significant Deterioration purposes. Class I areas are all international parks, national parks greater than 6,000 acres, and national wilderness areas greater than 5,000 acres which were

created prior to August 7, 1977. Class 1 areas provide the most protection to pristine lands by severely limiting the amount of additional, human-induced air pollution, which can be added to these areas. Class II areas are currently all other areas of the country that are not Class I. To date, there are no Class III areas. Glacier National Park and the Cabinet Mountain Wilderness, Class I Areas, and impact zones were considered in the development of this project.

The 1977 amendments to the Clean Air Act contained provisions for the Prevention of Significant Deterioration (PSD) Program to prevent the growth of stationary industrial sources from causing a significant deterioration of air quality in areas that meet present air quality standards of National Ambient Air Quality Standards (NAAQSs) and placement of limits on the “increment” of clean air that can be used by industrial projects. The PSD Program is administered by the State air regulatory agencies with oversight authority retained by EPA.

The Clean Air Act authorizes states with approved PSD Programs to exclude particulate matter emissions caused by temporary activities from consuming increment. EPA expects the states, on an individual basis, to decide the extent to which prescribed fires (and the resulting emission increases) should be considered temporary sources of air pollution when determining increment consumption in specific areas.

The majority of the legal entities in Montana (including the Forest Service), which create particulates as a result of their burning activities, formed the Montana/Idaho State Airshed Group. Through a Memorandum of Understanding with the Montana Air Quality Bureau, this group has established a smoke monitoring system that provides daily air quality predictions and air quality restrictions to its members. The Montana Air Quality Bureau issues an annual burn permit to the Forest Service. Issuance of this permit is based on participation and compliance with burning restrictions set by the Montana/ Idaho State Airshed Group.

Prescribed burning within the analysis area will comply with the current Federal and state management plans. Prescribed burning is reported to the Airshed Coordinator on a daily basis. If the monitoring unit forecasts ventilation problems, prescribed burning is either restricted by elevation or curtailed until good ventilation exists.

Combustion products of wildfires and prescribed burning smoke include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, nitrogen oxides, and trace minerals. Federal and State ambient air quality standards have been established for particulate matter (PM), which is the pollutant of most concern from smoke. Specifically, PM less than or equal to 10 micrometers in aerodynamic diameter (PM-10) is the size which can penetrate the inner recesses of the lungs, causing health problems. It is also the size that most severely impacts local and regional visibility.

If a community does not meet or “attain” the National Ambient Air Quality Standards, it is designated as a non-attainment area and must demonstrate to the public and the Environmental Protection Agency how it will meet standards in the future. This demonstration is done through the State Implementation Plan.

In July 1997, the EPA issued revised national air quality standards for ozone and particulate matter in the 2.5 micron class (PM-2.5). The EPA proposed the following implementation plan for the new standards, which took effect on January 17, 2007:

- Nationwide fine particulate monitors in place.
- States and EPA collect data from nationwide network.
- States submit to EPA their State Implementation Plans (SIPs) describing how they'll meet and enforce the new standards.
- States implement their Plan to assure they attain the standards.

In December of 2012 the EPA issued a new final rule which changed the national annual arithmetic average from 15 micrograms per cubic meter to 12 micrograms per cubic meter.

The current Federal and State standards are:

PM 10: 1) the concentration of PM 10 must not exceed 150 micrograms per cubic meter over a 24-hour period; or 2) the annual arithmetic average must not exceed 50 micrograms per cubic meter.

PM 2.5: 1) the concentration of PM 2.5 must not exceed 35 micrograms per cubic meter over a 24-hour period; or 2) the annual arithmetic average must not exceed 12 micrograms per cubic meter.

PM 10 and PM 2.5 monitors are located in Thompson Falls, Libby, Kalispell, Whitefish, Missoula, Helena, and several other sites in Montana.

Bounds of Analysis

The state of Montana is divided into 10 Airsheds according to the Montana State Air Quality Bureau. The Pilgrim Creek project area lies within Airshed 1. The analysis area for air resource impacts will be a 140 kilometer radius from the project area. Sensitive areas, like population centers, impact zones, non-attainment areas, and Class 1 areas are considered (refer to the Airshed information in the project file).

Analysis Methods

Burning would be expected within the ten years following the signing of a Finding of No Significant Impact (FONSI) and would occur during spring and fall seasons.

Emissions production was estimated by the computer model First Order Fire Effects Model (FOFEM). Modeling was used to predict the particulate produced by a wildfire pre and post implementation of an action alternative.

Dispersion modeling of smoke is more complex than estimation of emissions, since atmospheric stability conditions and winds transport and mixes the particulate matter downwind. *Wind Roses* produced From Spokane, Washington Radiosonde Data are used to predict annual percent probability of wind direction and speed. This method is analyzed to predict the probability of smoke produced from the project area affecting downwind airsheds of concern.

Location and Frequency of Burning

The proposed burning and fuel treatments for each alternative are indicated in Tables 2-5, 2-8, 2-11, and 2-12.

Burning associated with this project would occur annually, during the spring or fall burning periods, until all burning is completed. The spring burning period usually runs from late March through June. The fall burning period usually occurs in September through November. Historically by October broadcast, jackpot and underburning are prohibitive due to wet conditions. Pile burning would occur during the late fall burn period which runs from October through November. The Montana Air Quality Regulations restrict open burning during December, January and February.

The criteria used to select timing of burn projects would include: fuel moistures, risk of escape, general weather patterns, smoke dispersion, live fuel moistures, and resource objectives.

Measurement Indicators

Indicators used for measuring effects to the environment will be the amount of particulate matter produced modeled pre and post treatment for the project area. Probability of wind direction will be used to measure the chance that a smoke event will affect a Class 1 area.

1) Particulate matter 2.5 micrograms/meter3 produced. Measured in total tons produced.
2) Probability of wind direction that would affect adjacent airsheds.

Affected Environment/Existing Condition

Airshed Characteristics

Smoke and dust from the west is the predominant influence on air quality in Airshed 1. Prescribed burning of logging residue by private and other government entities adds smoke to the air mass. Wildfires burning in the localized area, Canada, and from areas as far west as the coastal range of Oregon and Washington also contribute to air quality degradation. Dust, originating from tilled farmland during dry windy weather, can add to local haze and reduce air quality.

