Chapter 3

Affected Environment and Environmental Consequences

Introduction

This chapter presents both the existing environment of the project area and potential consequences to that environment by implementing the action alternatives presented in Chapter 2. The consequences of no action are also presented. Discussions of the current condition describe the physical, biological, social, and economic environment for each potentially affected resource. Discussions of environmental consequences form the scientific and analytical basis for comparing the alternatives. All direct, indirect, and cumulative effects are disclosed. The means by which potential adverse effects would be reduced or mitigated are also described (also see Chapter 2).

The proposed action and its alternatives are limited to the specific timber harvest, fuel treatments, and reforestation activities on NFS land in the Valley Face Project area, although the geographic extent of some areas used to analyze different components (i.e., fisheries, old growth, wildlife home ranges) may extend beyond the analysis area. The analysis of effects disclosed in this document includes those occurring from the entire "scope" of the decision. Scope is defined in 40 CFR 1508.25 as the range of actions, alternatives, and impacts to be considered in an environmental analysis document. Any new information that develops after the Decision is made would be considered prior to implementation.

The discussions of resources and potential effects take advantage of existing information included in the Forest Plan, other project documents, project-specific resource reports and related information, and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The Project Record for the Valley Face Project includes all project-specific information, including resource reports and results of field investigations.

Affected Environment Analysis

The resource information provided in the Affected Environment narratives includes the effects of past actions in that they are now assessed as part of the existing condition of the landscape. Specific past actions considered in the Affected Environment analysis are summarized in Table 3-1 below. A decade by decade description of the amount and type of past timber harvest is presented in Table 3-2. The Project Record provides additional information for these actions. The list of past actions is not necessarily exhaustive, as records may not exist for all past activities (by project). This is particularly true for those actions that predate the passage of NEPA in 1970. Nevertheless, the effects of such past actions are fully accounted for in the assessment of existing condition as the current condition assessment necessarily reflects the impact of such actions (to the extent they are still affecting the particular resource considered).

Environmental Consequences Analysis

Environmental consequences are the effects of implementing an alternative on the physical, biological, social, and economic environment. The Council on Environmental Quality (CEQ)

regulations implementing the NEPA include a number of specific categories to use for the analysis of environmental consequences. Several are applicable to the analysis of the proposed project and alternatives, and form the basis of much of the analysis which follows. They are explained briefly here.

Direct, Indirect, and Cumulative Effects

Direct effects are those occurring at the same time and place as the initial cause or action. *Indirect effects* are those that occur later in time or are spatially removed from the activity, but would be significant in the foreseeable future. *Cumulative effects* result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative actions are those actions, which when viewed with past actions, other present actions, and reasonably foreseeable actions, may have cumulatively significant impacts and therefore should be discussed in the same environmental analysis document. Past, present, and reasonably foreseeable actions are activities that have already occurred, are currently occurring, or are likely to occur in the vicinity of the project area and may contribute cumulative effects. The past and present activities and natural events have contributed to creating the existing condition, as described in the Affected Environment sections of this chapter. These activities, as well as reasonably foreseeable activities, may produce environmental effects on issues or resources relevant to the proposal. Therefore, the past, present, and reasonably foreseeable activities described in the following tables have been considered in the cumulative effects analysis for each resource area.

Table 3-1. Cumulative Effects Summary by Ownership. Actions spanning each column are relevant to past, present and reasonably foreseeable actions.

Forest Service Action	Past	Present (Fall 2005 – Summer 2006)	Reasonably Foreseeable
Wildland Fire Suppression	Since about 1936, wildland fires have been actively suppressed by the Forest Service and other agencies. Wildland fires will continue to be suppressed. Since 1936, no major wildfire activity that required large-scale suppression has occurred. Wildfires within the project area boundaries have typically been less than one acre and were suppressed using hand crews. A few fires have been over one acre and may have utilized aerially-applied chemical retardant.		
Hunting, Fishing, Trapping	These activities have been and continue to be popular uses of National Forest System land.		
Firewood and Other Miscellaneous Forest Product Gathering	Firewood gathering has occurred and will continue in the future; high energy costs may increase the public's desire to obtain firewood but air quality concerns may also reduce reliance on this source of fuel in the future. Other products gathered in small quantities in the area include posts and poles, mushrooms, berries, and Christmas trees.		
Snowmobiling	A minor amount of this activity currently takes place and is expected to slightly increase in the future.		
Camping/Boating	There are no developed campgrounds in the project area but dispersed camping is popular and will continue. The only boating opportunities are on Bootjack Lake.		
Driving	Driving, sightseeing, and wildlife viewing on open Forest roads will continue.		
Hiking, Mountain Biking, and Horseback Riding	These activities have occurred and will continue to occur on both trails and roadways. All trails and roadways are available to each of these three activities. Some trails in the Round Meadows Cross Country Ski Area were designed and constructed specifically for mountain bikes.		

Forest Service Action	Past	Present (Fall 2005 – Summer 2006)	Reasonably Foreseeable
Cross Country Skiing	Cross country skiing can take place throughout the project area, however most of this activity is focused on the Round Meadows Cross Country Ski Area in the northern part of the project area. Ski trails are groomed with snowmobiles when snow conditions allow.		
Road Maintenance	Roads open for motorized use by the public are maintained with safety as a high priority. Some roads have been closed and are maintained at a lower level. There are approximately 90 miles of road under USFS jurisdiction; 62 miles of which are open year-long and receive a higher level of maintenance. Approximately 11 miles of USFS roads are closed year-long and maintained at a lower level.		
Trail Maintenance	Trail maintenance is accomplished annually on the Tally Lake Ranger District.		
Outfitter and Guiding	No outfitter/guide permits are issued in the Valley Face area.		
Motorized Trail Riding	Many trails in the project area have been and will continue to be open to motorcycles.		
Road Access/ Utilities Special Use Permits	There are twelve road access and/or utility corridor special use permits in effect in the analysis area. The total length of permitted use is less than five miles.		
Noxious Weed Control	Noxious Weed Control as outlined in the 2001 Flathead National Forest Noxious and Invasive Weed Control Environmental Assessment and Decision Notice will continue to take place in the project area.		
Fish Stocking	The only water body in the project area that is regularly stocked is Bootjack Lake. This lake is stocked and managed for trophy-sized trout. The Montana Department of Fish, Wildlife, and Parks intend to continue to manage Bootjack Lake in this manner. It has also been illegally stocked with the non-native pumpkinseed sunfish. Lost Creek and Big Lost Creek were also stocked with non-native brook trout in the 1920s. These fish are now self-sustaining and the streams have not been stocked since.		
Timber Harvest (see Figure 3-2)	Approximately 9,200 of acres of timber have been harvested on National Forest System land since the late 1940s. A majority of the work in the 1960's and 1970's. Table 3-2 below details the acreage by decade for treatment type.		
Cattle Grazing	The Chinook Lake allotment is partially located in the Valley Face project area. Cattle have been grazed on this allotment for many years, although the allotment is currently inactive. The last year cattle were grazed on this allotment was 2003.		
Best Management Practices	Road work to improve surface drainage, stabilize slopes, and reduce erosion and stream sedimentation has occurred in a number of projects in the 1990s. A majority of the work took place near the Round Meadows area, Bootjack Lake and the Tally Lake Road. Details are provided in Exhibit M-2.		

Forest Service Action	Past	Present (Fall 2005 – Summer 2006)	Reasonably Foreseeable
Road Construction	Approximately 106 miles of road have been built on federal land in the project area. This total includes National Forest System Roads, Flathead County roads, and private roads under permit. The roads are in varying levels of use, ranging from the highly used Tally Lake Road to roads that have been closed and are no longer drivable. These roads were built since the beginning of the last century, though the majority of roads built on federal land were completed between 1950 to the mid-1980s. The 1992 Lost Reid Timber Sale included the most recent system road construction of four miles. Exhibit M-1 details past road construction and current road status.		
Trail Construction	Nearly all trail construction in the project area took place prior to 1990. The most recent trail construction took place in 2002 and 2003 at the Round Meadows Cross Country Ski Area.		
Precommercial Thinning	Approximately 4600 of acres of sapling-sized stands have been thinned since the late 1960s. Some of these stands originated from wildland fire and others from timber harvest activities.	A decision has been made to thin a total of 201 acres in the project area. Four thinning units are located in T30N, R23W and one unit is located in T31N, R23W. All of this thinning should be accomplished by the beginning of November 2006.	
Wildland Fire	There is evidence of extensive wildland fire in and near the project area over the last several hundred years. Most recently, large fires burned approximately 1700 acres on all ownerships in the project area in 1910, 1800 acres in 1917, and 2000 acres over two separate fires in 1931.		Wildland fires will continue to occur within the Valley Face area and suppression efforts may not prevent large, high severity fires from occurring in the future.

Forest Service Action	Past	Present (Fall 2005 – Summer 2006)	Reasonably Foreseeable
Predator Control	Some predator populations, such as wolves and coyotes, were reduced in numbers from the project area in the early part of the last century.		
Beaver Control	Trapping of beavers and destruction of beaver dams occurred up to the 1990s.		
Temporary Road Openings			Short-term (less than three months), one-time opening of roads closed yearlong to public access for the purpose of firewood gathering is likely to occur. Which roads would be opened in what years is not known at this time.
Round Meadow Cross Country Ski Area Improvements			Reconstruction of the existing but abandoned cross-country ski trail network on the south side of the Star Meadow road could occur in the next three years. The amount of trail to be reconstructed and what additional improvements would be necessary are not known at this time.

Other Actions	Past	Present (Fall 2005 – Spring 2006)	Reasonably Foreseeable
Cattle Grazing	Grazing will continue to occur on private land.		
Private Land Development	The construction of roads and buildings on private land within the project area has been occurring for decades and will continue. The rate of development on private land has been recently increasing.		
Road Construction	Roads have been constructed, are being constructed, and will continue to be constructed on private and State of Montana land within the project area. Most of these roads are used to access private residences but other roads are used for forested land resource management. Most of the roads constructed and maintained on industrial timber lands meet Best Management Practices. Miles of road on private and state lands are difficult to quantify.		
Timber Harvest	Timber harvest has occurred in the past on F.H. Stoltze Land and Lumber Company Land, Plum Creek Timber Company Land, other industrial timber lands, private property, and lands managed by the State of Montana. An estimated 6000 acres, or 40 percent of non-	Timber harvest may be occurring on F.H. Stoltze Land and Lumber Company Land, Plum Creek Timber Company Land, other industrial timber lands, private property, and lands	Montana DNRC is planning to harvest timber on their property in the Pete Ridge area in the east side of the analysis area over the next several years. Their proposal is being developed.

Other Actions	Past	Present (Fall 2005 – Spring 2006)	Reasonably Foreseeable
	Forest Service lands, have had regeneration harvest over the past 50 years (Exhibit P-2). Intermediate harvests, ranging from a few scattered trees to thinning over a half of the trees in a stand, has also occurred on the majority of these lands. Since 2003, approximately 600 acres have been harvested on Plum Creek, Stoltze, and MT DNRC lands.	managed by the State of Montana. Plum Creek expects to complete harvest on about 27 acres in 2006. Ongoing harvest is not expected on the other ownerships.	F.H. Stoltze Land and Lumber Company will continue to manage their lands, including harvesting timber, according to their stewardship principles. They expect to manage primarily for bark beetle salvage and prevention and to maintain healthy, vigorous stands. However, they have no specific areas identified. Plum Creek Timber Company does not have plans for additional harvest in the foreseeable future. Small private landowners are expected to harvest timber for fuels reduction, development, and stand management. However, no specific areas are identified.

Table 3-2. Past Timber Harvest Activity on National Forest System land.

Harvest Type	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Regeneration	0	911	1086	2574	991	704	0	6266
Intermediate	?*	49	546	2326	102	3	0	3026
Totals	?*	960	1632	4900	1093	707	0	9292

*No records exist

VEGETATION

Introduction

This section describes the existing vegetation conditions of the Valley Face area and how the no action alternative and two action alternatives would affect the various components of this resource. A number of vegetation parameters could be affected by implementation of the alternatives, so they will each be analyzed. Vegetative structure and composition, insect and disease, threatened and sensitive plants, and noxious weeds will be discussed at the landscape and stand level to facilitate analysis of direct, indirect, and cumulative effects. Past, present, and reasonably foreseeable activities are identified and considered in the analysis of effects. Refer to the Fire and Fuels, Old Growth, Riparian, and Snag and Downed Wood wildlife habitat sections for further information on how vegetation affects those resources.

Information Sources

This analysis area coincides with that used for the Valley Face EAWS completed in 2005 (Exhibit U-3). Information collected for the EAWS, as well as existing Forest Service databases, provided the information used to characterize the affected environment for vegetation.

The Forest Service Natural Resource Information System (NRIS), specifically the FSVeg database, was the primary data source used to describe existing vegetation conditions on National Forest System lands. It contains information such as stand age, species composition, and average diameter for stands that have had field inventories (stand exams). Aerial photos taken in 1997 and 2003 were used to classify vegetation in stands without exam data and to verify or update the field data. All of the stands proposed for treatment were field reviewed by a silviculturist, fuels specialist, and/or timber sale preparation specialist to verify the vegetation data and diagnose the treatment needs. Summaries of vegetation characteristics for stands proposed for treatment are located in the project file (Exhibit P-3).

The primary data source for vegetation conditions on state and private lands was R1 Vegetation Map (R1 VMP) (Brewer et al. 2004). It is a satellite image classified to provide information about species composition, stand size class, and canopy cover.

Both FSVeg and R1 VMP provide consistent baseline data with accuracy assessments for vegetation conditions. The results of all of the above data are summarized in the Valley Face Geographic Information System (GIS) files (Exhibit P-4).

Analysis Area

The analysis area used to examine the impacts of the proposed action and associated alternatives on vegetation resources is displayed on the Vicinity Map, Figure 1-1, in Chapter 1. The area directly, indirectly, and cumulatively affected by the proposed action and its alternatives is defined by the National Forest System lands and other ownership within the Valley Face project area. The effects analysis focuses on proposed treatments that may have measurable effects on vegetation structure, composition, or distribution. The stands proposed for treatment are in Management Areas 7, 9, 15, 15B, and 17 as described in the Flathead National Forest LRMP. The time frames for this analysis are focused on the period during and immediately after implementation of activities. Immediate effects are described as lasting until shrubs and trees are

established as a canopy layer in areas disturbed by treatments, approximately 2030. However, some effects of treatments may last up to 100 years, until the next stand altering disturbance, such as thinning, timber harvest, or wildfire.

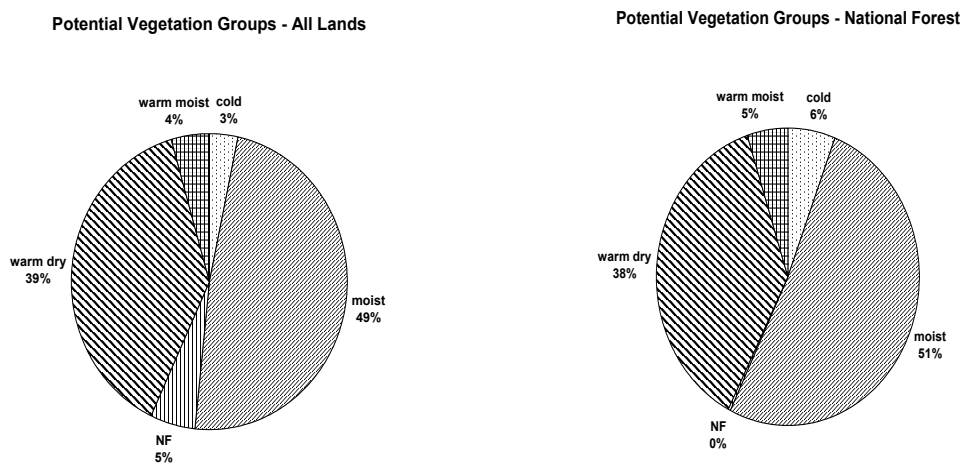
Affected Environment

Vegetative Structure and Composition

Potential Vegetation Groups (PVG)

Forest vegetation develops through continually changing ecological processes involving soils, weather, and disturbance patterns. Vegetation attributes such as stand age and type of current vegetation community can also influence vegetation development. The Valley Face landscape and the processes at work there can be examined by using a land classification system (Pfister et al. 1977). A classification system describes relatively homogeneous physiographic units that are characterized by identifying the potential vegetation that would occupy the site in the final stage of succession. Such units are termed Potential Vegetation Groups (PVGs), and they display similarity in potential natural vegetation, nutrient cycling, successional change, productivity, and fire behavior. Four PVGs have been identified and mapped in the Valley Face area and percentages for each type have been calculated (Exhibit P-7, Figure 3-1).

Figure 3-1. Potential Vegetation Groups.



Moist PVG

This PVG represents the cool moist and cold moist potential vegetation types between 3100 and 5800 feet in elevation. This is the dominant PVG in the analysis area covering 48 percent (Figure 3-1). Average annual precipitation for this PVG is about 27 inches. It is found on glacial moraine and glacial scoured hillside landforms.

The majority of the stands in this PVG are comprised of a mix of conifer species: Douglas-fir, subalpine fir, Engelmann spruce, western larch, and lodgepole pine. This PVG occupies most aspects due to the elevation and climate; however, vegetation attributes vary some based on aspect. On northern and eastern aspects, age classes in mid-to late-successional stages tend to be

single to multi-structured. These stands develop as a result of stand-replacement fires. The mid- to late-seral stands on the south and west slopes were primarily generated by mixed-severity fires with more vertical structure resulting from fire survivors. Tree density is typically high, reflecting favorable climatic and soil conditions. This PVG is one of the more productive areas for vegetation on the Tally Lake Ranger District. In early-seral stages, understory plants (forbs and shrubs) are abundant depending on the intensity of past fires, timber management, and seed availability.

Warm Dry PVG

This PVG occurs at lower elevations and covers 39% percent of the Valley Face landscape (Figure 3-1). The elevation ranges from 3000 to 5200 feet, with most below 4000 feet. It occurs on all aspects, but more on east, south, and west. The average annual precipitation is less than 20 inches. It is found mostly on glacial moraine, stream terrace, and structural break landforms. Open stands of coniferous forest dominate this type of PVG, except where lack of fire or other disturbances have encouraged more dense stands. The existing cover is a combination of Douglas-fir, ponderosa pine, western larch, and lodgepole pine, with minor amounts of subalpine fir, Engelmann spruce, western red cedar, grand fir, and white pine. These stands develop primarily as a result of low and mixed-severity fires where many fire-resistant larger trees survive multiple disturbance events. Late successional stands consist of multiple vegetation layers with long-lived shade intolerant emergent trees. Areas within this PVG on south and west aspects can be difficult to regenerate if all the tree cover providing shade is removed.

Warm Moist PVG

This PVG occurs in valley bottoms and uplands and covers less than five percent of the Valley Face landscape (Figure 3-1). The elevation ranges from 3200 to 4800 feet. The average precipitation is about 32 inches. It is found mostly on glacial moraine landforms. Dense coniferous forest and occasional meadow openings dominate this type of PVG. The existing cover is a combination of Douglas-fir, western larch, lodgepole pine, subalpine fir, and Engelmann spruce, with minor amounts of western red cedar, grand fir, and white pine. These stands develop primarily as a result of mixed-severity fires where some trees survive multiple disturbance events. Late successional stands consist of multiple vegetation layers with long-lived shade intolerant emergent trees.

There are inclusions of wet or riparian type habitats that are dominated by climax species such as subalpine fir, grand fir, and Engelmann spruce.

Cold PVG

This PVG is in the upper subalpine setting of the Valley Face landscape above 4600 feet in elevation. It is found on glacial scoured hillside and some glacial moraine landforms.

The climate is characterized by a short growing season with early summer frost. Annual precipitation averages 30 inches and falls mostly in the form of snow. Soil moisture is typically high during the summer months; however, a period of successive drought years has rendered many sites abnormally dry. Soils tend to be shallow and rocky. Subalpine fir, lodgepole pine, and western larch are the dominant forest types in this zone. Associated species include Douglas-fir, and Engelmann spruce. Common indicator plants and shrubs include alder, elk sedge, and whortleberry. Fire is the primary disturbance process, usually preceded by drought and insect or

disease events. Lightning-caused fires are the most common causes of wildland fires. Fire regimes here are normally long interval stand replacement (high severity). However, cool and moist conditions coupled with broken topography and limit fire spread and create a mosaic of patches where non-lethal and mixed severity fires also occur.

Historical Conditions and Methodology

The evaluation of how closely the Valley Face area emulates historical vegetative conditions relied on a process using R1 Vegetation Map and a landscape disturbance model called SIMPPLLE (Exhibit P-5, Exhibit P-12, Brewer et al. 2004). The results were compared with those used to evaluate the natural variation in landscapes in the Upper Columbia River Basin (UCRB). That was a process developed by Hessburg et al. 1999. Various parameters of the Stillwater watershed were compared with average conditions for similar watersheds within the UCRB. The product of this evaluation is frequently referred to as the historic range of variability (HRV).

The current proportion of vegetation cover types, structure classes, and patterns within the Valley Face area vary widely from the range of historical conditions. Some ecologically substantial changes have been detected, as discussed below. Consistent with findings from the UCRB study, the Valley Face results suggest that the functioning of ecological processes have declined as a result of fire exclusion, increased road density, and past timber harvest patterns. Some vegetative conditions are near the historical mean or median value; others are at or near the maximum or minimum amount found historically. Variation over time and across the landscape is desirable as it adds to the vegetative diversity and resilience to disturbances at the larger scale. Specific vegetation conditions of interest or concern--as well as areas of opportunity for changes--are further discussed below. Two important points to note are:

> 1) The structure (size) class distribution is currently within historical ranges. However, the large tree class is at the very low end of the historical range at 28 percent and the seedling/sapling class is at about twice the historic mean of 7 percent.
>
> 2) Historically, the Valley Face area was occupied by about the same amount of shade-intolerant cover types. However, the Douglas-fir type occupied an average of 20 percent of the landscape and now occupies about 44 percent. Western larch historically covered an average of almost 30 percent and now averages 8 percent. Lodgepole pine historically dominated less than 1 percent and now averages 7 percent.

Forest Structure and Pattern in the Valley Face Area

Forest or stand structure refers to the mix and distribution of tree sizes, canopy layers, and ages in a forest. It is a function of disturbance and plant succession. Successional stages are developmental stages of a forest and can be described in terms of forest structure. The UCRB and Amendment 21 to the Flathead LRMP divide vegetative structure into three different successional stages. These stages are described as early-, mid-, and late-seral. For the Valley Face analysis, structure classes will be used to group stands by size rather than seral stage, as described in the following paragraphs and displayed in Figure 3-2 (Exhibit P-9):

The *seedling/sapling structure class* describes a forest of forbs, grasses, shrubs, tree seedlings, and saplings. It represents the early-seral successional stage. Under the natural disturbance regimes in this landscape (mainly large-scale fire), at any point in time the amount of area in a

seed or sapling stage of forest development could range from none up to about 25 percent. Currently, the seedling/sapling class covers about 15 percent of the Valley Face area. The grass and shrub classes cover about 5%. Most of the areas now in the grass and shrub classes were historically potentially forested and would have been in the seedling/sapling class. Now they are mostly agricultural and private developed lands. Together these classes are within and near the high end of the historic range. The seedling/sapling class is more than two times the historic mean of 7 percent.

Fires historically created large openings, which were soon regenerated with a diversity of tree species. Mean fire disturbance size for fires greater than 100 acres in and near the Valley Face area from 1889 to the 1930's was 6,740 acres, ranging from 394 to 21,726 acres (Tally Lake District Fire Atlas, on file at the District Office). Mean patch size for all fires within the boundaries of the Valley Face area since 1989 is about 970 acres. Few fires have burned on this landscape over the past 75 years. HRV analysis for the Flathead National Forest revealed average seedling/sapling patch sizes of 200 to 300 acres in the Stillwater watershed (Exhibit P-11). Presently, average patch size in the seedling/sapling class in the Valley Face area is 32 acres, ranging from 1 to 260. The current maximum patch size is within the historical range, but the average size is well below the historic minimum (Exhibit P-13). Although the amount of young, open forest structure class is within the desired historical ranges, the sizes of these forest patches are smaller than those that existed historically, primarily the result of timber harvesting creating small openings. This highlights the differences in patch size that result from timber harvesting compared with fire as disturbance processes.

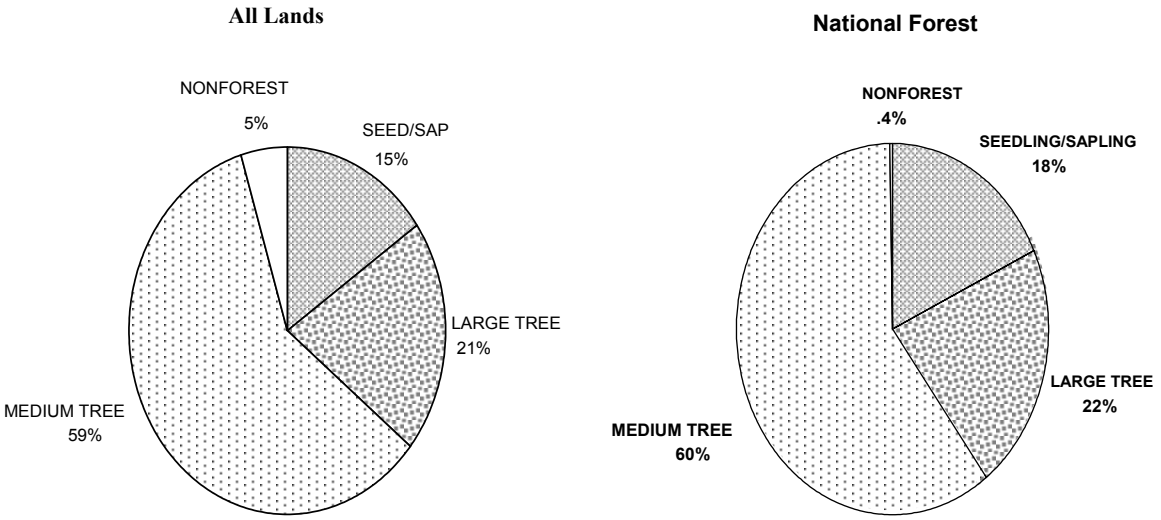
The *medium tree structure class* describes a forest of pole and medium size trees with the average diameters ranging from 5 to 15 inches. Most of the trees in this stage are usually at low risk from natural disturbances, such as insects, diseases, windstorms, or severe fires. It represents the mid-seral successional stage. Historically, this structure class covered from 25 to 100 percent of the Valley Face landscape, with an average of 43 percent. It currently covers about 60 percent. Considering the large amount of warm-dry habitat types and that historically there was more western larch and less Douglas-fir and lodgepole pine, we can assume this class had more open canopies than the current condition.

The current average patch size in the medium class in the Valley Face area is 70 acres, ranging from 2 to 3464 acres.

The *large tree structure class* describes a mature forest with many trees greater than 15 inches in DBH. In these stands, the stand development changes begin to slow down, creating some stability for a time. This stage contains large trees and multi-layered canopies that can be more susceptible to natural disturbances. Old growth conditions can develop during this stage (Green et al. 2005). Large live trees, large snags, and downed logs are abundant enough to provide habitat for a variety of old growth associated fauna. This class represents the late-seral successional stage. It currently covers just over 20 percent of the Valley Face landscape. This is at or slightly less than the historic range of 25 to 100 percent and about half of the historic average of 50 percent. Also, considering the large amount of warm-dry habitat types and that there was more western larch and less Douglas-fir and lodgepole pine, we can assume this class had more open canopies than the current condition.

The current average patch size in the large class area is 52 acres, ranging from 1 to 1265 acres.

Figure 3-2. Forest Structure Class Distribution



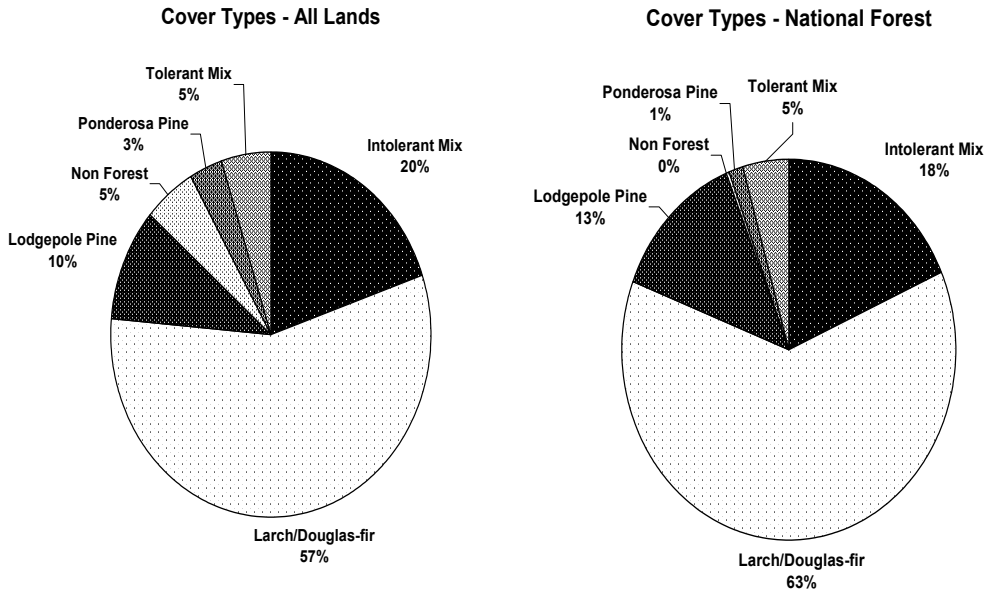
Cover Type

Cover type refers to the dominant tree species that currently occupy a forested area (Helms 1998). Within the Valley Face area, Douglas-fir is the dominant tree species on about 44 percent of the area. The next most abundant cover type, at 17 percent, is a mix of shade-intolerant species including Douglas-fir, western larch, lodgepole pine, and others where no single species is dominant. The western larch cover type, which has Douglas-fir as the primary associate, comprises 14 percent of the area. Other types have more minor representation: lodgepole pine with ten percent; ponderosa pine, subalpine fir, and spruce, each with about three percent. Douglas-fir is a major species on approximately 75 percent of the landscape and approximately 80 percent of the national forest in the project area. Many stands that are dominated by Douglas-fir, especially in mature or older stands, are vulnerable to natural agents of change, such as insect epidemics, and mortality from diseases, or fire. Many stands are currently affected by high levels of bark beetles and/or root disease.

For the purposes of this assessment, the cover types will be grouped into five classes: (1) Douglas-fir/western larch, (2) shade intolerant mix, (3) lodgepole pine, (4) shade tolerant mix of mostly spruce and subalpine fir or grand fir, and (5) ponderosa pine. Note that Douglas-fir is the primary associate of larch in both Douglas-fir/larch and intolerant mix cover types. The next section will provide a detailed description of the existing condition of the cover types.

Figure 3-3 displays the distribution of cover types for both national forest and private lands within the analysis area (Exhibit P-8).

Figure 3-3. Distribution of Cover Types.



Descriptions of Stands, Grouped by Cover Type

Current conditions of all National Forest stands in the Valley Face area were grouped based on dominant tree species, structure class, and habitat type. Stands within a group can be expected to respond similarly to disturbances and successional changes. These groupings will be the basis for describing changes on the landscape in the Environmental Consequences discussion of this section.

The stand groups are presented in the order of abundance in the Valley Face area.

Larch/Douglas-fir and Shade Intolerant Mixed-Conifer Stand Groups – 16,295 acres of National Forest System Lands

These groups are the most widely represented and complex of all the stand groups due to species variation, structure, and disturbance regime. Typically, Douglas-fir and western larch are the primary species in these stands. Lodgepole pine, ponderosa pine, subalpine fir, grand fir, and Engelmann spruce are other common associates. In these groups, western larch, lodgepole, and ponderosa pine are always seral species that, historically, have been maintained by wildland fire. Larch develops in mixed-species stands, secures an early height advantage over its competition, and continues to outgrow them for a century or more unless weakened by insects or disease. In the absence of disturbance, Douglas-fir, subalpine or grand fir, and spruce dominate the understory forming multi-strata stands.

The larch/Douglas-fir group is stands where one species accounts for 60 percent or both species together comprise over 80 percent of the trees. The intolerant mixed species group has a more diverse composition where no single species makes up more than 60 percent of the trees.

Structural/successional stages represented in this group include mostly medium and large tree with 25 to 90 percent canopy cover. About 20 percent of the acreage in this group is seedling/sapling stands. Old-growth stands are included in the large trees structure.

Seedling/sapling or early-seral stands are in the larch/Douglas-fir group. They are even-aged stands created by regeneration harvesting over the past 15 to 30 years. They are sapling sized (1 to 5 inches DBH) and densely stocked with a mix of larch, Douglas-fir, lodgepole pine and lesser amounts of other species.

Medium tree structure or mid-seral stands in these groups are also primarily even-aged, ranging from 50 to 200 years old and from 5 to 15 inches DBH in size. They are typically single or two strata with a few emergent trees. The understory consists of smaller, more shade-tolerant trees. In most cases, growth equals mortality in terms of cubic foot volume.

Large tree structure or late-seral stands are mostly in larch/Douglas-fir group. They range in age from 80 to over 200 years old; usually with two or more age classes. Structure is diverse having generally two strata, and often three or four. With each stratum, tree diameters change. Trees in the upper level strata range from 15 to over 30 inches DBH. Middle to lower level strata tree diameters range from saplings to 15 inches DBH.

Most old growth stands in this group are included in the large tree structure, although some are in the medium tree type. The character of old growth stands resemble the large tree or late-seral stands with: (1) more large trees, (2) a wider range of ages and heights, (3) a greater amount of decadence (snags or coarse woody debris), and (4) more small gaps or openings in the forest canopy. In the old growth stands, dominant overstory tree ages are greater than 180 years and commonly exceed 250 years. All stands identified as old growth meet the Western Montana Zone old growth definitions (Green et al. 2005; Appendix C, Flathead LRMP, Amendment #21). Three stands that are currently old growth are proposed for regeneration harvest in Alternative B. These stands are currently deteriorating from insect and disease infestations that jeopardize their future ability to function as old growth habitat. *(NOTE: At the time of implementation, these old growth stands would NOT be included in any proposals if they retain their old growth status.)* See Chapter 3 Old Growth for more detail.

All PVGs are represented in these stand groups. However, most of the larch/Douglas-fir group is in the warm dry PVG and most of the intolerant mixed conifer group is in the moist PVG. The moist types have more of spruce, grand fir, and subalpine fir in all strata, while the warm dry type has a more Douglas-fir and ponderosa pine. The response to disturbance, whether from blowdown, harvesting, or fire, is somewhat different between PVGs. The vegetative response to disturbance in cold and moist types would result in greater amounts of grouse whortleberry, false huckleberry, beargrass, lodgepole pine, and associate species. The vegetative response to disturbances in warm dry type favors pinegrass, snowberry, buffaloberry, Douglas-fir, ponderosa pine, and other associated species. Complete descriptions of these plant associations can be found in Pfister et al. (1977).

The larch/Douglas-fir and mixed-conifer types are dominated by mixed severity fire regimes. Mixed-severity fire regimes typically create mixed species stands. The relatively frequent disturbances allow regeneration of early-seral species such as larch, lodgepole and ponderosa pine, and to a lesser degree Douglas-fir.

Lodgepole Pine Stand Group - 2600 acres of National Forest System Lands

Stands in this group are primarily even-aged and resulted from stand replacement fires in 1910, 1917, 1919, and 1931. Most are mid-successional in their development. About 9 percent of the stands are seedling/sapling structures. Stands are dominated by pole-sized lodgepole pine trees

with varying tree densities ranging from well-stocked to densely overstocked. Canopy cover ranges from 30 to 70 percent. Dense stocking results in many small diameter stems that can succumb to snow loads or possibly mountain pine beetles.

Stands in this group are primarily in the warm dry and moist PVGs; a few are in the cold PVG. Where there are sufficient openings in the canopy, an understory of grouse whortleberry, twinflower, kinnikinnick, and alder exists, as well as subalpine or grand fir and Engelmann spruce. On the warmer and drier sites, beargrass, pinegrass, and buffaloberry cover the forest floor.

Fuel Model 10 (Anderson 1982, Exhibit 0-6) characterizes the current fuel profile for this type of stand. Fuel loading in tons per acre varies widely in this fuel model. The heaviest fuel accumulations are on the north and east aspects where moisture regimes allow sufficient growth to make trees susceptible to mountain pine beetle. These conditions have resulted in partial stand mortality and large amounts of dead, standing, and down trees. These stands were thinned from mortality by mountain pine beetle in the late 1970s and early 1980s and have average diameters at breast height (DBH) of five to nine inches. On south and west aspects, growth potential is less. However, stand density is greater and natural thinning has caused mortality primarily in smaller diameter trees of three to seven inches DBH.

Historically, these stands become susceptible to mountain pine beetle after about 80 years (Cole and Amman 1983). These stands are now 70 to 100 years old. Based on history of fire as evidenced by sampling fire scars in the Logan and Good Creek drainages, the interval between fires in the mixed-severity regime is directly correlated to the susceptibility of stands to mountain pine beetle occurrence; i.e., the longer the interval between fires, the more susceptible that stand is to mountain pine beetle attack.

The aspect, topography, and potential vegetation of the area would support a mixed-severity fire regime. Based on the environmental conditions and evidence of fire-scarred trees, it is reasonable to classify the area as a mixed-severity type. This implies that historical disturbance processes included light to moderate severity fires as well as the severe stand replacement type indicative of the last disturbance. The north and east aspects appear to support historical lethal stand replacement fire regimes.

Shade-tolerant Mixed Conifer Stand Group– 925 acres of National Forest System Lands

This group has a mix of Engelmann spruce, subalpine fir, grand fir, lodgepole pine, Douglas-fir, and other trees. It occupies lower elevation moist sites, stream bottoms, and basins characterized by slow drainage and accumulation of cold air. The age and size of trees is highly variable within stands. Most stands are dominated by medium and pole sized trees; about 30 percent are large tree structure class. Canopy cover ranges from about 30 to 90 percent. Stands in this group are in the moist and cold PVGs. The historical fire regime can be described as long interval stand replacement with some mixed severity.

This group includes only one unmanaged stand proposed for treatment. The stand proposed for treatment is in the moist PVG, medium tree structure class and mid-seral stage of successional development.

Fuel Models 8 and 10 (Anderson 1982) characterizes the current fuel profile for these stands. While fuel loading in tons per acre varies widely in this fuel model, overall fuel levels are high in

most of these stands. Root disease, blowdown, and bark beetles have caused low levels of mortality.

Ponderosa Pine Stand Group – 240 acres of National Forest System Lands

The stands in this group are even-aged and resulted from planting or seeding after stand replacement fires and subsequent harvesting in the 1930s, 1960s, and 1970s. They are early to mid-successional in their development. The stands are dominated by pole and medium sized ponderosa pine mixed with Douglas-fir, lodgepole pine and other trees. One stand (92 acres) is sapling. Canopy covers ranges from 30 to 60 percent. Ponderosa pine is scattered in the other stand groups, but is the dominant species here.

Stands in this group are in the warm dry PVG. Common understory vegetation includes pinegrass, twinflower, kinnikinnick, and buffaloberry, as well as small Douglas-fir and grand fir.

Fuel Models 8 and 10 (Anderson 1982) characterizes the current fuel profile for these stands. Fuel loading varies with the heaviest fuel accumulations in the older stands that has more understory development and dead wood accumulated from natural thinning.

The aspect, topography, and potential vegetation of these stands would support mixed-severity or non-lethal fire regimes. The current species mix could survive low-intensity fires, if some of the smaller trees are thinned.

Insects, Diseases, and Windthrow

Insects and diseases are natural components of a healthy ecosystem. In most forest ecosystems, they are the major nutrient recyclers for soils and provide food and habitat for a variety of birds, amphibians, reptiles, and mammals. Insects and diseases commonly cause mortality in large forested areas and can affect a number of resource values. These effects relate directly to those described in the purpose and need for management actions described in Chapter 1. The following discussion focuses on the most prevalent insects and tree diseases that can impact forest vegetation. For a detailed discussion of the natural history and types of damage caused by these insects and diseases, see Exhibit P-1.

Douglas-fir Bark Beetle (*Dendroctonus pseudotsugae*). – This insect species is of greatest concern due to the amount of tree mortality it has caused in recent years and the potential for increased mortality to continue. Endemic populations of Douglas-fir bark beetles (DFBB) are common and integral to the functioning of an ecosystem. They infest and kill Douglas-fir trees throughout most of its range in western North America. However, when environmental conditions are suitable and susceptible trees are abundant, beetle population levels can rapidly increase and spread. During outbreaks, they commonly kill groups of 100 trees or more. Outbreaks of longest duration coincide with drought. A DFBB epidemic has been affecting the Valley Face area, as well as most of the Douglas-fir forests in western Montana for the past eight years.

The potential for a bark beetle epidemic to occur can be evaluated in terms of risk and hazard. The risk of an epidemic relates to the population of bark beetles in the vicinity. If bark beetle populations are high, then the risk of future mortality to Douglas-fir trees and an epidemic population has been elevated.

Hazard refers to the susceptibility of a stand to infestation. Warm dry conditions throughout the year are considered an environmental hazard for DFBB. Precipitation for the past seven years has

been below average, causing moisture stress in trees. Stressed trees are more vulnerable to insect invasion. The potential for increased mortality to Douglas-fir will continue as long as drought conditions persist.

Another aspect of hazard is the amount of breeding and feeding habitat available for bark beetles. Entomologists have developed a model for rating DFBB hazard based on habitat conditions (Negron et al. 1999, Randall and Tensmeyer 1999). The hazard rating measures the ability of a stand to support a population of DFBB based on characteristics such as number of Douglas-fir per acre, stand age, and average tree diameter. Hazard levels are categorized as very low (none), low, moderate, and high. The Valley Face area was evaluated using a modification of this hazard rating system (Table 3-3).

Table 3-3. Hazard Rating for Douglas-fir Bark Beetle on National Forest System lands in the Valley Face area.

Douglas-fir Beetle Hazard Rating	Acres	Percent of National Forest at Risk
None to Very Low	6,227	31%
Low	2,778	14%
Moderate	9,456	47%
High	1,681	8%

Exhibit P-1

Of the 20,100 acres of National Forest System land in the Valley Face area, 13,873 acres were determined to have some level of hazard. Based on aerial detection and ground surveys, most of the DFBB infestation occurs in stands with a hazard rating of moderate to high. However, due to the high-risk conditions that currently exist (i.e., high populations and extended drought), even stands rated as low hazard are becoming infested with DFBB. Taking a conservative approach to estimate the potential for future mortality, 11,137 acres of National Forest System land in the Valley Face area are currently in a moderate to high hazard rating.