The principal impact to air quality in Class 1 areas from prescribed burning and wildfires is the temporary visibility impairment caused by smoke. This may reduce the quality of forest recreation experiences, as vistas beyond the boundaries of the Class 1 areas may be temporarily obscured. The conditions that may reduce visibility also produce visual benefits, such as spectacular sunsets.

The effects of smoke from prescribed burning within the analysis area are affected by the season of burning, the atmospheric stability, topography, and the time of day the burning occurs.

Season - Smoke dispersal is usually best during the spring and early summer because daytime heating and general wind flows help smoke rise above ridge tops and into the free-air winds where it is transported and dispersed.

Stability- Stable high-pressure systems that often occur during late summer and fall decrease the vertical motion of air reducing the smoke dispersion potential.

Topography - The mountainous topography of the analysis area also influences the dispersion of smoke. Smoke produced at high elevations is closer to the free-air winds that occur so dispersion is improved over low elevation units. Burns on slopes exposed to the prevailing wind would have better smoke dispersion than units located on the lee slope.

Time of Day - Smoke dispersal is best between 1:00 and 6:00 PM. This is when daytime heating is greatest. This usually coincides with the period of greatest atmospheric instability for the day.

Historical Conditions (Reference Conditions)

Quantitative air quality data is not available for the period prior to settlement of the analysis area late in the 19th century. However, journals from early day explorers and newspaper articles from the late 1800's often mention the smokey conditions from summer fires burning in western Montana and northern Idaho (paper by Mark J. White in project file).

The annual amount of smoke generated from forest fires has generally decreased since the early 1900's. Prior to the advent of effective fire suppression, fires which started on the Cabinet District, generally burned unchecked from the time of ignition until weather changes stopped their spread. Smoke production varied as environmental factors changed. Smoke could have been produced for just a few hours or for as long as several months. During severe fire seasons, especially when stagnant high pressure systems persisted, regional air quality was probably poor. The acrage burned by wildfires within the project area decreased as effective fire suppression evolved resulting in inproved air quality. During the last half of the 20th century, natural fuels resulting from decades of fire suppression have reached a level where larger, more intense fires are possible.

Existing Conditions

Studies conducted by the Montana Health and Environmental Sciences Department have demonstrated that prescribed burning of logging slash, when burned in compliance with State regulations, is not a major contributor to reduced air quality in the Thompson Falls and Libby areas. Source apportionment studies taken in Libby, a non-attainment area, have shown that slash burning contributes less than three percent of the total PM-10, with road dust and wood stove smoke being major contributors. PM-10 readings taken in Libby since 1988 have shown a trend toward improvement in air quality from September through November when most fall prescribed burning occurs.

Situations in forest management require treatment of activity created fuels at timber sale completion. Prescribed fire is one common technique used to dispose of these fuels. Because prescribed fire is a forest management adaptation of wildfire, it simulates natural processes better than other fuel treatment alternatives.

According to the Environmental Protection Agency's Report, AP-42 Compilation of Air Pollution Emission Factors, air pollution is generated from prescribed burning. The net amount is believed to be a relatively small quantity compared to that produced by wildfires. The Environmental Protection Agency states in this report, "prescribed fire is a cost effective and ecologically sound tool for forest, range, and wetland management. Its

use reduces the potential for destructive wildfires and thus maintains long term air quality."

Environmental Consequences

Direct and indirect effects on the air quality are described below for activities proposed in Chapter 2. Cumulative effects were considered for all past, present, and reasonably foreseeable activities listed and described in Table 3-1.

Prescribed burning is a land management treatment to accomplish natural resource management objectives. Prescribed fires are conducted within limits of a burn plan that describes the conditions under which the burn can be implemented to accomplish resource objectives. Prescribed fire is a cost-effective and ecologically sound tool for forest, range and wetland management. Its use reduces the potential for high intensity wildfires and thus has the potential to maintain long-term air quality. Prescribed burning removes logging residues and fuel accumulations, controls insect and disease, improves wildlife habitat and forage production, increases water yield, maintains natural succession of plant communities, and reduces the need for pesticides and herbicides. The major air pollutant concern is the smoke produced by prescribed fire (A Desk Reference for NEPA Air Quality Analysis, 3.1.2-1).

The following objectives are taken into consideration when selecting the appropriate fuel management technique.

1. Treat activity fuels and natural fuels to reduce the potential for unwanted wildfires.

2. Prepare harvested sites for tree planting or natural seedlings using the most appropriate method, including prescribed fire and mechanical means.

3. Use prescribed fire to maintain the natural succession of fire dependant plant communities.

4. Use methods that reduce unwanted fuel through improved harvest techniques or through higher utilization standards. Favor utilization when the cost of onsite treatment equals the cost of removal for utilization.

The selection of a fuel management technique depends of several factors including: silvicultural prescription, timber harvest method, timber harvest type, wildlife habitat, soil, water, cultural resource protection, and air quality. The Interdisciplinary Team selected fuel treatment options which balance resource objectives and economic concerns.

Direct and Indirect Effects of Alternative 1 – No Action

Wildfire

The direct effects of wildfire smoke on air quality from implementing the no-action alternative is that fire occurrence, intensity, and size would be similar to fires in the recent past. Historic records show that since 1940 the fire occurrence rate for the project area is 1.2 fires per year (see fire history map in fuels section). During the period since 1940 there have been 82 fires in the project area. These fires are generally small,

burning less than one acre each due to fire suppression. However, there is an increasing probability that a fire would escape initial attack growing large in size and burn for a long duration due to increasing fuel loads. Fires of this scale and duration would impact air quality. A recent example is the Ulm Peak Fire that burned over 800 acres on the Cabinet Ranger District and actively burned for over four weeks.

For analysis purposes, a model comparison is made of burning all treatment acres proposed in each alternative compared to the same acres left untreated. This modeling gives the deciding official an opportunity to compare the different effects on air quality to expect during a wildfire event under different treatment scenarios. Smoke produced by wildfire is largely unmanageable in terms of the timing and duration of the event.

Be aware the modeling is not an attempt to depict reality, but merely an analysis for comparison purposes. Outputs are in total tons of particulate produced.