The most effective actions for managing actual or potential beetle infestations are efforts aimed at preventing outbreaks rather than suppressing them (Samman and Logan 2000). This involves modifying susceptible stands, to the extent possible; to make them less vulnerable before a disturbance occurs that could trigger a beetle attack. Actions may include altering tree densities and species composition. Once an outbreak occurs, removal of infested and potentially susceptible trees is the most effective action to take to minimize beetle impacts. A less effective strategy for reducing mortality in the short term utilizes pheromones to trap and repel beetles, burning/peeling infested logs to destroy brood, and chemical treatments. All these methods have been tested and are applicable in the proper circumstances. Many of these strategies may be employed in this project.

Other Insects and Diseases Affecting the Valley Face Area

Several other forest pests are active in the Valley Face area. The most common ones that are currently or expected to affect the forested stands include Mountain Pine Beetle, Spruce Beetle, Western Balsam Bark Beetle, Fir Engraver Bark Beetle, and Dwarf Mistletoe. See Exhibit P-1 for a discussion of these insects and diseases.

Past Timber Management

Timber harvest on National Forest System lands in the Valley Face area has occurred to varying degrees since the turn of the century. In the early 1900s, timber harvest consisted of removing individual or small groups of large western larch, Douglas-fir, Engelmann spruce, and ponderosa

pine. Timber management that removes some trees in a stand while leaving the majority intact is referred to as intermediate harvest. Examples include commercial thin, liberation harvest, and salvage. These types of harvest methods reduce fuel to some degree. However, as growth and development progresses over time, green trees and shrubs contribute to the vertical structure and fuel complex. Tree species that dominate the understory are primarily shade tolerant and relatively short-lived.

Before the 1950s, records about the amount, location and type of timber harvesting were not entered into our current databases or file systems. However, evidence of logging, such as old stumps, landings, and skid roads, can be found in many parts of the Valley Face area.

Since the 1950s, timber production has been the major land use activity on National Forest System lands in the Valley Face area. Even-aged timber management such as clearcutting, seed tree, and shelterwood harvests and associated road construction substantially influenced stand structure and fuel levels. In the 1970s, there was an increase in the amount of both regeneration and intermediate harvest. This is consistent with an increase in timber harvest across the west during that time; it also reflects attempts to prevent and control the mountain pine beetle outbreak that occurred in the later part of that decade. Timber harvesting on State and private lands also occurred throughout this period.

Table 3-2 near the beginning of this chapter displays the acres of various timber harvests on National Forest System lands by decade (Exhibit P-2).

Reforestation - On the national forest, reforestation in previously harvested stands has been successful. The National Forest Management Act of 1976 included requirements to assure forestlands meet reforestation objectives within five years after final harvest. Regeneration indices for the Valley Face area show a 93 percent success rate in meeting these reforestation objectives since 1976 (Exhibit P-6).

Some units were regenerated naturally and others were planted. Both naturally regenerated and planted units were certified as meeting stocking objectives an average of 5.5 years following final harvest. Of the 4000 reforested acres, 150 (less than 4%) were successfully reforested by planting after an initial failure; most of these were initially natural regeneration units.

Environmental Consequences

This section describes the effects on vegetation from implementation of the alternatives. Alternative A (No Action) provides a baseline for comparison of effects from the action alternatives. The effects of Alternative A represent potential natural changes over time. The effects on vegetation are discussed as changes over time for each forest stand group. Effects from the treatments proposed in the action alternatives relate to changes in:

- stand density
- species composition
- stand structure or successional stage
- potential for mortality from bark beetles, particularly Douglas-fir beetle
- noxious weeds *(described in a separate section of this chapter)*
- threatened and sensitive plants *(described in a separate section of this chapter)*

- potential for wildland fire and hazardous fuel reduction *(described in a separate section of this chapter)*

The effects of each alternative are also summarized for specific components of the vegetation resource, including reforestation, opening size, and habitat fragmentation.

The description of effects in this section incorporates the most recent research literature, stand data, and monitoring results.

Direct and Indirect Effects-Alternative A (No Action)

Alternative A would have no short-term effects on vegetation and would allow natural processes such as growth and mortality to continue over time. Successional change and disturbance are the basic processes in species composition, structure, and function of plant communities. In a simplified model of forest succession, the forest progresses through stages, generally described in chronological terms such as early; mid-seral; late-seral; and old growth, a subset of late-seral (refer to the Affected Environment section on structure above for a description of these stages).

If this alternative were selected, no new timber harvest, thinning, or associated burning, weed control or road improvements would occur at this time on National Forest System land. Within the analysis area, the Forest Service policy to suppress wildland fires would continue. Assuming fire suppression and no harvesting would occur, biomass would accumulate causing more stand replacement fires where mixed-severity fires historically occurred. A stand replacement fire would kill 95 percent or more of the trees. This would increase the probability of mortality to large old trees that have survived numerous fires. Continued fire suppression would also extend the interval between stand-replacement fires, allowing live and dead fuel to accumulate and shifting the species composition to more shade tolerant trees.

In the shade tolerant mixed species cover types, species composition would remain similar over time. Lodgepole pine would disappear in the mid-seral stage of succession, and subalpine fir and other tolerant trees species would dominate. Taking no action (Alternative A) would result in increased physiological stress and the potential for extensive tree mortality by a variety of insects and diseases (Biondi 1996 *in* Arno et al. 1999). In mid- to late-seral types, root disease and associated bark beetles would likely increase. Elevated levels of western balsam bark beetle, fir engraver, and spruce bark beetle would probably continue and expand as subalpine fir and spruce age and become more extensive. For the time period or this analysis, mid- and late-successional stage stands would largely remain the same in terms of their overstory and understory species composition and average size.

The larch/Douglas-fir and shade intolerant mixed conifer stands in the early and mid-seral stages of succession would differentiate over time by forming a multilayered forest. Natural thinning would eliminate some of the overstory shade-intolerant tree species, and the understory would contain one or two layers of shade-tolerant tree species, such as subalpine fir, grand fir, spruce, and Douglas-fir. Extended periods with dense conifers and no natural disturbance would cause herbaceous and shrub species to decline. In the late-seral and old growth stages, advanced shade tolerant regeneration would occupy more and more of the stand until they dominate, leaving only a few remnant intolerant trees remain in the overstory. Down wood would accumulate as trees die and fall. The larger pieces would rot slowly and be relatively fire-resistant, providing important

structures for wildlife, soil processes, and other functions. The smaller material would continually add to the fuel bed.

The extensiveness of the Douglas-fir cover type, which is a large part of the larch/Douglas-fir group discussed above, was presented in the EAWS as an important finding. To reiterate briefly, historically the Valley Face area had an average of 20 percent of the Douglas-fir cover type. Currently, about 40 percent of the watershed is occupied by the Douglas-fir cover type and it is a major species on about 80 percent. The implications of having so much Douglas-fir, especially in the medium and large tree structure classes, are described in the Vegetation Affected Environment section of Chapter 3 in this document. With no action, root disease centers would expand and the existing Douglas-fir bark beetle population would likely be sustained or increase causing continued mortality in Douglas-fir.

Without treatment in lodgepole pine stands of medium size structure, the potential for a mountain pine beetle infestation would increase in the next 20 years as these stands age beyond 80 to 100 years (McGregor et al. 1985). Historically, a stand-replacement fire follows mountain pine beetle infestations before the stand is converted to shade tolerant species. In the absence of a mountain pine beetle infestation, tree mortality would appear minor at the stand level, but cumulatively would create sufficient fuel to support an active crown fire. Total stand mortality would exceed growth. Very dense lodgepole pine stands would become or remain stagnant with low vigor. With no disturbance, species composition would gradually shift to shade-tolerant species as "understory reinitiation" (Oliver and Larsen 1996) occurs. Understory reinitiation refers to the trees that become established on the forest floor, underneath an existing forest canopy.

Precommercial thinning would not occur with the no-action alternative. This would result in dense mixed species stands that would stagnate at worst or grow well below site potential over the next 10 to 30 years. Differentiation in growth of individual trees would be delayed indefinitely or extended substantially. It would also take longer for these presently young stands to grow into large trees, increasing the amount of time until one or more of the attributes of old growth are realized. The return on the reforestation investment in the current stands would diminish due to the delayed time until merchantable wood products are removed. The fuel loading and fire risk would increase with dense crowns and ladder fuels as the stands develop. The ability to control species composition and future insect and disease outbreaks would be forgone. In the ponderosa pine stands, the opportunity to shift the fire regime to a mixed severity or non-lethal type with fire resistant overstory trees will be lost or delayed.

Understory fuels reduction would not occur with the no-action alternative. This would also result in maintaining dense mixed species stands that would grow below site potential over the next 10 to 30 years. The understory trees are predominantly shade tolerant species that are more susceptible to fire, insect and disease mortality. The fuel loading and fire risk would increase with ladder fuels and increased surface fuels as the stands develop and the shade tolerant species compete with the intolerant species in the overstory.

All of the stand groups have evolved with disturbance as a common and recurring process. Stand-replacement fire regime types are approaching or have exceeded their historical average disturbance return interval. The mixed-severity fire regime types have generally exceeded their historical average disturbance return interval. As mentioned above, the presence of bark beetles, root disease, and windthrow suggest the incipient stage of some type of disturbance, likely insect or disease followed by fire. Accumulated fuel from natural processes currently jeopardizes the

adjacent private residences and the safety of their occupants from future wildland fire. This trend would continue to intensify with no action.

As mentioned in the "Affected Environment" section, hazard and risk factors suggest a high potential for future mortality from Douglas-fir bark beetle. With high existing bark beetle populations, effects of drought conditions, and at least 11,000 acres currently at moderate to high risk of beetle attack (Table 3-3), it is reasonable to anticipate additional mortality if no action is taken (Exhibit P-1). While it is impossible to predict the weather for the upcoming years, a continuation of the recent mortality will likely occur should the drought conditions persist. The older Douglas-fir stands on south and west facing slopes have had the most Douglas-fir bark beetle mortality. As mentioned earlier, infestations do not kill all host trees. Generally, bark beetles kill clusters or clumps of trees with a dozen trees or so, unless the stand has root disease. In that case, the bark beetle will follow the root disease until host trees are completely unavailable.

Cumulative Effects of No Action

Vegetation Management - Regeneration harvests have been conducted on 6,266 acres of National Forest System lands in the Valley Face area since the 1950s. When combined with other ownerships, more than 12,000 acres (34 percent of the analysis area) have been harvested, primarily with even-aged silvicultural systems (Exhibit P-2). Many of these harvests have contributed to a pattern of 5 to 250-acre patches of seedling and sapling sized stands across the landscape. All of the acres on National Forest System land have been reforested.

Wildland fire suppression has been effective in the Valley Face area since the 1930s. Fire exclusion allows forests to develop under the influence of vegetative succession, rather than the natural disturbance processes. In stands managed largely for timber production, fire suppression protects young trees until they can be harvested. In the Valley Face area on national forest, it has probably prevented fires from burning onto private lands.

The distribution of acres among structure classes in the short-term would remain the same as described in the Affected Environment section of this chapter. However, high levels of fuels would eventually result from no disturbance. The fuel accumulation could exaggerate the potential for a high-severity fire (Quigley and Arbelbide 1997).

The value of analyzing and disclosing forest structure relates to the desired conditions and the purpose and need of the Valley Face project. Maintaining diverse forest structures and composition across the landscape can help reduce the potential for large scale mortality from disturbances such as insects, disease, and fire.

The following table displays the distribution of structure classes on National Forest System lands, private land, and collectively on all ownerships. Private land includes industrial/corporate forest, Montana Department of Natural Resources and Conservation forest, Montana Department of Fish, Wildlife and Parks, and small private ownership.

Table 3-4. Existing Distribution of Structural Classes in the Valley Face area on National Forest, Private Land, and Both Ownerships.

Seral/Structural Stage	Percent of National Forest Land	Acres of National Forest Land	Percent of State & Private Land	Acres of State & Private Land	Percent of all Ownership	Acres of all Ownership
Non-forest*	<1	82	12	1,783	5	1,865
Seedling/sapling	18	3,564	12	1,852	15	5,416
Medium Tree	60	12,105	58	8,778	59	20,884
Large Tree	22	4,391	18	2,755	21	7,146
Total*		20,142		15,168		35310

*Includes 173 acres of water (lakes and ponds) Exhibit P-9

Douglas-fir and other Bark Beetles - Over the past five years, Douglas-fir bark beetles, fir engravers, and western balsam bark beetles have infested stands in the Valley Face area. As mentioned above, if drought conditions persist, additional trees on National Forest and private lands could be infested over the next few years. With the no action alternative there would be no change to the vulnerability of the stands on national forest lands that are at risk of beetle infestation.

Reforestation - The regeneration of conifers would occur very gradually over the next several decades in the absence of wildland fire or other site-disturbing activities. Subalpine fir, grand fir, spruce, and Douglas-fir would regenerate under the partial shade of the existing overstory and the down logs of beetle-killed trees. Small amounts of lodgepole pine, larch, and Douglas-fir may also regenerate on the exposed mineral soil on and near root mounds created by blown down trees.

Ongoing reforestation and stand improvement (thinning) activities in past harvest units would continue. Monitoring planted and naturally regenerated stands would continue.

Firewood and forest products gathering would also continue and would have little or no effect on the vegetation conditions in the Valley Face area. Firewood cutting would continue to remove trees that die from bark beetle attacks and are near open roads.

Precommercial thinning in the past on 4300 acres in regenerated harvest units and planned on 201 acres in 2006 reduces stand density and allows for a higher proportion of shade intolerant species across the landscape. The slash left from thinning increases the potential for high severity fire in those stands until it decomposes. As it decomposes, it releases nutrients that encourage soil development and plant growth. The thinning planned to occur in 2006 is near some of the proposed Valley Face units in the "East Mountain Meadows" area. With implementation of the no action alternative, some benefits to stand growth, species diversity, and long-term fuel reduction would still occur.

Private land development in the Valley Face area includes rural home sites with forested acreage that is increasingly managed for fuels reduction and aesthetics. The no action alternative would retain dense stands with higher potential for stand replacement fires adjacent to these private lands. Private land development that thins forested stands can reduce the potential for insect and disease spread.

Direct and Indirect Effects of Alternatives B and C

Stand Groups

As described in the Affected Environment section, stands in the Valley Face action alternatives were combined into groups based on three parameters:

- cover type
- structure class
- potential vegetation groups

No units are proposed in the cold PVG or in riparian habitat types. None of the proposed activities would affect the structure or composition of riparian areas. There would be no ground-disturbing activities, harvesting, or burning. Shrubs would be planted in a few isolated places to augment existing wildlife browse, but that action would not change the structure and function of the riparian ecosystem.

Within these groups the retention (stand density) or the amount and distribution of trees retained varies by treatment type and the existing stand condition. See Chapter 2, Table 2-1 for a brief description of the retention levels and stand densities for the various treatment types proposed.

See the Affected Environment for descriptions and definitions of cover type, structure class, and potential vegetation group (PVG).

Retention or Canopy Cover - Most silvicultural treatments; including seed tree, shelterwood, and thinning; leave some trees on the site. *Retention* refers to the amount and distribution of trees remaining after harvest. There are two retention distribution types called *dispersed* and *aggregated*. *Dispersed* retention leaves trees somewhat evenly scattered throughout the stand. *Aggregated* retention leaves trees in clumps of unharvested areas with most of the trees removed from the harvested portions. These are further categorized as *light, moderate*, and *heavy* amounts. The amount is called *canopy cover* and is measured by the percent of area covered by tree crowns. The canopy cover after treatment is determined by the canopy cover before treatment and the desired retention amount.

Heavy Retention (High Canopy Cover*)* would leave greater than 50 percent canopy cover after treatment.

Moderate Retention would leave 10 to 50 percent canopy cover after treatment. For this project, most of these treatments would leave between 15 and 30 percent canopy cover.

Light Retention (Low Canopy Cover) would leave up to 10 percent canopy cover.

Stands within a group develop in a similar manner over time and have a similar response to disturbances. These groupings are used to describe changes and effects to vegetation and the landscape. Figure 3-4 illustrates these retention levels (Franklin et al. 1997).

Figure 3-4. Examples of Retention Levels

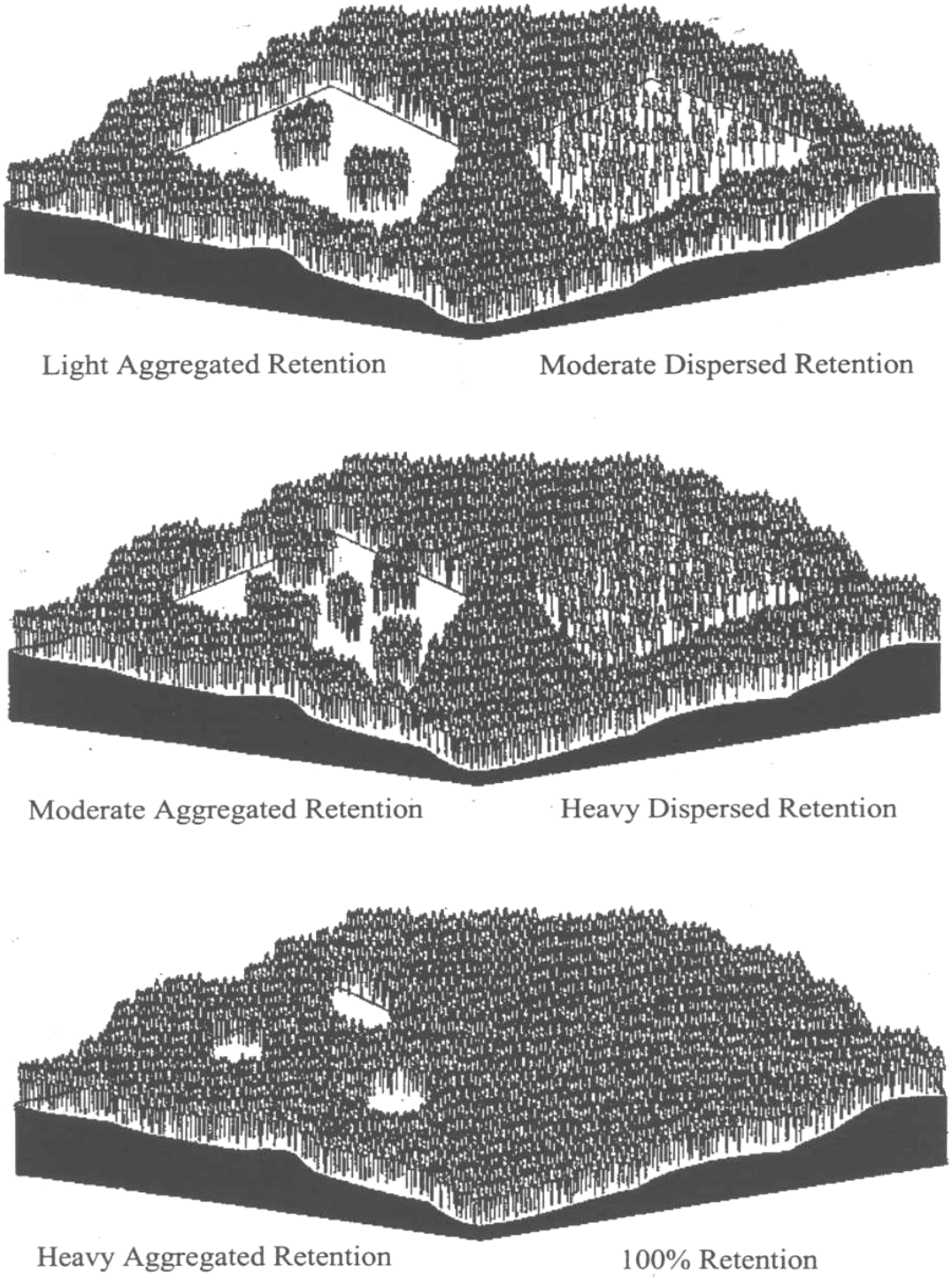


Table 3-5 describes the Valley Face stand groups by unit numbers after implementation of each Alternative. Alternative A is the existing condition of the units in the proposed action (Alternative B).

Table 3-5. Stand Groups of units by Alternative (Exhibit P-10)**.**

Stand Group	Cover Type, Structure Class, Potential Vegetation Group	Alternative A Unit Numbers	Acres	Alternative B Unit Numbers	Acres	Alternative C Unit Numbers	Acres
1	Larch/Douglas-fir, Large Tree, Moist	5, 8A, 39	232	39	123	39	155
2	Larch/Douglas-fir, Large Tree, Warm Dry	16, 19, 19A, 200	185	26, 200	232	19, 26	172
3	Larch/Douglas-fir, Medium Tree, Moist	1, 1A, 6, 6A, 7, 9A, 12, 18, 30, 304, 308, 403, 409	666	7, 18, 30, 36, 304, 308, 403, 409	434	18, 30, 30B, 36, 304, 308, 403, 409, 417	296
4	Larch/Douglas-fir, Medium Tree, Warm Dry	13A, 14A, 17, 22A, 25, 26, 27, 28, 29, 31A, 33, 40, 41, 201, 306, 309, 400, 401, 404, 500	1275	14A, 23, 24, 25, 201, 306, 309, 400, 401, 404, 500	695	14A, 24, 25, 306, 309, 400, 401, 404, 500	646
5	Larch/Douglas-fir, Medium Tree, Warm Moist	405	43	405	43	405	43
6	Larch/Douglas-fir, Seedling/sapling, Moist		0	1, 1A, 3, 4, 4A, 5, 6, 6A, 8A, 9A, 10A, 11, 11A, 12, 21, 21A, 35, 37, 37A, 38	964	1, 3, 4, 4A, 5, 6, 6A, 8A, 9A, 10A, 11, 11A, 12, 21, 35, 37, 37A, 38	789
7	Larch/Douglas-fir, Seedling/sapling, Warm Dry	300, 301, 302, 408	168	13, 13A, 16, 16A, 17, 19, 19A, 22A, 27, 28, 29, 31A, 33, 34, 40, 41, 300, 301, 302, 408	837	13, 13A, 16, 16A, 17, 19A, 22A, 27, 28, 29, 31A, 33, 34, 41, 300, 301, 302, 408	608
8	Larch/Douglas-fir, Seedling/sapling, Warm Moist	410	51	31, 410	228	31, 410	228
9	Intolerant Mixed-Conifer, Large Tree, Moist	3	31		0		0
10	Intolerant Mixed-Conifer, Medium Tree, Moist	4, 4A,10A, 11, 11A, 21, 21A, 35, 36, 407	485	32, 407, 411	77	32, 407, 411, 421	110
11	Intolerant Mixed-Conifer, Medium Tree, Warm Dry	13, 16A, 23, 202, 412	78	20, 202, 412	161	20, 412, 423	173
12	Intolerant Mixed-Conifer, Medium Tree, Warm Moist	31	177		0		0
13	Lodgepole pine, Medium Tree, Moist	37, 37A, 38, 411	157		0		0
14	Lodgepole pine, Medium Tree, Warm Dry	20, 24, 34, 307	249	307	30	35B, 307	46

Stand Group	Cover Type, Structure Class, Potential Vegetation Group	Alternative A Unit Numbers	Acres	Alternative B Unit Numbers	Acres	Alternative C Unit Numbers	Acres
15	Ponderosa pine, Medium Tree, Warm Dry	305	88	305	88	305	88
16	Tolerant Mixed-Conifer, Medium Tree, Moist	32	27		0		0
	totals		3912		3912		3354

Acres are approximate in all tables because of rounding and small errors introduced by GIS data analysis.

Table 3-6 displays the acreage of the current canopy covers of the Valley Face stand groups for stands proposed for treatment.

Table 3-6. Acres of Existing Canopy Cover by Stand Group for units in the Proposed Action

Stand Group	Cover Type, Structure Class, Potential Vegetation Group	Canopy Cover			Grand Total
		LOW (<10%)	MOD (10-50%)	HIGH (>50%)	
1	Larch/Douglas-fir, Large Tree, Moist		21	211	232
2	Larch/Douglas-fir, Large Tree, Warm Dry			185	185
3	Larch/Douglas-fir, Medium Tree, Moist		304	362	666
4	Larch/Douglas-fir, Medium Tree, Warm Dry		660	615	1275
5	Larch/Douglas-fir, Medium Tree, Warm Moist		43		43
6	Larch/Douglas-fir, Seedling/sapling, Moist				0
7	Larch/Douglas-fir, Seedling/sapling, Warm Dry	38	53	77	168
8	Larch/Douglas-fir, Seedling/sapling, Warm Moist		33	17	51
9	Intolerant Mixed-Conifer, Large Tree, Moist		31		31
10	Intolerant Mixed-Conifer, Medium Tree, Moist		238	247	485
11	Intolerant Mixed-Conifer, Medium Tree, Warm Dry		20	58	78
12	Intolerant Mixed-Conifer, Medium Tree, Warm Moist		165	12	177
13	Lodgepole pine, Medium Tree, Moist		147	10	157
14	Lodgepole pine, Medium Tree, Warm Dry		187	62	249
15	Ponderosa pine, Medium Tree, Warm Dry		88		88
16	Tolerant Mixed-Conifer, Medium Tree, Moist			27	27
	totals	38	1991	1883	3912

Acres are approximate in all tables because of rounding and small errors introduced by GIS data analysis.

Effects by Treatment Type

The following sections describe the effects of various vegetative management treatments proposed by the action alternatives. Please refer to Exhibits P-3, P-10, and P-15 for detailed stand level information about these treatments and the description of these treatments in Chapter 1.

The primary difference between Alternatives B and C is the amount of area treated by the various treatment types. The treatments that shift stands to different stand groups and density have the most effects, as described below. The descriptions of treatments in this section apply to both alternatives similarly.

Table 3-7 presents approximate acreages of the various vegetation management treatments that are described in this section:

Table 3-7. Vegetation Management Treatments for Alternatives B and C.

Treatment	Alternative B	Alternative C
Commercial timber harvest, total acres	2965	2225
Seed-tree harvest with reserve trees (light dispersed retention), acres	196	188
Shelterwood harvest with reserve trees (moderate dispersed retention), acres	1614	1218
Commercial thinning (moderate dispersed retention), acres	836	560
Commercial thinning (heavy dispersed retention), acres	104	259
Patch thinning (heavy aggregated retention), acres	215	215
Understory fuels treatment without associated commercial harvest (moderate and high dispersed retention, acres	382	349
Precommercial thinning of sapling-sized trees and hand piling slash in previously thinned stands (moderate and light dispersed retention), acres	565	565

Regeneration Harvest Using Seed Tree and Shelterwood with Reserve Trees Methods

Table 3-8 displays by alternative the acres by affected stand group and canopy cover that would be harvested using the seed tree with reserve trees or shelterwood with reserve trees methods. Some of these units would be planted and some would be regenerated naturally.

Table 3-8. Acres by stand group and canopy cover for all alternatives in stands proposed for Regeneration Harvest (ST, SW)

		Alt. A - Existing			Alternative B				Alternative C			
Stand Group	Cover Type, Structure Class, Potential Vegetation Group	HIGH	MOD	Alt A Total	HIGH	MOD	LOW	Alt B Total	HIGH	MOD	LOW	Alt C Total
1	Larch/Douglas-fir, Large Tree, Moist	88	21	108								
2	Larch/Douglas-fir, Large Tree, Warm Dry	116		116								
3	Larch/Douglas-fir, Medium Tree, Moist	146	90	236								
4	Larch/Douglas-fir, Medium Tree, Warm Dry	368	118	486								
6	Larch/Douglas-fir, Seedling/sapling, Moist					787	175	961		642	145	786
7	Larch/Douglas-fir, Seedling/sapling,					647	22			423	18	441

		Alt. A - Existing			Alternative B				Alternative C			
Stand Group	**Cover Type, Structure Class, Potential Vegetation Group**	**HIGH**	**MOD**	**Alt A Total**	**HIGH**	**MOD**	**LOW**	**Alt B Total**	**HIGH**	**MOD**	**LOW**	**Alt C Total**
	Warm Dry											
8	Larch/Douglas-fir, Seedling/sapling, Warm Moist					176				176		176
9	Intolerant Mixed-Conifer, Large Tree, Moist		31	31								
10	Intolerant Mixed-Conifer, Medium Tree, Moist	243	197	440								
11	Intolerant Mixed-Conifer, Medium Tree, Warm Dry	44	2	46								
12	Intolerant Mixed-Conifer, Medium Tree, Warm Moist	11	166	176								
13	Lodgepole pine, Medium Tree, Moist		147	146								
14	Lodgepole pine, Medium Tree, Warm Dry	16	5	21								
	Grand Total	1031	776	1808		1611	197	1808		1241	163	1404

Acres are approximate because of rounding and small errors introduced by GIS data analysis.
Exhibit P-10

The seed tree and shelterwood with reserve trees harvest methods would create a new stand of trees. These harvest methods would change the stands from large and medium tree structure classes to the early-successional seedling stage. The species composition would also change. Fewer shade tolerant trees would occupy the site and shade-intolerant trees would dominate for at least 20 to 50 years.

The seed tree method would retain 5 to 10 percent canopy cover by leaving 5 to 20 of the largest and phenotypically best trees. The shelterwood method would retain 10 to 30 percent canopy cover by leaving 10 to 40 medium and large-sized trees. Species and numbers of trees retained after harvest would vary by cover type and tree size. The retained trees would generally be the largest, healthy larch and Douglas-fir. However, all larch 18 inches DBH and greater, and all Douglas-fir 25 inches DBH and greater would be retained regardless of condition unless they would compromise safety. Ponderosa pine and white pine would also be retained where they occur. In stands dominated by lodgepole pine or shade tolerant trees some of these species would also be left. In most units, some seedlings and saplings would be left to provide species and structural diversity. These would generally be vigorous, healthy larch, Douglas-fir, ponderosa pine, or white pine. They may be left as scattered individuals or in small groups. In addition to offering structural and species diversity, the retained trees would provide snag replacements, genetic reserves, aesthetics, shade, seed sources for the new stand, and future management options. Reserve trees selected for seed trees would be the best phenotypes available and the most windfirm. In the event of blowdown, the trees would not be removed and would be left to become woody debris.

Tree species removed would be primarily lodgepole pine, subalpine fir, grand fir, spruce, Douglas-fir and, to a lesser degree, larch. Large Douglas-fir may be removed if they are infested with bark beetles or recently dead and not needed to provide adequate amounts of standing or down dead wood. The harvested trees would provide forest products, such as sawlogs, house logs, pulpwood, or posts and poles.

Seed tree and shelterwood treatments would resemble the effects of stand-replacing and mixed-severity wildland fires, except that harvesting leaves fewer snags and the reserve trees can be selected and left alive. There would be no assurance that any live trees would be left should a wildland fire occur. Also, with harvest, most of the wood and its stored nutrients would be removed rather than volatilized and returned to the soil and air.

All seed tree and shelterwood harvests would retain between 5 to 23 tons per acre of the largest down logs greater than nine inches in diameter where available. Down wood requirements could be achieved with material less than nine inches in diameter; however, wood less than nine inches in diameter is less effective in meeting fuel reduction objectives. Lesser amounts of woody debris would be left on dry sites, areas with smaller diameter trees, and sites close to private lands. Greater amounts would be left on more mesic sites and areas farther from private land. Refer to Regulatory Framework below for snag and down wood retention requirements to meet nutrient cycling and other ecosystem functions. Excess fuels from logging slash, dead, down, and stagnated lodgepole pine, windthrow, root rot, and ladder fuels would be reduced by either excavator piling or subsequent burning of the piles, or broadcast burning.

Units adjacent to residential private land would have a zone of very low amounts of residual fuel to minimize the potential for wildland fire spreading onto private land and to facilitate fire suppression. This may compromise ecosystem functions somewhat in this narrow zone, but is necessary for firefighter safety.

The management objective to reduce the potential for widespread future insect epidemics could be met by shifting the species composition in some stands from Douglas-fir, grand fir, or subalpine fir to mixed species with a higher proportion of larch and ponderosa pine. This would minimize the potential for future bark beetle infestations because the species that would be managed are far less susceptible to Douglas-fir beetles.

Windthrow risk would increase in treated and adjacent stands. Douglas-fir, grand fir, spruce, and subalpine fir are the most susceptible to windthrow and breakage, especially in small-diameter trees in dense stands that are opened by harvest. Most windthrow would affect individual trees. This can be mitigated somewhat by locating reserve trees and unit boundaries in less wind-prone areas. Although windthrow is not an objective, the scattered down trees would add to the accumulation of large woody material for soil and wildlife habitat.

All stands with seed tree or shelterwood harvest would be regenerated, either naturally from seed provided by onsite seed trees or artificially with transplanted seedlings. The target species for reforestation are larch, ponderosa pine, western white pine, Douglas-fir, and lodgepole pine. The species selected to regenerate each stand depends on the PVG, the species and condition of retained or adjacent seed trees, and the type and degree of site preparation. Site preparation for reforestation would require scarification of the forest floor, either mechanically or by broadcast burning. Successful regeneration of conifers is dependent on this process to reduce competition for sunlight and to expose mineral soil for natural regeneration or facilitate hand planting.

Reforestation after Seed Tree and Shelterwood Harvest

All seed tree and shelterwood with reserves harvested units would be regenerated after harvest either by planting or natural regeneration. Table 3-9 outlines the type of regeneration planned for both action alternatives:

Table 3-9. Acres of Reforestation to Occur After Seed Tree and Shelterwood with Reserve Trees Harvest, by Alternative.

	Alternative B		Alternative C	
Type of Reforestation	**Seed Tree**	**Shelterwood**	**Seed Tree**	**Shelterwood**
Full Plant	122	25	122	25
Interplant for species diversity	21	715	17	557
Natural	53	874	24	661
TOTAL	**196**	**1614**	**163**	**1243**

Site preparation for regeneration of the new stand would be accomplished in most units by yarding treetops and branches with the tree as it is removed; i.e., whole tree yarding. The purpose of this is to reduce the amount of fuel to be treated in the units. Slashing would remove suppressed understory tree species that would not grow sufficiently after removing the overstory. In places where small needles and branches leftover from logging would not present a fire hazard to private landowners, residue would be left on site for one wet season to enhance site productivity through leaching nitrogen and other nutrients.

An excavator would then pile the logging and slashed understory residue in excess of desired woody debris and scarify the ground. Scarification provides a suitable site for seeds to germinate and reduces plant competition with seedlings. Piles would be burned when fire hazard and risk of spread is low.

In stands with slopes too steep for an excavator, jackpot burning or underburning would accomplish the fuels reduction and site preparation. In some cases, it would be necessary to yard the unmerchantable material to a landing near the road in order to reduce fuels to levels that protect residual trees.

Hand scalping of a planting site with no other scarification would occur in parts of units too steep for excavators or not compatible with jackpot burning. Those include units that are too moist; have insufficient access roads; are cost-prohibitive; or have desirable residual vegetation, such as reserve trees or saplings, which could not be reasonably protected.

Grasses and forbs, along with existing shrubs, still inhabit the site the first year after site preparation. Conifer seedlings and shrub sprouts would likely regenerate a year or two later. Natural conifer tree regeneration from seed trees would vary by stand. Where planted, trees would include one or two-year-old seedlings of larch, Douglas-fir, ponderosa pine, lodgepole pine, and western white pine. Seedlings are expected to be well established three to six years after regenerating. After several decades (60-100 years) the stands would consist of mature, mixed conifer trees.

In all stand groups where regeneration is proposed, the objective would be to have less than 40 percent of the regenerated trees be Douglas-fir or lodgepole pine. The remainder would be larch, ponderosa pine, spruce, western white pine, grand fir, and subalpine fir. This management regime

would reduce the susceptibility of treated stands to Douglas-fir and mountain pine beetle invasions as they mature. The results of these treatments would provide a greater diversity of vegetation species and genetic material than would be expected if unmanaged.

Commercial Thinning

Thinning would select the healthiest trees with large, well-formed crowns for leave trees. These trees would then have more growing space, light, nutrients, and water to allow them to develop into large, mature overstory trees. The leave trees would include all larch and ponderosa pine 18 inches and greater and all Douglas-fir 25 inches and greater regardless of condition, unless they would compromise safety. In most units, some seedlings and saplings would be left to provide species and structural diversity. These would generally be vigorous, healthy larch, Douglas-fir, ponderosa pine, or white pine. They may be left as scattered individuals or in small groups. Thinning would encourage growth and discourage potential losses from insects, disease, and fire, thus offering options for future management.

The thinned stands would be more resistant to a stand-replacing fire and better able to survive a ground fire. Wider spacing and less lodgepole pine, Douglas-fir, and grand fir would reduce the risk of bark beetle epidemics. Intermediate harvest would not occur in areas where root disease exists, where stands are under stocked due to high levels of mortality, or in stands vulnerable to blowdown.

Commercially thinned stands generally would not require reforestation, nor is it an objective. Fully stocked stands would remain after harvesting. However, conifers can be expected to regenerate in these stands and shade tolerant species such as subalpine fir, grand fir, Douglas- fir, and spruce are the most likely to regenerate. They would contribute to long-term management objectives for structural diversity. They would also contribute to ladder fuels and stand densities that detract from the hazardous fuel management objectives in the Valley Face area. Logging and piling activities, as well as burning piles would create a seedbed for shade-tolerant and intolerant plants. Conifer regeneration would vary by stand.

Table 3-10 displays the acres by affected stand group and canopy cover or retention that would be harvested by thinning. The acres with high canopy cover would have an average of 50 percent canopy cover remaining, either dispersed in individual trees or in groups of trees. The acres with moderate canopy cover would have an average of 30 percent canopy cover remaining dispersed in individual trees.

Table 3-10. Acres by stand group and canopy cover for all alternatives in stands proposed for commercial thin, including patch thin

		Alt. A - Existing			Alternative B			Alternative C		
Stand Group	**Cover Type, Structure Class, Potential Vegetation Group**	**HIGH**	**MOD**	**Alt A Total**	**HIGH**	**MOD**	**Alt B Total**	**HIGH**	**MOD**	**Alt C Total**
1	Larch/Douglas-fir, Large Tree, Moist	123		123		123	123		155	155
2	Larch/Douglas-fir, Large Tree, Warm Dry					163	163	102	69	172
3	Larch/Douglas-fir, Medium Tree, Moist	156	158	314	103	215	318	113	48	161
4	Larch/Douglas-fir, Medium Tree, Warm Dry	215	253	468	215	160	375	215	141	356

		Alt. A - Existing			Alternative B			Alternative C		
Stand Group	**Cover Type, Structure Class, Potential Vegetation Group**	**HIGH**	**MOD**	**Alt A Total**	**HIGH**	**MOD**	**Alt B Total**	**HIGH**	**MOD**	**Alt C Total**
10	Intolerant Mixed-Conifer, Medium Tree, Moist	4		4		27	27	27		27
11	Intolerant Mixed-Conifer, Medium Tree, Warm Dry		18	18		147	147		147	147
14	Lodgepole pine, Medium Tree, Warm Dry	15	183	198				15		15
16	Tolerant Mixed-Conifer, Medium Tree, Moist	27		27						
	Grand Total	540	612	1153	318	834	1153	472	560	1033

Thinning objectives vary by stand group. Each group is discussed below.

Group 1 - Commercial thinning in Stand Group 1 (Unit 39) would maintain sufficient structural attributes to retain the large tree structure and continue to function as a mid to late-successional forest community. This stand has a multi-layer stand structure created by past shelterwood harvesting in irregular patches. It consists of low to moderate densities of large and medium-sized trees with many understory seedling and sapling trees. The small and medium-sized trees are becoming suppressed from dense stocking, but have potential to improve or continue growth rates after thinning. By removing mostly shade-tolerant and lodgepole pine trees, as well as some Douglas-fir and larch from all canopy layers, this stand would retain the multi-layered canopy. The species and size class would shift somewhat by retaining a higher proportion of large larch and Douglas-fir and removing a greater proportion of smaller and more shade tolerant trees.

This stand is in a stand replacement fire regime. If a major disturbance such as windthrow or fire occurred, the new stands would be even-aged, mixed species with predominance of lodgepole pine, larch, and Douglas-fir. However, the current and proposed stand conditions resemble those of mixed-severity fire regimes where historical disturbance patterns typically left survivors or remnant trees. The potential for crown fires and the loss of large old remnant larch and Douglas-fir in this stand would again increase as more shade tolerant trees regenerate and grow in the understory.

Groups 4, 11, except Unit 500 - Stand Groups 4 and 11, like Group 1, are previously harvested stands with mixed species and sizes. They have multiple canopy layers and the overstory is relativity open. They consist of low to moderate densities of large and medium-sized trees with moderate to high densities of seedlings and saplings. In some areas the small and medium-sized trees are becoming suppressed from dense stocking, but have potential to improve or continue growth rates after thinning. The multiple canopy layers create ladder fuels that could carry a fire into the tree crowns, killing the large trees and reducing the effectiveness of firefighting efforts. By removing mostly shade-tolerant and lodgepole pine trees, these stands would retain the multi-layered canopy. The stand density would be reduced, especially in the understory layers, reducing the ladder fuel and increasing crown spacing. The species and size class would shift by retaining a higher proportion of large larch and Douglas-fir. Most of the stands in this group would move into the large tree structure class (stand group 2).

These stands are in stand replacement and mixed-severity fire regimes where historical disturbance patterns typically left survivors or remnant trees. If a major fire occurred, the new stands would be even-aged, mixed species with predominance of lodgepole pine, larch, and Douglas-fir. However, the current stand conditions are those of mixed-severity fire regimes where historical disturbance patterns typically left survivors or remnant trees. The structure and composition retained after harvest would resemble the size and species of trees that have survived numerous historical fires. The potential for crown fires and the loss of large old remnant larch and Douglas-fir in these stands would again increase as more shade tolerant trees regenerate in grow in the understory.

Group 4, Unit 500 - Unit 500 contains unharvested and previously harvested stands that consist primarily of Douglas-fir, with scattered larch and ponderosa pine. Where there has been no previous harvest, the canopy cover is very dense with pole to medium sized trees. In the harvested stands, there are openings that are filled with sapling-sized Douglas-fir and some larch. The thinned portions of these stands have a more open (moderate) canopy cover. The small and medium-sized trees are becoming suppressed from dense stocking, but have potential to improve or continue growth rates after thinning.

Both alternatives would thin patches (Unit 500) to a total of 75 acres creating one- to 10-acre openings in dense stands of mostly pole-sized trees, leaving the larger trees. No more than 40 acres of this would occur in the denser portion of this unit (Stand 810-04-002) that now functions as thermal cover. In Alternative B, the treatment would be accomplished with a commercial, tractor-based removal and excavator piling to treat the slash, resulting in five percent to forty percent tree canopy densities. The lower densities would be in the openings created and the higher densities in thinned areas around the opening. Due to soils concerns, the treatment in Alternative C would consist of cutting and hand-piling only small diameter trees without heavy equipment, leaving canopy densities averaging 60 percent. The openings expected in Alternative C are limited to those already created during the previous harvest. The commercial treatment in Alternative B is expected to produce a better distribution of leave trees that could develop into larger trees. The openings created in Alternative B would provide an opportunity to regenerate larch, ponderosa pine, and shrubs, if they could be protected from deer browsing.