Table 3-95. Modeled Particulate Production Pretreatment vs Post Treatment for All Action Alternatives

ALTERNATIVE 2					
TREATMENT	ACRES	Pre Treatment (No Action)		Post Treatment	
		PM 2.5	PM 10	PM 2.5	PM 10
Broadcast Burn	207	83.5	98.4	42.0	42.1
Under Burn	427	105.3	124.0	65.5	77.5
Lop & Scatter	407	74.1	87.3	151.4	178.9
Natural Fuels Burn	3754	373.5	441.1	167.1	195.2
Grapple Pile	370	91.2	107.5	56.8	67.2
Total	5170	727.6	858.3	482.8	560.9

ALTERNATIVE 3					
TREATMENT	ACRES	Pre Treatment (No Action)		Post Treatment	
		PM 2.5	PM 10	PM 2.5	PM 10
Broadcast Burn	93	37.4	44.2	18.8	18.8
Under Burn	505	124.2	146.6	77.2	91.4
Lop & Scatter	387	70.0	82.8	143.5	169.8
Natural Fuels Burn	3754	373.5	441.1	167.1	195.2
Grapple Pile	481	118.3	139.4	73.5	87.0
Total	5220	723.4	853.9	480.1	562.2

ALTERNATIVE 4					
TREATMENT	ACRES	Pre Treatment (No Action)		Post Treatment	
		PM 2.5	PM 10	PM 2.5	PM 10
Broadcast Burn	90	36.2	42.8	18.2	18.2
Under Burn	333	81.9	96.5	50.9	60.2
Lop & Scatter	470	85.0	100.5	174.3	206.3
Natural Fuels Burn	3754	373.5	441.1	167.1	195.2
Grapple Pile	397	97.6	115.1	60.7	71.8
Total	5044	674.2	796.0	471.2	551.7

ALTERNATIVE 5					
TREATMENT	ACRES	Pre (No	Treatment Action)	Post	Treatment
		PM 2.5	PM 10	PM 2.5	PM 10
Broadcast Burn	82	33.1	39.0	14.1	16.7
Under Burn	216	53.2	62.7	33.2	39.2
Lop & Scatter	115	20.9	24.7	42.8	50.5
Natural Fuels Burn	3754	373.5	441.1	167.1	195.2
Grapple Pile	219	54.0	63.6	33.6	39.8
Total	4386	534.7	631.1	290.8	341.1

Direct and Indirect Effects of All Action Alternatives

Prescribed Burning Associated with Harvest and Non-harvest Activities
All action alternatives are portrayed in Table 3-95. Smoke from fuel treatment is related to fuel loading. Current fuel loading information can be found in the project file fire fuels section.

Smoke emitted by prescribed burning is managed because the timing of the burn is selected when air quality and dispersion are favorable. Fire intensities, fuel moisture levels, and utilization of the flaming phase of combustion would all be monitored and used to reduce particulate production and airshed impact. By burning under favorable conditions, particulate amounts would be drastically reduced compared to amounts generated by a wildfire of the same acreage. PM 10 and PM 2.5 levels would rapidly disperse as they are carried by local and general winds. Another management technique is limiting the size of burn units to reduce the amount of particulate released at a time thus giving the particulate an opportunity to disperse before introducing more to the airshed.

All action alternatives would generate particulate during implementation. The smoke produced during project implementation would be in compliance with the Montana/ Idaho State Airshed Group thus causing no significant impact to the airshed. Participation and coordination with the Montana/ Idaho State Airshed Group is instrumental to successful smoke dispersion and reduced smoke impacts.

Summary

The potential amount of unmanaged smoke produced during a wildfire would vary by alternative proportionate to the amount of fuel reduction. The greatest potential reduction of wildfire emissions through fuel reduction would occur from the implementation of Alternative 3, while the least amount would occur with Alternative 1. Alternative 5 would produce the least potential reduction in in wildfire particulate emissions of the action alternatives due to it having the least acres of treatment. Alternative 2 and Alternative 4 would show similar levels of potential smoke production post implementation in the event of a wildfire.

One treatment, models an increase in potential smoke production post implementation, that treatment is lop and scatter. The reason for this is surface fuel loading is increased post-harvest however crown fire potential is reduced so it is an effective fuel treatment. For a complete discussion of lop and scatter as a fuels treatment see the Fuels report.

Smoke produced by prescribed burning would be managed through the Montana/Idaho State Airshed Group to stay within the EPA Standards. All action alternatives would produce particulate during implementation however standards would not be exceeded.

Cumulative Effects

The Cumulative Effects Worksheet, located in the Air Quality Project File, describes proposed activities in addition to the past, current, and reasonably foreseeable activities listed in Chapter 1. Those activities that cumulatively affect air quality are discussed below.

Vegetation Management

The cumulative effects on air quality by smoke produced from implementation of an action alternative could result in an incremental decrease in air quality if unmanaged. Particulates from this source would combine with other particulates from local and regional sources located upwind. Smoke produced by alternative implementation would be managed through the Montana/Idaho State Airshed Group to stay within the EPA Standards mitigating negative cumulative effects.

General wind patterns may cause smoke to drift into Libby, Thompson Falls, Glacier National Park and the Flathead Valley. Visibility may be temporarily reduced until prevailing weather influences mix and disperse smoke. Impacts would be minimized in the spring due to fewer park and forest visitors, higher fuel moistures (less emissions), better smoke dispersion, and reduced impacts from other PM 10 and PM 2.5 producing activities.

Fire Suppression

The cumulative effects of wildfire smoke on air quality includes all pollution sources contributing particulates to the air mass in addition to the smoke produced by wildfires within the analysis area. The largest impacts occur when wildfires are burning upwind of the analysis area and within the analysis area concurrently. The cumulative effect of these particulate sources could result in extended periods of poor air quality.

Potential Impacts to Non-attainment Areas, Class I Airsheds and Local Communities on Air Quality

The following analysis is based on radiosonde data collected at Spokane, Washington for the period from January of 1991 to December of 2008. The data selected for this analysis is for the 750-millibar level, which corresponds to 8,400 feet above sea level. Winds at this level represent the free-air wind direction and velocity that are likely to occur over the analysis area. *Wind Rose* and tables containing the source data are included in the project file.

The range of wind speeds at 8,400 feet above sea level, for the entire year, ranges from a low of 3 mph to a high of 23 mph. Winds that originate from a westerly direction tend to be stronger than those originating from an easterly direction. Winds with a westerly component, those ranging from SSW to NNW, account for 81% of wind origin directions. Southeasterly winds are the least frequent.

Two data sources were used to estimate the likelihood that air pollutants from the Pilgrim Creek project area would impact a given area of interest. The percent probability that wind direction would be such that it would carry smoke toward the area of concern from information taken from the *Wind Rose* data tables, and the distance from the project area to the points of concern.

The premise of the analysis is the likelihood that smoke produced as a result of the implementation of one of the action alternatives would affect an area of concern, is a function of the following factors.

1. The probability a wind direction blowing from the project area to the area of concern would occur.

2. The dilution of the smoke as it traverses the distance from the project area to the area of concern.

The analysis, summarized in the following table, considers the combined factors that would influence the effects that smoke from the project area would have on non-attainment areas, Class I area, and other local communities.

Table 3-96. Probability of wind direction that would affect areas of concern.

Area of concern and reason for concern	Transport wind direction to location of potential impact	Distance to area of concern in kilometers	Percent Probability of wind direction occurrence: May (Spring)1	Percent Probability of wind direction occurrence: Oct. (Fall)1
Libby, MT, Non-attainment area	S	47	26.2 %	25.8 %
Whitefish, MT, Non-attainment area	SW	115	36.3 %	26.4 %
Kalispell, MT, Non-attainment area	SW	104	36.3 %	26.4 %
Thompson Falls, MT,	NW	46	10.6 %	10.5 %

Area of concern and reason for concern	Transport wind direction to location of potential impact	Distance to area of concern in kilometers	Percent Probability of wind direction occurrence: May (Spring)1	Percent Probability of wind direction occurrence: Oct. (Fall)1
Impact Zone				
Eureka, MT, Sensitive area	S	116	26.2 %	25.8 %
Cabinet Mt. Wilderness, Class I Airshed	SW	10	26.2%	25.8 %
Glacier National Park, Class I Airshed	SW	138	36.3 %	26.4 %
Plains, MT Sensitive area	NW	49	10.6 %	10.5 %
Sandpoint, ID Non-attainment area	SE	100	11.0 %	13.2 %
Couer d'Alene, ID Sensitive area	E	100	29.6 %	30.2 %
Big Fork, MT Sensitive area	NW	104	10.6 %	10.5 %

This includes the primary wind direction and both adjacent subdivisions, eg, West (W), includes WSW, W, WNW Over a seven (17) year average .

Effects Analysis of Potential Impacts to Class I Area.

Certain wilderness areas and National Parks established before August of 1977 were designated as Class 1 areas. Class 1 designation allows limited increase in air pollution above existing air pollution levels. The Clean Air Act amendments of 1977 included a program for prevention of significant deterioration of air quality, generally referred to as the PSD program. This program is to prevent areas currently having clean air from becoming polluted. The Bob Marshall Wilderness, Glacier National Park and the Cabinet Mountains Wilderness are all Class 1 areas.

Effects resulting from the implementation of the action alternatives would be considered direct effects since the Cabinet Mountains Wilderness is within close proximity of the project area.

The analysis presented in Table 3-96 above indicates that transport winds, from a direction that would carry smoke toward the Cabinet Mountains Wilderness Area, would occur less than 26% of days in the spring or the fall. If burning occurs on one of these days, smoke may impact visual quality and could also deliver airborne pollutants to this Class I area. The effects of visual impairment would be noticed less during spring weather because of low visitor use due to deep snow. The probability of impacting air quality of Cabinet Mountains Wilderness is low.

The data in the table above indicates the probability that transport winds would carry smoke toward Glacier National Park 36% of the days in the spring and 26% of days in

the fall. If burning occurs on one of these days, smoke could impact visual quality and could also deliver airborne pollutants to this Class I area. Smoke dilution due to the 138 kilometers distance from the project area would greatly reduce the level of pollutants reaching this airshed. The probability of impacting Glacier National Park is low due to the distance to this area.

Mitigation Measures Taken to Reduce Prescribed Burning Emissions.

The potential air quality impacts from prescribed burning would be reduced by four general methods: fuel load reduction, fuel consumption reduction, flaming combustion optimization, and impact avoidance.

1. Fuel Loading Reduction:

The Kootenai National Forest has encouraged material utilization through contract provisions. Purchasers may be required to pay for top wood smaller than the utilization standard. This encourages utilization of small diameter material. These measures help decrease the amount of available fuel (Standard Contract Provision BT 3.41).

2. Reduction in the Amount of Fuel Consumed:

Fuel consumption can be accomplished through spring burning. Harvested areas located on east, southeast, south, southwest and west aspects could be burned during the spring season. Typically the spring season runs from late March through June. During this timeframe larger diameter fuels and the duff layer usually have relatively high moisture contents reducing fuel consumption, which reduces smoke emissions.

3. Flaming Combustion Optimization:

When prescribed burning is determined to be the most appropriate fuel treatment, methods which increasing flaming combustion phase would be used. Concentration of logging slash by whole tree yarding or excavator piling increases the amount of material consumed during flaming combustion. Purchasers are required to construct piles so they are compact and free of excess soil.

4. Impact Avoidance:

Smoke impact avoidance would be accomplished through daily monitoring of airshed conditions. In Montana, the open burning season runs from March 1 through November 30. All open burning in the state is regulated by the State of Montana Air Quality Bureau. Major prescribed burners, including the Forest Service, have formed the Montana/Idaho State Airshed Group. Through a Memorandum of Understanding with the Montana Air Quality Bureau, this group has established a smoke monitoring system that provides daily air quality predictions and restrictions to its members. To accomplish this, the Airshed Group has a monitoring unit consisting of meteorologists and technicians that use weather forecasts and air quality conditions to determine, on a daily basis, the need for restrictions on prescribed burning. The Forest Service is issued an annual permit to burn by the Montana Air Quality Bureau. Issuance of this permit is based on participation and compliance with burning restrictions issued by the Montana/Idaho State Airshed Group. Proposed prescribed burns on the Cabinet Ranger District are reported to the Airshed Coordinator on a daily basis. If ventilation problems are forecasted by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation conditions return. The Forest Service will cooperate with the state in meeting the requirements of the State Implementation Plan and the Smoke Management Plan (Forest Plan, II-26).

Individual burn bosses are trained in smoke management techniques prior to being qualified as burn bosses. Part of a burn boss responsibility is to evaluate smoke dispersion and halt burning operations in the event the actual smoke dispersion is not as forecasted and will cause significant harmful impacts.

Regulatory Consistency

The forest-wide objectives for air quality are:

1) Maintain excellent air quality on the forest and protect local and regional air quality by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and State Implementation Plan (SIP). Requirements of PSD and SIP and the Montana Smoke Management Plan would be met.