The stand group and overall canopy cover class for Unit 500 does not substantially change with either alternative. Both alternatives reduce fuels, break the continuity of fuels, and reduce competition between leave trees, with Alternative B more effective than Alternative C.

Groups 3, 10, 16 - Groups 3, 10, and 16 are medium and pole-sized stands with some large trees and many understory seedling and sapling trees. The small and medium-sized trees are suppressed by dense stocking. The medium-sized trees have potential to improve or continue growth rates after thinning. Most of these stands have an increasing amount of dead wood on the forest floor from lodgepole pine and other trees that are unable to survive in the dense stands. The stands would be more open, with a greater proportion of larch and Douglas-fir and less subalpine fir, grand fir, spruce, and lodgepole pine than currently present.

Thinning would not change the structural class of these stands. However, the average diameter would be increased by removing smaller and leaving larger trees. They would continue to develop toward the large tree structure class with faster growth rates and fewer insect and disease occurrences. Without a major fire, these thinned stands would develop into stands dominated by

larch and Douglas-fir with minor amounts of spruce, subalpine fir, grand fir, and lodgepole pine. Eventually, subalpine fir, spruce, and Douglas-fir regeneration would occur forming multi-layered stands. To maintain the overstory structure and retard growth of shade tolerant seedlings that could increase the ladder fuels over time, maintenance burning and/or associated thinning and burning could occur in 10 to 20 years.

These stands are in a stand-replacement fire regime. If a major disturbance such as windthrow or fire occurred in this group, the new stands would be even-aged, mixed species with predominance of lodgepole pine, larch, and Douglas-fir.

Group 14 - Group 14 consists of even-aged stands of lodgepole pine mixed with larch and Douglas-fir. Shade tolerant trees that are beginning to establish in the understory are suppressed from the dense overstory. Although the canopy cover is currently moderate over most of the acres, in the warm dry PVG competition for water and nutrients limits growth more than in the moist PVGs. Thinning in these stands would remove mostly smaller lodgepole pine, grand fir, spruce, and Douglas-fir. The stands would be more open, with a greater proportion of larch and less lodgepole pine, grand fir, spruce, and Douglas-fir than currently present.

Thinning would not change the structural class of these stands. However, the average diameter would be increased by removing smaller and leaving larger trees. They would continue to develop toward the large tree structure class with faster growth rates and fewer insect and disease occurrences. Without a major fire, these thinned stands would develop into stands dominated by larch and Douglas-fir with minor amounts of spruce, subalpine fir, grand fir, and lodgepole pine. Eventually, grand fir, spruce, and Douglas-fir regeneration would occur forming multi-layered stands. To maintain the overstory structure and retard growth of shade tolerant seedlings that could increase the ladder fuels over time, maintenance burning and/or associated thinning and burning could occur in 10 to 20 years.

These stands are in a mixed-severity fire regime where historical fires typically left survivors or remnant trees. The residual stands would be structurally simplified in the short-term. A simplified structure would be one layer of trees that are dominant or codominant. However, as new seedlings and saplings establish and grow under the older trees, multi-layering would develop. The potential for crown fires and the loss of large old remnant larch and Douglas-fir in these stands would increase as the understory becomes pole-sized.

Understory Fuel Reduction

Fuel reduction is proposed in both action alternatives to minimize hazardous fuel accumulation and ladder fuels adjacent to private lands. Due to the forest structure and composition in these stands, only trees less than six inches DBH would be cut. Slash would be hand piled and burned. This type of treatment is intended to reduce the potential for crown fire and allow firefighters to safely protect dwellings on private land (see Fire and Fuels section). Overstory canopy cover would change very little because only understory trees would be cut. Some increase in tree growth could result from these treatments as the competition for water and nutrients is reduced.

Up to half of the shrubs may be cut where they have become decadent and difficult for wildlife to browse. Cutting shrubs would stimulate sprouting from the base, but growth would be relatively slow due to canopy shading. Conifers would regenerate slowly and would consist of shade tolerant subalpine fir, Douglas-fir, grand fir and spruce.

Table 3-11 shows the affected stand groups and canopy cover for the stands proposed for understory fuel reduction and hand piling.

Table 3-11. Acres by stand group and canopy cover for all alternatives in stands proposed for understory fuels treatment:

		Alt. A -Existing			Alternative B			Alternative C		
Stand Group	**Cover Type, Structure Class, Potential Vegetation Group**	**HIGH**	**MOD**	**Alt A Total**	**HIGH**	**MOD**	**Alt B Total**	**HIGH**	**MOD**	**Alt C Total**
2	Larch/Douglas-fir, Large Tree, Warm Dry	69		69	69		69			
3	Larch/Douglas-fir, Medium Tree, Moist	29	27	56	12	44	56	33	44	77
4	Larch/Douglas-fir, Medium Tree, Warm Dry	30	118	148	30	118	148		118	118
5	Larch/Douglas-fir, Medium Tree, Warm Moist		43	43		43	43		43	43
10	Intolerant Mixed-Conifer, Medium Tree, Moist		40	40	10	40	50	44	40	84
11	Intolerant Mixed-Conifer, Medium Tree, Warm Dry	14		14	14		14	7	18	25
13	Lodgepole pine, Medium Tree, Moist	10		10						
	Grand Total	152	228	380	136	245	380	84	263	347

Exhibit P-10

Alternative B would treat 33 acres more than Alternative C. Alternative C would not treat in any old growth stands and proposes understory fuels reduction in parts of some stands that are proposed for commercial harvest in Alternative B (73 acres).

Table 3-11 shows very little change in canopy cover with either action alternative. When compared with the existing canopy cover, units in Alternative B move from high to moderate canopy cover on about 4 percent of the acres. Alternative C shifts from high to moderate canopy cover on about 5 percent of the acres. Table 3-11 does not display the existing canopy cover of the 73 acres of understory fuels treatments in Alternative C that are commercial harvest in Alternative B. Those stands are in stand groups 3, 10, and 11 with currently high and moderate canopy covers.

Species composition would change somewhat with both action alternatives by thinning out more shade-tolerant species, lodgepole pine, and Douglas-fir. However, the overstory trees that comprise the cover type are not affected. The only change that can be seen in Table 3-11 is the reduction in stand group 13 and increase in group 10. This is because the lodgepole pines are generally small on those 10 acres and many would be removed, leaving a mix of species.

Overall, average tree size would be increased by removing small diameter trees and leaving larger ones. Again, the larger trees that most affect the structure class for the stand would remain.

Precommercial Thinning

Both action alternatives propose precommercial thinning in 437 acres of sapling and pole-sized stands. Generally, only seedling and sapling sized trees would be removed (2 feet tall to 5 inches DBH). Trees are about 10 to 25 feet tall and approximately 15 to 25 years old. Stand density ranges from 2000 to 7000 trees per acre. Stand density after thinning would range from 300 to 400 of the largest and most vigorously growing trees of all species. While stem density would be reduced, these stands would still function as early successional. Thinning would help achieve the desired species composition and greatest possible diameter growth by leaving ponderosa pine and western larch where available. Douglas-fir and lodgepole pine would be favored to leave over shade tolerant species.

Up to half of the shrubs may be cut where they have become decadent and difficult for wildlife to browse. Cutting shrubs would stimulate sprouting and growth from the base. Where shrubs are very dense, competition could be reduced providing the conifers additional light, water, and nutrients for several years. By the time the shrubs reach competitive heights and densities, the trees would be taller, vigorous, and beginning to shade the shrubs. Thinning would generate slash consisting of fine, highly flammable fuels for a period of up to ten years. To reduce the potential for wildland fire to spread to or from private property, most thinning slash would be piled and burned to create a fuel break adjacent to private property.

For this analysis, Units 408 and 410 (128 acres) are included with precommercial thinning, rather than understory fuels reduction as described in Chapter 2. These are sapling sized stands that were precommercially thinned in 1997 and 2001. The proposed treatment is to hand pile the thinning slash that is still a fuel load adjacent to private land. Some additional thinning may occur, if there are dense areas where fuel hazards could be reduced by increasing crown spacing. The stand structure, age, and cover types are more similar to the stands proposed for precommercial thinning than to those proposed for understory fuel treatment.

Table 3-12 shows the affected stand groups and canopy cover for the stands proposed for precommercial thinning and hand piling.

Table 3-12. Acres by stand group and canopy cover for all alternatives in stands proposed for precommercial thin; includes hand pile only:

		Alt. A – Existing Cover*				Alternative B*				Alternative C*			
Stand Group	Cover Type, Structure Class, Potential Vegetation Group	H	M	L	Alt. A Total	H	M	L	Alt. B Total	H	M	L	Alt. C Total
3	Larch/Douglas-fir, Medium Tree, Moist	30	27		57		57		57		57		57
4	Larch/Douglas-fir, Medium Tree, Warm Dry		170		170		143	27	170		143	27	170
7	Larch/Douglas-fir, Seedling/sapling, Warm Dry	77	53	38	168		77	91	168		77	91	168
8	Larch/Douglas-fir,	17	34		51		51		51		51		51

		Alt. A – Existing Cover*				Alternative B*				Alternative C*			
Stand Group	**Cover Type, Structure Class, Potential Vegetation Group**	**H**	**M**	**L**	**Alt. A Total**	**H**	**M**	**L**	**Alt. B Total**	**H**	**M**	**L**	**Alt. C Total**
	Seedling/sapling, Warm Moist												
14	Lodgepole pine, Medium Tree, Warm Dry	30			30		30		30		30		30
15	Ponderosa pine, Medium Tree, Warm Dry		88		88		88		88		88		88
	Grand Total	154	372	38	564		446	118	564		446	118	564

* H, M, L = High, moderate, low

Table 3-12 shows that precommercial thinning will not change the cover type or structure (size) class in any units. The canopy cover shifts from predominantly moderate and high to moderate and low. The canopy cover is a function of tree spacing and tree size. As these small trees grow over the next 50 years, the canopy cover will shift back to moderate and high. Meanwhile, the more open stands will reduce competition and allow the trees to maintain vigorous growth rates.

Road Access for Current and Future Management

Roads and their management indirectly affect the condition of vegetation. The presence or absence and the condition of a road influence the ability of firefighters to suppress fires. Road access can also determine whether or not silvicultural treatments that can influence the health and productivity of a stand are applied.

Road access for current and future vegetation management activities would not change with any alternatives. Existing roads would have drainage features improved to meet Best Management Practices. Temporary road would be required to access some of the units; these would be obliterated following their use. All alternatives would have sufficient road access for silvicultural exams, precommercial thinning, and response to initial attack fire suppression.

Shrub Planting for Wildlife Habitat

Shrub planting for wildlife habitat improvement may occur in or near some of the harvest units on approximately 50 to 150 acres. Shrub planting would usually consist of willow, serviceberry, red-osier dogwood, mountain maple, or redstem ceanothus at a density of about 100 to 300 plants per acre. More shrubs would be planted near riparian areas to enhance wildlife forage, security, and nesting habitat. Shrub planting would not affect conifer stocking objectives. Post-harvest site conditions and natural conifer regeneration success would determine specific areas and planting density.

Direct and Indirect Effects of Douglas-fir Bark Beetle Suppression

The Valley Face project would have an effect on vegetation conditions that could support Douglas-fir bark beetle populations. As mentioned in the Affected Environment section, an

evaluation of the National Forest System land within the Valley Face area determined the number of acres that currently have various levels of Douglas-fir bark beetle hazard (Table 3-1). Private land was not evaluated due to a lack of sufficient data on tree size and species composition to make an evaluation. Table 3-13 displays the change in the number of acres by hazard level for Douglas-fir beetle infestation that would result from implementing the Alternatives.

Table 3-13. Douglas-Fir Beetle Hazard on National Forest Land Before and After Implementation of Each Action Alternative.

	Existing (Alt A)		Alternative B After			Alternative C After		
	National Forest land, acres	**National Forest land, percent**	**Acres Treated**	**Results in units**	**National Forest land, acres and percent**	**Acres Treated**	**Results in units**	**National Forest land, acres and percent**
No or Very Low Hazard	6227	31%	530	2051	7748 38%	530	1648	7345 36%
Low Hazard	2778	14%	830	120	2068 10%	723	120	2175 11%
Moderate Hazard	9456	47%	2231	1406	8631 43%	1883	1258	8831 44%
High Hazard	1681	9%	314	328	1695 9%	214	324	1791 9%
Total	20142		3905	3905	20142	3350	3350	20142

Exhibit P-1.

The regeneration harvest treatments would change the stand structure to have no hazard. The stands would be open enough that even if some of the Douglas-fir leave trees were attacked, the beetle populations could not increase to levels that would kill the entire stand. Alternative B results in more acres changed to no hazard than Alternative C. In addition, several units already have moderate to high levels of bark beetle infestation that would be reduced by harvesting many of the Douglas-fir. These are units 5, 6, 6A, 8A, 9A, 12, 17, 40, and 41. All commercial harvest treatments, including thinning, would reduce the number of Douglas-fir trees susceptible to bark beetles. However, in a few units, the larger trees that would be left are the most susceptible, increasing the hazard somewhat.

Generally, the reduced density of trees would improve the overall vigor of individual trees, allowing trees to more effectively compete for moisture, nutrients and sunlight. The more open environment of the stands would help inhibit invasion and breeding by allowing trees to repel bark beetle invasion. Particular care must be taken in units proposed for jackpot burning. In these cases flame lengths and fire intensity must be low enough to minimize scorch on tree boles and crowns that could leave reserve trees vulnerable to insect attack, especially in stands with heavy retention and those on warm dry and warm moist PVGs.

Most of the proposed treatments would reduce the susceptibility to Douglas-fir bark beetle in the treated stands. However, there would still be approximately 50 percent of the National Forest System land that could support Douglas-fir bark beetle populations (i.e., in the moderate and high hazard categories after implementation of an action alternative), and private land has many acres that are vulnerable. Therefore, these actions would reduce bark beetle hazard from moderate and high to no, very low or low on 811 acres (four percent) with Alternative B and 515 acres (three percent) with Alternative C.

Summary of Effects of Implementation of Action Alternatives

The change in the distribution of structure class, cover type, and canopy cover across the landscape are measures to determine the effects of management activities. The existing stand conditions (Alternative A) are a result of site conditions (PVG), wildland fire history, past timber harvest, other vegetation treatments, and forest succession. Alternative A is summarized in this section to compare the existing and no action condition with the post treatment conditions of the action alternatives.

Structure Class

Table 3-14 displays the effect of proposed treatments on structural stage distribution on National Forest System lands and on all ownerships in the Valley Face area. The change is displayed for three structure classes: seedling/sapling, medium tree, and large tree that represent the early, mid and late-seral stages. Nonforest areas (approximately 1865 acres), such as roads, lakes, rock, meadows, and agricultural land and private development are not capable of becoming forested.

Table 3-14. Effect of Each Action Alternative on Structure Class Distribution in the Valley Face Analysis Area, Before and After Implementation.

	Alternative A (Before)		Alternative B (After)		Alternative C (After)	
Structure Class	**NFS land, acres & percent**	**All Owner-ships, acres & percent**	**NFS land, acres & percent**	**All Owner-ships, acres & percent**	**NFS land, acres & percent**	**All Owner-ships, acres & percent**
Seedling/Sapling	3,564 18%	5,416 15%	5,374 27%	7,226 22%	4,970 25%	6,822 21%
Medium Tree	12,105 60%	20,884 59%	10,388 52%	19,167 57%	10,262 53%	19,041 58%
Large Tree	4,391 22%	7,146 21%	4,298 21%	7,053 21%	4,270 22%	7,025 21%
Non-Forest	82 <1%	1,865 5%	82 <1%	1,865 5%	82 <1%	1,865 5%

Exhibit P-10.

Alternative B changes forest structure from medium and large tree classes to an early successional seedling stage on approximately nine percent of National Forest System lands and seven percent of all land in the Valley Face area. Alternative C changes forest structure from medium and large tree classes to seedling stage on approximately seven percent of National Forest System lands and six percent of all land in the Valley Face area. Some private landowners are expected to harvest timber on their land in the next two to three years that would increase the number of acres in the early successional stage.

Both action alternatives retain most of the large tree structure and decrease the medium tree, bringing the landscape closer to the mid-range of historic conditions. Alternative C retains slightly more large and medium tree structures than Alternative B. By changing the species composition and reducing stand densities (see canopy cover on the next page), many stands in the medium tree group would be more capable of growing into the large tree class over the next 20 to 50 years. Both alternatives, especially B, increase the seedling/sapling class moving it closer to the high end of the historic range. The proposed treatments, along with past harvests, would increase the patch sizes of the seedling/sapling class, which is more consistent with the natural fire disturbance patterns.

Cover Type

Table 3-15 displays the effect of proposed treatments on cover type distribution on National Forest System lands and on all ownerships in the Valley Face area. Nonforest areas are not capable of becoming forested.

Table 3-15. Effect of Each Action Alternative on Cover Type Distribution in the Valley Face Analysis Area, Before and After Implementation.

	Existing (Alt A)		Alternative B After		Alternative C After	
Cover Type	**NFS land, acres and percent**	**All Owner-ships, acres and percent**	**NFS land, acres and percent**	**All Owner-ships, acres and percent**	**NFS land, acres and percent**	**All Owner-ships, acres and percent**
Larch/Douglas-fir	12,600 63%	20,043 57%	13,533 67%	20,876 59%	13,476 67%	20,910 59%
Shade Intolerant Mix	3,695 18%	6,922 20%	3,165 16%	6,392 18%	3,209 16%	6,436 18%
Lodgepole Pine	2,603 13%	3,561 10%	2,227 11%	3,185 9%	2,243 11%	3,201 9%
Shade Tolerant Mix	923 5%	1,784 5%	896 4%	1,757 5%	896 4%	1,757 5%
Ponderosa Pine	239 1%	1,136 3%	239 1%	1,136 3%	239 1%	1,136 3%
Non-Forest	82 <1%	1,865 5%	82 <1%	1,865 5%	82 <1%	1,865 5%

Exhibit P-10.

Both Alternative B and C shift cover types from shade tolerant mix, lodgepole pine, and shade intolerant mix to larch/Douglas-fir on approximately five percent of National Forest System lands. Alternative B increases the amount of larch/Douglas-fir cover type by about 935 acres. Alternative C increases the amount of larch/Douglas-fir cover type by about 870 acres. Both alternatives would increase the proportion of larch and decrease the proportion of Douglas-fir within the larch/Douglas-fir and the intolerant mix cover types. Alternative B would allow for more stands dominated by fire-tolerant and shade-intolerant species that more closely resemble the historic, fire-dominated landscape.

Canopy Cover

Table 3-16 displays the effect of proposed treatments on canopy cover on National Forest System lands and on all ownerships in the Valley Face area. Nonforest areas are not capable of becoming forested.

Alternative B reduces the high canopy cover on about seven percent of National Forest lands, which is four percent of all lands in the Valley Face area. The treatments that reduce the high canopy cover result in an increase in moderate and low of six percent and one percent, respectively, of National Forest System lands. Over all lands, the moderate increases by four percent and low by less than one percent.

Alternative C reduces the high canopy cover on about six percent of National Forest lands, or three percent of all lands in the Valley Face area. The treatments result in an increase in moderate and low of five percent and one percent, respectively, of National Forest System lands. Over all lands, the moderate increases by three percent and low by less than one percent.

Table 3-16. Effect of Each Action Alternative on Canopy Cover in the Valley Face Analysis Area, Before and After Implementation.

	Existing (Alt A)		Alternative B After		Alternative C After	
Canopy Cover	**NFS land, acres and percent**	**All Owner-ships, acres and percent**	**NFS land, acres and percent**	**All Owner-ships, acres and percent**	**NFS land, acres and percent**	**All Owner-ships, acres and percent**
High	8,445 42%	9,885 28%	7,020 35%	8,460 24%	7,223 36%	8,663 25%
Moderate	10,830 54%	20,929 59%	11,978 60%	22,077 63%	11,802 59%	21,901 62%
Low	786 4%	2,631 8%	1,062 5%	2,907 8%	1,028 5%	2,873 8%
Non-Forest	82 <1%	1,865 5%	82 <1%	1,865 5%	82 <1%	1,865 5%

Exhibit P-10.

Reducing the canopy cover would create more open forest stands and landscapes; reduce competition for light, water, and nutrients; and allow shade intolerant species to become or remain more dominant in the stands. All alternatives provide a diversity of stand densities across the landscape. However, Alternative B provides the most reduction in stand densities.

Cumulative Effects of Implementation of Alternatives B and C

Pattern and Disturbance

The type, amount, and locations of disturbances that occurred naturally served as a frame of reference for the treatments involved with the action alternatives to manage the Valley Face ecosystems within the range of variability and to sustain native species and ecosystem integrity. An important element of the treatments is the magnitude of change in vegetative structure and composition as compared to historical events. To achieve the changes that approximate historical events and reduce the potential for undesirable wildland fire, each of the action alternatives includes creating patches of early-seral vegetation structure greater than 40 acres (see the Regulatory Framework and Consistency section below). This proposed pattern of disturbance would shift the landscape toward historical disturbance patterns. In many cases the newly created openings offer a mosaic of scattered trees and/or clumps similar to what wildland fires created historically. Proposed treatments consolidate fragmented areas to manage for large blocks of mature and old forest in the future. Alternative B proposes 19 and Alternative C proposes 13 new openings that are greater than 40 acres. They range in size from 43 to 229 acres in both alternatives.

Other Cumulative Effects

Wildland fire is historically the primary disturbance that shaped the forest species, structures, and patches. Stand replacement fires affected about 15 percent of the area over the last 100 years. There were large fires in the area in the 1800s that are not mapped.

Wildland fire suppression has been effective in the Valley Face area since the 1930's and will continue to be a priority in this area. Fire exclusion allows forests to develop under the influence of vegetative succession, rather than the natural disturbance processes. In stands managed largely for timber production, fire suppression protects young trees until they can be harvested. On national forest land in the Valley Face area, it has probably prevented fires from burning onto private lands.

Past timber management has occurred on more than 45 percent of the National Forest System lands within the Valley Face area. Some of the proposed treatments are in the same stands that had previous harvests. Past timber management on national forest lands is described in detail in Table 3-2 and under the Past Timber Management section earlier in this chapter. Timber harvest has also occurred on at least 35 percent of the private lands in the Valley Face area. Most of this is on private timber lands; some on small private (Exhibit P-2). Past timber management, along with wildfire and fire suppression, have created the vegetation patterns that exist on the forested lands in the Valley Face area.

Firewood and forest products gathering would continue and would little or no effect on the vegetation conditions in the Valley Face area. Firewood cutting would likely remove some reserve trees that die after the Valley Face treatments and are near open roads. Firewood cutting primarily affects forests within 200 feet of roads open year-round or seasonally. Larch and Douglas-fir are preferred for firewood collection, but lodgepole pine and other species are also removed. Collecting forest products such as posts and poles, Christmas trees and boughs also occurs close to roads. Douglas-fir, subalpine fir, lodgepole pine, and grand fir are the primary species affected. These activities are likely more concentrated in the Valley Face area compared with other areas because of the easy access and close proximity to the Flathead valley.

Precommercial thinning reduces stand density in 15 to 20 year old stands and allows for a higher proportion of shade intolerant species across the landscape. The slash left from thinning increases the potential for high severity fire in those stands for several years. As it decomposes, it releases nutrients that encourage soil development and plant growth. Precommercial thinning has been accomplished on approximately 4600 acres (23 percent) of National Forest land since the 1960s. The amount on thinning on private land is not known. However, timberland managers tend to intensively manage their forests for growth and yield. Therefore, it is assumed for this analysis that at least 10 percent or 1800 acres of private lands have been thinned. The 201 acres of thinning planned for 2006 is near some of the proposed Valley Face units in the "East Mountain Meadows" area. Along with implementation of either of the action alternatives, thinning provides benefits to stand growth, species diversity, and long-term fuel reduction at the landscape scale.

Private land development within the analysis area has been occurring for the last century and has increased in the past two decades. Private land development often converts forested lands to low-density forests or grasslands and roads. Much of the private development in the Valley Face area includes rural home sites with forested acreage that is increasingly managed for fuels reduction and aesthetics. The action alternatives would reduce stand density and the potential for stand replacement fires adjacent to these private lands. Private land development that thins forested stands can reduce the potential for insect and disease spread and compliments the proposed Valley Face treatments.

Cattle grazing on national forest in the north end of the Valley Face area occurred for many years. Cattle can compact soils and damage seedling and sapling trees, if they stay in one area for long periods. The effects of grazing on forest vegetation conditions were minimal and are no longer easily apparent.

Regulatory Framework and Consistency

Flathead National Forest Land and Resource Management Plan (LRMP). The Forest Plan provides goals, objectives, and standards for the protection, improvement, and management of all

resources (Forest Plan Chapters II and III) including vegetation management. Amendments to the Forest Plan provide updated guidance for management of particular resources. The most recent and pertinent amendment related to vegetation management is Amendment 21 (1998). Required Forest Plan standards related to vegetation management are presented with an explanation of how the Valley Face Project complies with each standard.

Standard: Silvicultural examination and prescriptions be prepared before any vegetative manipulation takes place.

> *Compliance*: Silvicultural exams and prescriptions were part of the analysis for the project (Exhibits P-3, P-4, P-15).

Standard: Project silvicultural prescriptions will emphasize treatments that reduce losses due to insects and/or disease.

> *Compliance*: Increased tree vigor following thinning and understory fuels treatments would increase the trees' ability to withstand future insect or disease influences. Thinning would also reduce the number of currently affected trees. More open stand conditions tend to create less favorable bark beetle habitat, which may help maintain the stands for a longer period against beetle attacks. Regeneration harvests would replace the stands with a higher proportion of species that are more resistant to insects and disease (larch, ponderosa pine).

Standard: Timber sales will be designed to consider cost effectiveness while maintaining the long-term sustained yield and protecting the soil and water resources.

> *Compliance*: The purpose of the project is to reduce fuel loadings, future fire risk, and improve stand conditions to reduce the incidence of bark beetle and root disease. Treatments were not chosen primarily because they would give the greatest dollar return or timber outputs. However, cost efficient implementation methods would achieve the fuel reduction objective, while still protecting all resource values.

Standard: Where compatible with management area direction, firewood removal opportunities will be enhanced.

> *Compliance*: Temporary roads would be reclaimed. However, firewood opportunities in landing piles would be determined after harvest operations to see whether there is interest in the material or if there are any adverse effects in allowing firewood cutters to remove the material.

Standard: Vegetation management will be guided by the Vegetation Management Practices and Habitat Type Guidelines (Appendix I), and the Northern Regional Guide.

> *Compliance*: Vegetation treatments in the action alternatives are consistent with the objectives described in Appendix I for timber, site preparation, reforestation, etc. for the habitat type groups in the Valley Face area. Current USFS Region One timber utilization guidelines will be used when preparing timber sales.

Standard: Existing old growth will be maintained or restored consistent with wildlife and fish objectives and standards.

Compliance: Alternative B would remove understory trees and fuels in some old growth stands to reduce the risk of stand replacement wildfires in those stands and adjacent private lands. These treatments would maintain old growth structure and composition consistent with a mixed severity fire regime, but would reduce the habitat value for some species (see EA chapter 3, Old Growth). Alternative C would not treat any old growth stands.

Standard: Consistent with native disturbance and succession regimes, long-term snag and coarse woody debris recruitment; essential soil processes, species habitat; and long-term structural diversity of forest stands will be provided for.

Compliance: Site-specific prescriptions were developed for this project. Although the Valley Face area includes primarily the Moist and Dry PVGs, the prescriptions are intended to retain the minimum snag, snag recruitment, and coarse woody debris specified for the Moist PVG. The prescriptions were developed with consideration for current and desired conditions of vegetation structure and disturbance processes at both the landscape and stand level (Exhibits P-15, Rd-3, Rd-10). See the Features Common section of Chapter 2 for details of the snag and coarse woody debris retention requirements. Almost 20 percent of the national forest would be treated in this project. When combined with past timber harvesting, about 60 percent of the national forest would have some type of vegetation treatment. This was considered in the Valley Face treatment prescriptions. In the treated areas, downed wood and snags would be maintained at the low end of the range of variability, to meet fuel reduction objectives. The remaining area would follow a natural disturbance and successional regime. A variety of forest conditions would result, and long-term snag and coarse woody debris recruitment, and associated soil processes and wildlife habitat, would be provided for.

<u>The National Forest Management Act (NFMA) (16 USC 1604)</u>. The NFMA establishes specific management requirements for timber harvest projects on National Forest System (NFS) lands (also described in FSM 1921.12). Required NFMA requirements related to vegetation management are presented with an explanation of how the Valley Face Project complies.

Under 16 USC 1604 (g)(3)(E) a Responsible Official may authorize site-specific activities to harvest timber on NFS lands only where:

Requirement: Soil, slope, or other watershed conditions will not be irreversibly damaged.

Compliance: The design criteria, protection measures, and monitoring features outlined in Chapter 2 are sufficient to protect soil and water resource values. In addition, by reducing existing forest fuel loads within the treatment areas, there would be a reduced chance of having a severe surface fire or crown fire event on the site that could result in adverse soil and water effects.

Requirement: There is assurance that such lands can be adequately restocked within five years of final regeneration harvest.

Compliance: The action alternatives include regeneration harvest treatments. Some of these areas would be planted to supplement natural regeneration with the desired species mix and to insure adequate restocking. Adequate stocking would be determined from stocking surveys conducted for three to five years after planting or natural regeneration. Survey results would be compared to the desired stocking levels identified in the detailed silvicultural prescriptions to determine if subsequent treatments are needed. Based on the regeneration success after

previous timber harvesting in the Valley Face area, adequate stocking within five years is assured. Thinning and understory fuel treatments will retain adequate stocking of trees after treatment.

Requirement: Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water are protected from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment where harvest are likely to seriously and adversely affect water conditions or fish habitat.

Compliance: Harvest units are delineated outside of riparian habitat conservation areas and are not likely to affect water or fish resources. See Chapter 3, Fish and Water.

Requirement: The harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber.

Compliance: The purpose of the Valley Face Project is to reduce hazardous fuels and improve forest health and vigor within the treatment areas, not to generate revenues from a timber sale. However, the forest products and subsequent revenue derived from the vegetation treatments are a positive outcome of the treatments.

Under 16 USC 1604 (g)(3)(F) a Responsible Official may authorize projects and activities on NFS lands using cutting methods, such as clearcutting, designed to regenerate an even-aged stand of timber only where:

Requirement: For clearcutting, it is the optimum method; or where seed tree, shelterwood, and other cuts are determined to be appropriate to meeting the objectives and requirements of the relevant land management plan.

Compliance: Commercial and understory thinning are proposed for over half of the treatment areas (54 percent of Alternative B and 58 percent of Alternative C). These are not regeneration harvest methods but are intermediate treatments within an even-aged management system. The desired species (larch, ponderosa pine, western white pine, and to a lesser degree Douglas-fir) require abundant light to establish on a site and grow well. The more shaded conditions in the thinned areas do not provide good or even acceptable growing conditions for these species.

To provide necessary conditions for regeneration of desired species, about 40 to 45 percent of the proposed treatment acres are regeneration treatments (seed tree and shelterwood harvest). Larch, ponderosa pine, and white pine would be planted; Douglas-fir and lodgepole pine are expected to naturally regenerate. The treatments are intended to reduce fuels adjacent to private lands and across the landscape and shift the species compositions to more long-lived, vigorous, fire-tolerant seral species. These treatments meet the purpose and need for the project of reducing fuels and reducing the vulnerability of stands to future large-scale disturbances. They also create the desired diversity of species composition across the landscape composed of long-lived fire tolerant species. The seed tree and shelterwood methods are determined to be the appropriate method to achieve these objectives.

Requirement: Cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain.

Compliance: The regeneration harvests are proposed in forest stands where the conditions warrant fuels reduction using regeneration methods. The units are delineated with consideration of the natural terrain. Some of the units are designed, in part, to improve the scenery by modifying sharp contrasts from past harvesting.

Requirement: Cuts are carried out according to the maximum size limit requirements for areas to be cut during one harvest operation.

The size limit established for our geographic area is 40 acres, with exceptions for larger openings when they will produce a more desirable combination of net public benefits (36 CFR 219.27 (d) (2) (i). Forest Service Manual 2400, Supplement No.: R1 2400-2001-2 states that openings created by even-aged silviculture that exceed 40 acres may be allowed with Regional Forester approval.

Compliance: Regeneration treatments (seed tree and shelterwood harvest) are proposed on 1,810 acres in Alternative B and 1,406 acres in Alternative C. These treatments would create openings (12 to 229 acres in size) where larch, ponderosa pine, and white pine would be planted. Douglas-fir and lodgepole pine are expected to naturally regenerate. These treatments would result in 13 openings that are greater than 40 acres in size. The units are located to provide stand conditions that would allow for more effective fire suppression over the next several decades, add to the diverse pattern of forest structures across the Valley Face landscape, and increase the size of the patches to more closely resemble the historic, fire-maintained conditions. The Regional Forester has approved exceeding the 40-acre limit (Exhibit P-25).

Requirement: Cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, esthetic values, cultural and historic resources, and the regeneration of timber resources.

Compliance: Protections are included for all resources. See Chapter 2, Features Common to the Action Alternatives, and the effects analysis for the various resources.

Requirement: Stands of trees are harvested according to the requirements for culmination of mean annual increment (CMAI) of growth (FSM 1921.12f).

Compliance: This requirement does not apply to the Valley Face units because the treatments are proposed to meet multiple-use objectives other than timber production (fuel reduction). However, all stands proposed for regeneration harvest have achieved at least 95 percent of the cubic foot volume that can be expected at culmination. In fact, many of the stands are beyond CMAI and are beginning to loose volume to insects, disease, and windthrow (Exhibit P-3).

INVASIVE PLANT SPECIES - NOXIOUS WEEDS

Introduction

Invasive plant species are non-native plants that can inhabit and negatively alter native plant communities. A number of invasive species are recognized as noxious, meaning laws have been developed to restrict their spread and effect on the environment. Dry vegetation types and areas affected by road development, grazing, logging, fire, or other disturbances are most susceptible to weed invasion. Typically, invasive species have the ability to spread rapidly and reproduce in high numbers, which enables them to effectively crowd out native plant populations. Some can pose serious threats to the composition, structure, and function of native plant communities. Field observations, road surveys, and weed treatment records indicate that the presence and extent of invasive plant populations is expanding within the analysis area.

Information Sources

The Flathead County noxious weed list was consulted, and invasive species of concern were identified. In addition to county listed weeds, a recent weed risk assessment (WRA) project in the Northern Region of the U.S. Forest Service (Mantas 2003) has identified additional species that pose a threat to native vegetation. Noxious weed surveys were conducted from June through August 2005 along major road corridors and proposed haul routes within the project area.

Analysis Area

The analysis area and timeframes used to examine the impacts of the proposed action and its alternative on invasive plant species is the same as described in the vegetation section earlier in this chapter.

Affected Environment

Areas most susceptible to invasion by weeds are areas of severe ground disturbance (e.g., parking lots, gravel pits, roads, skid trails, horse corrals). However, once established on a disturbed site, many weed species can spread onto relatively undisturbed adjacent areas. Non-forested plant communities are also at high risk for invasion by weed species. Most forested communities are less susceptible to invasion and infestation by weed species because of the shade and competition for water and nutrients they provide (with the exception of orange and yellow hawkweeds). However, some invasive species have been successful at invading warm/drier forest types dominated by Douglas-fir and/or ponderosa pine. The warm-dry forest conditions found in 39% of the Valley Face project area make those forest communities more susceptible to invasion, especially if they are disturbed. In addition, the Valley Face project area is located in close proximity to the lower elevation valley floor and urban interface. Consequently, the project area is more vulnerable to weed establishment, persistence, and subsequent potential risk to native habitats. Invasive plant species are more likely to establish and spread from adjacent disturbed areas such as the urban interface and also more likely to persist at lower elevations.

<u>Invasive Species of Concern</u>

The analysis area is entirely within Flathead County. Flathead County has adopted the Montana State Noxious Weed list with additional County invasive plants of concern. In addition, a weed

risk assessment (WRA) identified additional species that pose a threat to native vegetation (USDA Forest Service 2003a). After assessing those species recognized by Flathead County and the WRA, a list was compiled of invasive plant species of concern with regards to impacts on ecosystem integrity for the analysis area (see following table).

Table 3-17. Invasive plants considered in this analysis.

Scientific Name[a]	Common Name	WRA list	Known from the project area	Potential invader to the project area[c]
Category 1 – Widespread established[b]				
Acroptilon repens (*C. repens*)	Russian knapweed	X		X
Cardaria draba	hoary cress	X		X
Centaurea biebersteinii (C. maculosa)	spotted knapweed	X	X	
Centaurea diffusa	diffuse knapweed	X		X
Cirsium arvense	Canada thistle	X	X	
Convolvulus arvensis	field bindweed	X		X
Cynoglossum officinale	hound's-tongue	X	X	
Euphorbia esula	leafy spurge	X		X
Hypericum perforatum	St. John's-wort	X	X	
Leucanthemum vulgare (Chrysanthemum. leucanthemum)	ox-eye daisy	X	X	
Linaria dalmatica	Dalmatian toadflax	X		X
Linaria vulgaris	yellow toadflax	X	X	
Potentilla recta	sulphur cinquefoil	X	X	
Tanacetum vulgare	common tansy	X	X	
Category 2 – Recently established, rapidly spreading[b]				
Hieracium aurantiacum	orange hawkweed	X	X	
Hieracium caespitosum, H. floribundum, H. piloselloides, H. pretense	yellow hawkweed complex	X	X	
Lepidium latifolium	perennial pepperweed	X		X
Lythrum salicaria	purple loosestrife	X		X
Lythrum virgatum	wandlike loosestrife			X
Ranunculus acris	Tall buttercup	X		X
Senecio jacobaea	tansy ragwort	X	X	
Tamarix spp.	salt cedar or tamarisk	X		X
Category 3 – Not yet detected or small occurrence[b]				
Centaurea solstitialis	yellow starthistle	X		X
Chondrilla juncea	rush skeletonweed	X		X
Crupina vulgaris	common crupina	X		X
Iris pseudacorus	yellowflag iris			X
Isatis tinctoria	dyer's woad	X		X
Myriophyllum spicatum	Eurasian water milfoil	X		X
Additional Invasives of Concern for the Flathead National Forest				
Bromus tectorum	cheatgrass	X		X
Carduus nutans	musk thistle	X		X
Chorispora tenella	purple mustard	X		X
Cirsium vulgare	bull thistle	X	X	
Elymus repens	quackgrass	X		X
Melilotus officinalis	yellow sweetclover	X		X
Phalaris arundinacea	reed canarygrass	X		X
Potentilla argentea	silvery cinquefoil		X	
Sonchus spp.	perennial sowthistle	X		X
Tragopogon dubius	goat's bear/salsify		X	
Veronica officinalis	common speedwell	X		X
Additional Invasives of Concern from the Flathead County Weed List				

Campanula rapunculoides (undesirable)	creeping bellflower	X		X
Euphorbia species (cautionary)	spurge (all)			X
Tripleurospermum perforata (Matricaria inodora, M. perforata) (undesirable)	scentless chamomile			X

[a] Nomenclature follows the USDA Plants Database: USDA, NRCS 1999. The PLANTS database (http://plants.usda.gov/plants). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
[b] Montana Department of Agriculture Noxious weed categories
Category 1 is defined as noxious weeds that are currently established in the State and generally widespread in many counties of the state. Management criteria include awareness and education, containment and suppression of existing infestations and prevention of new infestations. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses.
Category 2 is defined as noxious weeds that have recently been introduced into the state or are rapidly spreading from their current infestation sites. These weeds are capable of rapid spread and invasion of lands, rendering lands unfit for beneficial uses. Management criteria include awareness and education, monitoring and containment of known infestations and eradication where possible.
Category 3 is defined as noxious weeds that have not been detected in the state or may be found only in small, scattered, localized infestations. Management criteria include awareness and education, early detection and immediate action to eradicate infestations. These weeds are known pests in nearby states and are capable of rapid spread and render land unfit for beneficial uses.
[c] Potential invasive plant species of concern with potential to impacts ecosystem integrity for the analysis area.

Inventory and Monitoring

The Flathead National Forest has completed an Environmental Assessment analyzing the effects of treating noxious and invasive plants (USDA Forest Service 2001a - FNF Noxious and Invasive Weed Control Environmental Assessment). A Forest-wide Weed Management Plan is currently under development to outline methodology in prioritizing treatment and inventory and monitoring protocols. In addition, this plan will outline a methodology for minimizing the establishment and spread of invaders in all projects and special use permits, such as grazing allotments and timber management areas. Currently, treatment and inventory is prioritized at quarterly meetings of the FNF Weed Advisory Group. Factors for prioritization include:

Weed invasive category (see following table) as outlined in the FNF Noxious and Invasive Weed Control Environmental Assessment.

Level of invasive risk to a potential vegetation group. The Western Montana Planning Zone Weed Risk Assessment is used as a tool to ascertain the level of invasiveness for weed species within potential vegetation groups (USDA Forest Service 2003a).

Special areas that are threatened by weed invasion. Particular areas of greater conservation concern need additional protection from weed invasion. Examples would be designated wilderness, sensitive plant habitat, and pristine native plant communities.

Potential for increased off-site movement of weeds that could increase the spread to new areas. Weed infestations that are located along roads, at trailheads, in grazing allotments, or at high use recreation sites are higher priority for treatment because of the increased vectors of spread in these areas.

Table 3-18. Weed Treatment Prioritization on the Flathead National Forest[a]

Forest Priority	State Category	Objectives	Prioritization Factors
1	3 (Potential Invaders)	Currently absent on FNF; goal is prevention, then eradication, if possible	• detection • available funds
2	2 (New Invaders)	Localized containment and strong emphasis on overall population reduction	• available funds • relative invasive nature of the species and its potential to displace native vegetation • potential for off-site movement of seeds • relative ecological importance of rarity of the site that could be damaged by the presence of the invader species
3	1 (Widespread Invaders)	Containment and localized reduction of populations	• available funds • relative invasive nature of the species and its potential to displace native vegetation • potential for off-site movement of seeds • relative ecological importance of rarity of the site that could be damaged by the presence of the invader

[a] USDA Forest Service, 2001.

Surveys

Major roads and proposed haul routes were surveyed for noxious weeds from June through August 2005. These sites are considered the areas most susceptible to establishment and serve as vector corridors for spread into newly disturbed areas. Twenty-six road segments (estimated at 124 acres or 53 miles) were surveyed for invasive plants. A total of 14 invasive species were mapped during 2005 surveys. The most abundant and widely distributed noxious weed species in the Valley Face area is spotted knapweed (*Centaurea biebersteinii*) followed by oxeye daisy (*Leucanthemum vulgare)* and orange and yellow hawkweed (*Hieracium aurantiacum*, *H. floribundum*), as shown in the following table.