2) Prevent long-term deterioration of the air quality, classified as Class I for the Cabinet Mountains Wilderness Area and Class II for the rest of the Forest.

The Montana/Idaho State Airshed Group regulates smoke management for air quality. The Kootenai National Forest coordinates and schedules burning activities to maintain air quality. Prescribed burn plans describing how and under what conditions the burning would take place are prepared by qualified personnel for all burning activities. All activities under the proposed action would be consistent with the Forest Plan.

By participating in the Montana/Idaho State Airshed Group, complying with the Memorandum of Understanding with the Montana Air Quality Bureau and meeting the requirements of the State Implementation Plan and the Smoke Management Plan, the proposed activities would comply with the Forest Plan and the 1977 Clean Air Act.

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://fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_056343.pdf) (Russell et al, 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 KNF. This analysis indicates the counties within the analysis area are affected by timber management on the forest.

The collapse of the U.S. housing industry and the related global financial crises has had a large negative impact on the Montana and Idaho forest products industry. With declines in housing and generally weakening demand, lumber prices have dropped about 35 percent from 2005 to 2008 (Morgan and Keegan, 2009). Availability of stumpage is still important to industry to help ride out the current market situation. There is local demand for stumpage from the Forest, as evidenced by the amount of timber sales sold on the Kootenai in recent years. Most sales offered were sold with strong competition. There continues to be demand for stumpage, although at reduced prices.

Methodology

Four measures are appropriate for the economic analysis: project feasibility, financial efficiency, 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 and delivered log prices. The TEA uses regression analysis of recently sold timber sales to predict bid prices. The most recent appraisal and feasibility model for the area of interest was used to estimate the stumpage value (expected high bid resulting from the timber sale auction) for the timber project. The estimated stumpage value for each alternative was compared to the base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury) for that alternative. The

project is considered to be feasible if the estimated stumpage value exceeds the base rates. If the feasibility analysis indicates that the project is not feasible (estimated stumpage value is less than the base rates), the project may need to be modified. The infeasibility indicates an increased risk that the project may not attract bids and may not be implemented.

Financial efficiency provides information relevant to the future financial position of the program if the project is implemented. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. PNV combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive PNV indicates that the alternative is financially efficient.

Many of the costs and benefits associated with a project are not quantifiable**.** For example, the benefits to wildlife from habitat improvement, underburning to stimulate browse and reduced fuel loadings, are not quantifiable. These costs and benefits are described qualitatively, in the individual resource sections of this document. Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) indicates "For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are qualitative considerations."

Management of the forest is expected to yield positive benefits, but not necessarily financial benefits. Costs for various vegetation, recreation, wildlife, road and burning activities are based on recent experienced costs and professional estimates. Non-harvest related costs are included in the PNV analysis, but they are not included in appraised timber value.

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 2009 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 and delivered log price appraisal, which took into account logging system, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, temporary roads and road maintenance. The estimated high bid was compared to base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury). The estimated high bid and base rates for each alternative are displayed in Table 3-97. Given the predicted high bids and the base rates, all alternatives are feasible.

The predicted high bid is the basis for the timber revenue estimate. The actual timber value will depend on the market when the timber is sold, and may be higher or lower than the predicted high bid. The analysis included a relatively low Western Wood Products Association (WWPA) average value per thousand board feet (MBF).

Financial Efficiency

The financial efficiency analysis is specific to the timber harvest and ecosystem management activities associated with the alternatives (as directed in Forest Service Manual 2400, Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue for each alternative is the corresponding predicted high bid from the transaction evidence appraisal equation. The present net value (PNV) was calculated using Quicksilver, a program for economic analysis of long-term, on-the-ground resource management projects. A four percent discount rate was used over the 11-year project lifespan (2013-2023). 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. Projects to improve forest health and reduce fuel

loading through burning were 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 3-97 summarizes the project feasibility and financial efficiency for each alternative. Alternative 1 is not listed, as all values would be zero (no costs or revenues). 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. 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 (prescribed burning to improve forest health).

Table 3-97 indicates that all action alternatives are financially inefficient. Alternative 1 has the highest PNV at zero. Of the action alternatives, Alternative 4 has the highest and Alternative 2 the lowest PNVs. The PNVs for the timber harvest and required design criteria are higher than those for the timber harvest plus non-timber harvest activities.

A reduction of 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. 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 3-97 Project Feasibility and Financial Efficiency (2011 dollars)

Category	Measure	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Timber Harvest Information	Acres Harvested	1,411	1,434	1,290	632
	Total Sawtimber Volume Harvested (CCF)	19,484	24,544	21,288	7,012
	Base Rates ($/CCF)	10.12	8.70	9.18	12.83
	Predicted High Bid ($/CCF)	16.77	31.65	44.04	6.80
	Total Revenue	$326,747	$776,817	$937,523	$47,681
Timber Harvest and Required Design Criteria	PNV	-$553,633	-$356,884	-$56,822	-$289,444
Timber Harvest and Other Planned Activities	PNV	-$735,755	-$539,006	-$238,944	-$471,566

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, with an estimated 80% of the sale going towards sawtimber and 20% to post and poles. 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 3-98).

Table 3-98. Reforestation and Other Restoration Activity Expenditures by Alternative over an eight-year period (2009 dollars) (does not include overhead costs)

REFORESTATION/ RESTORATION ACTIVITY	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Burning	$224,450	$224,450	$224,450	$224,450
Planting	$116,625	$123,000	$143,250	$65,625
Stand exams/surveys	$25,737	$30,873	$27,675	$11,449
Total	**$366,902**	**$378,413**	**$395,465**	**$301,664**

Table 3-98 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 a five-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 five years of the project. These are not new jobs or income, but rather jobs and income that can be attributed to this project.

Table 3-98 – Total Employment and Income (2010 dollars) Over the Life of the Project

ANALYSIS ITEM	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Direct Employment (persons)	70	84	76	32
Total Employment (persons)	120	148	131	51
Direct Labor Income	$3,213,000	$3,973,000	$3,506,000	$1,306,000
Total Labor Income	$5,091,000	$6,323,000	$5,556,000	$2,015,000

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 3-98 indicate that Alternative 3 would maintain the highest number of jobs and labor income with total employment at 148 persons and total labor income being $6.3 million dollars. Alternative 5 maintains the fewest jobs and labor income of the action alternatives. 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:

The sale of timber on private lands near the project area will have a positive impact on the local economy, maintaining jobs and labor income in the surrounding counties.

Large-scale mining activities take place adjacent to the project area. Most significant for the economy is the Troy Mine and the proposed Rock Creek Mine. The Troy Mine continues to bring jobs and labor income to Lincoln County. Possible development of the Rock Creek Mine would bring a significant amount of jobs and labor income to Lincoln and Sanders counties.

Private timber lands owned by Plum Creek Timber Company are either for sale or sold and actively being subdivided in the zone of influence. Real estate transactions could potentially be a significant short-term contributor to the local economy, though the loss of natural resource management 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, 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.

For the Pilgrim 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.

DISCLOSURES

American Indian Rights and Tribal Consultation

The Federal government has government-to-government responsibilities with the Salish Kootenai, Kootenai Tribes of Idaho, Coeur d' Alene, Spokane and Kalispell Tribes, to insure that issues of concern are considered. The Project Area is located within lands encompassed by the Hellgate Treaty of 1855. The treaty was signed between the United States and the Flathead Indians, Salish, Upper Pend d' Oreilles Indians, and Kootenai Tribes. Within the area encompassing the Hellgate Treaty, the tribes retained rights including fishing, hunting, gathering plants, erecting temporary buildings for the curing, and pasturing their horses and cattle. Ongoing consultation with the Confederated Salish and Kootenai Tribes ensures that their rights are protected. Thus far, the Confederated Salish and Kootenai Tribes and Kootenai Tribe of Idaho have expressed no concerns pertaining to proposed activities within the Pilgrim Creek Project Area.

A map and general project description of the proposed Pilgrim Creek Planning area was submitted to the CSKT Liaison to the KNF in March of 2010 via inclusion of the Pilgrim project in the Forest's annual report to the Tribe. Tribal representatives were also provided with all other scoping information. High probability areas and areas of concern were identified by the Tribes and the Tribal Liaison was given a tour of the project area. No prehistoric sites were located.

American Indian Tribes are afforded special rights under the National Historic Preservation Act (NHPA), the Native American Graves Protection and Repatriation Act (NAGPRA), and the American Indian Religious Freedom Act (AIRFA). Federal guidelines direct federal agencies to consult with modern American Indian Tribal Representatives, who may have concerns about federal actions that may affect religious practices and other traditional cultural uses, as well as cultural resource sites and remains associated with American Indian ancestors. Any tribe whose aboriginal territory falls within a project area is afforded the opportunity to voice concerns for issues governed by NHPA, NAGPRA, or AIRFA.

The American Indian Religious Freedom Act of 1978 protects the "inherent right of the freedom to believe, express, and exercise their traditional religions" (P.L. 95-442 Stat. 1065; 7 U.S.C. 2269). The Forest has identified the Confederated Salish and Kootenai Tribes and Kootenai Tribe of Idaho as having general concerns about the management of the Project Area. These concerns include, but are not limited to, access to sites, use and possession of sacred objects, and the freedom to practice sacred worship ceremonies. There are no areas in the project area known to be sensitive to the Kootenai or Salish Tribes.

Environmental Justice

The alternatives were assessed to determine whether they would disproportionately impact minority or low-income populations, in accordance with Executive Order 12898. No local minority or low-income populations were identified in the area during scoping or effects assessment. No minority or low-income populations would be impacted by implementation of the alternatives.

Potential Conflicts with Plans and Policies of Other Jurisdictions

Heritage Resources – The laws and policies that govern heritage property management of Federal Lands are coordinated with the State Historic Preservation Officer (SHPO) of Montana, who serves in an advisory capacity. The policies for the Forest Service and SHPO are consistent. The Forest Service would inform and consult with Confederated Salish and Kootenai Tribes and Kootenai Tribe of Idaho on proposed activities, site information and potential impacts.

Wildlife – The Forest Service and the Montana Department of Fish, Wildlife, and Parks work together to manage wildlife, but the missions of the agencies differ. The Forest Service manages the land and affects wildlife by modifying the structure and composition of vegetation and by creating and restricting access. The State of Montana manages the animals, and they affect wildlife by adjusting hunting seasons, bag limits, and enforcing other rules that affect the populations of fish and wildlife.

The Forest Service works with the US Fish and Wildlife Service (USFWS) for the recovery of Threatened and Endangered Species. The Forest Service consults with the USFWS when Threatened, Endangered and Proposed Species may be affected.

Water Quality – Section 313 of the Clean Water Act requires Federal Agencies to comply with all Federal, State, interstate and local requirements, administrative authority, and process and sanctions with respect to the control and abatement of water pollution. Executive Order 12088 also requires the Forest Service to meet the requirements of the Act. All action alternatives would comply with the Clean Water Act and Montana State Water Quality Standards. These alternatives would incorporate reasonable Soil and Water Conservation Practices, avoid channel degradation, and comply with the Kootenai Forest Plan.

Air Quality – The prescribed burning of harvest units or natural fuels under all action alternatives has the potential to affect local air quality. This activity is conducted in accordance with the State of Montana air quality guidelines administered by the Montana/Idaho State Airshed Group, made up of industry, State and Federal agencies, and local Health Department representatives.

Potential conflicts occasionally exist between National Forest concerns for meeting land management goals and the commitments of the State Agencies for clean air.

Other sources of potential conflict exist between private landowners within Montana, State land management agencies, and other adjoining National Forests competing for the limited number of suitable burning days. When such conflicts are identified, the Forest Service does not burn.

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR

1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101). Short-term uses are those that generally occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource.

Soil Resources – Proposed activities would result in a decrease in long-term soil productivity for areas of detrimentally disturbed soils. These areas are quantified and described in the soil resources section of this chapter.

Water Quality – The duration of effects of timber management and prescribed burning on the water resource is highly variable and dependent on land and vegetation types. Stream channel conditions are expected to be protected, and water quality is not expected to be impacted by proposed activities. Short-term effects may occur as described in the hydrology and the fisheries section of this chapter. No impacts to long-term productivity are anticipated.

Wildlife – Key habitat requirements for wildlife species include feeding habitat or foraging areas interspersed with nesting or denning habitat and thermal and hiding cover. The appropriate scheduling of timber harvest and prescribed burning can provide and sustain a mosaic of cover and feeding habitat.