Table 3-19. Occupied acres within weed survey areas of Valley Face analysis area.

State Category	Species	Common name	% occupied of acres surveyed (total 124.3 acres)	Acres occupied within surveyed areas
1	*Centaurea biebersteinii*	spotted knapweed	71	88.10
1	*Leucanthemum vulgare*	oxeye daisy	51	62.81
2	*Hieracium aurantiacum*	orange hawkweed	25	31.27
2	*Hieracium floribundum*	yellow hawkweed	24	29.46
1	*Cirsium arvense*	Canada thistle	7	8.17
1	*Hypericum perforatum*	St. John's wort	4	4.69
1	*Linaria vulgaris*	Yellow toadflax	3	3.60
1	*Cynoglossum officinale*	hound's-tongue	3	3.12
1	*Tanacetum vulgare*	common tansy	<1	0.55
2	*Senecio jacobaea*	tansy ragwort	<1	0.25
NA	*Tragopogon dubius*	goat's bear/salsify	<1	0.15
NA	*Potentilla argentea*	silvery cinquefoil	<1	0.10
NA	*Potentilla recta*	Sulphur cinquefoil	<1	0.09
1	*Cirsium vulgare*	bull thistle	<1	0.04

These species occur along portions of many of the roads, gravel pits, and other disturbed sites. State listed Category 2 noxious weeds species, orange hawkweed, meadow/yellow hawkweed, and tansy ragwort are of greatest concern in the area. These species are recently established (within the last 5-10 years) and are rapidly expanding in established areas. They are present along

many of the roads and in some regenerated harvest units. A control effort for tansy ragwort has been active in the Little Wolf Fire area, to the west of the Valley Face analysis area, since 1996. These treatments have been effective in reducing the spread and area occupied as indicated by the decreasing levels of treatments from year to year.

People, vehicles, domestic animals, wildlife, and wind are all vectors contributing to the transport of weeds within the analysis area. Once seeds are dispersed to a new site, habitat type and disturbance patterns influence the establishment potential of invasive plant species. The potential for each species to establish is also dependent on life history, morphology, phenology, ecology, and reproductive biology of the individual weed species.

Control and Containment

Efforts to control the spread of noxious weeds include prevention, containment, and eradication methods. Eradication is generally limited to localized areas and category 2 and 3 species. Methods used for eradication include hand pulling and herbicide applications. Containment methods are used to prevent weeds from spreading into new areas and reducing the coverage, if possible, in existing infestations. Containment methods include closing infested areas to travel (for example Little Wolf Fire area), washing vehicles and equipment upon entering or leaving an infested area, using weed free seed and straw mulch for revegetation, hand pulling, and herbicide application around the perimeter of the infestation. Prevention uses similar techniques as containment, with the objective of preventing a new weed infestation rather than limiting spread of an existing one. Biological control agents (seed, leaf, and root feeding insects) have had some success in controlling noxious weeds in Montana. Biological control agents are being used to help control tansy ragwort on the Tally Lake Ranger District.

Environmental Consequences

To compare the three alternatives, the following table displays a relative rating of ground disturbance anticipated by each alternative; 1 indicates the most impacts and 3 the least. Ground disturbance is used as a measure of vulnerability of a site to weed invasion. The overall ranking is the simple average of all activities by alternative.

Table 3-20. Relative rating of vulnerability to weed spread (1-highest, 3-lowest) by ground-disturbing activity by alternative.

Activity proposed	Alt. A	Alt. B	Alt. C
Burning - slash piles	3	1	2
Burning - understory	3	2	2
Commercial timber harvest	3	1	1
Non-commercial fuel reduction	3	2	2
Temporary road construction	3	1	1
Road BMP work	3	2	2
Temporary Road obliteration	3	2	2
Slashing – Excavator	3	1	2
Slashing – Hand pile	3	2	1
Reforestation	3	3	3
Overall ranking	3.0	1.7	1.8

Direct and Indirect Effects-Alternative A (No Action)

Alternative A provides the least opportunity for creating new weed habitat due to no new areas of ground disturbance. However, roads currently open may continue to serve as corridors for weed spread. Invasive species considered in the analysis area could potentially expand by utilizing roads as vector corridors. Once seeds are dispersed to a new site, habitat type and disturbance patterns influence the establishment potential of invasive plant species. Because Alternative A proposes no ground disturbance related to this project, the potential for noxious weeds species to establish in undisturbed areas is low. With the exception of orange and yellow hawkweeds, noxious weed species commonly require disturbance, bare ground openings, and reduced competition (early successional habitat conditions) for initial establishment. However, if established, the ability for weed species to out-compete existing native vegetation, to sustain its occurrence, and potentially alter native habitat functions is largely dependent on the habitat conditions and the life history, morphology, phenology, ecology, and reproductive biology of the individual weed species.

Orange and yellow hawkweeds are Category 2 species (recent invaders to Montana). Life history and reproductive biology of these two invasive hawkweeds allow for rapid spread, once established, not only on open areas but also under forested conditions. Hawkweeds are already well established within the Valley Face project area. Unlike the other known weeds in the project that remain primarily within open disturbed areas, orange and yellow hawkweeds can spread into forested habitats beneath the forest canopy despite reduced understory light levels.

Direct and Indirect Effects-Alternatives B & C

Vegetation treatments and temporary road construction are proposed for this project. General effects on the risk to weed establishment and spread are discussed below by activity. Areas with more acres of ground disturbance or open roads are expected to have greater vulnerability to weed colonization.

Timber Harvest and Other Vegetation Treatments

The effects of logging are variable depending on the amount of ground disturbed during the activity; the more bare soil exposed, the more germination substrate is available for colonizing weed seeds. Ground-based systems (tractor) with wheeled machinery usually disturb more ground than do skyline cable systems or swing systems, which use a combination of both skyline and tractor operating systems. Areas used for landings with any logging system can be highly impacted. The amount of area disturbed may vary by the type of retention prescription planned. With heavy retention, less volume would be removed, more canopy (shade) would remain, and less soil would be disturbed than with light retention. Alternative B proposes the greatest proportion of acres using tractor logging systems and propose more acres for low retention prescription than Alternative C. Based on logging system and retention prescriptions proposed, Alternative B would have more risk to native communities in the Valley Face area from weed establishment and spread than Alternative C. The differences in these logging systems and retention levels by alternative are displayed in the following table.

Table 3-21. Logging system and retention acres (% of total), listed in order of most ground disturbance to the least.

	Alternative A	Alternative B	Alternative C
Logging System			
Tractor	no action	2503 (64 %)	1815 (54 %)
Skyline	no action	380 (10 %)	335 (10 %)
Swing	no action	82 (02 %)	75 (02 %)
No system*	no action	947 (24 %)	1129 (34 %)
Total	0	3912	3354
Retention Level			
Low	no action	314 (08 %)	281 (08 %)
Moderate	no action	3143 (80 %)	2515 (75 %)
Group Selection	no action	215 (05 %)	215 (06 %)
High	no action	240 (06 %)	343 (10 %)
Total	0	3912	3354

*non-commercial thinning or fuels reduction where no yarding system is used (slash is hand piled)

Machinery can also spread weed seeds if not washed prior to use; therefore design features include cleaning all off-road equipment prior to entering the area. Use of dedicated skid trails will also minimize spread across units. Other features designed to minimize soil impacts (see Chapter 2) will also aid in reducing noxious weed spread.

The effect of weeds on native plant communities from proposed slash treatments also depend on the amount of ground disturbed during the activity. As with logging systems and retention prescriptions, the more bare soil exposed from the slash treatment method, the more germination substrate is available for colonizing weed seeds. Slash treatment methods using excavators to pile slash would commonly disturb more ground and expose more bare soil than hand piling the slash piles. In addition, underburning the units and burning the slash piles would reduce competing native vegetation and expose some bare mineral soil to create a favorable environment for noxious weeds. Consolidated fuels in slash piles will also burn hotter than dispersed underburns and expose more bare mineral soils. Alternative B would post more risk to weed establishment as this alternative proposes the greatest proportion of excavator piling and burning as described in the following table.

Table 3-22. Slash treatment method acres (% of total), listed in order of most ground disturbance to the least.

Piling methods	Alternative A	Alternative B	Alternative C
Excavator piling	no action	2536 (65 %)	1879 (56 %)
Excavator piling /Jackpot burn	no action	181 (07 %)	164 (05 %)
Jackpot burn	no action	0 (0%)	38 (01 %)
Hand piling	no action	947 (24 %)	1129 (34 %)
Underburning (no piling)	no action	148 (04 %)	144 (04 %)
Total	0	3912	3354

Temporary Road Construction and Haul Routes

Portions of the existing Forest Service road network would be utilized to implement this project. Use of existing roads facilitates weed establishment because cars and trucks, along with mountain bikes and horses, are among the main vectors of weed spread. Alternatives B and C both propose 40 haul route miles.

Temporary road construction activities would expose bare soil and parent material, creating suitable substrates for weed germination. In addition, use of these temporary roads may also contribute to the dispersal and spread of weed seeds. Alternative B proposes 4.5 miles of temporary roads and would pose the highest risk of altering native plant communities with the greatest potential for weed expansion and dispersal. Alternative C proposes construction of 3.5 miles of temporary road. This alternative would provide fewer miles of exposed bare soil and reduce the risk of invasive weed establishment. Proposed weed control actions, revegetation, and closing these roads to vehicular use would lessen the establishment and spread of weeds (see Chapter 2).

Cumulative Effects Alternative A – No Action

The Valley Face project area is highly susceptible to weed invasion due to its proximity to the urban development. Weed establishment is opportunistic in disturbed soils and open bare ground, common in development of urban areas. This may result in a high risk level of spread from adjacent urban areas to disturbed areas in the Valley Face project.

Past ground disturbing activities such as timber harvest, road construction, trail construction, road maintenance, and fire suppression activities (e.g. fireline, dozer line, and safety zone construction) have contributed to the establishment and spread of noxious and invasive plants in the area. Recreational and economic land uses (hunting, hiking, fishing, logging, mushroom harvesting, firewood gathering, etc.) have also promoted the spread of weed seeds, as users and their vehicles serve as vectors for weed seed spread. All these activities are likely to continue into the future.

Weed control efforts are likely to increase in the area as surveys have detected new and growing infestations resulting from other proposed and ongoing actions. Road closures have likely decreased the spread of weeds.

Cumulative Effects Action Alternatives B and C

In addition to the cumulative effects described for the no-action alternative above, the action alternatives will also contribute to cumulative effects to the degree described in the direct effects section above for each proposed activity.

In summary, many past, present, and foreseeable actions have and will contribute to weed risk and spread in the Valley Face Fuels Reduction Project area. Additional acres, outside and adjacent to the treatment units will become more susceptible to weed invasion from a number of weed species as a result of this action. Areas with greater miles of open roads, road use, and bare ground exposure will increase facilitation of weed spread. This contribution to cumulative effects will be greatly reduced, however, by design features that will lessen the impact of weed spread; specifically aggressive weed treatments, soil stabilization measures, revegetation of disturbed sites, and restoration of constructed temporary roads.

Regulatory Framework and Consistency

Management direction for noxious and invasive weed control on the FNF is set at the national and forest levels. Forest Service policies were developed in response to federal laws guiding implementation of noxious weed control actions. These policies are set forth in Amendment 2000-95-5 of the Forest Service Manual, Chapter 2080, Noxious Weed Management, and have

been incorporated into the FNF Forest Plan. Treatment and monitoring of known weed populations in the Valley Face Project area will be implemented under the authority and guidance of the Flathead National Forest Noxious and Invasive Weed Control Decision Notice (May 2001) and EA (March 2001). These were designed to meet legal requirements and Forest Service policies for noxious weed control. The Valley Face Project incorporates and is consistent with the FNF Weed Control Decision. Design features and management requirements for actions proposed under this project follow requirements documented in the Forest Service Manual Amendment for Noxious Weed Management, road and timber management projects.

THREATENED AND SENSITIVE PLANTS

Introduction

The Endangered Species Act (ESA) 1973, as amended (16 U.S.C. 1536(c), 50 CFR 402), requires that the Forest Service conserve endangered and threatened species. The National Forest Management Act (NFMA) and Forest Service policy direct that National Forest System (NFS) lands be managed to maintain populations of all existing native plant and animal species at or above minimum population levels. A minimum viable population consists of the number of individuals adequately distributed throughout their range necessary to perpetuate the existence of the species in natural, genetically stable, self-sustaining populations.

In addition to plants protected under the ESA, the Forest Service identifies plant species for which population viability is a concern as "sensitive species" as designated by the Regional Forester ({FSM} 2670.44). Currently, 52 plant species are designated as sensitive on the Regional Forester's sensitive plant list for the Flathead National Forest. USDA Forest Service policy requires that activities conducted on NFS lands be reviewed for possible impacts to threatened, endangered, or sensitive (TES) species ({FSM} 2670.32). The Forest Service has no jurisdiction to protect habitat of sensitive plant species on private lands.

To summarize field survey findings for threatened and sensitive plants, there are no known occurrences of the federally threatened water howellia (*Howellia aquatilis*) or Spalding's catchfly (*Silene spaldingii*) within the affected action area. No Regional Forester's sensitive plants (hereafter referred as sensitive plants) are currently known to occur within the project area. Three sensitive plants are known to occur within five miles of the project area: sweet coltsfoot (*Petasites frigidus* var. *nivalis*), water marigold (*Bidens beckii*), and water star-grass (*Heteranthera dubia*).

Information Sources

Data sources used for this analysis includes the Montana Natural Heritage Program's (MNHP) Element Occurrence Database; the FNF's Threatened, Endangered, and Sensitive Species (TES) Survey Atlas; and the FNF's TES Plant Location Database. These databases include data collected from field surveys conducted by a FNF botanist, trained technicians, and other botanists contributing surveys and element occurrences to the Montana Natural Heritage Program (MNHP). All other sources of information are cited in the text.

On the ground sensitive plant surveys were conducted in the 2005 field season. A five-person crew conducted surveys from 3 June to 21 June 2005 (for a total of 36 person days) across approximately 3263 acres within the proposed treatment areas. Field crews consisted of a botanist and biological technicians. All surveyors were trained and tested in the identification and habitat associations of the Flathead National Forest sensitive plants. For each proposed unit surveyed, aerial photos taken in 2004 were used to assist in targeting potential sensitive plant areas that could be discerned from aerial photos (e.g., wetlands and rock outcrops). Surveyors walked through units using intuitive searches based on knowledge of potential habitat for sensitive plants and aerial photo interpretation. Surveys attempted to visit the varying habitat types and aspects for each unit. Where the surveyor considered habitat potential high, more time was spent searching for sensitive plants for that area; whereas less time was spent in other areas considered

having less potential for sensitive plants. A complete species list of plants encountered was assembled for each area surveyed (some smaller units were combined into one survey area).

The lower, eastern portions of the Valley Face area, with the undulating terrain and abundant wetlands and rock outcrops, suggested good potential for sensitive plant species. Due to this habitat potential and the scarcity of previous surveys in the area, nearly all proposed units and haul routes in the eastern portions were surveyed. The more upland units in the southwestern portion of the project area were surveyed less intensely. Pre-field photo interpretation suggested these areas featured similar vegetation to upland areas in the Logan Creek Drainage immediately to the west, which have been surveyed and offer only low to moderate potential for sensitive plants.

Analysis Area

The analysis area and timeframes used to examine the impacts of the proposed action and its alternatives on sensitive plants is the same as described for vegetation section at the beginning of this chapter.

Affected Environment

Threatened and Endangered Plant Species

There are currently no federally listed endangered plant species in Montana. Two threatened plant species, water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*), do occur in Montana and have been identified by the U.S. Fish and Wildlife Service as having potential to occur within the Valley Face project area. A species account of water howellia and Spalding's catchfly is located in Exhibit S-3.

Water howellia (Howellia aquatilis)

The USFWS has identified all areas below 5000 feet on the FNF to be within the range of water howellia. Consequently, all areas above that elevation are outside the range of the species. Elevations in the Valley Face drainage typically do not exceed 5000 feet, so most of the project area is evaluated in this EA with regards to current status and effects to water howellia even though it has not been found in the Valley Face project area. Areas exceeding 5000 feet in elevation will be excluded from this evaluation.

Several wetland ponds were identified in aerial photos within the project area. Surveys were conducted from 3 June 2004 through 21 June 2005 (see Exhibit S-5 for survey records). Water howellia or potential habitat was not detected during these surveys.

Spalding's Catchfly (Silene spaldingii)

Suitable habitat for Spalding's catchfly does exist in the FNF, although it is extremely scarce. Grasslands dominated by rough fescue (*Festuca campestris*, formerly *F. scabrella*), bluebunch wheatgrass (*Pseudoroegneria spicata* formerly *Elymus spicatus*), and/or Idaho fescue (*Festuca idahoensis*) are the typical plant community associated with Spalding's catchfly. These sites may also have scattered ponderosa pine trees. Although there are numerous mountain grasslands on the FNF with similar species composition, it appears that Spalding's catchfly prefers mesic sites within a matrix of drier grassland communities in the foothill and valley floor zones.

On the FNF, small isolated suitable habitats exist along the North Fork of the Flathead River floodplain from the Canadian border to Polebridge, in very small isolated grasslands in the Swan Valley, and in larger open fescue bunchgrass prairies in the South Fork of the Flathead and Danaher Creek Drainages within the Bob Marshall Wilderness. Although these sites are not specifically mapped, their entire area would not exceed more than one percent of the land base of the FNF. None of these sites are within the Valley Face project area; however, the location near Ashley Lake is within five miles of the southern boundary for this project.

No grasslands with potential for Spalding's catchfly were located within the project area on aerial photos or during surveys in June 2005. In addition, Spalding's catchfly plants were not found during the 2005 project area surveys from 3 June 2004 through 21 June 2005.

Sensitive Plants

There are 52 recognized Regional Forester's sensitive plants for the Flathead National Forest (see Exhibit S-1). The MNHP database and Flathead National Forest element occurrences databases were queried to determine known occurrences within the Valley Face area. The MNHP Element Occurrence database is a collection of positive surveys for species of concern for Montana.

No sensitive plants were located during the 2005 field surveys and no sensitive plants are currently known to occur within the project area. Potential habitat was located for sensitive plants associated with upland coniferous forest, riparian, wet coniferous forest, other wetlands (not peatlands, fens, or aquatic), moist cliffs, rock outcrops, and grasslands/forest openings. Three sensitive plants are known to occur within five miles of the analysis area and are displayed in the following table.

Table 3-23. Regional Forester's sensitive plants known occurrences within 5 miles of the Valley Face Fuels Reduction action area.

Species	Common Name	EO number[a]
Bidens beckii	water marigold	08
Heteranthera dubia	water star-grass	03
Petasites frigidus var. *nivalis*	sweet coltsfoot	04

[a] EO = Element Occurrence numbers as assigned by the Montana Natural Heritage Program.

Species Accounts of Known Occurrences Within 5-Mile Buffer of Action Area

Beck water-marigold (*Bidens beckii*) (G4/S2) is an aquatic perennial and the only truly aquatic member of the *Asteraceae* family in our area. It is readily distinguished by its aster-like flowers and dimorphic emergent and submergent leaves. Plant lower stems are submerged in water while the upper portions are usually submerged. This plant flowers in August and September (MNHP 2005).

Beck water-marigold occurs in still or slow-moving water of lakes, rivers, and sloughs in the valleys, 0.1- 3m deep. It is found in southern British Columbia to Quebec and Nova Scotia, and south of B.C. to Washington, Oregon, and northwest Montana. Beck water-marigold in on the periphery of its range in Montana where there are nine known populations. Only one of these occurrences is located on the FNF, occurring at Tally Lake.

Water star-grass (*Heteranthera dubia*) (G5/S1) is a submerged or partially floating, herbaceous perennial with long, flaccid stems that root at the nodes. Flowers appear in August and float on the surface of the water. The fruit is a many-seeded capsule.

Water Star-grass occurs in shallow, slow-moving water of rivers and sloughs in the valleys from 2490 to 3000 feet (759 to 910 m). Plants are known from Quebec to Washington, south to North Carolina, Alaska, New Mexico, Montana, Idaho, and Oregon. This taxon is sparsely distributed in Montana known in three locations in the Flathead River drainage. All Montana occurrences are within the FNF.

Palmate-leaved coltsfoot (*Petasites frigidus* var. *nivalis*) (G5/S1) is a perennial from a creeping rhizome. There are several heads of whitish flowers in a corymb or raceme inflorescence. Plants flower in May.

Palmate-leaved coltsfoot occurs in swamps, fen margins, and riparian seeps within open forest and meadows in the valley and foothill zones from 3400 to 4000 feet (1037 to 1219 m). This species is circumboreal, extending south in North America to Massachusetts, Michigan, and California. In Montana, its range is considered peripheral with five occurrences known from the Livingston Range, North Fork Flathead River and Stillwater River drainages. Two of the five occurrences are located in the on the FNF.

Potential Occurrences

A habitat suitability analysis was conducted to evaluate the potential for additional sensitive plants occurrences within the proposed treatment areas. Sensitive species were assigned to one or more habitat groups based on elevation, habitat descriptions from literature and element occurrence site forms, and associated species at known locations. These groups or guilds represent broad habitat associations occurring on the FNF and are used as a tool to evaluate potential habitat of sensitive plants within a project area. Known vegetation types and elevation ranges of the action area were considered during pre-field work and during 2005 surveys. Six of these habitat guilds are represented in the Valley Face project area: upland coniferous forest, riparian, wet coniferous forest, other wetlands (not peatlands, fens, or aquatic), moist cliffs, rock outcrops, and grasslands/forest openings. Sensitive plants with habitat affinities for these six habitat groups potentially occur within the project area.

All of the Regional Forester's sensitive plant species were searched for during the 2005 project surveys within the project area and no sensitive plants were found. Although surveys were intuitive (searching in high potential habitats for these sensitive plants), there is a small likelihood that surveyors overlooked possible occurrences. In addition, some areas proposed for treatment were not surveyed due to low potential for plants (Units 1, 1A, 2, 4A, 7, 9A, 10A, 11, 11A, 19A, 39, 40, and 41, see botanical surveys in Exhibits S-4 and S-5).

Environmental Consequences

Direct, Indirect, and Cumulative Effects of The No-Action Alternative For Threatened And Sensitive Plant Species

No activities are proposed by Alternative A. Therefore, there would be no short-term effects on any listed threatened or sensitive plant species or their habitats. Long-term effects would depend on disturbances such as fire or floods.

Direct, Indirect, and Cumulative Effects Common To All Action Alternatives For Threatened Plant Species

Water howellia and Spalding's catchfly are listed by the U.S. Fish and Wildlife Service as threatened species that exists on the Flathead National Forest. Surveys and analysis of existing conditions determined that there are no known occurrences or suitable habitat for water howellia or Spalding's catchfly within the project area. A Biological Assessment (BA) is required for federal actions that may impact threatened and endangered species. This has been prepared and is located in Exhibit S-3. The proposed project would have no effect on either of these species. There are no federally listed endangered plants in Montana.

Direct, Indirect, and Cumulative Effects Common To All Action Alternatives For Sensitive Plant Species

Surveys were conducted on the majority of the treatment units (see Exhibit S-4). No sensitive plant species were found. The proposed Valley Face project is expected to have no direct, indirect, or cumulative effects on any known occurrences of Regional Forester's sensitive plants due to the lack of known occurrences within the project area. All ground-disturbing activities from the on-set of the Flathead National Forest Botany Program, since 1990, have been analyzed for effects to threatened, endangered, and sensitive plants. In addition, all foreseeable federal actions within the project area are required to be evaluated for impacts to threatened, endangered, and sensitive plant species.

The proposed Valley Face project action alternatives would have no effect on the Regional Forester's sensitive plant species associated with aquatic, fens and fen margins, and alpine and subalpine habitat guilds due to the lack of known occurrences and potential habitat within the project area.

The proposed Valley Face project action alternatives may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability for potentially occurring Regional Forester's sensitive plant species associated with upland coniferous forest, riparian, wet coniferous forest, other wetlands (not peatlands, fens, or aquatic), moist cliffs, rock outcrops, and grasslands/forest openings. This is based on the, 1) presence of suitable habitat for potentially occurring sensitive plants within the project area; 2) the potential for indirect effects of noxious weed competition; and 3) delineation and exclusion of riparian areas and wetlands from the proposed action areas. The Biological Evaluation at Exhibit S-4 analyzes the potential effects of the alternatives.

Regulatory Framework and Consistency

Threatened or endangered status affords a species and its habitat special protection from adverse effects resulting from federally authorized or funded projects. It is the responsibility of the Forest Service to design activities that contribute to the recovery of listed species in accordance with recovery plans developed as directed by the Endangered Species Act (ESA) (50 CFR part 402). The Flathead National Forest's Amendment 20 to the Forest Plan provides for conservation measures to ensure the protection of water howellia. Amendment 21 to the Forest Plan has a goal to "provide sufficient habitat to promote the recovery of threatened and endangered species and conserve the ecosystems upon which they depend."

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the Forest Plan has standards to conduct analyses to review programs and activities, to determine their potential effect on sensitive species, and to prepare a Biological Evaluation (BE). It also states "adverse impacts to sensitive species or their habitats should be avoided. If impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole will be analyzed. Project decisions will not result in loss of species viability or create significant trends towards federal listing." Future conservation strategies for each species will present direction on maintaining habitat diversity and managing for population viability, as required by the NFMA and Forest Plan Amendment 21. The Forest Service is bound by Federal statutes (ESA, NFMA Act), regulations (USDA 9500-4) and agency policy (FSM 2670) to conserve biological diversity on NFS lands. A goal in Forest Plan Amendment 21 is to "ensure that Forest Service actions do not contribute to the loss of viability of native species."

All Alternatives of the Valley Face Fuels Reduction Project would meet the direction of Forest Service Manual 2670.3 (sensitive plant species) and are consistent with the Forest Plan direction for sensitive plants. In addition, the proposed project is also in compliance with ESA and Flathead National Forest LRMP Amendments 20 and 21, with respect to federally listed plants.

FIRE AND FUELS

Introduction

Fire has historically been the dominant disturbance factor in forests across the northern Rocky Mountains. Most forests have evolved with the continual influence of fire, and forest ecosystems depend on this type of disturbance regime for their continued perpetuation on the landscape (Habeck and Mutch 1973).

Historical natural fire regimes best illustrate fire disturbance patterns. A fire regime describes the frequency, predictability, and severity of fire in an ecosystem. Fires regimes can range from non-lethal to stand-replacing levels; typically, fire frequency declines as fire severity increases.

Drought cycles and fuel availability have a considerable influence on fire regimes. Wildland fires most often occur during the driest months of the year, typically July, August, and early September, and can be especially numerous and severe during drought periods. The quantity and type of fuels also play a major role in determining fire behavior. Wildland fuels are composed of dead woody debris and living vegetation. Fuel quantities can vary considerably, depending on the vegetation composition and recent fire history.

Pre-settlement era wildland fires typically burned until extinguished by fall precipitation. In the settlement period before 1941, wildland fire suppression efforts were often not successful and fires burned thousands to ten of thousands of acres. Suppression efforts since that time have altered pre-settlement fire regimes and reduced the number of forested acres burned each year. The combination of fire suppression, fire exclusion, and natural disturbance processes has allowed fuels to accumulate in unmanaged timber stands. This situation currently exists in the Valley Face area.

An analysis of fire history in the Valley Face area was used to characterize historical fire regimes that typify this area and to determine to what extent fire suppression has altered these regimes and affected fuel accumulations.

Information Sources

The fire history analysis in the Valley Face area was based on data from the Flathead GIS library (Exhibit O-1). Fire history data collected for the Logan Creek and Good Creek watershed analyses supported the Valley Face analysis (Exhibit O-2 and O-3). Good Creek and Logan Creek are adjacent watersheds that share similar topographical, biophysical, and climatic characteristics. Data gathered by the National Interagency Fire Management Integrated Database (NIFMID) were used to evaluate fire ignition and suppression events and their associated causes from 1936 to the present. Data used to evaluate fire regime and condition class include field stand examination information and aerial photo interpretations found in the Tally Lake Ranger District Timber Stand Management Record System (TSMRS) and the Region 1 Vegetation Mapping Project. See the Vegetation section for a more detailed description (Exhibits P-3 and P-4).

Analysis Area

The area evaluated for this fire and fuels section includes the entire Valley Face analysis area as illustrated in Figure 1-1. The fire regime patterns in Valley Face are characteristic of those in the northern Rocky Mountain region. Elevation is moderate, ranging from 3,000 to 5,800 feet. Topography is a moderate-relief landscape composed of valleys, ridgelines, and crests. About 51 percent of the area has a mean slope of 20 percent with approximately 11 percent of the area having slopes greater than 40 percent. The western larch/Douglas-fir and the intolerant mixed species (made up of larch and Douglas-fir mixed with other species) are the major forest cover types within the Valley Face area. These forest types are initiated and maintained by fire. For a more specific break down of species cover types, see the Vegetation section.

Affected Environment

Historical Natural Fire Regimes

A fire regime is defined as the frequency, predictability, and severity of fire in any given ecosystem. An analysis of fire history in the Valley Face area was used to determine:

- Spatial and temporal distribution of fire disturbances.
- Mean fire intervals in areas with similar biophysical and climatic characteristics.
- The impact of fire suppression on historical fire regimes.

Valley Face Fire Regimes: Based on field sampling, a fire regime was assigned to each of the potential vegetation groups (PVGs) in the Valley Face area. See Exhibit O-10 for a map. The two predominant fire regimes that currently occur in the Valley Face area are as follows:

Mixed-severity fire regime areas can experience the full range of severities during either a single fire event or consecutive fire events. In other words, mixed-severity fire regime areas may experience fires of intermediate effects, often consisting of a mosaic of varying severity. The mixed-severity fire regime in the Valley Face area is predominately of a moderately low frequency with moderate to high severity. The mean fire interval in the mixed-severity fire regime ranges from 63 to 80 years (range of 44 to 97 years), depending on the site's potential vegetation group.

Stand-replacement fire regime areas typically have lethal fires with less than 10 percent of the forested canopy cover remaining alive after the fire. In the Valley Face area, these are low frequency with high severity events. The mean fire interval in the stand replacement fire regime ranges from 106 to 156 years (range of 83 to 180 years), depending on the site's potential vegetation group.

Historically, the spread of a typical moderate to severe large fire was on a west-to-east axis with a broadening north-south axis as it moved across the moderate relief landscape, while low to moderate fire spread was confined in a valley-to-ridgeline pattern. Within the Valley Face analysis area, the size of the historical mean major fire disturbance (greater than 100 acres) was approximately 968 acres and usually resulted in a full range of fire severities. Considering the total large fire disturbance areas for fires within and surrounding the Valley Face area, the mean fire disturbance area was 6,740 acres.

Fire Regimes in Similar Environments in Western Montana:

As noted above, the western larch/Douglas-fir fire-initiated and maintained forests and the intolerant mixed species are the major forest cover types within the Valley Face area. Together they comprise approximately 77 percent of the analysis area (see Vegetation section). These types are common within the northern Rocky Mountain region and fire history information exists for them based upon studies in this region. Information about fire history from other areas in western Montana is displayed to corroborate the fire history and fire regime information presented for Valley Face.

In Glacier National Park, two kinds of historical fire regimes were identified in these forest types west of the Continental Divide:

- a mixed-severity regime ranging from non-lethal underburns to stand-replacing fires at mean intervals of 25 to 75 years, and
- a regime of infrequent stand-replacing fires at mean intervals of 140 to 340 years (Barrett et al. 1991).

A study of western larch/Douglas-fir forest types on the Coram Experimental Forest near Hungry Horse, Montana described similar biophysical classifications for the valley, montane, and lower subalpine slopes as the Valley Face area, and found a range of mean fire intervals from 117, 121, and 146 years, respectively (Sneck 1977). Before 1900, lodgepole pine-dominated forests regenerated in various fire regimes (Arno 1980). These included a mixed regime of non-lethal surface fires (25 to 50-year intervals) and stand-replacing fires (100 to 150 year intervals) in moderate elevation dry forest types (Barrett et al. 1991).

In the Good Creek drainage just north of the Valley Face area, fire history data were collected and analyzed at the stand scale to determine pre-settlement fire regimes for the various PVG groups. The adjacent Valley Face watershed has similar topographical, biophysical, and climatic characteristics when compared to Good Creek; therefore it is appropriate to apply the historical fire regimes of Good Creek to Valley Face (see Exhibits O-2 and O-3). Two codominant types of historical fire regimes were identified for the Valley Face analysis area:

- a mixed severity regime ranging from nonlethal to stand-replacing fires at mean intervals of 63 to 97 years (range of 44-97 years). This is an MS-2 fire regime as corroborated with Steve Barrett during the Good Creek Fire History Study of September 1997.
- a stand-replacement regime (SR), with fires at mean intervals of 106 to 156 years (range of 83-180 years) with multiple site average fire intervals (MAFI) of 125 and 147 years. Intervals for stand-replacing fires are generally greater than 100 years.

These two fire regimes are representative of the Fire Regime Groups III (mixed severity) and IV (stand replacement), which have fire return intervals of 35 to 100 years or greater but less than 200 years, as discussed in the National Fire Plan (Laverty and Williams 2000).

In addition, there is one other historical fire regime that is intermingled with the co-dominant fire regimes, primarily at the lower elevations within the Valley Face area. This is regime I, which is low and mixed severity fires with mean fire intervals less than 35 years and accounts for less than one percent of the analysis area.

Current Condition Class Departures

The condition class departure is a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, and canopy closure. Current Condition Class Departures are defined in terms of the relative risk of losing one or more key components that define an ecological system (Laverty and Williams 2000) including:

(1) disturbance regimes (patterns and frequency of fire, insect, disease, etc)

(2) disturbance agents

(3) hydrologic function

(4) vegetative attributes (composition, structure, and resilience to disturbance agents)

The higher the number of condition class departure, the more the risk of losing key components of an ecological system if a wildland fire occurs (see Exhibits O-9 and O-10).

Condition Class Departures are categorized by the National Fire Plan as:

Class 1 - Maintenance: Fire regimes are within a historical range, and the risk of losing key ecosystem components is low. Vegetation attributes are intact and functioning within a historical range. No fire return intervals have been missed.

Class 2 – Restoration: Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystems components is moderate. Fire frequencies have been interrupted in comparison to historical frequencies by one or more fire return intervals. This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.

Class 3 – Conversion: Fire regimes have been substantially altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been substantially altered from their historical range (Laverty and Williams 2000). The Valley Face area has no Condition Class Departure 3 lands.

The acreage of the current condition class departure on forested lands for 35,300 acres of all ownerships within the Valley Face area is displayed in the following table. There are approximately 1,462 acres of non-forested rock outcroppings, lakes, ponds and gravel pits, etc. that are not considered in the fire regime and current condition class classification. Approximately half the Valley Face analysis area is within natural historical range for fire regimes (Current Condition Class Departure 1), and half the area is moderately altered from historical range for fire regimes (Current Condition Class Departure 2). No Current Condition Class Departure 3 stands have been identified in the Valley Face Analysis Area. Condition class 3 also does not exist on private lands because these lands have been heavily impacted by human and agricultural development.

Table 3-24. Current Condition Class Departure by Historical Natural Fire Regime on all ownerships within the Valley Face Analysis Area.

Fire Regime	Current Condition Class Departure 1	Current Condition Class Departure 2
Stand Replacement (IV)	9,938 acres	8,412 acres
Mixed Severity (III)	6,176 acres	8,623 acres
Low Severity (I)	187 acres	109 acres
Total by Current Condition Class	16,301 acres	17,144 acres

Table 3-25 provides a summary of the historical average interval (mean fire interval, abbreviated as MFI) between fires in the mixed-severity and stand-replacement fire regimes by PVG. The table also displays the current Condition Class Departure by vegetation type for timbered stands that have not been entered for timber management activities.

Table 3-25. Historical Average Interval Between Fires in the Valley Face Analysis Area.

PVG and Fire Regime *	Pre-1940 Stand MFI's (years)	Condition Class Departure
Warm-Dry MS-2		2
Range	69-87	
Mean	80	
Warm-Moist MS-2		2
Range	54-83	
Mean	73	
Cold-Dry MS-2		2
Range	59-67	
Mean	63	
Cold-Moist MS-2		2
Range	51-97	
Mean	80	
Cool-Moist MS-2		2
Range	44-97	
Mean	79	
Warm-Moist SR		1
Range	131-180	
Mean	156	
Cold-Moist SR		1 to 2
Range	97-148	
Mean	120, 125 MAFI**	
Cool-Moist SR		1 to 2
Range	83-119	
Mean	106, 147 MAFI*	

* MS-2 is mixed severity fire regime; SR is stand replacement fire regime.
**Multiple site Average Fire Intervals for ecologically similar types, i.e. PVG.

Forest Management

Although timber harvest and associated fuel treatments have not replicated wildland fire, they have changed the patterns of vegetation and woody debris accumulations in the forest. Since the 1950s, the Valley Face area has had approximately 15,159 acres of timber harvest and fuel treatments (prescribed burning and machine piling of slash with pile burning). These previously

managed areas are considered to be in a Condition Class 1. The forest management activities have created fuel mosaics, which are breaks or changes in standing timber and surface fuel patterns. The existing Flathead Forest Plan requires that all fires be suppressed in the Valley Face area using the appropriate management response. The appropriate management response in the Valley Face area is suppression using aggressive initial attack actions to control a wildland fire, with the safety of the public and fire management personnel being the first priority, and sequentially the protection of property/natural resources.

Fire Ignitions and Suppressions Since 1936

The Flathead National Forest fire history GIS layer identified 59 suppressed ignitions (22 lightning-caused and 34 human-caused) that occurred from 1981 though 2005 within the Valley Face area. See spatial and temporal distribution by referring to Exhibit O-16. The National Interagency Fire Management Integrated Database (NIFMID) identified a total of 126 ignitions that occurred from 1936 to 2004. The total acres burned from 1936 to 2005 (69 years) by wildland fires within the analysis area is 85. By comparison, between 1889 and 1931 (42 years) 5,807 acres burned within the analysis area. Of the total ignitions since 1936, 124 were promptly suppressed and averaged only 0.3 acre; the largest of the 126 fires were two in the headwaters of Lost Creek on Forest Service land in 1973 and 1987. These two fires were human caused ignitions that consumed 25 and 20 acres respectively. Since 1981 there have been 34 human caused fires, accounting for approximately 58 percent of all fire suppressions.

Fire Suppression Effects on Fire Return Intervals

Prior to 1940, a spreading wildland fire severe enough to change stand structure occurred in or near the Valley Face area approximately every 13 years. Wildland fire occurrence was two to three times more frequent within the mixed-severity fire regime than the stand-replacement regime. The large fire-free interval from 1940 to 2006 is more than seven times longer than the historical major fire interval.

Several studies have concluded that stands in the Rocky Mountains within the mixed-severity fire regime have missed one or two fire cycles because of long-term fire suppression (Sneck 1977, Barrett et al. 1991, Barrett 1995). Therefore, effective fire suppression since 1940 has probably prevented at least one spreading fire within the mixed-severity fire regime in the Valley Face area. This is indicative of a Condition Class Departure 2, which suggests that restoration activities be done in late-mid seral and late seral stands that have missed a natural fire cycle.

The stand replacement fire regime intervals varied widely throughout the area, ranging from 16 to greater than 200 years. Dendrochronological research on fire-scarred trees in the Good Creek area (Exhibit O-3) indicates that fires occurred more frequently before the mid-1700s, with large fires declining during the “Little Ice Age” (approximately 1650 to 1850). These results indicate that numerous stands were relatively old when they experienced a stand-replacing fire following this period (e.g., 1910, 1917, 1919, and 1931) suggesting that current fire intervals for most stands are within their historical range. However, using a less conservative approach that recognizes current patterns of climate suggests that one spreading fire would have occurred in each PVG within the stand replacement fire regime since 1932.

Existing Condition of Forest Fuels and Fire Behavior

Fuels are made up of the various components of vegetation, live and dead, that occur on a site. These components include litter and duff layers, the dead-downed woody material, grasses and forbs, shrubs, and trees of varying age. Various combinations of these components define the major fuel groups of grass, shrub, timber, and slash. The differences in fire behavior among these groups are basically related to the fuel load and its distribution among the fuel particle size classes. Fuel load and depth are critical fuel properties for predicting whether a fire will ignite, its rate of spread, and its intensity (Exhibit O-5).

Fuel component characteristics contribute to fire behavior properties. Fuel loading, size class distribution of the load, and its arrangement (compactness or bulk density) govern whether an ignition will result in a sustaining fire. Horizontal continuity influences whether a fire will spread or not and how steady the rate of spread will be. Loading and its vertical arrangement will influence flame size and the ability of a fire to torch into the overstory. With the proper horizontal continuity in the overstory, the fire may develop into a crown fire. Fuel moisture content has a substantial impact upon fire behavior, affecting ignition, spread, and intensity.

The greatest effect of fire suppression and exclusion in unison with other natural disturbance processes has been to allow biomass to accumulate in most unmanaged timber stands. The bulk of the biomass currently found in the analysis area is in the form of dead standing and downed trees and shrubs, as well as live, shade-tolerant true firs, spruce, lodgepole pine, and Douglas-fir. The combination of dead fuel and continuous live vegetation from the forest floor to the upper forest canopy creates a complex of fuel that, when ignited under severe fire conditions, would leave little or no surviving above-ground vegetation.

Wildland fires will always occur and may escape initial attack during severe fire conditions. The intensity of these fires would be dependent upon weather, fuels, and topography. When burning conditions are less than severe, fires may be of low to moderate severity and result in only moderate or no damage to overstory trees. If downed fuels are present, tree mortality can occur even during moderate burning conditions.

Fuel Models and Fire Behavior

Fuel models are a tool to help the user realistically estimate fire behavior. Each fuel model is described by:

- the fuel load and the ratio of surface area to volume for each size class.
- the depth of the fuel bed involved in the fire front.
- fuel moisture, including when the fire will not spread (called the moisture of extinction).

The fuel models found or desired in the project area are described below. These descriptions are based on Albini's (1976) paper "Estimating Wildfire Behavior and Effects." Of greatest concern in the Valley Face analysis area are the 16,800 acres currently estimated to be in a Fuel Model 10 condition, which may allow rapid fire growth and spread during periods of severe fire weather. The predominant fuel models found in the Valley Face area are described below.

Grass Group

Fire Behavior Fuel Model 2 (post timber harvest stands; nonstocked and seedling) - Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to down stemwood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub lands or low brush and pine stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands.

Shrub Group

Fire Behavior Fuel Model 5 (sapling stands and riparian shrub) - Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. The riparian shrub portions of this fuel model in the analysis area are usually intermingled with riparian marshgrass and separated by expanses of water greater than 30 feet (e.g. adjacent to wet meadows and beaver pond areas).