Species requiring old forest habitat would experience a short-term reduction in available and/or suitable habitat. If no management action is taken, there is the potential for long-term loss of old forest habitat. Successional vegetation conditions would change over time to provide a variety of habitat stages.

Vegetation – Managed stands of timber produce a higher volume of wood fiber through time, than unmanaged stands. Regeneration of desired, fast-growing species, planting of genetically selected trees, stocking control to reduce competition and improve growth of individual trees, and intermediate treatments to maintain the health and vigor of stands are silvicultural means of maintaining the long-term yield of forest stands.

In short term, harvesting stands that are at high risk of mortality captures economic value that would otherwise be lost. Timely reforestation puts the land back into a productive growing condition.

Depending on the level of timber harvesting and the site preparation method that follows, reductions in organic mater could reduce long-term site productivity. Silvicultural prescriptions include measures designed to maintain varying levels of organic matter. Reforestation of harvest areas could change plant succession, stand development, and species composition.

Air Quality – The temporary impacts of smoke from prescribed burning and road dust from vehicles associated with proposed activities would have minor, short-term effects on visual quality and recreation use. The short-term impacts are offset by minimizing the risks from wildland fire and long-term, increased site productivity. The short-term impact of prescribed burning is necessary to decrease the risk from wildland fire on these sites. Wildland fires generally provide significantly more air pollution.

Unavoidable Adverse Effects

Implementation of any alternative may result in some adverse environmental effects. The severity of the effects can be minimized by adhering to the features of the alternatives, such as the Best Management Practices and other design criteria. If management activities occur, however some effects cannot be avoided. Even the No Action alternative has effects.

Heritage Resources – There is no assurance that every heritage resource site may be located in advance of all planned management activities. Some ground-disturbing activity may affect an undiscovered historic or prehistoric site. Sites discovered in this manner would immediately be protected from further disturbance.

Scenic Resources – The introduction of timber harvest units would add a variety of line, form, color, and texture to the landscape. Forest users may see a modified forest in the foreground, middle ground, and background where harvest and prescribed burning are implemented. All units in the various alternatives are designed to meet or exceed Forest Plan standards for visual resources.

Wildlife – The availability of stand structure, composition, patch size, and specific wildlife habitat elements is dynamic and changes over time. Consequently, wildlife populations associated with specific habitat conditions also change with time. All action alternatives would move habitat conditions within or towards historic ranges. All of the action alternatives would have an effect on the cover/forage relationships in the project area. Changes in habitat availability can cause changes in local population numbers of specific species. Old growth-dependent wildlife species may experience fluctuations in their populations as successional conditions change. Action alternatives can also directly harm species through timber harvest and associated activities. Species primarily affected would be birds, amphibians, and small mammals. Although the proposed action may affect individuals, it is not expected to cause a loss of population viability.

Air Quality – Temporary seasonal effects on air quality are unavoidable under any of the Action Alternatives. Prescribed fire is an integral part of ecosystem management, fuel treatment, and site preparation for reforestation. These activities would be scheduled when air dispersion is good.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Soil Productivity – Best Management Practices would be used to avoid soil productivity losses from timber harvesting and associated road/skid trail construction. Road construction is proposed under some alternatives. Temporary roads, landings and skid trails would constitute and irretrievable commitment of resources even though they would be recontoured or rehabilitated. The soil mixing and disturbance that would be associated with temporary construction would lower soil productivity. While plant and

tree growth on these sites would occur over the short term, full productivity recovery would take decades to hundreds of years. The permanent road construction in Alternatives 2 and 3 would constitute an irreversible commitment of a resource.

Forest Vegetation – Timber harvest would change plant succession, stand development, and species composition. Refer to the forest vegetation and wildlife sections of this chapter for the detailed analysis of this topic.

Air Quality – The impact of prescribed burning and road dust would have temporary seasonal impacts on the air quality in all alternatives except Alternative 1, (No Action). Reduction of air quality would constitute a short-term irretrievable resource impact. Refer to the air quality section of this chapter for the detailed analysis of this topic.

Scenic Resources – Irretrievable changes in the existing appearance of the landscape would occur under the action alternatives. These changes would become progressively less noticeable as vegetation recovers in harvested areas and along roads. Refer to the scenic resources section of this chapter for the detailed analysis of this topic.

Wildlife – The loss or modification of habitat for certain wildlife species is an irretrievable commitment of resources. As vegetation recovers this habitat would recover. However, the time-frame for this to occur may be as long as several decades for mature and old growth-related species. For further details on the effects to wildlife species refer to the wildlife section of this chapter.

Inventoried Roadless Areas – An analysis of Inventoried Roadless Area effects is included in the IRA section. No irreversible or irretrievable commitments of roadless area attributes are anticipated.

U**nroaded Areas -** This DEIS analyzed the effects on the potential future designation of the unroaded areas in the Pilgrim Creek Project area as an IRA or Wilderness. Implementing this project would not pose a significant change on the consideration for future designation, but the indirect and cumualtive effects, size, and location make these unroaded areas unlikely for future designation.

Heritage Resources – Any activity that would disturb a heritage (or cultural) resource is an irreversible commitment.

SPECIFICALLY REQUIRED DISCLOSURES

Threatened and Endangered Species

Threatened and endangered wildlife, fish, and plant species may be affected by the proposed activities in the project area. A biological assessment has been prepared and will be submitted to the U.S. Fish and Wildlife Service for concurrence according to the Endangered Species Act to insure protection of these species. The direct, indirect, and cumulative effects upon plant species are described in the wildlife section of this chapter. The direct, indirect, and cumulative effects upon fish species are described in the fisheries section of this chapter.

Prime Farmland, Rangeland, and Forestland

The alternatives presented are in compliance with Federal Regulation for prime lands. The definition of prime forest land does not apply to lands within National Forests. Lands administered by the Forest Service in the project area do not include any prime farm lands or range lands. In all alternatives, Federal lands would be managed with the appropriate consideration to the effects on adjacent lands.

Energy Requirements and Conservation Potential

Alternatives requiring the most road construction and logging have the least potential for conserving energy. The amount of energy required to implement any of the actions alternatives, in terms of petroleum products, would be insignificant when viewed in light of the production costs and effects of the national and worldwide petroleum reserves.

Urban Quality, Historic and Cultural Resources, and the Design of the Built Environment

Implementation of any of the action alternatives would not affect urban quality. No buildings or other forms of man-made structures would be affected by any of the alternatives. Any historic or cultural resources that may potentially be impacted would be avoided or mitigated. See the cultural resources section of this chapter for more specifics.