Timber Litter Group

Fire Behavior Fuel Model 8 (closed timber litter) - Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Close canopy stands of short-needle conifers or hardwoods that have leafed-out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Refer to Exhibit O-15 for representative Photo Guides for Appraising Down Woody Fuels.

Fire Behavior Fuel Model 8/10 Mosaic and 10 (timber litter and understory) - The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead and down fuels include greater quantities of three-inch or larger limbwood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Any forest type may be considered if heavy downed material is present; examples are insect or disease-ridden stands, windthrown stands, overmature situations with deadfall, naturally thinned stands, and aged light thinning. These types may have a well-developed vertical or ladder fuel component.

Stands in this condition include greater quantities of three-inch dead and down wood resulting from over-maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Any forest type may be in a Fuel Model 10 condition if heavy downed material is present; examples are insect or disease-ridden stands, windthrown stands, over-mature situations with deadfall, naturally thinned stands, and aged light thinning. These types may have a well-developed vertical or ladder fuel component.

Table 3-26 gives numerical estimations of fire behavior by fuel model. The fire intensities and spread rates of the fuel models listed below are indicated by the following values when the dead fuel moisture is eight percent, live fuel moisture is 100 percent, and the effective wind speed at mid-flame height is five miles per hour. As indicated in the table, fires burning in stands typical of Fuel Model 10 can exhibit extreme rates of spread and flame lengths, posing severe risks to fire fighters and property in the path of the flames.

Table 3-26. Fire behavior fuel model distribution

Fuel Model Number	Total Fuel Load, >3" dead & live, tons/acre	Dead Fuel Load, 1/4", tons/acre	Live Fuel Load, foliage, tons/acre	Fuel Bed Depth, feet	Moisture of Extinction	Rate of Spread, chains / hour	Flame Length, feet	Approx. Acres in Analysis Area
1	0.74	0.74	0	1.0	12 %	18*	< 4*	1,283
2	4.0	2.0	0.5	1.0	15 %	12 - 20**	< 4**	1,597
3	3.0	3.0	0	2.5	25 %	104	12	130
5	3.5	1.0	2.0	2.0	20 %	13	< 4	3,019
8	5.0	1.5	0	0.2	30 %	1.6	1.0	11,051
10	12.0	3.0	2.0	1.0	25 %	7.9 - 72#	4.8 - 78##	16,803
11	11.5	1.5	0	1.0	15 %	6.0	3.5	1,163
12	34.6	4.0	0	2.3	20 %	13.0	8.0	80

^ moisture of extinction is the fuel moisture content at which the fire will not spread or spreads only sporatically and in an unpredictable manner.
* lower due to discontinuous fuel bed created by interspersed rock outcrops or the treatment of the grass on private pastureland. Flame lengths on utilized private pastureland will generally be less than 1 foot. Rate of spread established during the monitoring of the Elk Mountain Wildlife Prescribed Fire of 1999 in this fuel type.
** lower due to discontinuity of fuel bed from harvest activity, post harvest site preparation / slash treatment and inclusions of Fuel Model 5, i.e. surface fire behavior experienced on the Elk Mountain Fire and the Stone Young Fire Complex of 2000, Swaney Fire of 1999 in these fuel models .
# average crown fire potential of 40 chains per hour with a maximum rate of spread of 72 chains per hour. (Rothermel 1991)
crown fire potential of 38 to 78 feet. (Rothermel 1991)

Wildland Urban Interface

The National Fire Plan of 2000 (www.fireplan.gov) describes three categories of wildland urban interface (WUI). The wildland urban interface is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The Valley Face area only includes the Category 2 type of WUI called the Intermix Community, which exists where structures are scattered throughout a wildland area. There is no clear line of demarcation. Wildland fuels are continuous outside of and within the developed area. The development density in the Intermix area ranges from structures very close together to one structure per 40 acres. Fire protection districts funded by various taxing authorities normally provide life and property fire protection and may also have wildland fire protection responsibilities. The other categories of WUI are the Interface Community, where structures directly abut wildland fuels with a clear line of demarcation, and the Occluded Community, which generally exists where structures abut an island of wildland fuels, often within a city.

The areas within and adjacent to the Valley Face area fall into Category 2: Intermix Community. These areas include small cluster developments (e.g., Lower Logan, Highland Meadows, Chinook Lake, Cliff Creek, Bootjack Lake, Twin Lakes, Tobie Creek, Beaver Creek, and Upper, Mid, and

Lower Lost Creeks), ranches, summer residences, hay meadows, timber production areas, ranch outbuildings, and other structures.

Although the amount of private ownership is finite within the analysis area, the current trend of development on private ownership is one of further subdivision and subsequent increase in population /dwelling-structure density. When wildland fire enters these areas, the suppression efforts require a large commitment of firefighting resources. During the fires of 2000 and 2003 in Montana, large sectors of otherwise high-priority fires remained unstaffed because resources were committed to structure protection

Home Ignitability: Recent research (Cohen 2000a) addresses home ignitibility, or the potential for a home to ignite, in the wildland urban interface. Cohen concludes that homes most often ignite via one of two processes, direct flame contact with the structure and lofted firebrands landing on a receptive fuel such as a house. The Structure Ignition Assessment Model (SIAM) developed by Cohen (1995) and results from the International Crown Fire Modeling Experiment (Alexander et al. 1998) generally concur that a flaming front at a distance of 40 meters or more from a structure does not deliver sufficient heat energy to ignite the exterior of a home. However, lofted firebrands are also a principle WUI ignition factor, and in the 2000 Cerro Grande Fire in New Mexico, surface fires ignited homes while leaving green needles on trees around the home (Cohen 2000b). Highly ignitable homes can ignite during wildland fire without fire spreading near the structure. This occurs when firebrands are lofted downwind from fires. The firebrands subsequently settle on and ignite flammable home materials (such as roofs) and adjacent flammables (such as woodpiles, decking, or landscaped vegetation). Firebrands that result in ignitions can originate from wildland fires that are a distance of one kilometer or more (Cohen 2000a).

The above-cited research exclusively addresses home ignitibility. Not addressed in the research are some of the other issues and problems faced by resource managers, fire professionals, and residents when considering fire in the WUI. When fire enters the WUI, there remains the potential for loss of life, property, and other values even if homes have been made fire safe. When fire enters areas adjacent to private land, there is high probability that firefighting resources will be deployed and members of the public may be exposed to hazards even if all homes have been made fire safe. Many homeowners would likely find it undesirable to live in an intensely or severely burned-over forest even if their home has survived the passage of fire. Not only are aesthetic values decreased for most people, but the risk of flooding and landslides can put homes and lives at risk during subsequent precipitation events.

Because of the problems and complexities associated with the Intermix Community, resource managers and fire managers find it desirable to exclude, to the extent possible, wildland fire from these areas, and prefer to use prescribed fire to manage fuels; however, sociopolitical constraints may preclude or limit its implementation (Kalabokidis and Omi 1998, DellaSalla, et al. 1995). Limitations include public attitudes toward smoke, fear of escaped fire, and potential negative visual effects of burns. The purpose of fuel treatments is to provide for firefighter safety and minimize future loss of property and natural resources.

Values to Protect from Wildland Fire

Values to protect are usually considered to be physical, including houses and private property; however, ensuring firefighter and public safety is the highest value. An uncompromising rule in

fire suppression events is to provide for firefighter and public safety. Fuels reduction offers a safer environment for firefighters and the public in the event of a wildfire.

Private Structures and Development

The following table illustrates the approximate number of private structures per square mile within or near the analysis area boundary. The number of structures and dwellings are based on the most current information from a field survey conducted in 2004 and from 1998 aerial photos; given the rate of development in the area the numbers are almost certainly greater today. The number of dwellings is included in the total number of structures.

Table 3-27. Structure Densities within the Analysis area.

Subdrainage	Total Number of Dwellings and Structures
Lower Logan (Outback Mobile Home Settlement)	170/ sq. mi.
Lower Logan	24/ sq. mi.
Lower Logan (Highland Meadows Subdivision)	32/ sq. mi.
Chinook Lake (LLC) Subdivision	21/ sq. mi.
Cliff Creek/Boot Jack Lake	75/ sq. mi.
Twin Lakes	156/ sq. mi.
Tobie Creek	43/ sq. mi
Beaver Creek Housing Co-op	61/ sq. mi.
Upper Lost Creek (Mountain Meadows)	60/ sq. mi.
Mid Lost Creek	16/ sq. mi.
Lower Lost Creek	160/ sq. mi.
Lower Lost Creek outside F.S. boundary	90/ sq. mi.
Lower Big Lost Creek/Rhodes Draw outside F.S. boundary	88/ sq. mi.

Private/Corporate and State of Montana Timberlands:

The Forest Service and the State of Montana share the fire protection responsibilities of these lands within and adjacent to the analysis area. Within the analysis area, approximately 9.19 miles of untreated common boundary are shared with other ownerships. The following table gives miles of untreated land broken down by corporation. For a detailed analysis displaying miles of common boundary, see Exhibit O-11.

Table 3-28. Miles of Forest service boundary.

Corporate Owner	Miles of Forest Service Boundary by Drainage				Total Miles of Bdy. By Corporate Landowner
	Tobie Creek	Lost Creek	Brown Creek / Big Lost Creek	Big Lost Creek	
F.H Stoltze Land & Lumber	1.25	0.25	0.50	3.35	5.35
Montana Forest Products	0.00	0.72	0.00	0.00	0.72
Plum Creek Timber	0.00	0.40	0.00	1.22	1.62
American Timber Co.	0.00	0.00	0.00	1.50	1.50
Total Miles per Drainage	1.25	1.37	0.50	6.07	9.19

Public Utilities

Lincoln Electric Cooperative maintains an overhead power line along Farm to Market Road and Forest Road (FR) 539. Flathead Electric Cooperative maintains an overhead power line along the Mountain Meadows Road, FR 542 and across country in the lower Lost Creek drainage. The overhead powerline runs adjacent to the county road through Section 15 to Farm to Market Road. Underground lines also exist adjacent to FR 351, 351B, 50819 (Cliff Creek/Bootjack lake area), 2922 (Twin Lakes area), 913 (Tally Lake Road), 2924 and 50812 (Beaver Creek area) and may exist on private ownership adjacent to the aforementioned roads. CenturyTel maintains an overhead telephone line following the same corridor as the overhead power line and underground lines associated with the respective power line.

Road Access for Fire Suppression

Road management activities affect fire suppression effectiveness. In general, the more access in an area, the more effective fire suppression is in that area. Within the Valley Face analysis area there are 89.3 miles of National Forest system roads. The existing road system provides adequate access for wildland fire suppression. A mix of gates and berms/rocks are used as road prohibition devices on some of the roads. Gates allow emergency vehicles to respond to a wildland fire without any time delay, thus expediting the suppression process. Barriers that do not allow administrative vehicle access, such as berms and rocks, negatively impact fire suppression efforts by reducing the areas accessible by vehicular fire fighting equipment. To facilitate wildfire suppression, road prohibition devices on roads accessing lands adjacent to private lands should be gates. Rock and berm barriers should be avoided if possible in the WUI. The action alternatives would not affect the access for fire suppression activities.

Environmental Consequences

Fire as an ecological process and the characteristics of fuel that contribute to fire were described in the Affected Environment section of this chapter. As mentioned, fire exclusion has had a profound effect on the Valley Face landscape and has led to the Purpose and Need for the actions proposed in this project. The Flathead National Forest Fire Management Plan and the Federal Wildland and Prescribed Fire Management Policy direct that suppression would be the appropriate management response to a wildland fire in the Valley Face area. Right now, the landscape is in a condition where it would likely burn more severely than under historical conditions. Aggressive initial attack actions would be used to control wildland fires, where human life, property, and resource values, respectively, are the priorities.

Suppressing or excluding wildland fires, insect and disease processes, and harvest practices have created forest conditions that are functionally different from historical conditions (see Vegetation section). This has resulted in a landscape less diverse and less resilient than in the past. The objective of the action alternatives is to reduce the potential for undesirable, large-scale wildland fires or insect infestations in order to protect resource values. These values include, but are not limited to, investments in timber management, old growth forest communities, and the interface between private land and National Forest System lands.

The alternatives vary by how much they restore historical conditions related to fire as an ecological process or current condition class departure with respect to historical fire regimes. The

variation relates to the amount and type of vegetative treatments proposed in each alternative. Vegetative treatments that affect fire and fuels include commercial timber harvest with post harvest fuel reduction, precommercial thinning, and non-commercial fuel reductions.

The delineation of treatment unit boundaries considered terrain, access from existing roads, fuel conditions, and slope. Most of the treatments were developed with the idea of complimenting existing areas that function as Fuel Reduction Zones (FRZs). These areas have been previously treated and function as areas with a low hazardous fuel density. FRZs specifically are areas throughout the landscape where vegetation treatments were developed to reduce fuel to either slow the spread or reduce the intensity of wildland fire (Agee et al. 2000).

Vegetation treatments within units are not intended to fireproof the forest, as this is not possible nor desirable ecologically. Rather, fuel reduction treatments are designed to increase the ability to use low-intensity prescribed fire as a future tool and to provide a safe, defensible environment for firefighters. Fuel treatments in and near the Intermix Community also serve to protect National Forest System lands from the risk of wildland fire spreading from private property.

Direct and Indirect Effects of Alternative A

Alternative A would not treat any areas with heavy fuel accumulations, root disease, and active bark beetle attacks. Existing conditions and trends would continue in the foreseeable future. The overall result would be increased fire hazard due to the following conditions:

Continued Dense Understory and Ladder Fuel: Large-diameter Douglas-fir and larch in most of the drier forest stands would continue to lose vigor due to competition from dense understories of shade-tolerant tree species. This would perpetuate a denser understory. This understory also would serve as ladder fuel that would permit a surface fire to expand into the canopy, thereby killing many of the existing large-diameter trees that would have otherwise survived a ground fire.

Continued Beetle Infestation: Stands in the drier forest types with high densities of mature Douglas-fir would continue to be predisposed to high levels of Douglas-fir beetle activity. Stands with high densities in the moist and cold forest types would continue to be predisposed to high levels of mountain pine beetle and/or western balsam bark beetle attack, depending on the species composition of the stand. High tree mortality often occurs in pulses brought on by a combination of moderate to high bark beetle populations and environmental factors, particularly drought and windthrow. Moderate to high risk stands could lose 50 percent or more of their Douglas-fir, lodgepole pine, or subalpine fir component during an outbreak. Resulting stands would contain high fuel accumulations (50 to 100 or more tons per acre). This would not meet desired future conditions for fuel in the analysis area.

While insect-caused mortality, tree diseases, and fires are normal ecosystem processes, the objective is for them to function within historical ranges across the landscape. Occasional blowdown of individual and small groups of trees would occur. Wind thrown trees provide a breeding site for bark beetles, such as spruce beetle in Engelmann spruce, Douglas-fir bark beetle, and western balsam bark beetle in subalpine fir. Broods emerging from the wind throw could attack and kill nearby Douglas-fir, Engelmann spruce, or subalpine fir.

Continued Risk of High-Severity Wildland Fire: Because there would be no fuel treatments to reduce the fuel hazard in Alternative A, the potential for high-severity wildland fire to occur would continue. Many of the stands included in the Proposed Action are conducive to stand-replacement fire. As fire has been effectively suppressed from the Valley Face area for approximately 70 years and the risk of ignition (lightning or human-caused) is present, a wildland fire could occur at some point in the future. If such a wildland fire were to escape initial suppression efforts and burn into extensive fuel accumulations, especially during dry, windy conditions, it would likely burn with high rates of spread and high intensities. With the aerial (ladder) fuels that exist in many of the stands, a fire could reach into the crowns and become a stand-replacement crown fire. Large stand-replacing fires have a number of undesirable consequences, many of which are discussed in other sections of this chapter.

Historically, stand-replacing fires were less common in the drier forest types, where frequent moderate intensity fires maintained a mosaic pattern of vegetation with an overstory component of large diameter trees. If a stand-replacing fire were to occur in the Valley Face area today, the overstory trees that remain could be killed and the burned areas would likely regenerate to Douglas-fir, lodgepole pine, western larch, and others. The largest threat of stand-replacing fires in the lower elevations is to private property, homes, public safety, and firefighter safety.

Effects Common to Both Action Alternatives

Both action alternatives would emphasize treatment of timber stands that are in a current Condition Class Departure 2 for both the stand-replacement and mixed-severity historical natural fire regimes. In other words, the action alternatives focus on treating timber stands that have been moderately altered from the historical range of fire conditions. Some timber stands in Condition Class Departure 1 are also proposed for treatment in order to maintain their current condition. Implementation of an action alternative could result in modifying the behavior of a wildland fire and could increase the likelihood that fire suppression efforts would be successful in containing the fire at a small size.

Vegetation Treatments

Both action alternatives would implement timber harvest in stands with high tree densities and/or heavy fuel accumulations that predispose the stand to high levels of bark beetle attack and stand-replacing wildland fire. Regeneration harvest, intermediate harvest (commercial thinning), and post timber harvest fuel reduction (slashing, slash piling, slash pile burning) would be the primary methods used to modify stand structure, density, and species composition. This would improve vigor and improve stand resistance to insect attack and stand-replacing wildland fire (see Vegetation section). Tree density would be reduced by harvesting trees of lesser vigor, thereby reallocating water, light, and soil resources to the larger, more vigorous trees. The larger diameter, taller, more fire-resistant species (mostly western larch and Douglas-fir) would remain on site. Other treatments such as slashing, handpiling, and pile burning (the 200 and 400 series units) would also be used to reduce surface fuels, aerial fuels, and tree density. Alternative B has 2,965 acres of commercial treatment and Alternative C has 2,225 acres of commercial treatment. Both alternatives have similar prescriptions, however, in Alternative C, the overall acreage is less and the number of acres proposed for regeneration harvest is also less.

Precommercial thinning and non-commercial fuel treatment are included in all action alternatives. This would create a short-term increase in high fire hazard until the slash is piled. If slash is not piled in the pre-commercial thin units, moderate fire hazard from trees left on the ground would progressively diminish through slash decomposition over a 10- to 15-year period. Alternative B has 947 acres of non-commercial treatments. Alternative C has 1,129 acres of non-commercial treatments. Piling would occur throughout these units with more emphasis next to private property and natural fuel barriers. These areas would function as effective fuel treatment zones to increase the likelihood of successful fire suppression efforts. Refer to Exhibit O-13, Precommercial Thinning; Wildland Urban Interface Fuel Treatment Summary for specific stand activity data.

Many of the units proposed for treatment are large (greater than 40 acres) in order to treat an entire stand that has similar forest and fuels characteristics. As previously mentioned, unit delineations considered terrain, access from existing roads, fuel conditions, and slope to compliment existing areas that function as FRZs. Most of these stands have active bark beetle infestations with high mortality creating high fuel loading. Other large units are proposed adjacent to private land to reduce the probability of a high intensity fire moving onto private land and to improve the fire suppression success should a fire burn in the area. Treating areas smaller than 40 acres would not be effective because dense fuels would be left between treated areas. Small patches would not achieve the objective of reducing fuels enough to provide for effective fire suppression. Firefighter safety would be compromised because the remaining fuel loading in the untreated areas would allow for intense fire behavior.

Both action alternatives would reduce the potential for stand-replacing wildland fire to impact resources and the wildland urban interface area, although they vary in degrees of effectiveness based on their juxtaposition to existing FRZs and their effective fuel treatments. Implementation of an action alternative would modify the behavior of a wildland fire and increase the likelihood that fire suppression efforts would be successful in containing the fire at a small size.

Surface and Aerial Fuels

Fuels, weather, and topography influence fire behavior. Fuels are the only factor that management can modify. The fuel treatments proposed by the action alternatives would not fireproof the analysis area, but would affect fire behavior of future wildland fires.

Surface Fuel: The post-harvest treatments proposed by the action alternatives would retain large coarse woody debris (LCWD), relative to their historical disturbance regime, seral stage, and potential vegetative group. The LCWD would primarily range from 9 to 20 or more inches in diameter and 5 to 12 tons per acre scattered on the ground. These amounts, size classes and distributions of residual LCWD would not increase the predicted low intensity surface fire behavior after harvest. Fire hazard and fire suppression difficulties reach high ratings when large woody fuels exceed 25 to 30 tons per acre, and are combined with small woody fuels of 5 tons per acre or more (Brown et al. 2001).

Aerial Fuels: Aerial Fuels would be aggressively treated and reduced in post-harvest treatment areas. The canopy bulk density and subsequent canopy fuel loads would be reduced by 60 to 90 percent or more with canopy base height ranging approximately from 13 to 55 feet or an average of 30 feet for a post treatment canopy base height (see Exhibit O-14). It would be unlikely that the

post-treatment areas would produce or sustain crown fire if canopy bulk density and subsequent canopy fuel load were reduced by 50 percent (Agee et al. 2000). In a mixed conifer forest, Agee (1996) estimated that at canopy bulk density levels below 0.10 kilograms per cubic meter (kg/m³) crown fire spread was unlikely, but no definitive single "threshold" is likely to exist.

In areas where non-commercial fuel reduction is the only treatment, reduced surface and aerial fuels would result in conditions typical of surface Fuel Model 8, and the canopy base heights would average 23 feet. During extreme drought conditions and when canopy base height is 20 to 40 feet, the minimum flame lengths required to start a crown fire range from 8 to 12 feet (Agee et al. 2000). The expected flame lengths of surface fires in the post-treatment environment for this project would be 1.4 feet or less. Torching and crowning could not initiate within these post-treatment types, but crown fire could come from outside the treated area and move inside the area as an independent crown fire during unusual wind events. Although a crown fire is doubtful, prescribed fire use and non-commercial harvest fuel reduction treatment areas are generally more vulnerable to crown fire when compared to commercial harvest treatments because there is less reduction in canopy fuel loads. For a spatial display of expected fire behavior as represented by the Flamap model for both alternatives, see Exhibit O-7.

Surface and Crown Fire Behavior Fuel Model Linkage

The surface fire behavior fuel model results referenced below are all incorporated into the Nexus Model (Scott and Reinhardt 2001). Nexus is an Excel™ spreadsheet that links surface and crown fire prediction models. It computes surface, transitional, and crown fire behavior, as well as three indices of crown fire hazard. Although these values may not be absolute, they help evaluate the treatments involved with various alternatives to reduce crown fire risk and assess the potential for crown fire activity. The Fire and Fuels Extension of the Forest Vegetation Simulator (FFE/FVS) was used to obtain canopy fuel characteristics at the stand level for canopy bulk density and canopy base height. These canopy fuel characteristics are calculated as described in Scott and Reinhardt (2001). The pre-treatment and post-treatment comparisons are based on these canopy fuel characteristics. The FFE/FVS canopy fuel characteristics by stand and the Nexus Model Inputs and Outputs for the following evaluations are in Exhibit O-14.

The proposed commercial thinning and pre-commercial thinning with understory slashing units that would receive treatment range between Fuel Model 10, 8, and 5 (on rare occasion) in the pre-treatment environment. The post treatment fuel models show conversion from a Fuel Model 10 to 8 and 5 to 2. Stands with fuel model 8 or 10 would be converted to a treated surface Fuel Model 8 reducing their susceptibility to crown fire. Treatment of aerial fuels would increase canopy base height and reduce canopy bulk density. The areas treated in a pre-treatment surface Fuel Model 8 would remain a surface Fuel Model 8, but be less susceptible to crown fire because of the treatment of aerial fuels that increases canopy base height and reduces canopy bulk density.

Pre- and post-treatment canopy bulk densities are displayed in detail by treatment unit in Exhibit O-14. On average the post treatment canopy bulk density for commercial treatment is 0.052 kg/m³. Pre-commercial post treatment canopy bulk densities average 0.086 kg/m³. In a mixed conifer forest, Agee (1996) estimated that at canopy bulk density levels below 0.10 kg/m³ crown fire spread was unlikely, but no definitive single "threshold " is likely to exist.

Proposed Regeneration Harvests: Unit 27 Shelterwood

The action alternatives propose regeneration harvest units that would use the shelterwood or seed tree regeneration harvest methods. The proposed regeneration harvest areas in pre-treatment (existing condition) Fuel Model 10 would be converted to Fuel Model 8 for most units. In some proposed shelterwood units, Fuel Model 8 may also remain an 8 after treatment, although decreased crown bulk density and increased canopy base height and flame length initiation would occur due to treatment. Unit 27 is representative of the fuel and fire behavior characteristics in many of the proposed shelterwood units. Unit 27's post-treatment condition would have canopy bulk densities ranging from 0.201 kg/m³ to 0.042 kg/m³, and canopy base heights ranging from 6 to 37 feet. For a detailed display of other units analyzed using stand data see Exhibit O-14. Reference the following table for comparisons between fire behavior in the existing condition and the post treatment environment. The following comparisons are based on the same fuel moisture content values, wind speeds, and constants as used to model intermediate harvests.

The proposed treatment would alter Unit 27's fuel conditions as follows:

- Canopy base height would increase from 6 feet to 37 feet.
- Canopy bulk density would decrease from 0.201 kg/m³ to 0.042 kg/m³
- Surface fuel model would be converted from a 10 to a treated 8.

Table 3-29. Unit 27 NEXUS model fire behavior predictions for shelterwood treatment:

	Fuel Scenario				Units
	High Weather Existing Condition	**Extreme Weather Existing Condition**	**High Weather Post-Treatment Condition**	**Extreme Weather Post-Treatment Condition**	
Fuel Model	10	10	8	8	Fire Behavior Fuel Model
Crown Bulk Density	0.201	0.201	0.042	0.042	kg/m^3
Canopy Base Height	6	6	37	37	feet
Canopy Fuel Load	5.2	5.2	0.9	0.9	tons/acre
Rate of Spread	2.56	3.19	0.71	0.9	chains/hour
Flame Length	3	3.5	0.7	0.8	feet
Crowning Index	17.5	15.2	22.4	19.5	miles/hour
Flame Length needed to initiate crown fire	4.1	4.1	12.4	12.4	feet

Proposed Commercial Thinning Unit 20

All action alternatives propose an intermediate harvest in Unit 20, used here as an example of the effects of commercial thinning. The proposed treatment would alter the stand's fuel conditions as follows:

- Canopy base height would increase from 6 feet to 30 feet.
- Canopy bulk density would decrease from 0.08 kg/m³ to 0.044 kg/m³
- Surface fuel model would be converted from a 10 to a treated 8.

Table 3-30 below displays fire behavior outputs (Nexus Model) of pre- and post-treatment fuel conditions for intermediate harvest Unit 20 (mixed-severity 2 fire regime). These conditions were based on high and extreme weather conditions. Winds used were upslope open wind speeds of 4.8 (high) and 5.1 (extreme) miles per hour. The information was taken from Fire Family Plus using the Stillwater Weather Station in Olney, Montana. See Exhibit O-8 for entire weather report.

The rates of spread are reduced up to two-thirds in the post-treatment environment. This increases the likelihood of successfully suppressing a fire, while simultaneously reducing the risk of crown fire initiation within the treated stand.

Table 3-30. Unit 20 Nexus Model Fire Behavior Predictions for Commercial Thin (moderate retention):

	Fuel Scenario				Units
	High Weather Existing Condition	**Extreme Weather Existing Condition**	**High Weather Post-Treatment Condition**	**Extreme Weather Post-Treatment Condition**	
Fuel Model	10	10	8	8	Fire Behavior Fuel Model
Crown Bulk Density	0.08	0.08	0.044	0.044	kg/m³
Canopy Base Height	6	6	30	30	feet
Canopy Fuel Load	3.4	3.4	1.6	1.6	tons/acre
Rate of Spread	2.56	3.21	0.71	0.9	chains/hour
Flame Length	3	3.5	0.7	0.8	feet
Crowning Index	34.8	30.5	77.7	68.3	miles/hour
Flame Length needed to initiate crown fire	4.1	4.1	14.6	14.6	feet

Understory Fuels Reduction Treatment: Unit 401

Understory treatments have proven useful in areas where soils, wildlife cover, and other resource issues constrain activities. Unit 401 is similar to other units proposed for understory treatments in the Valley Face project. All proposed understory treatments show the flame length needed to initiate crown fire to be more than two times that of the existing condition. Understory fuels reduction treatments reduce the severity of expected fire behavior, increasing the probability of successful fire suppression. Additionally, the wind speed needed to make a crown fire possible after treatment is not typical or likely to occur in the Valley Face area.

The proposed treatment would alter Unit 401's fuel conditions as follows:

- Canopy base height would increase from 6 feet to 19 feet.
- Canopy bulk density would decrease from 0.166 kg/m³ to 0.149 kg/m³

- Surface fuel model would be converted from a 10 to a treated 8.

Table 3-31. Unit 401 NEXUS model fire behavior predictions for understory fuels treatments:

	Fuel Scenario				Units
	High Weather Existing Condition	**Extreme Weather Existing Condition**	**High Weather Post-Treatment Condition**	**Extreme Weather Post-Treatment Condition**	
Fuel Model	10	10	8	8	Fire Behavior Fuel Model
Crown Bulk Density	0.166	0.166	0.149	0.149	kg/m^3
Canopy Base Height	6	6	19	19	feet
Canopy Fuel Load	7.4	7.4	5.3	5.3	tons/acre
Rate of Spread	2.56	3.21	0.71	0.9	chains/hour
Flame Length	3	3.5	0.7	0.8	feet
Crowning Index	20.2	17.6	52.6	46.2	miles/hour
Flame Length needed to initiate crown fire	4.1	4.1	11.5	11.5	feet

Proposed Understory Treatment Unit 500 (Patch Thin)

Unit 500 is proposed differently in Alternatives B and C. Alternative B is considered a commercial unit, whereas Alternative C is a non-commercial unit. However, in both alternatives the actual treated acreage would be approximately 75 acres; the entire unit is 215 acres. The treatments would include thinning in existing openings and creating new opening in the dense canopy. This method was designed to meet wildlife, silvicultural, and fuels concerns. The following outputs are for the thinned patches in Alternative C. The following bullet points display some of the differences in post and pre-treatment environments.

- Canopy base height would increase from 6 feet to 30 feet.
- Canopy bulk density would decrease from 0.201 kg/m^3 to 0.145 kg/m^3
- Surface Fuel Model 10 would be converted to a treated Fuel Model 8.

These three results for the treated area mean that the non-commercial thinning would cause tree crowns to be higher off the ground, the amount of canopy biomass would be reduced, and the post-treatment Surface Fuel Model indicates that the forest would be unlikely to support high-intensity wildland fire when compared to the existing condition (i.e., sustained crown fire runs, group torching, firewhirls, and long range spotting). For a visual display of fire behavior, see Exhibit O-7.

Table 3-32 displays fire behavior outputs (Nexus Model) of pre- and post-treatment fuel conditions for both the commercial (Alternative B) and non-commercial (Alternative C) treatments of Unit 500. The commercial treatment, Alternative B, reduces the chance of crown fire substantially more than Alternative C; reference the last two rows of Table 3-32 for data specific to crown fire initiation. These results were based on high and extreme weather

conditions. Winds used were upslope open wind speeds of 4.8 (high) and 5.1 (extreme) miles per hour. The information was taken from Fire Family Plus using the Stillwater Weather Station in Olney, Montana. See Exhibit O-8 for entire weather report. The post-treatment scenarios indicate that passive and active crown fire would not be initiated within the unit, but crown fire could be initiated outside the unit and carried inside the unit.

In Exhibit O-14, the raw data from the Nexus outputs show that prior to the thinning treatment, Unit 500 will produce 1,434 BTU/ft. in extreme weather conditions. The post treatment environment under Alternative B would produce 223 BTU/ft, which is below the estimated "threshold" for fire control by ground based suppression personnel in direct attack of a fire (Albini 1976). The treatment under Alternative C would produce 550 BTU/ft post treatment under extreme weather conditions. Albini also states, "that if (Byram's) fireline intensities exceed 600 BTU/ft/sec., spotting becomes serious and the fire is, to all intents and purposes, uncontrollable."

Table 3-32. Unit 500 Nexus Model Fire Behavior Predictions Patch Thin

	Alternative A		**Alternative B**		**Alternative C**		
	Existing Condition		**Commercial**		**Non-commercial**		
	Fuel Scenario						**Units**
	High Weather Existing Condition	**Extreme Weather Existing Condition**	**High Weather Post Treatment Condition**	**Extreme Weather Post Treatment Condition**	**High Weather Post-Treatment Condition**	**Extreme Weather Post-Treatment Condition**	
Fuel Model	10	10	2	2	8	8	Fire Behavior Fuel Model
Crown Bulk Density	0.201	0.201	0.011	0.011	0.145	0.145	kg/m^3
Canopy Base Height	6	6	50	50	30	30	feet
Canopy Fuel Load	5.2	5.2	0.3	0.3	3.1	3.1	tons/acre
Rate of Spread	2.56	3.19	8.82	11.13	0.71	0.71	chains/hour
Flame Length	3	3.5	3.4	3.9	0.7	0.7	feet
Crowning Index	17.5	15.2	142.5	125.4	22.4	22.4	miles/hour
Flame Length needed to initiate crown fire	4.1	4.1	17.6	17.6	12.4	12.4	feet

Summary of the Post-Treatment Fire Environment

The post-treatment areas would result in low to moderate surface fire conditions and would be unlikely to initiate or sustain a crown fire. Expected flame lengths less than four feet and a

predicted surface fire would be more conducive to fire suppression activities. These two criteria are the thresholds of fire control for ground-based suppression personnel directly attacking the fire. Also, these conditions would substantially reduce the potential for long range and short range spotting from firebrands, which are associated with high fire intensities, torching, crowning, and fire whirls (Rothermel 1983). Fires exhibiting long range spotting pose some of the greatest threats to firefighter safety because they are extremely difficult to control.

Manipulation of the forest structure has been shown numerous times to reduce the severity of wildland fire events (Agee 1996) and fire intensity as evidenced on the Tally Lake Ranger District. Examples include the fires of 1994 (USDA Forest Service 1995c), the 1999 Swaney Fire, the 2000 Elk Mountain Fire, and the 2000 Stone Young Fire Complex within the Kootenai National Forest. During the extreme fire season of 1967, fires within the Flathead National Forest decreased from crown to surface fires when they encountered thinned areas (Cron in Agee et al. 2000). The decreased fire intensities from the effective reduction of surface and aerial fuels would enable suppression forces to have a much better chance of controlling the fires (Agee et al. 2000). This would be the expected result with the activities proposed in this project.

None of the alternatives can influence the time and place a natural fire may start. Wildland fire is a natural, ongoing process whose time and location can never be precisely predicted by fire behavior science. There would still be untreated areas of high fuel accumulations that could lead to high-intensity fires. Blowdown, beetle-related mortality, and other causes of fuel accumulation would likely continue in the analysis area. However, treated stands would help reduce fire effects for approximately 15 to 20 years; at that time, maintenance fuel reduction treatments may be needed. These periods of effectiveness could be extended by future thinning with simultaneous fuel treatments.

Proposed timber harvest and non-commercial fuel reduction would decrease fireline intensity, the potential for large stand-replacing fires, and improve long-term forest health. Besides mostly providing beneficial effects, some harvests may also have negative indirect effects. The most substantial indirect effects of these actions would be:

- Lower stocking levels in harvested stands, which would improve vigor and growth of the remaining stand.
- Possibility of increased blowdown in some intermediate (commercial thinning) harvest units and adjacent to some regeneration harvest units. Unless timely salvage of heavier concentrations of blown down timber occurred, these could lead to fuel accumulations and increased bark beetle risk.
- An increased ability of harvested stands to withstand wildland fires. This would have myriad beneficial effects associated with retaining a healthy forest.

Effects Specific to Individual Action Alternatives

Both action alternatives emphasize the restoration of timber stands that are in a current Condition Class Departure 2 for both the stand-replacement and mixed-severity historical natural fire regimes, but to varying degrees. Maintaining current Condition Class 1 within treatment areas is also a desired objective. The mixed-severity current Condition Class Departure 2 (MSCC2) for the Valley Face area is 8,623 acres. This represents the portion of the analysis area in need of restoration due to current Douglas-fir beetle epidemic, increased tree density, and susceptibility to

stand-replacement wildland fire. The Valley Face area has 8,412 acres in stand-replacement current Condition Class Departure 2 (SRCC2). The SRCC2 stands have departed from their historical fire frequencies by one or more return intervals and have a large component of dead downed trees from endemic root rots and bark beetle-caused mortality, primarily from the mountain pine beetle epidemic of the 1980s.

Table 3-33. Treatment Acres for Alternatives by Historic Natural Fire Regime and Current Condition Class Departure

Alternative	Historic Natural Fire Regime	Post Treatment Acres in Condition Class 1	Post Treatment Acres in Condition Class 2	Total Acres Within Treatment Units By Historic Natural Fire Regime
A	IV Stand-replacement	424	1,112	1,536
A	III Mixed -severity	651	1,650	2,301
A	I Low-severity	75	0	75
B	IV Stand-replacement	1,297	239	1,536
B	III Mixed -severity	1,925	376	2,301
B	I Low-severity	75	0	75
C	IV Stand-replacement	1,075	246	1,321
C	III Mixed -severity	1,445	513	1,958
C	I Low-severity	75	0	75

*Alternative A is the existing condition used for comparison

The above table illustrates the amount of Condition Class 1 in the existing and post treatment environments. As defined earlier, Condition Class 1 fire regimes are within an historical range and the risk of losing key ecosystem components is low. However, there are still benefits to treating these units, even though the Condition Class is not changed. Removing fuel and overstory structure will disrupt the horizontal and vertical continuity of fuel, thus affecting the potential fire behavior. As discussed in the Effects Common to Both Action Alternatives section of Chapter 3 above, fire behavior and stand structure will change to support suppression efforts and inhibit crown fire initiation within the treated stands.

To further illustrate the existing condition and percentage of acres converted from Condition Class 2 to Condition Class 1, reference the following tables. In summary, within the proposed treatment units, Alternative B increases the amount of Condition Class 1 to 84 percent of the treated area. When compared to Alternative A, Alternative C increases the amount of Condition Class 1 to 77 percent of the treated area.

Table 3-34. Percentage of treated area by condition class

Alternative	Percentage of area in CC1	Percentage of area in CC2
A	29%	71%
B	84%	16%
C	77%	23%

*Alternative A is the existing condition used for comparison

These project activities would provide effective fuel reduction at the stand level:

- Intermediate harvest

- Regeneration harvest, and intermediate harvest with whole tree yarding and slashing of ladder fuels followed by an underburn or excavator pile and burn
- Slash/pile/burn (non-commercial fuel) reduction treatments
- Post harvest underburn

Commercial and noncommercial fuel reduction treatments create a short-term increase in fire hazard (usually through one or two fire seasons) until site preparation and/or hazard reduction burning is accomplished. The treatment of forest residue next to the Intermix Community type of wildland urban interface would be completed as quickly as possible along with the proposed fuel reduction activity.

Although both action alternatives are effective to some degree in reducing fuel hazard, they do vary in effectiveness. In general, the more acres of effective fuel reduction treatment, the better the alternative would be at reducing fuel hazard and subsequent fire behavior characteristics (Tables 3-35 and 3-36):

Table 3-35. Acres of Fuels Treatment by Treatment Method by Alternative

Treatment	Alternative B	Alternative C
Intermediate Harvest: Slashing/excavator pile/burn	1,155	819
Regeneration Harvest: Slashing/excavator pile/burn	1,810	1,406
Non-Commercial Slashing/Hand Pile/Burn (200,300, and 400 Series Units; no harvest)	947	1,129
Total Acres	3,912	3,354

Table 3-36. Treatment Acres for Alternatives by Existing Surface Fire Behavior Fuel Model and Conversion to Post-treatment Surface Fire Behavior Fuel Model and Acres of Fuel Reduction.

Alternative	Acres of Fire Behavior Fuel Model 10 Converted to a Treated Fuel Model 8	Acres of Fire Behavior Fuel Model 8 Converted to a Treated Fuel Model 8	Acres of Fire Behavior Fuel Model 10 Converted to a Fuel Model 2	Acres of Fire Behavior Fuel Model 5 Converted to a Fuel Model 2	Acres of Fuel Reduction
A	0	0	0	0	0
B	2,712	837	201	157	3,912
C	2,256	821	186	91	3,354

Refer to Exhibit O-14 for pre-treatment and post-treatment surface fire behavior fuel model of individual proposed units.

Effective Fuel Reduction Zones (FRZs)

Nearly all treatment areas proposed by all action alternatives are linked to previously treated stands or areas of natural fuel breaks. This helps to create larger, more effective FRZs than would any one individual unit in the face of a large, uncontrolled wildland fire burning in adjacent untreated stands. These fuel breaks are important to either slow the spread or reduce the intensity of wildland fire, thus increasing the effectiveness of suppression efforts to protect values at risk. Alternative B includes more acres and commercial treatment than Alternative C, therefore B would create more effective and contiguous fuel reduction zones.

The fuel reduction zones adjacent to the Intermix Community are designed to protect primarily private structures and improvements; secondarily, they are designed to protect national forest resource values. Wildland fire can threaten a structure in three ways: direct exposure from flames, radiated heat, and airborne firebrands. The treatments proposed are meant to decrease the probability that airborne firebrands could reach structures.

The proposed treatment would also reduce the potential of direct exposure from flames and radiated heat by creating a "defensible space" around a property or structure. Defensible space refers to that area between a structure and an oncoming wildland fire where the vegetation has been modified to reduce the wildland fire threat and to provide an opportunity for firefighters to effectively and safely defend the structure. Fuels can be treated in a relatively small area immediately adjacent to structures to reduce exposure to flames and radiant heat. Some evidence suggests that fuel reduction within 40 meters of a structure can substantially reduce ignitions from direct exposure to flames or radiant heat (Cohen 1999). This project proposes to treat stands adjacent to the Intermix Community to create FRZs. This would provide an effective fuel reduction area to reduce the potential of the short range and long range spotting threat associated with those stands during wildland fire.

To reduce threat of ignition from firebrands, fuels need to be reduced both near and at some distance from structures. Firebrands that result in ignitions can originate from wildland fires that are at a distance of one kilometer or more (Cohen 1999). However, firebrands pose a greater threat the closer the fire is to the structures.

Cumulative Effects

Cumulatively, regeneration harvest, commercial thinning, and underburning would reduce fuels and the associated risk of wildland fire. Pre-commercial thinning would help to create healthy, vigorous stands of trees composed of a desirable mixture of tree species. These stands would be more resistant to insects and disease and be able to better withstand low- to moderate-intensity wildland fires over time. The overall cumulative trend would be a continued improvement in forest health conditions as management moves stands towards desired future conditions.

Past Activities

More than 45 percent of the National Forest System lands within the Valley Face area have been harvested in some manner. Some of the proposed treatments are in the same stands that had previous harvests. Past timber management on national forest lands is described in detail in the Vegetation section of this document. Timber harvest has also occurred on at least 35 percent of the private lands in the Valley Face area. Most of this is on private timber lands; some on small private holdings (Vegetation Exhibit P-2). These past activities have broken up the fuel connectivity on a landscape scale. Some of the recent regeneration harvests still function as effective fuel reduction areas. Even in areas where an intermediate harvest occurred, the crown connectivity has been altered enough to affect the sustainability of crown fire within these stands. Past treatments can make an area more defensible for fire suppression activities for up to 50 years.

Firewood cutting has an annual effect on forests within 200 feet of roads open year round and seasonally. Dead larch and Douglas-fir are preferred firewood; however, due to the high demand

and scarcity of available cutting area, lodgepole pine and any other dead species are removed. This activity has the potential to reduce coarse downed woody material, snags, and fuel up to 200 feet from roads. Removing the dead fuel component creates a corridor of defensible area necessary for successful suppression activities. In areas of heavy fire wood collection, the removal of dead wood breaks up horizontal and vertical fuel continuity; this action combined with the fuel-free road surface will assist in successful suppression operations.

Private land development has been occurring for the last century in the analysis area; however, it has been most active in the last two decades. The vegetative conditions on small private land are highly variable and range from grassland to dense old forest. The effect of private land development has been to convert some forested land to low density forest or grassland and roads. In most cases, the desire of the landowners has been to maintain a forested setting in the immediate vicinity of dwellings and structures that is contiguous with forested public lands. In many cases, small private forested areas have not been managed and stands have become densely stocked with large quantities of dead trees. These sites are highly vulnerable to insect and disease outbreaks and wildland fire. Due to the increase in dwellings on private property adjacent to national forest land, the risk of fire originating on national forest land and threatening these homes has also increased. Additionally, within the Valley Face area from 1981 to 2005, 34 human-caused fires have occurred, compared to 22 lightning-caused fires. Thus, even though private lands within the analysis area break up the stand and fuel continuity, creating small scale fuel breaks, the increased density of human activities has increased the probability of fire starts.

Past pre-commercial thinning temporarily increased the fuel loading due to the slash being left on the ground. However, these thinning treatments broke up the crown continuity, as well as the number of trees per acre contributing to the fuel load. Additionally, stand composition was changed by removing fire intolerant species to leave more fire tolerant species.

Present Activities

Precommercial thinning has been authorized on 201 acres in the Valley Face area for 2006. Additionally, firewood cutting and forest product removal would continue on an undetermined number of acres near open roads. Both activities would reduce fuels as described above.

Reasonably Foreseeable Activities

Firewood cutting is anticipated to continue along seasonal and yearlong open roads. This activity has the potential to reduce coarse downed woody material, snags, and fuel up to 200 feet from roads. This removal of dead standing and downed wood will reduce the amount of fuel left on national forest land. Firewood gathering contributes to the overall effort to reduce fuels in the wildland urban interface. The expected fire behavior in areas affected by firewood gathering would be less then adjacent areas that have not been used to gather firewood.

Plum Creek Timber Company, F.H. Stoltze Land and Lumber Company, and Montana State DNRC are tentatively planning to continue harvesting timber using both regeneration and intermediate harvest methods. These activities would take place in the south and east portions of the analysis area. Activities on private lands affect the overall landscape when analyzing potential fire behavior and fuel loading.

Private inholdings within the Valley Face area have been subdivided and sold in the recent past and the development trend shows no sign of slowing. This means more forest vegetation would be removed to accommodate new landowner's objectives. Furthermore, the presence of more dwellings elevates the importance of fuel reduction to reduce the potential loss of life and property.

Other foreseeable actions include noxious weed control, road maintenance, administrative road use, public recreational use, and small forest products gathering for personal use. These activities are not expected to contribute to or inhibit efforts to achieve desired stand conditions.

Regulatory Consistency

Action Alternatives B and C are consistent with the following Forest Plan Fire Management Direction (Appendix G, LRMP 2001) and fire and fuels direction for all affected Management Areas:

- Use existing fire management literature as reference documents to guide project development, execution, and evaluation.
- Integrate an understanding of the role fire plays in regulating stand structure into the development of silvicultural prescriptions.
- Use existing fire behavior predictive techniques to evaluate prescribed fire application and evaluate emerging wildfire ignitions.
- Evaluate prescribed fire alternatives from a risk of escape and economic cost/benefit analysis when complex applications are planned.
- Assure that the appropriate suppression response is applied to each wildfire ignition.

A discussion of this project's consistency with the Healthy Forests Restoration Act of 2003 is found at the end of Chapter 1.

AIR QUALITY AND SMOKE MANAGEMENT

Introduction

This section discusses the current condition and proposed project's effects on air quality. The primary air quality concerns associated with forest management activities include dust produced from unpaved roads and smoke from wildfires and prescribed burning. The main air quality concern associated with this specific project is the amount and concentration of particulate matter (PM) produced by proposed prescribed burning. Wood smoke produces particles too small to be seen by the human eye, measuring 10 microns and smaller (one micron equals a millionth of a meter). Larger particles tend to settle out of the air quickly, and are less likely to affect public health. Particles 10 microns and smaller (PM_{10}) may be inhaled deep in the lungs, posing a threat to public health. Particles 2.5 microns and smaller ($PM_{2.5}$) are of the highest concern for potential health effects. Smoke particles also have the potential to reduce visibility.

The basic framework for controlling air pollutants in the United States is the Clean Air Act (CAA) of 1970, as amended (42 U.S.C. 7401 et seq.). The CAA was designed to protect and enhance the quality of the nation's air resources. The CAA encourages reasonable federal, state, and local government actions for pollution prevention. State Implementation Plans (SIPs) are developed to implement the provisions of the Clean Air Act. The SIPs describe the actions the state takes to achieve and maintain the "national ambient air quality standards" (NAAQS). Under the CAA, the Environmental Protection Agency (EPA) sets standards for air quality to provide both health and visibility protection. The state of Montana has also set standards to help protect air quality.

The EPA has established NAAQS for six criteria pollutants that have been determined harmful to the public and environment, including carbon monoxide, lead, nitrogen dioxide, sulfur dioxide, ozone, $PM_{2.5}$ and PM_{10}. The major pollutant of concern in smoke from wildland fire is fine particulate matter, both PM_{10} and $PM_{2.5}$. Smoke from prescribed fire must meet the ambient air quality standards for PM_{10} and $PM_{2.5}$. For Montana, the state standard for PM_{10} is the same as the federal NAAQS: 50 $\mu g/m^3$ (micrograms per cubic meter, which is 1/1,000,000 of a gram per cubic meter) for the annual arithmetic mean, and 150 $\mu g/m^3$ for the 24-hour average. For $PM_{2.5}$, no state standard has been established, and the federal NAAQS is 15 $\mu g/m^3$ for the annual arithmetic mean and 65 $\mu g/m^3$ for the 24-hour average. Fine particulate matter, $PM_{2.5}$, is the primary cause of visibility impairment although gases also contribute. Emissions from wildland burning include both gases and particulate matter ranging in size from 0.1 to 2.5 microns which greatly impacts visibility. More information on air quality guidelines can be found at *www.fs.fed.us/clean/air/airquality.html*.

Information Sources

The Valley Face Ecosystem Analysis at the Watershed Scale (Exhibit U-3), as well as existing Forest Service databases, provided the information used to characterize the vegetation and forest fuel attributes within the project boundaries. The Forest Service Natural Resource Information System (NRIS) database was the primary source of data used to describe existing vegetation conditions. This database is used as a reference tool by agency employees, our partners, and the public. It provides consistent baseline data and standards from which to assess field related

conditions and to base natural resource decisions. These datasets are used as baseline inputs for comparative modeling to estimate the production of smoke emissions.

Analysis Area

Montana Airsheds

The Montana Air Quality Bureau divides the State of Montana into ten airsheds. Airshed 2 is the primary analysis area for assessing the influence of Valley Face Project activities on air quality because it encompasses the effects of any activities undertaken in the project area (as defined by the Montana/Idaho Airshed Group). Airshed 2 comprises Flathead, Lake, Sanders, and the northern portions of Missoula and Powell counties. The Kootenai National Forest, which is entirely in Airshed #1, lies immediately to the west and north of the project area. Airsheds are managed by Airshed Groups composed of the government agencies and timber companies that routinely perform prescribed burns, and with the assistance of National Weather Service meteorologists specifically assigned to the Airshed Group.

Each airshed in northwest Montana is designated as either Class 1 or Class 2 depending on how stringent the air quality standards are for that airshed. Glacier National Park and the Bob Marshall Wilderness Complex are within the Class 1 airshed designation, which has stricter visibility standards than the Class 2 airsheds of the Flathead National Forest and adjacent Kootenai National Forest (See Figure 3-5).

Air Quality Impact Zones / Nonattainment Areas

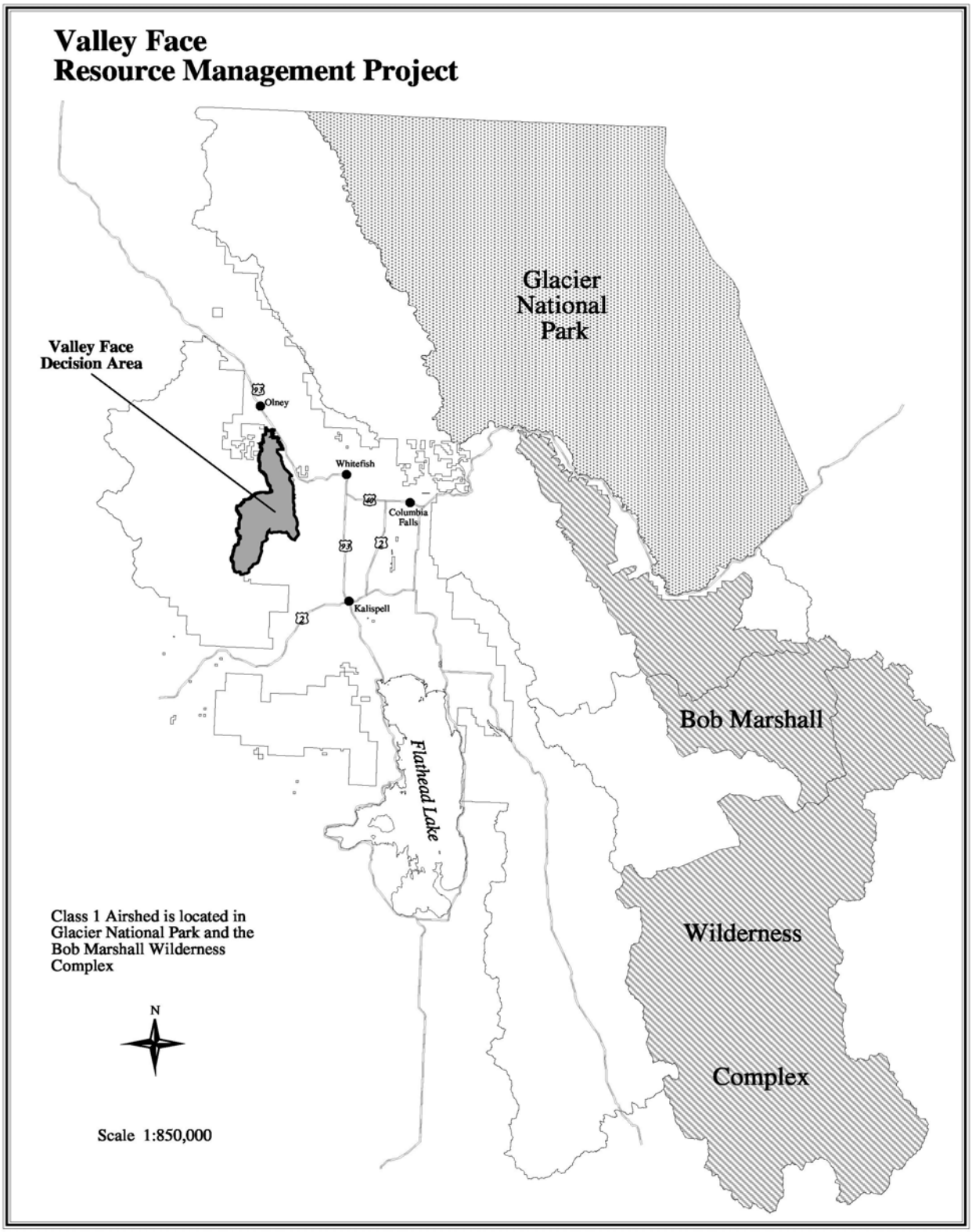
The Airshed Group has also established Air Quality Impact Zones. These zones consist of the local airsheds surrounding cities where emissions from prescribed burning could have adverse effects on air quality. The Flathead Valley is in Impact Zone K and Libby is in Impact Zone L, which includes nonattainment areas. Areas within the State that have previously exceeded the national ambient air quality standards are classified as non-attainment (see below).

Special air dispersion conditions and other factors are closely monitored and considered for each scheduled emission event in the impact zone. The intent is to continue to permit emissions from needed treatments under the acceptable ventilation conditions.

Sensitive Areas

The EPA designates communities that do not meet air quality standards (NAAQS's) over a period of time as "non-attainment" areas." States are then required to develop a plan to control source emissions and ensure future attainment of the standards. The emissions from prescribed fire may be considered as contributing emissions. Impacts from any burning within the project area will usually occur downwind in an easterly-northeasterly direction, as prevailing winds are from the west to southwest. Sensitive areas potentially affected include the wildland urban interface within and adjacent to the project area and downwind non-attainment areas within 50 miles. Three cities in the Flathead Valley are considered sensitive areas because they are non-attainment areas for PM_{10}: Kalispell, Columbia Falls, and Whitefish. Kalispell is considered an area of concern, though not formally designated a non-attainment area for carbon monoxide.

Figure 3-5. Air Quality Vicinity Map.



Glacier National Park and the Bob Marshall Wilderness Complex are considered Class I airsheds. The remainder of the Flathead National Forest and adjacent Kootenai National Forest lands are included in Class II Airsheds, where visibility standards are less strict.

Affected Environment

Historical Conditions

Fire has been a part of the vegetative dynamics in the Northern Rockies as evidenced by the mosaics of different size and ages of forested areas. Fires continue to be a part of the natural forest ecosystem and produce local short-term impairment of air quality. The 2001 and 2003 fire seasons are extreme examples of wildland fire smoke effects on air quality.

There are no known data indicating Montana's historic air quality. The success of fire suppression may have resulted in a decrease in the annual amount of smoke generated by wildland fires since the early 1900s.

Treatment of natural and created fuels by prescribed fire is now a common practice on forested lands in Northwest Montana. The amount of smoke generated from prescribed fire has been reduced from earlier levels of post-settlement burning because modern forest managers schedule prescribed burns during periods of good smoke dispersion.

According to the U.S. Environmental Protection Agency's Report AP-42, *Compilation of Air Pollution Emission Factors* (1996), prescribed burning generates some air pollution, although the net amount is believed to be a relatively smaller quantity than that produced by wildland fires. The EPA states in this report "prescribed fire is a cost-effective and ecologically sound tool for forest, range, and wetland management. Its use reduces the potential for destructive wildland fires and thus maintains long-term air quality." The planning, scheduling, coordinating, and monitoring of prescribed fire on national forest lands follows the standards described in the Clean Air Act that provide direction to protect and enhance the quality of the nation's air resources and to protect public health and welfare.

Existing Air Quality Situation

Air quality in the various airsheds is affected by smoke, dust, industrial sources, and motor vehicle exhaust. Smoke is generated from occasional wildland fires, prescribed burning, residential wood burning, and agricultural field burning. Along with local sources, smoke is blown into the area from Washington, Idaho, Canada, and western Montana. Affects to air quality also include road dust, primarily from vehicle traffic on gravel and native surface roads in summer, spring, and fall; on paved sanded roads in all seasons; and from wind erosion on agricultural lands. Industrial sources of airborne pollutants include an aluminum plant in Columbia Falls and local sawmills.

Visibility in the Class I airsheds is monitored by the State Air Quality Bureau. Monitoring sites are located in Glacier National Park and the Bob Marshall Wilderness Complex. Visibility is generally good in the Class I airsheds. Some impairment of visibility occurs in the spring and fall due to the cumulative effects of smoke generating actions across Montana and adjoining states.

Air quality in Montana Airshed #2 is generally considered to be good to excellent through a majority of the year. Seasonal variations occur, resulting from weather conditions such as

temperature inversion. Areas in the airshed that are not adjacent to, or within, urban areas are generally within acceptable levels of particulate matter.

Air quality in the Kalispell, Columbia Falls, and Whitefish PM_{10} Impact Zones is generally good. Please see the Regulatory Framework section below for a discussion of PM_{10}/ $PM_{2.5}$ and Clean Air Act standards. Some populated valleys have periods of poor air quality that is attributed to stagnant air and high-pressure systems that trap pollutants, particularly in the winter months. Only a small percentage of the particulate matter (generally less than 2 percent) in these airsheds is attributed to burning of forest residue (Raisch and Jeffery 1988). The majority of particulate matter is attributed to re-entrained road dust and residential wood burning.

The downward trend since 1994 in the maximum values for 24-hour particulate matter and the annual arithmetic average for all three non-attainment areas is attributed to implementing measures for reducing particulates. These measures are increased miles of gravel surface travel ways that have been paved, automated road sweeping/washing, use of liquid road deicer, and the reduction in the use of sand on paved road surfaces during adverse cold weather conditions. This has reduced the re-entrained road dust quantity that is the primary source of particulate matter impairing these airsheds. The source of all data represented in the existing condition section is in Exhibit J-1 (U.S. EPA 1998).

All burning associated with the proposed alternatives would be in compliance with permit #MOB 90-1 with the Montana Department of Health & Environmental Science, Air Quality Bureau. This permit is updated annually.

Environmental Consequences

Direct and Indirect Effects of Alternative A - No Action

There would be no direct effects to the air quality or human health from Alternative A. The indirect effects to the air quality would occur when a wildland fire escapes initial attack efforts and starts to burn in unmanaged stands or in untreated fuels. Downed material combined with ladder fuels from the developing shade tolerant understory would act as a fuel source for a wildland fire. Smoke from wildland fires is unmanageable and would likely produce smoke in intensity and duration much greater than what would be produced by the planned ignitions of any of the action alternatives. The severity of air quality degradation from wildland fire is unpredictable. Air quality impacts from wildland fire would normally occur during the summer months when visitor use in affected airsheds is highest.

Alternative A would not implement any prescribed smoke-producing activities, such as pile burning, and would not directly contribute to air quality impacts. However, the potential of a large-scale wildland fire is greatest with Alternative A, and a large-scale fire could have far greater impacts on air quality than any action alternative. Air quality would not be impacted until a fire escapes initial attack efforts. At that time there would be a higher level of particulate matter released than pile burning because of the greater amount of fuel consumed. The eventual wildland fire would have a much different impact than controlled burning. Pile burning or underburning impacts usually last for a short period of time and are managed for the least amount of air quality impacts possible. Air quality from wildland fires could be impacted for weeks, as was experienced in various parts of the Northern Rockies in 1988, 1994, 2000, 2001 and 2003.

Alternative A would not implement any prescribed fire use; therefore, it poses no risk of prescribed fire escape.

Direct, Indirect, and Cumulative Effects Common To All Action Alternatives

Proposed fuel management treatments for all action alternatives involve prescribed burning of piled or unpiled fuels. Many factors contribute to the amount of smoke produced from prescribed burning including weather conditions, combustion processes, fuel properties (moisture, loadings, arrangement), and type of burn. The effects of smoke on air quality are of short duration due to regulatory requirements, weather factors, the qualities of smoke itself, and smoke impact reduction measures.

Smoke created by burning activities would temporarily reduce air quality. Much of the burning and subsequent loss of air quality would occur in the spring and autumn seasons when fuel moisture and atmospheric conditions are conducive to meeting all resource objectives.

With prescribed burning, smoke can be held to a minimum duration and intensity, although burning can temporarily reduce air quality. However, prescribed burning can reduce the acute impacts to air quality from wildland fires in the long-term. Levels of emissions from prescribed burning are below health standards, while wildland fires can produce emissions that are more than double federal health standards. Refer to the Upper Columbia River Basin Final EIS for a more in-depth discussion about air quality trade-offs between prescribed fire and wildland fire (U.S. Department of Agriculture and U.S. Department of the Interior, 2000).

Differences among the action alternatives are related to the type of burning and amount of fuel to be treated. The effects of the alternatives will be assessed based on the prescribed burn method and the acres of planned prescribed burning. The following prescribed burning methods would be used in all action alternatives:

Underburning would occur in some proposed timber harvest units. The objectives are:

1) to reduce fuel loading created from harvest activities, while protecting the remaining overstory trees;
2) reduce ladder fuels;
3) maintain sufficient down woody debris for nutrient and moisture cycling;
4) minimize soil disturbance; and
5) improve palatable browse for wildlife.

Underburning is deliberately slow to protect desired leave trees, so combustion is less efficient than with broadcast burning. More smoke per acre is produced than with other methods. Well-developed convection columns needed to aid smoke dispersal are seldom obtained as fire intensities are deliberately moderated to facilitate leave tree survival. Smoke generated from underburns typically lifts to approximately 6000 feet or greater and drifts with the prevailing wind present in the area.

Pile burning is used to dispose of woody debris that has been mechanically or hand piled. The objective of pile burning is hazard reduction. Pile burning is more effective at protecting overstory trees that are susceptible to fire than underburning. Combustion can be very efficient, but varies widely due to several factors. Unlike understory burning, which is done in the spring and fall, pile burning is accomplished in the late fall when escape potential is lowest. Because of

this time frame, pile burning is usually compressed into fall days with adequate ventilation. During this time of year, days that have good ventilation can be limited. This can lead to greater emissions over a shorter period of time. Also, there is usually more competition within the airshed as woodstove users begin to heat homes.

Effects Downwind **-** For all action alternatives, smoke generated from within the area could affect the air quality in parts of northwestern Montana. Potential exists for smoke to drift into the following Class I airsheds, nonattainment areas, and local communities as displayed in the following table.

Table 37. Class 1 airsheds

Airshed	Proximity from Analysis Area
Glacier National Park (Class I)	20 miles East-Northeast
Bob Marshall Wilderness Complex (Class I)	30 miles East-Southeast
Intermix Community Type	Within the area
Whitefish (nonattainment)	8 miles East
Columbia Falls (nonattainment)	14 miles East
Kalispell (nonattainment)	11 miles Southeast

Prescribed burning can cause smoke management concerns, especially if smoke drifts into populated, nonattainment, or Class I airsheds. Data derived from mass balance studies (Air Quality Bureau of the Montana Department of Health and Environmental Sciences) suggests that forestry slash burning contributes from 1.2 percent (Libby) to 1.5 percent (Kalispell) of the total PM_{10} contribution to these communities on a yearly average. On a daily basis, the contribution has risen up to 8.8 percent (Kalispell). Federal and state ambient air quality standards have been established for PM_{10} concentrations.

One of the most important factors affecting the ambient air quality of these airsheds is the weather. Because of the dynamic nature of the air resource and the inability to accurately forecast long-range weather conditions, effects on air quality from prescribed burning at a given location are difficult to analyze. The model used to estimate fuel consumption, on site smoke emission production (particulate matter) and dispersion was First Order Fire Effects Model: FOFEM 5.21 (Reinhardt et al. *in press*).

The Valley Face analysis area covers approximately 35,000 acres, including a wide range of proposed treatments. Due to the size of the project area, it will take several years to implement the proposed treatments in both Alternatives B and C. For this reason it is difficult to model dispersion accurately. To mitigate this, site specific burn plans are developed for proposed underburns and pile burning. These burn plans can accurately model dispersion based on time of year, current and expected weather patterns, site specific fuel loading, exact location, and other contributing factors specific to the proposed burn.

As stated previously, the principal impact to air quality in Class I airsheds from prescribed burning is the temporary visibility impairment caused by smoke. This may reduce the quality of forest recreation experiences, as vistas within and beyond the boundaries of the Class I airsheds may be temporarily obscured by smoke and haze, although the visible impairment would occur during the spring and fall which are periods of relatively low visitation to these areas. The relation between the effects of wildland fire, as opposed to prescribed fire use in a controlled setting, are more pronounced on air quality both from a contribution of pollutants over a broader area and a reduction in visibility or regional haze standpoint, even on similar acreage burned.

The levels of smoke anticipated from the action alternatives is not expected to be a health concern, with the exception of people living directly adjacent to the burns who are severely sensitive to smoke. The Tally Lake Ranger District policy is to personally contact all residents adjacent to areas scheduled for burning. Additional steps would be taken prior to burning to alert other nearby residents, including newspaper ads, posting notices, mailings, and/or contacting key members of the residential areas or communities. The intent is to provide smoke-sensitive individuals adequate notice of planned burning.

Dust and exhaust from vehicles during timber harvest would contribute short-term effects to air quality. Effects would be localized to the immediate vicinity of the operations.

Smoke and Road Use Impact Reduction Measures Common to All Action Alternatives - Several measures would be used to reduce the effects of prescribed burning and smoke on air quality. The Montana and Idaho Interstate Airshed Group operates an air quality monitoring unit from March 1 to November 30 annually and the Flathead County Health Department monitors burning at the local level during all seasons of prescribed fire use. These monitoring units regulate prescribed burning of all major burners in the airshed by restricting or curtailing burning activities when poor ventilation conditions exist or are forecasted. Besides operation of the monitoring group in the fall, the following measures would be used to help reduce emissions and/or reduce the effects of smoke from prescribed burning:

- One of the objectives of prescribed burning is to reduce the threat of wildland fires, so burning itself is a smoke reduction measure. The amount of fuel consumed and the subsequent smoke emissions from prescribed fire can be managed to a degree, whereas the smoke emissions from wildland fires are unmanageable.
- Late spring underburning would be maximized to help reduce the amount of fuel consumed, to allow for more favorable smoke dispersal conditions, and to conduct burns during periods of less competition within the airshed.
- Burn bosses would terminate ignition in the event smoke behavior is not as forecasted and there is potential for smoke to adversely impact local communities.
- Night time burning that could affect local communities would be avoided, as smoke dispersal is at its worst during this time.
- Machine piles would be reasonably free of dirt and sufficiently cured to facilitate good combustion, thereby reducing production of smoke.
- Stumps and heavy fuels (logs) would be mopped up adjacent to private land near any residences. This would be done to reduce the lingering, smoldering smoke that can occur from these fuels, as well as to help prevent escapes.
- Whole tree yarding, yarding unmerchantable material, and spot excavator piling of heavy concentrations of logging and thinning slash would be done when necessary before the underburns. The landing piles and excavator piles would be burned prior to the underburn in order to reduce the amount and duration of smoke resulting from the underburns.
- Dust abatement on logging haul routes would be kept current and commensurate with timber harvest activities.

Risk of Escape - There are risks involved in prescribed burning, mainly dealing with escaped fires. However, the majority of prescribed burning done on the Tally Lake Ranger District has been successfully completed with minimal escapes. Even minor slop-overs of one to two acres only happen occasionally (less than 5 percent of all burns), and these have all occurred in higher

elevation units away from private land. For cost efficiency reasons, more risk is taken in these remote areas, whereas more precautions are taken when burning near private land. No prescribed burns adjacent to private land on the Tally Lake Ranger District have ever become escaped wildland fires. Only one prescribed fire escape has been recorded since 1970 that involved approximately 35 acres in the Robertson Creek drainage.

Spring underburning and late fall slash pile burning would be priority treatment periods when fuel moisture levels are high outside of treatment areas. When only underburning is prescribed adjacent to a harvest activity, the post sale activities (including slash treatment, fuel breaks, or firelines) within the harvest area would be prioritized first for implementation.

Prevailing westerly to southwesterly winds cause nearly all control problems on the north and east sides of the prescribed burn areas. To help prevent escaped wildland fires adjacent to private land boundaries, fuel breaks (which include thinning, pruning of ladder fuels, and/or firelines) would be done with special attention given to the north and east sides of the prescribed burn areas prior to the underburn. Excessive accumulations of fuels from pre-burn treatments would be piled and burned under high moisture conditions prior to underburning. These efforts help to reduce the amount of torching and spotting which is often a cause of even minor escapes.

Prescribed fire management plans (burn plans) are approved by fire management officers for each individual prescribed burn and include plans for ignition, holding, escape fire contingency, mop-up, and patrol. Burn plans are developed is to ensure that each burn meets the objectives that were prescribed for that particular area. The plan is designed to utilize the prescribed weather, personnel, and equipment that are needed to control the burn within the unit boundaries and to achieve desired silviculture objectives. Strict adherence to the burn plan is required for each burn boss.

Direct and Indirect Effects of Action Alternatives B and C

Table 3-38 below shows the on-site total particulate emissions (in tons) estimated to be generated by each of the action alternatives. The total estimated tons of particulate emissions displayed are the PM_{10} production. The production of $PM_{2.5}$ is approximately 84.6 percent of the PM_{10} respective totals, based on FOFEM 5.0. FOFEM 5.0 inputs and calculations are displayed in Exhibit J-2.

Cumulative Effects of Action Alternatives B and C

Timber Management and Fuels Reduction Activities

The cumulative effects on regional air quality due to forest management activities are difficult to quantify. Because prescribed burning reduces fuel loadings, the potential for fires escaping initial attack is reduced. Therefore, the long-term effects of smoke from wildland fires on air quality are reduced. As discussed earlier, prescribed burning of forest fuels is a minor contributor of PM_{10}/ $PM_{2.5}$ emissions when compared to other sources. Under favorable weather conditions, the impacts of all PM_{10}/ $PM_{2.5}$ contributors are minimized. However, under stagnant atmospheric conditions, smoke from prescribed burns, wildland fires, residential wood burning, re-entrained road dust, vehicle exhaust, and other sources of air pollution can create a short-term, unhealthy impact on local air quality.

Table 3-38. Estimated Tons of Smoke Produced by Alternative. Tonnage is rounded to the nearest ton.

Treatments	Alternative B			Alternative C		
	Acres	Total $PM_{2.5}$	Total PM_{10}	Acres	Total $PM_{2.5}$	Total PM_{10}
Post Harvest Under-burn (Doug-fir)	144	72	84	148	59	87
Intermediate Harvest (lodgepole)	198	80	95	214	87	102
Intermediate Harvest (spruce/sub-alpine fir)	27	17	20	27	17	20
Intermediate Harvest (Doug-fir)	1,032	362	427	533	187	220
Regeneration Harvest (Doug-fir)	1,286	682	804	1,006	533	629
Regeneration Harvest (lodgepole)	274	167	196	256	156	185
Slash/Pile/Burn (Doug-fir)	819	203	240	1,001	248	293
Slash/Pile/Burn (lodgepole)	40	11	13	40	11	13
Slash/Pile/Burn (ponderosa pine)	88	3	4	88	3	4
Total	**3,908**	**1597**	**1,883**	**3,313**	**1,301**	**1,553**

In late spring, summer, and autumn, burning of slash is a common management practice occurring on the Flathead National Forest, other Federal and State land management agencies, and private forest lands. Weather patterns, topography, and fuel characteristics during these burning seasons are the key factors affecting air quality. As previously mentioned, spring burning conditions have the least impact on air quality. Fall burning has the greatest potential to impact air quality. The Montana Smoke Management Group regulates spring, summer, and fall burning by making daily evaluations as to whether or not members may burn, based on local and prevailing weather information and existing air quality conditions.

Smoke from prescribed burning associated with present, proposed, and foreseeable activities, combined with that of other PM_{10}/ $PM_{2.5}$ producing activities in the region, has the potential to temporarily reduce air quality in the areas of Whitefish, Columbia Falls, and Kalispell. General wind patterns may cause smoke to drift into the Class I Airsheds of Glacier National Park and the Bob Marshall Wilderness Complex. Visibility may be temporarily reduced while prevailing weather influences mixing and dispersion of smoke. Effects would be minimized in the mid- to late-spring because of fewer visitors, higher fuel moistures (less emissions), better smoke dispersion, and reduced impacts from other PM_{10}/ $PM_{2.5}$ producing activities. These anticipated impacts are considered to be within a reasonable range for these activities and pose no substantial health or environmental effects.

Private Land Development

Continued development of private land for residences would likely result in periodic smoke production from slash burning associated with home site clearing and burning wood for heat. Cumulative effects could include an increase in both the amount of smoke and duration of days with smoke present. While the Forest Service has no influence over burning which takes place on private land, the conditions resulting from these sources as well as from wildland fires would be taken into account when determining whether to ignite any prescribed fire. Although these burns from private landowners (that are nonmembers of the Airshed Cooperative Group) are not tracked

by the Monitoring Group, Ranger District fire managers visually check conditions prior to making the decision to ignite an adjacent prescribed fire area.

Other Activities Possibly Affecting Air Quality

Other foreseeable actions include noxious weed control, road maintenance, road construction, administrative road use, public recreational use, and small forest products gathering for personal use. These activities may include limited burning and road use, but are so minor so as not to have cumulative effects to air quality.

Regulatory Framework and Consistency

Regulatory Framework

Forest wide standards for maintaining air quality are: "Coordinate all Forest Service management activities to meet the requirements of the State Implementation Plan, State Smoke Management Plan, and Federal air quality standards" (FNF, LRMP, II-64, Forest Plan). There are no specific Forest Plan directions by Management Area for air quality. Whenever prescribed fire is used, Forest Plan Appendix G states, "Esthetic, visual, soil, air, and water quality concerns will dictate fire management direction in some areas."

The Clean Air Act of 1970 and amendments to the act (1972, 1977, 1990), (42 U.S.C. 7401 et seq) provide direction to protect and enhance the quality of the nation's air resources and to protect public health and welfare. Section 109 of the Clean Air Act requires the EPA to develop primary air pollution standards to protect human health and secondary standards to protect public welfare. Section 110 requires states to develop State Implementation Plans that identify how the state will attain and maintain national ambient air quality standards and other federal air quality regulations. The State Implementation Plan is made known through the Montana Clean Air Act and implementing regulations. The regulations provide specific guidance on maintenance of air quality, including restrictions on open burning (ARM 16.8.1300). The act created the Montana Air Quality Bureau and provides its regulatory authority to implement and enforce the codified regulations.

To maintain compliance with the various regulations concerning maintenance of air quality, Region One of the Forest Service participates in the Montana/Idaho Airshed Group. The Group is comprised of timber companies and government agencies that commonly conduct prescribed burning, and federal, state, and local air regulators.

The Group has developed a set of smoke management practices intended to maintain compliance with the State air quality standards through a Memorandum of Agreement with the Montana Air Quality Bureau. Beginning March 1, 2000, this includes a monitoring system for the months of the open burning season that extends from March 1 through November 30. The Montana Air Quality Bureau recognizes the current smoke management practices and the Montana airshed coordinating process as Best Available Control Technology for prescribed burning.

The Forest Service is a party in a Memorandum of Agreement with the State of Montana. Through this agreement, the Montana and Idaho Smoke Management Group shares information and coordinates activities to assure cumulative actions do not result in unacceptable effects on air quality in Montana.

Regulatory Consistency

By participating in the Montana and Idaho Interstate Airshed Group, complying with the Memorandum of Agreement 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 Clean Air Act.

By treating both natural and activity generated fuels, the proposed activities would meet the objectives of the LRMP in which the fuels management program intends to treat fuels to the degree needed to facilitate implementation of the fire protection program and other dependant activities of the LRMP. The proposed activities are also consistent with State laws requiring the treatment of slash to reduce the effects of high intensity fires.

WATER RESOURCES

Introduction

The Valley Face area has a variety of stream forms, wet meadows, and lakes that have been used by humans for many decades. The recent boom in land development and sub-divisions has made water and water front property very valuable for residential and recreational use and has made fire protection of private lands even more important.

The shape of the landforms in this area is attributed to glacial scour and deposition. These historic geologic actions have created 90 degree turns in streams, and deep clear lakes. Most of the area lakes are surrounded by private lands but a few, such as Bootjack, do have public land for general access.

Stream densities vary widely across this area, depending on soil porosity and bedrock composition. Most of the Valley Face area is undulating landforms that slope toward the Stillwater River, but no streams actually flow directly into this river as a result of subsidence into porous material. Because of this, runoff characterization in this area is simplified compared to other areas with stream connectivity and will only be used to analyze changes due to management.

Though most of the water comes from snowmelt, intense rainstorms can cause sizable but temporary increases in runoff. Because the ground is mostly composed of highly fractured rocky soils, much of the water infiltrates quickly and flows under ground and then emerges as wet areas with no distinct channels or outlets (Exhibit G-4).

Of all the watersheds in the Valley Face analysis area, Lost Creek above section 16 is the only segment of stream with a self-supporting population of coldwater fish – eastern brook trout. Local geology suggests Lost Creek most likely flowed into the south end of Tally Lake before the last glacier episodes. “The big bend” or “elbow” formed when the southward moving ice and glacial tills plugged the stream’s access to the lake. Below this turn the valley bottom widens and the velocity of the stream slows, contributing to the conditions that create “warm-water” habitat down stream. Lost Creek eventually sinks and adds to the ground water of the West Valley.

Information Sources

Because there are very few perennial or fish bearing streams in the Valley Face analysis area there has not been the intensive historic data collection for the stream network that would usually occur with other areas of the FNF. There have been a few permanent cross-sections established in Lost Creek to establish the existing condition and monitor for any long term changes in stream morphology. “Stream Reach Inventory and Channel Stability Evaluations” (Pfankuch, 1978) have been conducted in several established locations and re-measured to determine if there are any notable changes occurring. Most recently there was a study of the water quality of the ground water in the lowest portions of Lost Creek, which is most relevant to users of the ground water below the bounds of the Valley Face area (“Report of Findings for the Lost Creek Fan Nitrate Investigation July-October 2005,” see Exhibit G-1).

A road and culvert survey was conducted on most of the area’s open roads to determine if they were having any visible effect on stream flows or causing point sources of sediment. These basic surveys included stream channel measurements above and below road crossings to determine if

additional volumes of water from the roads or road-side ditches were enlarging stream channels. The culvert size was also measured and problems photographed, such as any drop-off or "shotgun" at the outlet of the pipe. These preliminary measurements were also used to evaluate problems with fish passage on Lost Creek. These surveys also measured the total length of roadside ditch draining water directly into streams. Data from these surveys are in Exhibit G-2.

Analysis Area

The water resources analysis for this EA focused on the Lost Creek drainage because it supports the only known stream-dwelling fish population on National Forest System lands in the project area. The rest of the project area, as defined on the alternative maps in Chapter 2, was analyzed for cumulative effects and site specific concerns from other resources. The approximate timeframe considered in this section includes the period of project implementation, estimated to extend until 2014, and an additional ten to fifteen years that would allow for hydrologic recovery within treatment units and also represents the temporal within which hydrologic models function reliably. Most of the analysis area landscape drains towards the Stillwater River. For other information about fish population in the general area, please see the "Aquatic Species" section.

Affected Environment

The primary source of water to this area is precipitation in the form of snowfall. Spring runoff occurs from late April to late May. Runoff in streams at this elevation is somewhat bimodal, with the earliest peak typically less than the second peak. Rains and warmer nighttime temperatures of late April and May augment the second rise of stream flow. Precipitation ranges from about 20 inches at lower elevations near the Stillwater River to about 30 inches on the ridge tops. Although rainstorms are often intense, they are normally brief. The only expected flooding is in the low-lying areas such as the small wetlands that can be found throughout the area.

Land management activities have been ongoing on the forested areas in most of the Valley Face area since the mid to early twentieth century. Of the entire area between one third and one half consists of private land where traditional forest management practices have been replaced with homesteads and raising of livestock. Traditional forest management does occur on State and privately owned industrial forest lands.

Because the area is so undulating and dissected by rock outcrops, there are few catchments that support perennial streams. The lack of surface water is also attributable to the underlying layer of fractured bedrock. Due to these conditions, it is difficult to separate overall changes to peak flow and total water yields caused by various land management activities from variations in residual soil water storage and annual variations of precipitation in most of the Valley Face area. Therefore only Lost Creek, above "the elbow" near Tally Lake has been modeled to reflect potential changes in runoff patterns although the entire area and activities on all ownerships has been considered.

Road densities have been identified in several studies as an indication of concern for water quality, particularly in contiguous watersheds. The Upper Columbia River Basin (UCRB) scientific teams suggested that watersheds that contain over 1.7 miles of road per square mile may have degraded water quality. The road surveys mentioned earlier indicated that many of the streams mapped by the U.S.G.S. in the uppermost elevations of the Valley Face area are actually dry or damp draws. Therefore the way "streams" and roads interact are not always as direct here

as they were in the typical analysis area of the UCRB. This was confirmed by notes from the road surveys.

The area of upper Lost Creek appears on maps to have a higher than desired road density, but on the ground review since the original EAWS process has shown that many of the stream/road intersections in this area are not active stream courses, and rarely carry water. Therefore, hydrologically they are of little concern as a sediment source and cause little effect on water quality. See Exhibit G-2.

The road system was again reviewed during a rainy spell in the fall of 2003. At that time it was found that there were a few locations where water quality would be improved by improving road surface drainage, i.e. brought up to current Montana Best Management Practices guidelines. One such point was documented with photos that can be found in the Exhibit G-3 where Road 2956 crosses Lost Creek just past the intersection with Road 542. In this location the stream-crossing pipe is at a low point of the road so water from the road has no where to go. With traffic during wet periods, a large puddle forms and becomes a mud hole. The result is mud and silty water splashing into the stream. This photo was taken in the fall of 2004, during hunting season when the road was getting heavy use. On the downstream side, the outlet of the culvert is not level with the water surface or streambed. This may have been caused by improper installation of the pipe, or the streambed may have experienced scouring at the outlet due to the pipe being undersized for the stream or past increased flows. What has resulted is a "shot gun" pipe causing the stream to under-cut the culvert and form barriers to fish passage during low flow periods.

In summary, there are many types of activities that may have lead to changes in stream channels in this area including logging, cattle grazing, and rural development. Because of the porous soils and exposed bed rock in the Valley Face area, many past disturbances that could cause negative effects to water quality and quantity have had less effect than what would be expected when compared to other systems on the FNF.

Water Quality: General

The Administrative Rules of Montana classify all waters in this area to be B-1, meaning the waters should be suitable for drinking, culinary uses, and food preparation after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fish and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. There are many registered water rights for "Consumptive Use" (households and stock watering) in the lower portions of the Valley Face area. The primary "Nonconsumptive Use" of stream water in the analysis area is for the propagation of cold-water fish and habitat for other aquatic life forms. There are no streams in this area listed on the State 303(d) list of impaired water bodies.

Monitoring of sediment, water temperature, and many other variables has taken place at different times and on nearby locations. Long-term monitoring continued until 2002 in the neighboring Hand Creek drainage, to the west of the Valley Face area, to track trends of hydrologic recovery after a large wildland fire. These data have been analyzed by the Flathead Lake Biological Station, and indicate that there is a notable trend of recovery, which helps support the concept that riparian areas are resilient and have a good capacity to recover even from catastrophic events such as wildfire. Interpretations of this monitoring of fire and forest management activities are part of

the Flathead Basin Commission Biannual Report available at the Flathead Commission office in Kalispell.