Wetlands and Floodplains

Floodplain areas constitute all of the wetlands in the project area and are protected by RHCAs. 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-tenth acre in size. Wetlands would be protected as they are identified, by adhering to Montana State Stream Management Zone regulations, Kootenai National Forest Riparian Area Guidelines as amended by INFS (USDA Forest Service, 1987), Best Management Practices (Appendix D) and Section 404 of the Clean Water Act (33 CFR 323) and Executive Order 11990. The floodplains within the project area would not receive measurable impact from upstream influences. Management activities designed to protect these resources conform to the federal regulations for floodplains (Executive Order 11900). See the hydrology section of this chapter for more specific information

Migratory Bird Treaty Act

Upon review of the information regarding neotropical migratory birds, there would be no significant loss of migratory bird habitat from the implementation of any of the action alternatives.

All action alternatives move stand structure, composition, patch size, and specific wildlife habitat elements within or towards historic ranges. Changes in habitat availability can cause changes in local population numbers of specific species. Proposed actions are expected to maintain sufficient amounts and types of habitat to allow migratory birds to continue to inhabit and reproduce within the project area.

The action alternatives contain practices that avoid or minimize, to the maximum extent practicable, adverse impacts on species of migratory birds. However, proposed actions may harm individuals but are not likely to cause a loss of population viability of associated migratory birds.

National Forest Transportation System

NFMA requires that the necessity of roads be documented and that road construction be designed to standards appropriate for the intended uses, considering safety, cost of transportation, and impacts on land and resources [16 USC 1608]. NFMA also requires that all roads are planned and designed to re-establish vegetation cover on the disturbed areas within a reasonable period of time, not exceed ten years unless the road is determined necessary as a permanent addition to the National Forest Transportation System [16 USC 1604 Sec.8].

In accordance with the Roads Policy contained within 36 CFR 212.5, a travel analysis was completed for the project area that analyzed current and future transportation needs (see the Travel Analysis Report in the project file). Roads were ranked by an interdisciplinary team of resource specialists (with low, moderate or high values) for their benefits and risk to resources and documented for future reference during project planning. The need for new roads to access potential harvest units was stated in the Travel Analysis Report to be looked at on a project specific basis.

The current Pilgrim Creek interdisciplinary team of specialists determined there was a need for some new road construction to access timber for this project as well as for future entries to this area. These roads are proposed as new system roads. Some shorter lengths of road were determined as needed for this project but not needed in the future and therefore are being proposed as temporary roads. Specifics on the proposed construction of permanent system and temporary roads can be found in the alternative descriptions in Chapter 2.

Minerals

Mineral exploration historical took place at many locations in the Pilgrim Creek drainage. There are several historic mining locations in the project area, which have been identified and recorded. As of February 2011, Active mining claims in the project area include the Holiday mine complex (eight claims) located in the West Fork Pilgrim Creek; the Thanksgiving Claim located north of the lower Pilgrim Creek road in Section 26; and the Skalkako Claim located between Pilgrim Creek and Stevens Creek in Section 2. The mines have not been in operation since the 1960s. Annual assessments are being done, but more extensive operations are unlikely in the near future. District archeologists have

recorded the Holiday mine site and details can be found in the district files. There are no patented claims within the Forest boundary in the project area.
Our analysis indicates there would be no known direct, indirect or cumulative effects to mineral claims as a result of implementing one of the action alternatives.

Required Licenses and Permits

All of the action alternatives propose activities that would involve in-stream work (culvert placement, stream channel reconstruction, fish habitat improvements, and watershed restoration projects such as road obliteration). In-stream work must be permitted by the Montana Department of Fish, Wildlife, and Parks. The Forest Service would obtain FG-124 permits prior to implementing any projects that involve in-stream work.

At this time it is uncertain whether this project will require a National Pollution Discharge Elimination System (NPDES) permit, due to several factors.

In Northwest Environmental Defense Center v. Brown, 640 F.3d 1063 (9th Cir. 2011) ("NEDC"), the Ninth Circuit Court of Appeals held that stormwater runoff associated with two logging roads that flows into systems of ditches, culverts, and channels before being discharged into forest streams and rivers is a point source discharge for which a National Pollutant Discharge Elimination System (NPDES) permit is required. The Court of Appeals then remanded to the district court for further proceedings consistent with its opinion. The State of Oregon and other parties filed petitions for certiorari with the U.S. Supreme Court to review the Ninth Circuit's decision. The United States was not a party to litigation.
NEDC v. Brown involved a citizen suit; thus any available relief on remand would be limited to addressing the violation in question and is only binding on the involved parties. Because the USDA Forest Service was not a party, the Ninth Circuit's decision did not impose any affirmative duties on it. However the case has implications for federal land management agencies.

In response to NEDC v. Brown, EPA issued a formal notice on March 23, 2012 in the Federal Register (77 FR 30473) indicating its intent to expeditiously propose revisions to its Phase I stormwater regulations (40 C.F.R. §122.26) to specify that stormwater discharges from logging roads are not stormwater discharges "associated with industrial activity." The notice also states that EPA intends to further study and seek public comment on alternative approaches for addressing stormwater discharges from forest roads.

Additionally, following the Ninth Circuit's decision, Congress took legislative action suspending any potential permitting requirement imposed by the decision:

> From the date of enactment of this Act until September 30, 2012, the Administrator of the Environmental Protection Agency shall not require a permit under section 402 of the Federal Water Pollution Control Act (33 U.S.C. 1342), nor shall the Administrator directly or indirectly require any State to require a permit, for discharges of stormwater runoff from roads, the construction, use, or maintenance of which are associated with silvicultural activities.

Consolidated Appropriations Act, 2012, § 429, Pub. L. No. 112-74, 125 Stat. 786, 1046-1047 (Dec. 23, 2011). Thus, until September 30, 2012, no NPDES permits are required for stormwater discharges from roads associated with silvicultural activities.

Permanent legislation is also pending in both the U.S. Senate and the House of Representatives that would amend Section 402 of Clean Water Act to exempt stormwater discharges resulting from silvicultural activities from NPDES permit requirements.
Due to these factors, it is uncertain at this time whether any NPDES permitting requirements apply, or will apply in the future to stormwater discharges from logging roads. Should it be determined that an NPDES permit is required for this project, the Forest Service will comply with any applicable NPDES permitting requirements.