Water Quality: Sediment

When urbanization, road construction, and associated management activates (i.e. land clearing and timber harvest) change the vegetative characteristics of a drainage basin, it is possible that sediment movement to streams will also be accelerated above what would be expected to occur with natural disturbance patterns. Because few segments of streams in the Valley Face area flow through sensitive landtypes, and in most cases a riparian buffer has been left intact along water bodies, the risk of sediment transport is small on FNF lands. Few if any of the stream reaches on National Forest lands were found to be inhabited by sensitive aquatic species in field surveys in the past few years. As discussed above, there are only a few roads built adjacent to or across active streams so sediment from this source is also small.

Rural development in the Mountain Meadows and lower Lost Creek areas has led to removal of riparian vegetation to make room for driveways, lawns, pastures, and corrals. Because the woody riparian vegetation that has been removed is critical in maintaining stable stream banks and limiting sediment delivery to streams, there are some areas where this has caused localized impacts to water quality and sediment levels. These areas are most problematic during intense rain events where disturbed areas were not treated with erosion control devices following new construction that disturbed the soil.

Water Quality: Flow regime

In "natural" conditions the Valley Face area would have had a relatively slow rate of runoff except in the steep cliff areas and during extreme snow melt events. The broad floodplains in the lower Lost Creek area that are primarily broad willow bottoms would have trapped most sediment through that drainage and ameliorated high runoff except in extreme events. This has been changed to some degree by draining of pasture lands with ditches. The flat valley bottom course of the Stillwater River, with its broad flood plain, would disperse any flash flows that may have originated in the north portion of the analysis area.

Historically wildland fire would have traveled through this area somewhat frequently. This would have kept the forested areas in a variety of age classes. Water yields would have also varied from year to year as forest stands died and re-grew. The growing forest would have moderated peak flows.

Stream Stability and Water Yield

Pfankuch Channel Stability surveys have been conducted at limited locations in the Valley Face area due to limited number of streams on National Forest lands. All survey results are in the "good" to "fair" category. These surveys are available at the Tally Lake Ranger Station in Whitefish and will be used in the future to document trends in channel stability.

Water yield predictions developed using the model WATSED (USDA Forest Service 1990) are one way to explain changes to channel stability ratings and help explain changes in sediment deposition over time. Models are used to simplify extremely complex physical systems and give repeatable predictions of potential affects from further management. In the case of the Flathead River Basin, and the Tally Lake area in particular, historic water quality data were used to help

develop the sediment coefficients and calibrate annual water yields. Even so, it should be remembered that the water and sediment yields predicted by WATSED are intended to be an estimate. The modeled values do give a good basis for comparison and finding areas that may be most sensitive to further change. Information derived from a model is most useful to evaluate existing conditions in combination with watershed characteristics, field data, field experience of the analyst, and best professional judgment. WATSED water yield and peak flow figures reflect increases originating from changes in forest canopy, including transportation systems, compared to unmanaged drainages.

Some possible concerns over sediment were identified in Lost Creek during the EAWS analysis process, so the upper reach that supports brook trout was modeled with the newest beta version of the WATSED model and verified with the older version. Both versions indicated that the current water yield increase above natural (9 percent) is well within acceptable ranges for these landforms and has not exceeded "unacceptable" ranges within the past 15 years. Therefore, existing data as analyzed by current techniques indicate that the conditions of the stream channels have held up to past land management activities. The few less stable areas are related to specific points where roads and streams meet and where private development has changed vegetation at home sites.

Wetlands and Riparian Areas

Riparian and wetland areas are important islands of diversity within terrestrial ecosystems. They provide critical functional linkages between aquatic and terrestrial ecosystems. Wetland sites provide critical habitat needs for many species of birds, mammals, and amphibians. Riparian zones and wetlands play a major role in protecting water quality, water quantity, stream stability, and fisheries habitat.

Riparian areas and wetlands occur in the Valley Face area generally in three forms; wet meadows and marshes, small lakes, and the riparian corridor of conifers and shrubs found along streams. Each provides habitat for different forms of life. All have standards that guide management activities within and adjacent to their boundaries.

Wet meadows and marshes: Marshes are open grassy or sedge-filled depressions that tend to have soils that retain water longer than the surrounding "upland" or terrestrial areas. They develop on mineral soil in areas where standing water is present at least part of the growing season. There is enough oxygen present to favor decomposition of organic matter on the surface of the soil. Wet meadows form in a similar geographic setting but have soils with higher infiltration rates. Therefore, they dry out faster in summer and vegetation tends toward more grass species rather than sedges.

Lakes/ponds: The lakes within the Valley Face area are generally small (<100 acres) and include both stream-fed and groundwater-supplied lakes. The shoreline vegetation surrounding these small lakes provides important nutrients and habitat structure to the aquatic environment. None of the lakes within the area has an outlet stream that connects to the Stillwater River, thus isolating their fish populations from those in the rest of the Flathead Valley.

Streamside Riparian: These are the green bands or zones along the edge of streams, rivers, or streamside seeps. Any number of vegetation communities can form in these systems, including riparian shrub fields, riparian coniferous forests, mixed coniferous/deciduous forests, and pure deciduous forests.

Many areas with wetland or riparian characteristics have experienced timber harvest activities in or near them in the past 50 years, before Streamside Management Zones became legally mandated, but wet areas are resilient and generally heal quickly. Field review in 2002 and 2005 revealed little long term damage from past management (Exhibit G-2).

Environmental Consequences

Direct and Indirect Effects-Alternative A (No Action)

The no action alternative would mean a perpetuation of the existing condition; in relation to the aquatic resource this would be most evident where the roads cross active stream channels. In the case of past timber harvest and its effect on stream flows, the trees that have been planted or naturally regenerated on managed land would likely continue to grow and use more of the water that is available in the surface soils. This would slowly reduce water yield increases to some small level above "natural" because areas that are used for roads and converted to home sites would keep the water yield from completely returning to pre-development levels.

In the absence of fuel reduction, future wildland fires may be more severe and widespread (see the environmental consequences analysis of the Vegetation and Fire and Fuels sections in this chapter). If fire were to spread through the area there is a risk there would be an increase in sediment transported from areas burned by wildfire. This would most likely cause site-specific impacts to water quality, but in Lost Creek sediment is likely to be deposited into a broad wetland area downstream of the "elbow." Below this point Lost Creek sinks sub-surface and sediment would not reach the Stillwater River. Similar cycles would be expected in the small streams throughout the project area.

Direct and Indirect Effects-Alternative B

Alternative B would involve commercial timber harvest and fuel reduction throughout the Valley Face area. All areas proposed for vegetative management would be in compliance with both Best Management Practices (BMP) and INFISH standards, which are specifically designed to protect aquatic resources. These guidelines have been found to be effective at blocking sediment transport to water bodies and wetlands, plus providing shade to retain desirable temperatures. The effectiveness of these buffers can be found for the entire State of Montana in the biannual audit reports available at the Department of Natural Resources and Conservation.

Within the Upper Lost Creek watershed, there would be treatment on approximately 700 acres. This equates to about 550 equivalent clearcut acres or approximately seven percent of the basin, which modeling indicates would result in about a three percent increase in annual water yield. Very few portions of this or other streams within the analysis area are perennial; most are intermittent or sink before they connect with another body of water. Because of the low percentage of disturbance of the area, the maintenance of riparian buffer strips, and the BMP improvements that will be implemented on all haul routes, it is very unlikely there will be any measurable effect on the water quality or quantity in the upper Lost Creek drainage.

Direct and Indirect Effects-Alternative C

Alternative C would involve commercial timber harvest and fuel reduction throughout the Valley Face area with fewer acres treated and some less intensive treatments than Alternative B. As with Alternative B, all areas proposed for vegetation management would be in compliance with both

Best Management Practices (BMPs) and INFISH guidelines, which are specifically designed to protect aquatic resources. Implementation of these guidelines has been found to be effective at blocking sediment transport to water bodies and wetlands whenever they are properly applied. Leaving riparian buffers also provides shade which helps retain desirable temperatures in stream systems.

Within the upper Lost Creek watershed there would be treatments on approximately 491 acres. This equates to approximately 363 equivalent clearcut acres or approximately five percent of the basin, resulting in a modeled two percent increase in annual water yield. BMP upgrades on the roads are anticipated to correct drainage problems on roads and sediment point sources at stream crossing. Because of the low percentage of disturbance of area, the buffer zones of a minimum of 50 feet, and the BMP improvements that will be implemented on all haul routes; it is even less likely that there will be any measurable effect on the water resource in the drainage under this alternative than under Alternative B. In general, there would be fewer effects to aquatic resources within the project area under Alternative C than Alternative B.

Cumulative Effects for Both Action Alternatives

Although the Upper Lost drainage has been used as a focal point of potential impacts to the water resource and therefore aquatic species, it is acknowledged that the Valley Face analysis area has other valuable water resources, such as Bootjack, Twin, and Northwestern Lakes. Most of the land surrounding these lakes is privately owned or managed by the State of Montana.

Neither action alternative is expected to have any substantial detrimental impacts to water resources when considered along with the other past, present, and reasonably foreseeable activities outlined at the beginning of this chapter. The small water yield increases predicted by modeling, coupled with the modeled increase resulting from past actions should not exceed levels that would result in stream bank instability or impairment of water quality. This is particularly true because of the underlying, fractured bedrock geology of the area that results in all streams sinking sub-surface before connecting to the river system of the Flathead Valley. There are no reasonably foreseeable future actions that would impact water yields in the project area at this time. Timber harvest and development of private lands is likely to continue in the future and may result in water yield increases in any affected watersheds. Future wildland fires could occur and result in water yield increases in burned watersheds but should not impact water quality within the Stillwater/Flathead River systems due to the discontinuous flow of project area streams.

The replacement of two road culverts in the upper Lost Creek drainage would benefit the resident brook trout population by allowing greater habitat connectivity. Sediment inputs at the two sites, while currently low, would be reduced further by replacing the culverts to BMP standards.

Regulatory Framework and Consistency

Framework: Water resources management in the Valley Face area is regulated by the Clean Water Act, the Environmental Protection Agency's Antidegradation Policy, Montana Water Quality Standards, the Montana Stream Protection Act, and the Streamside Management Zone Act. These are described in greater detail in Exhibit G-5, along with other appropriate water quality regulatory citations below.

Federal agency compliance with pollution control is addressed through Section 313 of the Clean Water Act, Executive Order 12580 (Jan. 23, 1987), National Nonpoint Source Policy (Dec. 12,

1984), USDA Nonpoint Source Water Quality Policy (Dec. 5, 1986) and the Environmental Protection Agency in their guidance "Nonpoint Source Controls and Water Quality Standards" (Aug. 19, 1987). In order to comply with State and local nonpoint pollution controls, the Forest Service would apply Best Management Practices (BMPs) to all possible nonpoint sources that may be due to management activities addressed in this EA. Best Management Practices are the primary mechanism to achieve water quality standards (Environmental Protection Agency 1987).

BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate introduction of pollutants into receiving waters. Usually BMPs are applied as a system rather than a single practice. BMPs are selected by site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility. The Forest Plan emphasizes the application of BMPs "to protect or improve the quality of the water source" (p. II-40).

Wetlands are protected under Executive Order 11990. This act directs federal agencies to "minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." Effects on the maintenance of natural systems, flora, fauna, habitat diversity, and hydrologic utility are to be considered when evaluating a proposed project that could potentially affect a wetland.

Most types of silvicultural activities are exempt from the 404-permit process of the Clean Water Act. Associated timber roads are exempt from the permit process only if they are constructed and maintained with the use of BMPs listed in 40 CFR 323.4(a) as well as those approved in the Montana Non-point Source Management Program (1986). The Montana Streamside Management Zone Act (1992) directs wetlands adjacent to stream channels to be included within streamside management zone boundaries.

Consistency: All action alternatives are consistent with the water quality goals, objectives, and standards described above and outlined in the Flathead Forest Plan, as amended. This consistency is met primarily by application of Best Management Practices in timber harvest areas and roads associated with timber removals.

AQUATIC SPECIES

Introduction

The Valley Face analysis area is unusual when compared to most of the Flathead National Forest because there are few fish-bearing streams and lakes and the area is not heavily utilized by anglers. Only Bootjack Lake, Lost Creek, and Big Lost Creek are known to support trout populations or provide any fishing opportunity. There are no data regarding the historical distribution of fish in the analysis area prior to the twentieth century. None of the streams or lakes has any surface water connectivity to other water bodies, so it is reasonable to conclude there were no fish historically in the analysis area. However, it is possible Lost Creek was once the outlet of Tally Lake but was isolated from the lake during the last glacial period. Lost Creek also occasionally has surface connectivity with Tally Lake and during very high water years, such as 1997, a small flow does reach the lake. This intermittent connectivity may allow fish to periodically colonize Lost Creek from the lake.

Many brook trout (*Salvelinus fontinalis*) were stocked throughout the Flathead Valley in the early part of the twentieth century. While the old stocking records are unclear, it is possible Lost Creek and/or Big Lost Creek was stocked with brook trout from 1927-1929 (Mark Deleray, Montana Fish, Wildlife and Parks biologist, personal communication). Brook trout are present in both streams today in wild, self-sustaining populations. The earliest documented fish population survey in Lost Creek was in 1991. Brook trout dominate the stream but in 2002 a single westslope cutthroat trout (*Oncorhynchus clarki lewisi*) was captured in the extreme headwaters of Lost Creek. Again, the stocking records are unclear but in 1960, cutthroat trout were stocked in some "Lost Creek" (there are several Lost Creeks in the Flathead area). Big Lost Creek has never been formally inventoried since all fish habitat is on private land, but the landowners report it only has a small population of brook trout. Bull trout (*Salvelinus confluentus*) have never been found in any stream in the analysis area.

The historical amphibian and reptile populations are likely to have included spotted frogs, long-toed salamanders, pacific chorus frogs, painted turtles, common garter snakes, and western terrestrial garter snakes. All of these species are native to the area, and the Valley Face area has abundant wetland habitat types. Leopard frogs were once widespread in the lower elevations of Flathead Valley and so it is likely they were also present in the Valley Face area.

Analysis Area

The analysis area for the Valley Face aquatic resources coincides with the project area boundary, but also includes the whole of Big Lost Creek. The entire area is within the Stillwater River basin, but the streams in the area sink subsurface before reaching the river. Therefore, the analysis area will be each stream and wetland considered individually. Given that the project area is about 35,000 acres and is not connected to the downstream Flathead River system, this area is large enough to encompass any potential cumulative effects. This is the same analysis area used in the Valley Face watershed assessment (EAWS), and the findings from that effort are used heavily in this report (Exhibit F-6). Most project effects would occur during project implementation (estimated to extend to the year 2014) and potentially for an additional ten years or so as vegetation grows. The beneficial effect of the culvert replacements proposed in Lost Creek should be manifest within one to two years in the local trout population.

Information Sources

Information considered in this analysis was drawn from several sources, including fisheries habitat and population monitoring conducted by the Flathead National Forest since 1990. Montana Fish, Wildlife and Parks (Montana FWP) biologists provided information on historical fish stocking of Lost and Big Lost Creeks, and the Montana Fisheries Information System (MFIS) database provided additional information regarding angler use of the streams in the area.

Affected Environment

Surveys of fisheries habitat and hydrologic conditions focusing on Lost Creek have been conducted by the Flathead National Forest since 1990. The data document a stream with fair to good quality fish habitat in the upper reaches, and a poorly defined channel (more a series of wetlands) in the lower reaches. In the absence of long term trend data, comparing Lost Creek to similar streams that are in pristine or "reference" condition is a credible method of analyzing the stream condition (Kerschner et al. 2004). In this analysis, Lost Creek was compared to four similar streams on the Flathead National Forest plus two published databases of reference streams (Overton et al. 1995) (Riggers et al. 1998). Exhibit F-4 has further information about these data sources. Certain habitat characteristics such as residual pool depth, bank stability, and fine sediment are considered sensitive to land management activities and are reviewed in this analysis. The results of this comparison are detailed below and in Table 3-39 in discussion about the existing condition.

The aquatic resources are discussed in detail for the following water bodies: Lost Creek, Big Lost Creek, Bootjack Lake, and the remaining wetlands.

1. Lost Creek. Lost Creek is the only stream in the analysis area with fish habitat on public land. As described earlier, it has two distinct segments with a coldwater trout stream above the "elbow" (the bend near Tally Lake) and a small, sluggish warm water stream below the elbow. Upstream of the elbow, Lost Creek currently has numerous, small brook trout. Multiple electrofishing inventories in 2002 determined that brook trout were abundant and averaged five inches in length. Although there are habitat limitations (detailed below), it appears that brook trout are self-sustaining and no stocking has occurred in decades. Downstream of the elbow, trout are very scarce due to the warm water habitat. A few brook trout were captured about a mile downstream of the elbow in 2002. Upper Lost Creek serves as the "source" for brook trout and lower Lost Creek is a "sink" for the population.

A single juvenile cutthroat trout (of unknown genetic purity) was captured at the extreme headwaters of Lost Creek near Forest Road 11229. A viability assessment of cutthroat trout on the Flathead National Forest ranked Lost Creek as a "depressed" (weak) population and it is not essential to maintain the overall species viability (Exhibit F-5).

The habitat condition of Lost Creek downstream of the elbow is characterized as a warm water system with very low gradient. The channel is very shallow and poorly defined. Water meanders from wetland to wetland until it finally slips underground altogether on private land. Traditional coldwater habitat characteristics such as gravel spawning habitat, undercut banks, temperature and so forth are not applicable here. There are no water diversions in the fish habitat portion of Lost Creek. While there is concern about high levels of nitrate in the aquifer downstream of Lost

Creek, there is no evidence of elevated nitrate levels in Lost Creek. The existing condition of lower Lost Creek is considered natural.

Upstream of the elbow, Lost Creek has coldwater fisheries habitat that extends for about five miles. This resource can be impacted by cumulative effects of land management activities although the geology is not as sensitive as other areas on Flathead National Forest (see the Water Resources section). The lower 1.5 miles downstream from Mountain Meadows (private land) has not been formally surveyed. A culvert under Forest Road 542 has an outlet waterfall that likely prevents fish from migrating upstream. The barrier created by the culvert does not allow brook trout that rear in this reach of Lost Creek to return upstream where the best available spawning habitat exists. Another culvert on Forest Road 2956 is currently passable but it is beginning to develop a waterfall on the outlet end. Over time, this outlet drop will grow taller and may become a barrier to fish migration. This culvert is located about 200 meters upstream of the FR 542 culvert. These two culverts isolate fish in the lower 1.5 miles of fish habitat from the upper 3.5 miles of habitat.

The Mountain Meadows area is a natural, low gradient meadow segment. Due to the gentle flows and deep pools, this reach of stream provides important winter habitat for fish. Since the rest of the stream is high gradient, the Mountain Meadows area is possibly the only area where trout can survive winter seasons. The culvert barrier prevents fish downstream of Mountain Meadows from reaching this critical winter habitat.

Habitat in Lost Creek above Mountain Meadows was surveyed in 1991. Surveyors divided the stream into five distinct “reaches” (segments of similar channel type and gradient). The stream is small and available habitat ends near the FR 2942 culvert. Surveyors noted the stream has plenty of shade and dense stands of dogwood, willow, alder and spruce stands. Most of Lost Creek has gentle gradient but a mile-long stretch has high gradient (5 to 15 percent) and several short waterfalls that could possibly hinder fish migration but not block it altogether. The stream banks were stable but levels of fine sediment were high. Lost Creek has considerable deposits of calcium carbonate which often “cements” gravels together. The combination of sediment and calcium carbonate deposits limit the amount of spawning habitat for trout. A portion of this area was re-surveyed in 2002. Although the methodology was slightly different, the data are comparable. The results of the two surveys are compared to reference streams in Table 3-39 below. Records of these field surveys are located in the stream folders at the Tally Lake District Office in Whitefish.

The interpretation of these data is that there are three limiting factors affecting upper Lost Creek fish habitat. First, the stream has small size and only limited room for fish growth. The small stream size is a natural feature and cannot be improved. The second limiting factor is the migration barrier at Forest Road 542. This is blocking fish from winter habitat and upstream spawning habitat.

The third limiting factor is excessive sediment limiting the amount and quality of spawning habitat. This is likely the result of several factors, including the small size and low gradient of the stream, the continuing drought and lack of “flushing flows” around the time of the surveys, and the effects of past land management activities.

Table 3-39. A comparison of the existing condition of Upper Lost Creek with reference condition or management goals and the interpretation of findings.

Habitat Feature	1991 Survey	2002 Survey	Reference condition or mgmt goal	Interpretation
Pools per mile	66 pools per mile	91 pools per mile	Reference condition is about 25-38 per mile	Lost Creek is not limited by number of pools.
Residual depth of pools	Not recorded	0.39m average	Reference condition is about 0.3 to 1.09 per mile	Lost Creek is not limited by residual pool depth
LWD per mile	"Plentiful"	604 pieces per mile	Reference condition ranges from about 235 to 612 per mile.	Lost Creek has not been limited by insufficient LWD
Stream bank stability	95% stable	100% stable	Reference condition ranges from 90-99% stable	Lost Creek is not currently impacted by unstable banks
% of Fine Sediment in riffles	Sand is dominate substrate, some rubble	82% fine sediment	Less than 50% in reference streams. Less than 35% for optimal cutthroat trout spawning habitat conditions	Lost Creek is limited by excessive amounts of fine sediment.
Wetted width/depth overall	Unknown	40.3	INFISH has goal of 10 or less. However, this habitat attribute is intended to classify streams, not evaluate them	Lost Creek is comparable to reference streams in this region
Width/max depth of pools	4.78	7.2	Reference condition ranges from 5-9	Lost Creek pool dimensions are not limiting.

2. Big Lost Creek Big Lost Creek does have a small, self-sustaining population of non-native brook trout on private land but the extreme headwaters on public land are fishless. No information exists on habitat conditions on private land. A review of 2003 aerial photographs finds this watershed is heavily roaded and has received varying levels of timber harvest. However the riparian areas appear undisturbed. Big Lost Creek has never supported cutthroat trout or bull trout.

3. Bootjack Lake There are several lakes on private lands with fish species (such as redsided shiners) but the only lake with any National Forest System lands is Bootjack Lake. The lake is mostly shallow water with a deep, coldwater basin in the middle that provides adequate habitat for trout. Water quality on Bootjack Lake is not monitored. Citizens that live around the lake have not indicated any concern.

Bootjack Lake was historically fishless but today is managed as a trophy fishery for rainbow trout and cutthroat trout, plus it also has an illegally stocked population of pumpkinseed sunfish. The lake was chemically treated by the Montana FWP in the 1990s to remove the sunfish but the removal was not successful. Bootjack Lake does not have suitable spawning habitat for trout. The lake is routinely stocked with trout and managed with special regulations to have a trophy (large sized) fishery. The majority of the lake is privately owned but National Forest System lands along about ¼ mile of shoreline offer access for portable rafts, canoes and float tubes. The lake has a seasonal inlet from Little Bootjack Lake (on private land) and an outlet stream that slips

underground a few miles downstream. Trout and pumpkinseed sunfish may periodically travel up and downstream from Bootjack Lake but they have no connectivity to Stillwater River.

4. Wetlands There are approximately 50 wetlands in the Valley Face area. They range anywhere from 50 acre lakes to very small, vernal pools that disappear in the dry season. A Forest Service riparian landtype inventory (USDA Forest Service 1995b) and a national wetlands inventory (Montana State Library 2005) found a diversity of wetland types. There is no evidence that any wetlands have been lost or degraded by human actions.

Fourteen of these wetlands have been surveyed for amphibian distribution since 1995 and eight of these have been monitored more than once. The inventories have found an abundant number of spotted frogs, Pacific chorus frogs, long-toed salamanders, as well as low numbers of western toads. This is an expected amphibian distribution and typical of the surrounding area. No leopard frogs have been found in the Valley Face area but it is presumed to be within the species' historic range. The absence of leopard frogs in Valley Face is not a surprise since they are almost extirpated throughout Western Montana. Their disappearance may be caused by a chytrid fungus but their decline is not clearly understood (Werner et al. 2004).

Western toads (also known as boreal toads) are a Regional Forester's sensitive species; monitoring to date has not found any toad breeding sites in the Valley Face area. Toads usually breed in wetlands with no moving water and black, organic soils. Riparian Landtypes NL1A and NL1E (USDA Forest Service 1995b) tend to be the only wetlands used by toads and these are present in Valley Face. Monitoring across the Flathead National Forest has found amphibian use of breeding wetlands is extremely variable, with large annual fluctuations in abundance at individual breeding sites (unpublished data is stored in Forest Supervisor's office, Kalispell).

Environmental Consequences

Direct, Indirect, and Cumulative Effects-Alternative A (No Action)

1. Lost Creek: With the no action alternative, it is expected the fish habitat conditions in upper Lost Creek will remain about the same overall. This alternative does not resolve any concern with the existing road network. The existing fish barrier at FR 542 will continue to block upstream fish passage for about two-thirds of available habitat. It is expected that, over a few years or decades, the culvert at FR 2956 will also become a fish barrier.

Furthermore, the no action alternative will keep all the existing roads in Upper Lost Creek but drainage improvements and other maintenance that would be required during implementation of one of the action alternatives would not occur. The Forest Service has a backlog of road maintenance needs (such as grading, cleaning culverts, brushing, etc) and this situation would limit these activities in the analysis area. The road network will continue to impact fish and habitat in Lost Creek, although there are relatively few areas where sediment from the roads is currently reaching the stream. Therefore, this alternative actually does not lead to watershed restoration. It is expected that sedimentation levels will remain about the same, even with the reforestation of previously harvested stands.

The cumulative effects of the no action alternative consider the past, present and reasonably foreseeable actions along with the above indirect impacts. The past and present actions, such as road construction and past harvest, have already been described and characterized as to how they affected the existing condition. Exhibit F-7 reviews all the itemized cumulative actions but the

only reasonably foreseeable actions with any potential impact to aquatic resources are described below.

Lost Creek's aquatic resources could be impacted by recreational fishing and private land development and private land timber harvest. Recreational fishing will continue to be rather poor but a few brook trout would be harvested. This is anticipated to have no meaningful consequences to the population. There is some potential for private land development in Mountain Meadow. Although the Forest Service is not aware of any specific development plans, the trend in Western Montana is increasing development and it is reasonable to conclude this will happen to Mountain Meadow someday. If private lands near Mountain Meadow become further developed, Lost Creek could have additional nutrient loading (due to septic systems) and weakened stream banks. This in turn could lead to poor habitat conditions during the critical winter period. Private timber companies have landholdings in the area but no specific plans at this time for harvest. It is reasonable to conclude they will apply Best Management Practices in their harvest designs but their cumulative impact on water yields and channel erosion will also hamper the stream's ability to recover much beyond the existing condition.

Therefore, the cumulative effects of the no action alternative are a slow, downward trend for brook trout. A possible slow decline in the quality of winter habitat, and no hope for better spawning habitat or better fish passage, would mean both smaller-sized and fewer brook trout in Lost Creek. Although brook trout are not as sensitive as native fish, they still need clear spawning gravels and do respond to habitat changes (Raleigh 1982). The true impact of the no action alternative is gradual decline of already-poor recreational fishing in Lost Creek. The existence of brook trout in Lost Creek has little ecological value since they are not native.

Since cutthroat trout are not viable in Lost Creek in the existing condition, the no action alternative would have no impact on cutthroat trout. The cutthroat trout will simply disappear (if they haven't already done so) with or without this alternative. There are simply too few cutthroat trout in Lost Creek to respond to habitat change. Failure to improve fish passage or spawning conditions does not make any difference and this alternative does not hasten their decline. The loss of Lost Creek's population will not have any impact on the species viability in the Flathead Basin since they are not considered a stronghold and critical for viability (Exhibit F-5). Additionally, this alternative will have no impact on bull trout since they are not present.

2. Big Lost Creek: Since so very little is known about the condition of Big Lost Creek, it is difficult to assess the cumulative impacts of the no action alternative. At best it can be concluded that the Forest Service land in this watershed has little impact to the stream since it is only a small portion of the watershed. Therefore, no action would have little to no impact on the stream and the status quo would continue. Big Lost Creek would continue to support brook trout; it is not thought to have ever contained cutthroat trout or bull trout.

3. Bootjack Lake: The no-action alternative would not have any direct or indirect impacts to Bootjack Lake. There is no concern with the existing condition and no concern with a continuation of status quo. Only one reasonably foreseeable action could impact Bootjack Lake and that is the high likelihood that Montana FWP will keep stocking the lake with trout. This action is essential to maintain a Bootjack Lake fishery.

4. Wetlands: This alternative is not anticipated to make any difference to wetland habitat or amphibian populations. Although the increasing fuels may result in more stand-replacing fires

(with subsequent mortality to amphibians), it is not possible to calculate when, where or how intense any fire would be at any particular wetland. Due to this randomness, it is reasonable to conclude that some amphibians may die from wildfires but it is no different than historic, random chance. Thus, there are no past, present or reasonably foreseeable actions that are expected to impact amphibians. Therefore, the no-action alternative should result in a status quo of the amphibian population.

Direct, Indirect, and Cumulative Effects-Alternatives B and C

Although Alternative C is a modification of Alternative B to address issues, they have identical impacts to fisheries resources. Most of the variations between the alternatives are located in fishless watersheds while those variations within Lost Creek or Big Lost Creek are minor. Therefore, both action alternatives are considered together.

1. Lost Creek: The direct and indirect effect of the action alternatives has a mix of positive and negative impacts to fisheries habitat. The impacts are primarily related to road management and not necessarily fuels reduction treatments.

The most substantial impact is the positive change for fish passage. Both action alternatives will address fish passage needs in FR 542 and FR 2956. Both of these roads are needed for timber haul and therefore, the culverts will be replaced in order to meet BMPs. The new culverts will be larger and set correctly in the stream to accommodate upstream fish passage. Juvenile brook trout will now be able to reach winter habitat and survive to grow to larger sizes. Fish habitat in the lower part of Upper Lost Creek would be reconnected to the spawning and winter habitat upstream.

Another positive impact of the action alternatives is BMPs applied to other haul routes as well. Both alternatives have about 19 miles of BMP work to be applied to haul routes in Upper Lost Creek (they are exactly the same haul routes in both alternatives). This will help reduce point sources of sediment. A reduction in sediment in the Upper Lost Creek watershed may improve the condition of spawning habitat for trout.

The action alternatives construct about one mile total of temporary roads in the Upper Lost Creek drainage. None of these temporary roads cross any stream channel and therefore it is not likely erosion will travel down roads and reach a stream. Direct sedimentation is not expected. However, construction of new roads can impact the way water travels down the mountainside (it collects water at the surface) and this in turn can alter Lost Creek's water yield. An increase in water yield could result in the stream banks eroding and widening. The risk of this impact is fairly low due to the geology of the watershed and the locations of the roads. Therefore, the temporary roads may result in a very minor amount of in-channel erosion and this will subside after the roads are decommissioned and the vegetation re-grows.

The actual vegetation management and fuel reduction actions in both alternatives are anticipated to have very little impact to fish habitat. No activity is proposed within riparian areas. Retaining vegetative riparian areas is a critical component of protecting stream banks, water quality, shade, woody debris recruitment, and preventing surface erosion (USDA Forest Service 1995). The action alternatives have riparian buffer areas that vary from 50 to 300 feet (see Exhibit F-1 for further information on riparian buffers). Furthermore, modeling of water yields for both alternatives does not indicate much change or any concern in Lost Creek (see Water Resources section).

The purpose of this project is intended to enhance fire suppression control efforts by reducing hazardous fuel and reduce the vulnerability of the forest to large scale disturbances, such as insects, disease, and wildland fire. The implications of this effort to aquatic resources are rather complicated as there are short-term verses long-term tradeoffs. Fish kills caused by a fire are believed to be uncommon. It has been observed in a few streams due to asphyxiation from sediment (Bozek and Young 1994) and/or abrupt changes in water chemistry and temperature (Minshall et al. 1989). Yet, streams that were completely devoid of fish after the 1992 Boise National Forest fires had entirely recovered in a few years (Rieman and Clayton 1997). In general, short-term harm tends to take place when a severe (stand-replacing) fire burns in steep terrain and then is followed by heavy precipitation (Rieman et al. 2005) and small, headwater streams are especially vulnerable (Minshall et al. 1989). Upper Lost Creek fits this description and is vulnerable to a catastrophic fire.

However, most fires leave behind a mosaic of burn intensities and the above scenario is not very common. Over the long-term the benefits of a wildfire become apparent. The charred trees topple into the stream to create new pools and cover. The initial pulse of sediment moves on and the stream flourishes under newly exposed gravels and nutrient inputs. New, complex fish habitat emerges and, in effect, the wildfire does some "house cleaning" for the stream (Rieman et al. 1995, Gardner 2002).

Wildfires and streams have a complex relationship that defies simplistic solutions. Rather than relying solely on vegetation management, scientists advocate restoring resiliency to both terrestrial and aquatic resources (Rieman et al. 2005, Bisson et al. 2003, Rieman and Clayton 1997, Riggers et al. 2001). In the Valley Face area, this would include actions like restoring habitat and providing adequate fish passage. Thus the action alternatives would benefit Lost Creek by providing fish passage and improving drainage from the road network.

When considering the past, present and reasonably foreseeable actions, Alternatives B and C should benefit the brook trout population. The action alternatives do provide better access to the best winter habitat. It is uncertain what impact, if any, the road construction and BMP work will have on sedimentation in spawning areas but the impact should not be substantial because there are relatively few areas where sediment from the roads is currently reaching the stream. Overall, the brook trout population of Lost Creek should remain about the same as the current condition.

The action alternatives would not impact cutthroat trout. There are simply too few cutthroat trout in Lost Creek to respond to any habitat change and they will likely disappear from the watershed if they have not already done so. The action alternatives are not designed to recover cutthroat trout but neither will they hasten their extirpation. The loss of this stream's population will not jeopardize the species viability since Lost Creek is not a stronghold (Exhibit F-5). Likewise, this alternative will have no impact on bull trout since they are not present.

2. Big Lost Creek: The action alternatives include 152 acres (Alternative B) or 119 acres (Alternative C) of vegetation management in Big Lost Creek's watershed. Both alternatives have one temporary road that is about 0.3 miles long and does not cross any channels. Since very little is known about the existing condition of Big Lost Creek, it is difficult to assess what impacts the action alternatives would have on the stream. The most logical conclusion is proposed actions would have little to no impact because it only affects a small percentage of the land in the watershed. The temporary road construction is minor in comparison to the existing high road

density on private land. The small, non-native brook trout population in Big Lost Creek will probably continue unaffected by either action alternative.

3. Bootjack Lake: The action alternatives have roughly 20 acres of vegetation management within the Bootjack Lake watershed (the exact size of the Bootjack Lake watershed is poorly defined). None of this is near the lake shoreline or near the inlet stream. There would be no measurable impact of this small amount of upland vegetation management on Bootjack Lake. The only reasonably foreseeable action is a continuation of fish stocking and this is desirable and necessary to maintain this trophy fishery.

4. Wetlands: The action alternatives have vegetation management only on upland areas. Each wetland's riparian area is left untreated. Exhibit Rr-1 illustrates that there are no harvest activities proposed in any wetland riparian area, including the most important NL1A and NL1E types. The Exhibit F-1 documents how the riparian area delineation is accomplished for each wetland. Since there is no activity in the wetland riparian areas, there is no impact to water quality. Amphibian habitat should be unaffected. The action alternatives do have a slight risk of increased mortality of individual frogs or toads being trampled by heavy equipment in upland areas (logging trucks, skidders, etc). Adult toads and, to a lesser degree, adult frogs do disperse on upland areas. Most should be able to easily avoid machinery in the units but some low level of mortality could occur from trampling by harvesting equipment or trucks (deMaynadier and Hunter 1995).

Amphibians are also considered well adapted to periodic fires and simply move out of harm's way (Russell et al. 1999). Although preliminary work shows that amphibian populations seem stable after a fire, more work is needed to better understand the role of fuel reduction (Bury 2004). Despite the information gap on the long-term impacts, it is reasonable to conclude that since microhabitat near the wetlands is left untreated, no short-term impacts are expected (deMaynadier and Hunter 1995).

There are no reasonably foreseeable actions that could contribute to cumulative effects. Therefore, these action alternatives may result in a very low level of adult toad and frog mortality (due to equipment trampling) but no population level changes and cumulative effects are anticipated.

Regulatory Framework and Consistency

The regulatory framework for aquatic resources is described in this section. The action alternatives fully comply with the regulatory framework itemized below. Three government agencies share responsibility for managing the fishery resource. The US Fish and Wildlife Service is a regulatory agency for federally-listed species and seeks to recover these species in conjunction with other agencies. The Montana Department of Fish, Wildlife, and Parks (MDFWP) have primary responsibility for fish populations. Management of fish habitat on National Forest system lands is largely a Forest Service responsibility. All three agencies cooperate in research and monitoring efforts.

Bull trout are listed by the US Fish and Wildlife Service as threatened species that exists on the Flathead National Forest. However, bull trout are not present in the analysis area. A Biological Assessment is required for federal actions that may impact bull trout and this has been prepared in Exhibit F-2. Since bull trout are not present, the action alternatives were determined to have "no effect" on bull trout.

Westslope cutthroat trout are considered a “sensitive species” due to their limited distribution, sensitivity to environmental disturbances, vulnerability to hybridization and/or competition with other fish species, and risk of overexploitation. The Forest Service seeks to protect their habitat and prevent population declines that would lead to protection under the Endangered Species Act (FSM 2670). A biological evaluation is required to assess the effects on these sensitive fish species (Exhibit F-3). Since the very tiny cutthroat trout population in Lost Creek is not viable (and may already be extirpated), the biological evaluation determined the project would have “no impact” on cutthroat trout.

The Flathead National Forest LRMP determined bull trout and cutthroat trout are management indicator species for all other fish species and prohibited "unacceptable fish losses" from land management activities (page II-21) in all management areas. Since the action alternatives will have no impact on either species, the project complies with LRMP goals.

In 1990, the Forest adopted Amendment #3 which added more trout stream standards. Certain standards were developed for key bull trout streams (none of which are in this analysis area). It also states four management standards for all streams known to contain westslope cutthroat trout. The first two standards deal with acceptable amounts of management activities in riparian areas and with stream shading; since no activity is proposed in riparian areas the project meets the standard. The third standard addresses the need to control sediment sources in critical spawning areas. Since very few direct sediment sources have been found in the analysis area and it is not considered a critical spawning area for cutthroat trout, the project meets the standard. The fourth standard seeks to pursue opportunities to recover cutthroat trout populations. This is not the purpose and need of the project and does not apply.

In 1992 the Forest published Implementation Note #10 which further set directions regarding fine sediment in key bull trout streams, none of which are in the analysis area.

In 1995, the Forest Service amended the Flathead LRMP by adopting the Inland Native Fish Strategy (INFISH) as a means of recovering native fish populations. Numerous "priority" watersheds were established to recover bull trout, but none of these are in the analysis area. INFISH also has various goals to maintain and restore the health of aquatic ecosystems and riparian areas. In order to achieve these goals, several riparian management objectives have been outlined. Activities must not retard the attainment of these objectives. Standard riparian buffer strips were incorporated but it is permissible to modify them based on local knowledge as long as the riparian management objectives are achieved. The action alternatives do modify the standard riparian buffer widths, sometimes larger than before and sometimes smaller. Exhibit F-1 is a site-specific analysis for these changes. This exhibit also documents how the action alternatives fully comply with INFISH.

SOILS

Introduction

The soil analysis process is described in the Soil Analysis Guideline contained in Exhibit H-1. Cumulative effects are discussed in terms of both the analysis area and the activity areas. The Forest Service Handbook FSH 2509.18-2003-1 (Exhibit H-2) defines an activity area as a land area affected by a management activity to which soil quality standards are applied. An example is a harvest unit within a proposed timber sale. Activity areas are a subset of the larger analysis area. The existing condition of the proposed activity areas and the analysis area is described later in this document.

The soils analysis describes the current soil condition and analyzes the soil effects caused by implementation of the proposed management activities. Soil effects are the result of detrimental soil disturbances. Detrimental disturbances are defined in Forest Service Handbook FSH 2509.18-2003-1 (Exhibit H-2) as the condition where established soil quality standards are not met and the result is a change in soil quality. This Handbook also states that at least 85 percent of an activity area be maintained in satisfactory soil conditions.

The Handbook defines the Regional soil quality guidelines in terms of detrimental soil disturbance, which includes compaction, rutting, displacement, severely-burned soil, surface erosion, and mass soil movement. Not all soil disturbances have a detrimental effect on soil productivity. For example, loss of less than one inch of topsoil over less than 100 square feet is not a detrimental soil disturbance nor is light compaction that causes less than a 15 percent increase in bulk density.

Information Sources

Definitions used in this analysis came from the Forest Service Handbook FSH 2509.18-2003-1 (Exhibit H-2) and the Forest Service Manual FSM 2500-99-1 (Exhibit H-3). The District's timber stand records database (TSMRS) was used to compile a first evaluation of the proposed units that have had previous management activities. The results of those queries are in Exhibit H-4. Field observations were used in addition to the TSMRS queries to determine the existing condition of proposed units. Field data sheets are in Exhibit H-7. Field observations followed the methods described in S.W. Howes, 2001, which is also in Exhibit H-7. Several monitoring projects from the Flathead National Forest were used to verify the amount of detrimental soil disturbance that could be expected from various activities. These projects can be found in the project record.

A landtype map, based on the detailed investigation conducted in the late 1980s, is located in Exhibit H-5. The soils in the project area are described in the updated landtype report for the Flathead National Forest (Martinson and Basko 1998). Landtypes are the basis for the soil analysis. All soils are classified according to the system of Soil Taxonomy. The intent of the taxonomic system is to classify soils according to their limitations that affect specific practical purposes. Classification allows soils to be grouped to permit the largest number and the most precise predictions possible about responses to use and management (USDA Natural Resources Conservation Service 1999). In other words, the monitoring results from one taxonomic unit can be related to other similar taxonomic units.

Analysis Area

The analysis area for soils is the same as the project area boundary shown in Figure 2-1. This area was selected because all proposed management activities would occur within this area. The effects on soils would not extend beyond the project boundary. This analysis area coincides with that used for the Valley Face Ecosystem Analysis at the Watershed Scale (Valley Face EAWS) completed in 2005 (Exhibit U-3). Information collected for the EAWS, as well as existing Forest Service databases, provided the information used to characterize the affected environment (the existing condition) for soil within the project boundary. The analysis area forms the boundary for the cumulative effects analysis of soils.

Affected Environment

Components of the Soil Resource

This section discusses the components of the soil resource that could be affected by the proposed activities. They are:

- Soil productivity
- Soil erosion
- Soil stability (mass failure)

Soil Productivity

Soil productivity is the ability of the soil to supply the water and nutrients needed to sustain plant growth. Characteristics that influence soil productivity include:

Organic Matter - Organic matter in its various forms contributes to soil productivity. Humus is decomposed organic matter. Duff and litter are partially decomposed leaves, needles, and twigs that are still recognizable on the surface of soils. Large woody debris consists of woody stems greater than three inches in diameter (Harvey et al. 1994, p.10). Large woody debris supplies moisture to plants after the soils dry out. All organic matter provides water and nutrients for soil organisms and plants. Garrison and Moore (1998) found 85 to 90 percent of the total nutrients in a Douglas-fir tree are contained in the branches, twigs, and foliage. These data indicate leaving fine logging slash on the ground for a winter before performing fuel treatment would supply nutrients to the soil and the vegetation that remains on the site. Prescott and Laiho (2002, p. 390) found the contribution of nutrients from large woody debris is relatively minor.

Microorganisms - Soil microorganisms, including fungi and bacteria, drive nutrient cycling by decomposing organic matter, which releases nutrients for plant growth. Soil organisms depend on organic matter for the nutrients they need to carry out their life processes. For example, large woody debris provides important habitat for the survival of mycorrhizae fungi. These fungi form a symbiotic relationship with tree roots, increasing water and nutrient uptake by the trees and the fungi (Perry et al. 1990, p. 268).

Physical Soil Properties - These characteristics include soil depth, the amount of pore space in the soil, and the density of the soil. Changes in soil characteristics occur when ground-based equipment makes repeated passes over the soil (Lull 1959). These activities compress or compact soils, reducing the amount of pore spaces. This in turn reduces the movement of water into and

through the soil and impedes root growth through soils, reducing a plant's ability to take up water and nutrients. Compaction and other physical soil disturbances alter the amount of carbon dioxide and oxygen in the soil, affecting both plants and animals that live in or on the soil. Other physical soil disturbances include displacement and rutting.

Most changes in physical characteristics are concentrated on skid trails and landings that resulted from past management activities. Minimizing the area occupied by landings and skid trails would reduce the effects on soil productivity from changes in physical soil properties. One way to accomplish this is by using designated skid trails (Garland, 1997; and Williamson and Nielson 2000, p. 1202).

The management practices outlined in the features common section of Chapter 2 are designed to do the following:

- Reduce the amount of detrimental soil disturbance by limiting the area affected by equipment operation.
- Leave a variety of organic matter on the soil to provide nutrients and habitat for microorganisms, thus maintaining the processes that drive nutrient cycling.

Soil Erosion

Soil erosion is the movement of soil particles by water or wind. In forested sites on steep slopes, water is the most common cause of soil erosion. Erosion is infrequent on undisturbed forest soils for two reasons: first, abundant organic matter provides a protective blanket on the soil surface that reduces the impacts of raindrops and allows water to move into the soil; second, the surface soil below the organic layer is by its nature porous, allowing water to move rapidly into and through the soil profile (Goldman et al. 1986 p.1.7).

Soil erosion can occur when the surface soil is compacted or when the loose surface soil and its protective layer of organic material are changed by management activities. Compaction, rutting, and puddling reduce the movement of water into the soil and tend to channel water. As a result, water runs off (overland flow) and carries soil particles with it. Natural occurrences such as fire also remove organic matter from the soil surface. When organic matter is removed, soil pores can be plugged by impact from raindrops resulting in overland flow and soil erosion.

Soil erosion is minimized by implementing the following management practices: reducing the area where equipment operates, locating landings and skid trails on flat ground with a low or moderate erosion hazard, using erosion control features such as water bars, planting vegetation, and placing slash on disturbed soils. Management activities that leave organic matter on the soil surface also reduce soil erosion. Using these management tools in the proposed project would keep soil erosion to a minimum. Detrimental effects caused by soil erosion are long term. The soil lost by erosion can take thousands of years to re-form.

Mass Failure

Mass failures can be caused by either natural or man-caused disturbances. Mass failures can result when a sequence of natural events, such as high precipitation or snowmelt, are followed by a trigger such as an earthquake. Some areas are prone to mass failures because of the nature of the geology or soil. Human disturbances such as roads can cause mass failures if road surface drainage is concentrated enough to saturate soils. Application of road BMPs would reduce

concentrations of road surface drainage, thereby reducing the risk of mass failures associated with road drainage.

Mass failures triggered by human causes are detrimental soil disturbances. These disturbances cause long-term changes in soil productivity that last centuries.

Current Conditions

Natural Disturbances

Natural disturbances have affected the soils in the analysis area. Natural disturbances include glaciation, floods, mass failures, drought, insects, plant disease, and wildland fires. These natural processes shaped the soils and landscapes of the Valley Face analysis area. Natural disturbances are not considered detrimental soil disturbances and are not discussed in the effects analysis.

Human Disturbances and Existing Soil Condition

Human disturbances include road construction, timber harvest, prescribed fire, fire suppression, and recreational activities. These activities are the basis for the discussion of current conditions and effects of implementing the proposed activities.

Timber Harvest, Roads, and Trails in the Analysis Area

Timber harvesting has reduced soil productivity and road construction has removed soil from productivity in the analysis area. We queried the timber stand and roads databases in order to indicate the extent of these activities and their effect on soils. The roads database also provides the miles of trails within the analysis area. This information is displayed in Table 3-40. Since the 1950s approximately 25 percent (7,000 acres of the 25,500 acre soil analysis area) of the project area has had past timber harvest. In addition, firewood gathering, motorized travel, cattle grazing, and recreational opportunities are additional sources of anthropogenic disturbances that affect the Valley Face analysis area. Table 3-40 shows the amount of detrimental soil disturbance in the analysis area assuming that some of the oldest and slightest disturbances have recovered and are now productive.

Table 3-40. Existing Soil Disturbance in the Soils Analysis Area

Acres of soil that has Reduced Productivity from past Timber Harvest	Acres of Land in Roads	Land occupied by the Trail System	Acres/Percent of Soil Analysis Area with Detrimental Disturbance
1429	354	11	1794/6.1

The numbers in the above table are based on information contained in Exhibit H-4. Standards do not exist for the amount of detrimental soil disturbance in an analysis area. Other analysis areas on the Flathead National Forest have had from 3 percent to 13 percent detrimental disturbance. The Valley Face area has a relatively low amount of soil that currently has detrimental impacts from past activities.

Soil Productivity - The 1429 acres with reduced productivity from timber harvest consists of skid trails and landings that have some combination of rutting, puddling, displacement, or soil compaction. More acres than this were originally disturbed; however, they have recovered due to natural processes such as freezing, thawing and root growth. Soil occupied by roads and trails

have a reduced level of productivity compared to undisturbed soils. Roads and trails are a dedicated land use allocation that is a result of multiple use of forestlands. These numbers provide an indication of the current condition of the soils in the Valley Face analysis area.

Soil Erosion - Most soil erosion in the analysis area is concentrated on roads. Road erosion has direct effects on water quality, but does not affect soil productivity because roads are dedicated to use as a transportation system and are not expected to produce forest vegetation. Landings and skid trails created in the analysis area since adoption of the Flathead Forest Plan have all had erosion control features installed, which reduce or eliminate soil erosion. Areas harvested prior to about 1980 may not have received erosion control measures, but have largely stabilized with the growth of vegetation. In general, vegetation has returned to disturbed sites either through planting or natural recovery and soil erosion levels are low throughout the analysis area.

Mass Failure - The Valley Face area has a low risk of mass failures. Landtypes that typically have a relatively high risk of mass failures (Landtypes 31 and 32) do not occur in the Valley Face area. Slopes greater than 60 percent also have an increased risk of mass failure compared to less steep slopes. The steepest slopes in the Valley Face area approach 60 percent. However, the typical slopes are less than 40 percent.

Proper implementation of BMPs such as water bars and adequate numbers of ditch relief culverts that disperse water from roads and skid trails reduce the risk of mass failures caused by management activities.

Past Management in Proposed Activity Areas

This section describes the existing condition of the proposed units (activity areas) within the Valley Face area. The timber stand database was used in conjunction with aerial photographs and field investigations to determine which proposed units currently had detrimental soil conditions caused by past management activities. All proposed units were individually examined on the ground to quantify/qualify the amount of detrimental soil disturbance. Copies of the field sheets from the field investigation are available in Exhibit H-7 for each of the units listed in Table 3-40.

The intensity of the field investigation varied with the amount of soil disturbance present in a proposed unit. Units that obviously had no soil disturbance had a quick walk through and a few random soil checks to verify the obvious. Units with obvious soil disturbance had a more detailed investigation with random transects and frequent soil checks.

Only proposed Unit 500 exceeds the soil quality standard of more than 15 percent detrimental soil disturbance. Units 26, 302 and 306 have greater than 10 percent detrimental soil disturbance.

The lack of detrimental soil disturbance from the past activity could be due to winter logging that protected the soil or due to natural recovery of compacted soils in the time since they were logged. Some of the activities described in Table 3-41 occurred prior to 1960.

Table 3-41. Previous Timber Harvest and Current Soil Condition of Proposed Valley Face Cutting Units.

Unit No.	Proposed Harvest Method	Past Harvest Method	Current Detrimental Soil Disturbance
1	Tractor	none	0%
1A	Skyline	none	0%
3	Tractor	Ground	9%
4	Tractor	Ground	0%

Unit No.	Proposed Harvest Method	Past Harvest Method	Current Detrimental Soil Disturbance
4A	Skyline	Skyline or Yard From Road	0%
5	Tractor	Ground	3%
6	Tractor	Ground	0%
6A	Skyline	Ground	0%
7	Tractor	Ground	6%
8A	Skyline	None	0%
9A	Skyline	None	0%
10A	Skyline	None	0%
11	Tractor	None	0%
11A	Skyline	None	0%
12	Tractor	Ground	0%
13	Tractor	Ground	1%
13A	Skyline	Ground	1%
14A	Skyline	Ground	0%
16	Tractor	Ground	7%
16A	Skyline	ground	4%
17	Tractor	None	0%
18	Tractor	Ground	2%
19	Tractor	Ground	7%
19A	Skyline	Ground	7%
20	Tractor	Ground	2%
21	Tractor	Ground	4%
21A	Skyline	Ground	3%
22A	Skyline	Ground	6%
23	Tractor	Ground	9%
24	Tractor	Ground	4%
25	Tractor	Ground	3%
26	Tractor	Ground	11%
27	Tractor	Ground	1%
28	Tractor	Ground	2%
29	Tractor	Ground	0%
30	Tractor	Ground	1%
30B	Tractor	Ground	1%
31	Tractor	Ground	1%
31A	Skyline	Ground	2%
32	Tractor	Ground	0%
33	Tractor	Ground	0%
34	Tractor	Ground	0%
35	Tractor	Ground	1%
35B	Tractor	Ground	1%
36	Tractor	Horse?	0%
37	Tractor	Ground	0%
37A	Skyline	Ground	0%
38	Tractor	Horse?	0%
39	Tractor	Ground	4%
40	Tractor	None	0%
41	Tractor	Ground	0%
200	Hand	Horse, ground	0%

Unit No.	Proposed Harvest Method	Past Harvest Method	Current Detrimental Soil Disturbance
201	Hand	Ground	0%
202	Hand	Ground	0%
300	Hand	Ground	8%
301	Hand	Ground	3%
302	Hand	Ground	14%
304	Hand	Ground	3%
305	Hand	Ground	8%
306	Hand	Ground	12%
307	Hand	Ground	3%
308	Hand	Ground	0%
309	Hand	Ground	5%
400	Hand	Ground	3%
401	Hand	Ground	7%
403	Hand	Ground	3%
404	Hand	Ground	4%
405	Hand	Ground	1%
407	Hand	Ground	1%
408	Hand	Ground	0%
409	Hand	Ground	0%
410	Hand	Ground	0%
411	Hand	Ground	3%
500	Tractor or Hand	Ground	16%

Landtypes and Proposed Management Activities

Table 3-42 lists each soil landtype map unit in the analysis area and the proposed units within the landtype. It also lists the soil properties important in determining management effects. Landtype productivity, stability, and erosion are from the Soil Survey Report for the Flathead National Forest (1998). The sensitive rating is from the GIS layer for landtypes found in Exhibit H-8. Sensitive soils contain an excess of soil moisture either yearlong or on a seasonal basis. Disturbance on sensitive soils can lead to overland flow, soil erosion or loss of soil productivity. Only proposed Unit 307 is on a landtype (14-2) that is rated as sensitive (in spring and times of heavy precipitation). All management practices and mitigation measures would be designed to ensure the Soil Quality Guidelines are met and soil quality is maintained at acceptable levels.

Table 3-42. Landtypes and Units.

Land-type	Acres	Product-ivity	Stability (cut slopes)	Erosion Surface /subsurface	Sensitive	Units in Landtype
12	113	High	NA	Low	Yes, this is organic soil in wetlands	None
14-2	590	High	Moderate on road cuts, which are low because the slopes are gentle.	Moderate/severe	Yes, in spring and during times of heavy precipitation.	307
14-3	442	High	Moderate	Moderate/moderate	Yes	None

Land-type	Acres	Product-ivity	Stability (cut slopes)	Erosion Surface /subsurface	Sensitive	Units in Landtype
23-8	3706	Moderate	High	Moderate/moderate	No	14A,16,200,24,27,29, 3,300,302,403,405
23-9	1153	Moderate	High	Moderate/moderate	No	13A,22A,301,306
26A-7	2559	High	High	Moderate/moderate	No	21A,26,411
26A-8	7981	High	Moderate	Moderate/moderate	No	10A,11A,12,16A,201,20 2,21,30,304,308, 309,31,31A,32,33,36, 39,40,408,41,410,412,5, 6,6A,7,9A
26A-9	1144	High	Moderate	Moderate/moderate	No	4,4A,8A
26G-7	2112	Moderate	High	Moderate/moderate	No	23,34,35,38,400
26G-8	1218	Moderate	Moderate	Moderate/moderate	No	1,1A,25,401,404,500
26G-9	103	Moderate	Moderate	Moderate/moderate	No	None
26L-8	74				Yes, during wet seasons	None
27-7	1205	Moderate	Moderate (steep cuts ravel)	Slight	No	13,18,19,19A,20,305
55	142	Low	Low	Low/Low	No	Rock land, no units
56-7	31	Low	High	Moderate/slight	No	None
56-8	164	Low	High	Moderate/slight	No	None
56-9	27	Low	High	Moderate/slight	No	None
57-7	1655	Moderate	High	Moderate/slight	No	37,37A,407
57-8	3906	Moderate	High	Moderate/slight	No	11,17,28
57-9	467	Moderate	High	Moderate/slight	No	None
75	12	Low	Moderate	Moderate	No	None
76	645	Low	Moderate	Moderate	No	None

Environmental Consequences

The analysis of effects for soils assumes that all of the practices outlined in Chapter 2, Features Common to All Action Alternatives, would be implemented, and would be effective. The analysis will show the expected amount of detrimental soil disturbance resulting from implementation of the alternatives and how that affects soil productivity, soil erosion, and mass failures.

The effects analysis is based on monitoring of past management activities on the Flathead National Forest. Monitoring reports used for comparison purposes were conducted for the same types of activities and were on the same landtypes and soils as those proposed in this project. Almost all productive timber ground on the Flathead National Forest has a volcanic ash surface layer. This makes it possible to extrapolate the results of monitoring in one place to another. The monitoring looked at all forms of detrimental soil impacts, including compaction, rutting, puddling, displacement, and erosion from all sources such as past timber harvest or unauthorized off road vehicle use. In addition, literature is cited that refers to the aerial extent of detrimental soil disturbance impacts resulting from various harvest systems.

The Flathead National Forest Soil Scientists have collected many bulk density measurements from soils where various types of equipment operated in a variety of capacities. A spreadsheet with the bulk density numbers and the type of equipment that caused them is in Exhibit H-19, along with statistical evaluations of what those numbers mean to each other and to soil physical

conditions that we monitor in the field. The result indicates that not all soil disturbances are detrimental and that we can relate the physical appearance of a soil to measured bulk density and the presence or lack of detrimental soil disturbance.

Direct and Indirect Effects of Alternative A - No Action

The No-Action Alternative provides a baseline to evaluate the effects of the action alternatives. The effects on soils are discussed as changes over time on soil productivity, soil erosion, and mass failures.

Soil Productivity - The No-Action alternative would cause no short-term effects on the soil resource over and above the existing condition. No additional road building, road reclamation, salvage harvest, or fuels reduction would disrupt the natural soil processes.

Organic Matter - With implementation of the No-Action Alternative, all standing dead trees would eventually fall over and contribute coarse woody debris. Needles and branches would remain on the site and fall to the ground. Soil organisms would decompose the organic materials thus adding humus to the soil. Nutrients associated with this material would slowly become available for plant growth. As the tree canopies close in and shade the soil surface, decomposition rates would slow, allowing organic matter and nutrients to accumulate on the soil surface. This process would continue until another major disturbance such as fire or a windstorm opens the tree canopy and speeds up the recycling process again.

An intense wildland fire is a possibility at some time in the future. This event could greatly reduce the amount of organic matter and associated nutrients on the site. This change would be temporary. In the Flathead National Forest it is usual for forests to grow back after wildland fires.

Microorganisms - Microorganism populations would fluctuate with the changes in the microclimate and the organic matter on the soil surface. These changes would be in response to the changing vegetation as natural events such as fire, insect, and disease create changes. The changes would be temporary because of the mobility of soil organisms.

Physical Soil Disturbances - The No-Action Alternative would not cause additional soil compaction, rutting, puddling, or soil displacement. Soil productivity in areas where past timber management compacted or puddle soils would slowly improve as plant roots, soil organisms, and freeze-thaw events loosen the soil. Most soil disturbances would recover after 70 years (Gonsior 1983, p. 13-16). Sites that are slightly compacted would recover in fewer than 70 years. Displaced soils may require centuries to recover.

Soil Erosion - The No-Action Alternative would allow the amount of soil erosion to decrease as vegetation returns to soils that lack plant cover. Wildland fires could cause a short-term increase in soil erosion. Soil erosion rates would fluctuate with natural changes in vegetation.

Mass Failures - The No-Action alternative would not change the risk of mass failures.

Direct and Indirect Effects of Alternatives B and C

Hand Treatments

Soil Productivity - All action alternatives are designed to incorporate management practices that would reduce the effects from timber harvest on soil resources and ensure that all activities meet the Regional Guidelines. The practices are described in Chapter 2 and Exhibit H-21. The effectiveness of properly applied BMPs is discussed in the opening paragraphs of Exhibit H-21. Each alternative has units that are ground based mechanical treatments utilizing heavy equipment; units that would be skyline yarded followed by under burning or excavator piling, and units that would be treated by hand.

Hand treatments would occur on units with three digit unit numbers with the exception of Unit 500 in Alternative B, where an excavator would be used to pile slash. The hand units would be treated with chainsaws or other hand tools; equipment would not operate on the ground. The activities include either pre-commercial thinning or understory fuel reduction. Materials to be piled and burned are brush and small diameter trees and existing down and dead fuel.

Organic Matter - The proposed activities are designed to reduce fuels, thus there would be some reduction in the amount of organic matter on the site. However, a variety of all organic matter would remain on the site after project implementation. All units would still have an active microorganism-rich organic layer on the soil surface.

In order to reduce fuels, some organic matter would be put into small hand piles and burned. Because the hand piles are small, the amount of area disturbed by burning them would generally be less than 10 feet in diameter and would burn with low amounts of heat and smoke. Thus, the amount of nutrients lost during burning would be minor. The ash where the hand piles are burned would contain nutrients that are available to nearby vegetation.

The amount of heat generated by small hand piles is less than that created when large piles burn. As a result, the amount of nutrients that go up with the smoke would be minor. As discussed by DeBano et al. (1999, p.112) the effect would not likely be adverse to soil productivity because nutrient replenishment mechanisms remain on the site. These mechanisms include the presence of nitrogen fixing organisms, both plant and microorganisms, organic matter that is left on the soil surface, and living vegetation on the site.

Microorganisms - The population of microorganisms would fluctuate with changed organic matter conditions within the proposed units. The changes would be much less than on the mechanically treated units, and would be short term. Organisms in undisturbed sites would gradually move into the disturbed sites as conditions permit.

Physical Soil Properties - Hand treatments would have no effect on the physical soil properties. All units proposed for hand treatments would meet the Region 1 Soil Quality Standards.

Soil Erosion - Soil erosion would not occur as a result of hand treatments because the amount of soil disturbance they cause in small or non-existent. In addition, if disturbance does occur, it is not detrimental and is not lineal in shape, characteristics that lead to soil erosion.

Mass Failure - All proposed activities avoid critical mass failure prone areas in all alternatives. Hand treatments would not cause an increase in mass failures. Soil disturbances would not be of the shape or size that channel water onto sites prone to mass failures.

Ground-Based Treatments

Soil Productivity - When mechanical harvesting (using ground based heavy equipment) of proposed cutting units is planned, the activities are designed to ensure detrimental soil impacts affect less than 15 percent of the activity area. This goal would be achieved by implementing the management practices described in Chapter 2 and Exhibit H-21. These design features and management practices would maintain soil quality by reducing the extent of compaction, rutting, puddling, and displacement.

Organic Matter - The proposed mechanical treatments are designed to reduce fuels. As a result, some of the proposed units could have less organic matter after treatment than what existed originally. When organic matter quantities are reduced, the total amount of nutrients on the site can also be reduced. This effect is a potential tradeoff of fuels reduction projects.

The net effect on growth of trees within the treatment areas could vary. Nutrients would be removed with the trees, especially when the needles and fine branches are burned or are hauled to the landing. After the proposed treatments are completed, the sites would have fewer trees and other vegetation. It is likely that the remaining vegetation would have more nutrients and water after treatment because of reduced competition (Powers et al. 2005, p. 46-48). The result could be trees that have increased vigor and disease resistance, which is one definition of productivity. Based on observations of similar treatments on the Flathead National Forest, the sites would continue to grow trees and other native forest vegetation.

One must also consider that the nutrients on the site and in the soil are not the only ones available to the forest vegetation. Jurgenson et al. (1981) studied logging followed by low severity slash burning in northwestern Montana. The authors concluded there would be no long-term depletion of nitrogen reserves because lost nitrogen would be more than replenished by inputs from precipitation and by biological nitrogen fixation over a rotation of 100 to 150 years.

The Valley Face project has a goal to reduce the risk of wildland fire by reducing the amount of fuels on the soils surface and by reducing the spacing of the trees remaining. The amount of fine organic matter would be reduced, resulting in a reduction of nutrients. However, the reduction could be less than if a severe wildfire burned through these stands.

All harvest prescriptions would leave a portion of the existing stand on the site. What is left behind is described in the Vegetation Section of this EA in terms of retention. Light, moderate, and heavy retention would leave about 10, 25, and 50 percent canopy density respectively. Timber management that leaves more trees on the ground also leaves more nutrients on the site for sustaining the future forest. Table 3-43 displays the acres of light, moderate, and heavy retention for each alternative.

Table 3-43. Acres Proposed Vegetation Treatment by Retention Level and Alternative.

Alternative	Light Dispersed Retention	Moderate Dispersed Retention	Heavy Dispersed Retention	Heavy Aggregated Retention
A	0	0	0	0
B	314	3143	240	215
C	281	2515	343	215

The areas with light and moderate retention would have the least amount of soil nutrients for the future stand of trees. Alternative C retains more nutrients on the site than Alternative B and thus has less risk of reducing the nutrient status of the soils. In order to reduce the loss of nutrients in light and moderate retention areas, site preparation and slash treatment would be delayed until after one wet season in all units where the FNF fire and fuels specialists believe doing so would not create an unacceptably high wildland fire risk for nearby private development. This design feature would provide time for most nutrients to leach from the organic debris before it is removed from the site, as recommended by Garrison and Moore (1998, p. 33-34).

After the trees are removed some of the remaining fuels would be removed using tracked excavators operating on or near existing skid trails. This method reduces the aerial extent of soil detrimental impacts from the site preparation activities (LRMP Annual Monitoring Report 1992, p. 131-139). Where slopes are too steep for ground-based piling equipment, fuels reduction would typically be accomplished by prescribed underburning. Underburning would occur when soils are moist enough to reduce soil heating. Both excavator fuels reduction and underburning would meet the Regional Soil Quality Guidelines. Soil monitoring field sheets from sites treated by underburning or excavators are in Exhibits H-11 and H-13. Harvey and others (1994 p.12 and 23) note that careful prescribed burns or mechanical site preparation can be practiced on most sites with relatively little effect on soil organic content.

Microorganisms - Jurgenson et al. (1977) note that after a fire, soil micro-flora recovers quite rapidly, frequently to levels greater than the original. Borchers and Perry (1990, p. 149-150) discussed the important role that less disturbed areas of soil play in inoculating soil that lacks or has reduced numbers of soil microorganisms. They state that unburned areas within burns, adjacent unburned areas, unburned large woody debris, and soils that have only minor amounts of disturbance all contain propagules for fungi, bacteria and other soil organisms and that these propagules are dispersed by wind, animals, and other agents. The organic matter left on the harvest areas would benefit soil organisms by providing substrate and habitat for soil organisms to survive. All alternatives would leave both dead and live trees and some amount of both fine organic matter (litter and duff) and large woody debris on the ground. This practice would leave a source of propagules for the disturbed sites in the Valley Face area. The amounts of live and dead trees to be left in the proposed harvest areas are described in the environmental consequences section of the Vegetation analysis.

Vegetation and soil microorganisms remaining in the harvested sites would utilize and store nutrients released from organic matter. This use would reduce the amount of nutrients that would be leached from the site. Leaching would be less than after wildland fires because the proposed treatments would retain a portion of the trees, shrubs, grasses, and forbs within in the treatment units.

Soil compaction, puddling, rutting, and displacement reduce the ability of soils to exchange oxygen and carbon dioxide, thus affecting the ability of soil organisms to survive. However, favorable habitat for soil organisms would be maintained over a large percentage of the proposed activity areas because all proposed harvest areas would be designed to reduce detrimental soil disturbance and meet the Regional soil guidelines.

Timber harvest increases the amount of sunlight and moisture available to soils. These warm, moist conditions increase microbial activity and decomposition rates, which then increase the amount of nutrients available to living vegetation. All proposed treatment areas within the Valley Face project would retain trees, shrubs, grasses, and forbs. This vegetation would be available to utilize nutrients released from decomposition processes before they could leach beyond the root zone (Harvey et al. 1994).

Management practices discussed above that leave a variety of organic matter on the site and minimize soil compaction would leave a favorable environment for the survival of soil organisms in the areas proposed for treatment. Any reduction of productivity attributable to soil organisms would be unsubstantial and short term.

Physical Soil Properties - Ground based mechanical treatments include both ground based operations that would utilize a tractor to remove trees and an excavator to pile excess logging debris. Ground-based yarding that is followed by either underburning or excavator piling would meet the soil quality guidelines. All equipment would operate on dedicated skid trails spaced far enough apart to disturb less than 15 percent of the area including the landing. Soil Monitoring on timber sale units within the Haskill Timber Sale (Swan Lake Ranger District, 2000) showed that ground-based equipment operating on dedicated skid trails, followed by excavator piling detrimentally disturbed less than 15 percent of the soil area (Exhibit H-13) unless the units are small. No small units are proposed for the Valley Face project. .

Bulk density measurements were taken on several areas where excavators were used to treat fuels and prepare sites for planting. The objective was to determine the effect of excavators on soil bulk density. The results of that exercise (Exhibit H-11) showed excavators increased density less than 15 percent wherever they operated. These results were attributed to low ground pressure. In addition, excavators usually operate on the existing skid trails from yarding.

Another option to reduce the effects of ground-based equipment use is to operate equipment when soils are snow covered, frozen, or dry. Operating equipment under these soil conditions reduces the amount of detrimental soil disturbances. This practice is suggested in FSH 2509.18 - Soil Management Handbook (Exhibit H-2). In addition, Alexander and Poff (1985, p. 85-86), and Williams (1993) discussed the reduced soil disturbance when logging occurs on winter conditions.

Our dry summers often create dry soil conditions from late July until the fall rains begin. Startsev and McNabb (2001, p. 8-9) and McNabb and others (2001, p.1246) found that soil compaction is reduced when soils are drier than field capacity and discuss the validity of using field methods to determine soil moisture levels. We monitored soil moisture for a number of years and our soils typically are drier than field capacity during the summer dry period. A Flathead National Forest monitoring report on soil moisture trends is in Exhibit H-

6. All ground-based yarding would occur in winter when conditions would reduce impacts, or in summer when soils are dry as determined by the hand feel method (Exhibit H-9).

The design features for this project require the use of designated skid trails, which have been found to reduce the area affected by skidding. Minimizing the area occupied by landings and skid trails would reduce the effects on soil productivity from changes in physical soil properties. One way to accomplish this is by using designated skid trails (Garland 1997 and Williamson and Nielson 2000, p. 1202).

The amount of soil disturbance from both skyline and ground-based yarding systems would be reduced if they occur in winter when soils are either snow covered or frozen. We are not requiring winter logging because the proposed systems would meet the soil quality standards as designed given the soil conditions. The timber sale purchaser would have the option of winter logging except in those units identified in Chapter 2 as important big game winter range. If winter logging takes place, the amount of detrimental soil disturbance would be less. The monitoring report and field sheets for the Half Moon timber sale (Swan Lake Ranger District, 2000, Exhibit H-17) and the Swaney Timber Sale (Tally Lake Ranger District, 2002, Exhibit H-18), both logged in winter, show detrimental soil disturbance levels of 2 to 8 percent.

The management practices and the design criteria described in Chapter 2 and in Exhibit H-21 would protect soils and maintain the level of detrimental soil disturbance below the levels recommended in the Regional guidelines. Table 3-44 shows the acres of each proposed harvest and site preparation method.

Table 3-44. Acres of Proposed Harvest and Site Preparation Method by Alternative.

Alternative	Ground-based/ Excavator	Swing Yard	Skyline/ Excavator	Skyline/ Under burn
A	0	0	0	0
B	2288	82	232	148
C	1815	75	153	182

Duration of Effects - Changes in soil bulk density (compaction) brought about by the implementation of an action alternative would be temporary. Natural processes such as freeze-thaw and root growth eventually loosen compacted soils. A maximum time for recovery of 70 years is discussed in a literature review and assessment by Gonsior (1983, p. 13-16). Rutting and puddling are soil disturbances that are similar to compaction and would be expected to last a similar time.

Displacement, which results in the loss of topsoil, is a long term and perhaps a near-permanent loss of soil productivity. However, the management practices outlined in Chapter 2 would reduce the amount of displacement and all other detrimental impacts to within the Region 1 guidelines.

Soil disturbance from felling trees would be negligible and would be less than the natural amount of soil disturbance caused when trees are uprooted by wind. All trees would be either hand felled towards the skid trails or would be mechanically felled using low-impact equipment. Fuels reduction or site preparation work would be accomplished with excavators, which displace their weight with large tracks and do not cause substantial amounts of soil disturbance. The harvest activities are designed to minimize the amount of soil disturbance off

skid trails. Where skid trails already exist from previous activities, they would be reused thus reducing the amount of additional detrimental soil disturbance.

These practices would cause minor and short-term changes in soil productivity at levels that would meet the Regional soil quality standards. A few areas would have more substantial changes caused by displacement. These changes would be long term. However, with implementation of the management practices in Chapter 2 and the BMPs in Exhibit H-21, the long term soil productivity changes together with the short term compaction affects would not exceed the Region 1 Soil Quality Standards. See Table 3-44 for a summary of the expected result for each proposed activity area.

Soil Erosion - Forests generally have low erosion rates unless they are disturbed in a manner that exposes bare soils to the erosive energy of water. Reducing the amount of bare, disturbed soils in harvested areas minimizes soil erosion. The practices that maintain soil productivity, such as leaving organic material on the soil surface and reducing the area impacted by skid trails, also reduce the risk of soil erosion. In addition, implementing specific erosion control measures such as water bars, placing slash on disturbed soils, and vegetating disturbed soils would also reduce erosion.

With the implementation of the management practices described in Chapter 2, the total amount of soil erosion caused by the proposed activities would be small and would decrease with time as vegetation returns to the soils. The WEPP (Water Erosion Prediction Project) model was used to estimate soil erosion from post harvest conditions both before and after implementing the erosion control practices described in Chapter 2. The WEPP run outputs are in Exhibit H-15 and are specific to the soils and climate found in the Valley Face area. They show that erosion would be reduced about 50 percent with erosion control measures including water bars and placement of slash on disturbed soils. Documentation for the WEPP model is in Exhibit H-16.

All skid trails would have soil erosion control features installed and or slash placed on bare soil.

Mass Failure - All proposed activities avoid critical mass failure prone areas in all alternatives. None of the alternatives would cause an increase in mass failures.

Skyline Treatments

Soil Productivity - In general, skyline treatments have less effect on the physical soil properties than ground based equipment. The reduced effects occur because the logs are often suspended above the ground. Where logs do drag on the ground, the area affected is narrower than a skid trail created by a tractor. The effects on organic matter and soil organisms are the same as the effects for ground based yarding systems.

Organic Matter - Skyline treatments disturb less soil than where tractors are used to remove logs. This reduced soil disturbance helps to maintain the integrity of soil organic matter on the site. Other than the reduced disturbance to the organic matter, the effects would be similar to the effects from ground based yarding.

Microorganisms - The reduced soil disturbance from skyline yarding would cause fewer effects on the soil microorganism community than where ground based equipment is used. Other than the reduced disturbance to the organic matter, the effects would be similar to the effects from ground based yarding.

Physical Soil Properties - McIver and Starr (2000, p. 14-16 and p. 45-46) found skyline yarding disturbed 2.8 percent of the soil in a unit. Observations on the Flathead National Forest show skyline yarding disturbs only the corridor where the logs are dragged uphill. These corridors, which can be detrimentally disturbed, are narrower than skid trails caused by ground-based equipment. Detrimental impacts from skyline yarding are consistently below 15 percent. Monitoring two units on the Riffin Timber Sale on Tally Lake Ranger District (1999) showed skyline yarding combined with prebunching of logs by a tracked feller-buncher caused 7 to 9 percent detrimental disturbance on glacial till soils (Exhibit H-10). Prebunching of logs with a feller-buncher is equivalent to following skyline yarding with site preparation by an excavator. These are basically the same piece of equipment with a different tool at the end of the mechanical arm.

Skyline yarding followed by under burning would meet the Regional Soil Quality guidelines. Monitoring of the Riffin sale (Exhibit H-10) showed 7 to 9 percent detrimental soil disturbance from skyline yarding followed by a broadcast burn. The Doogan Dog Timber Sale (Glacier View Ranger District, 2000) units 6A and 6B were skyline yarded and then broadcast burned. Monitoring showed they had 9 percent detrimental impacts, which included impacts from an old road at the bottom of the unit (Exhibit H-12).

Soil Erosion - Forests generally have low erosion rates unless they are disturbed in a manner that exposes bare soils to the erosive energy of water. Reducing the amount of bare, disturbed soils in harvested areas minimizes soil erosion. The practices that maintain soil productivity, such as leaving organic material on the soil surface and reducing the area impacted by skid trails, also reduce the risk of soil erosion. In addition, implementing specific erosion control measures such as water bars, placing slash on disturbed soils, and vegetating disturbed soils would also reduce erosion.

With the implementation of the management practices described in Chapter 2, the total amount of soil erosion caused by the proposed activities would be small and would decrease with time as vegetation returns to the soils. The WEPP model was used to estimate soil erosion from post harvest conditions both before and after implementing the erosion control practices described in Chapter 2. The WEPP runs (Exhibit H-15) are specific to the soils and climate found in the Valley Face area. They show that erosion would be reduced about 50 percent with erosion control measures including water bars and placement of slash on disturbed soils. Documentation for the WEPP model is in Exhibit H-16.

All skyline corridors would have soil erosion control features installed.

Mass Failure - All proposed activities avoid critical mass failure prone areas in all alternatives. None of the alternatives would cause an increase in mass failures.

Road Management

No additional land would be removed from production of forest vegetation by new permanent road construction. Table 3-45 shows the amount of roads to be constructed by alternative.

Table 3-45. Road Construction by Alternative.

Alternative	Miles of New System Road	Miles of Temporary Road
A	0	0
B	0	5.3
C	0	3.2

Soil Productivity - Temporary roads would be built and cause a temporary loss of soil productivity lasting several decades. Recontouring, planting grasses, and spreading slash on their surface begin the process of restoring soil productivity. It is possible the soils could be fully functioning in a few decades. Restoration would occur immediately after the sale was completed.

Soil Erosion - Road rehabilitation accomplished by adding BMPs to existing roads would effectively reduce the amount of soil erosion from those roads by providing places where water would run off the roads into vegetation where the water soaks into the soil and sediment is trapped. This is not a soil productivity issue, but is a road maintenance and a water quality issue. Roads are not expected to be productive sites for forest vegetation.

Mass Failure - Temporary roads would all avoid sites with a high risk of mass failure. Roads that are rehabilitated would have a reduced long-term risk of road-associated mass failures as a result of improved drainage of surface water, which spreads and disperses the water over a larger area. This practice reduces the risk of road-related fill failures.

Both ground-based yarding and skyline yarding would meet the Regional Soil Quality Standards. Ground-based systems usually create more soil disturbance than skyline systems.

Sensitive Soils - Unit 307 is the only proposed unit that is identified to occur on a landtype (14-2) that is rated as sensitive (in spring and times of heavy precipitation). This unit is proposed for hand thinning of sapling sized trees. Ground-based equipment would not operate on this unit therefore ground disturbance would not occur.

Cumulative Effects Common to Alternatives B and C

The main activities that disturb soils in the project area include timber harvest and its associated activities such as site preparation and reduction of fuels. In addition, road and trail construction have also occurred. Acres of these past activities on NFS lands are displayed in Table 3-40. The cumulative effects discussion will be centered on three areas; effects of past, present and reasonably foreseeable actions; cumulative effects within the approximately 20,000 acre analysis area; and cumulative effects within the proposed management units, also referred to as the activity areas.

Past, Present and Reasonably Foreseeable Actions

Timber harvest - Many thousands of acres of timber has been harvested on federal, state, and private land since early in the last century. This harvesting has ranged from individual tree removals to complete clear cuts. The vast majority of these acres have regenerated into new forests. Past harvests are part of the effects analysis.

Road Construction - Several hundred miles of road have been built on federal, state, and private land since the beginning of the last century. Road construction removes soil from

being productively adding to the vegetated forest community. This is a necessary trade off so forest management can occur.
Trail Construction - Trail construction, including cross-country ski trails, removes soil from productively adding to the vegetated forest community. This is a necessary trade off for recreation activities.
Precommercial Thinning - About 4600 acres of sapling-sized stands have been thinned since the 1960s and 201 acres are scheduled to be thinned. Precommercial thinning does not use tracked or wheeled equipment and thus does not compact or displace or otherwise cause detrimental soil disturbance.
Fish Stocking - No effect on soils.
Predator and Beaver Control - No effect on soils.
Wildland Fire - Creates temporary increase in erosion. All past wildland fires in the Valley Face area are currently vegetated and thus are assumed there were no lasting detrimental impacts to the soil resource.
Grazing - Approximately 5750 acres of the 9200 acre Chinook Lake Cattle allotment is within the Valley Face area. Cattle have been grazed on this allotment for many years but the allotment is currently inactive. Some amount of detrimental soil disturbance has resulted from cattle grazing mostly in the form of trails that are compacted and subject to soil erosion. Based on monitoring of other allotments on similar soils, detrimental soil disturbances from grazing would amount to at most 10 percent of the area (about 575 acres) in a worse case situation. These areas occur where roads intersect with streams, a situation that provides cattle with easy access to riparian areas and water and are dispersed throughout areas where timber was harvested in the past. Because cattle are no longer on the allotment, the soil conditions are improving with time.
Private Land Development - The construction of roads and buildings on private land has been occurring for decades and will continue. The rate of development on private land has been recently increasing. This activity is not considered as part of the soil analysis because it occurs off lands managed by the Forest Service and the effects of private land management do not affect the soils on lands managed by the Forest Service.
Wildland Fire Suppression - Since about 1940, the Forest Service and State of Montana have actively suppressed wildland fires. These agencies will continue to suppress wildland fire. As a result of this fire suppression, soils have been detrimentally disturbed by the construction of fire lines and other features needed to control wildland fires. After a fire is put out, fire lines and other soil disturbances are restored or rehabilitated. This activity does not totally restore soil quality, but it does begin the process leading towards improved soil quality.
Noxious Weed Treatment - The Forest Service, Flathead County, and private citizens have conducted weed treatments for many years. This activity will continue. This treatment has a positive effect on soils by increasing the cover of desirable plants. These plants provide more ground cover than most weeds, thus reducing the risk of soil erosion and encouraging the development of soils that are rich in organic matter and better able to cycle nutrients.
Hunting, Fishing, Trapping - These dispersed activities have little effect on soils. Some small amount of soil compaction or erosion may result from them, but given the size of the analysis area their effect is not measurable.
Firewood Gathering - This dispersed activity has little effect on soils. A small amount of soil compaction may occur, but given the size of the analysis area its effect is not measurable. Firewood cutting could reduce the amount of large woody debris available for future recruitment. This would most likely occur adjacent to roads where firewood cutting is

allowed. Within those areas, the future soil productivity could be reduced. It is not possible to estimate the effect on soils in the analysis area.
Snowmobiling - This activity will continue to occur. Snowmobiling is not as popular on the Tally Lake Ranger District as other parts of the Forest. Small areas of soil disturbance could result if snowmobiles operate where there is shallow snow cover. The effect is more likely to result in soil erosion if the slopes are 50 percent or greater. Effects on soil productivity would be limited to the areas disturbed and would occur only if erosion of the nutrient rich topsoil occurred. The result across the analysis area would be difficult to measure.
Driving, Motorized Trail Riding - Driving and sightseeing on open Forest roads will continue. Trails in the project area have been and will continue to be open to motorcycles. These activities have no measurable effect on soil productivity in the analysis area. They can increase soil erosion from the roads and trails where they occur.
Mountain Biking - This activity has occurred and will continue to occur on both trails and roadways. This activity has no measurable effect on soil productivity in the analysis area. It can increase soil erosion from the trails where it occurs.
Hiking - This activity has no measurable effect on soil productivity.
Road Maintenance - This activity has no effect on soil productivity in the analysis area. It would reduce the amount of erosion from the road surface.
Trail Maintenance - This activity has no effect on soil productivity in the analysis area. It would reduce the amount of erosion from the trail surface.
Re-vegetation and Reforestation - This activity would improve soil conditions by adding organic matter to the soil and by loosening compacted soils.
Installing BMPs - This activity would reduce the amount of erosion from the road. This effects water quality and the drivability of the roads, but has little or no effect on soil productivity.

Cumulative Effects within the Soil Analysis Area

The cumulative effects analysis for the Valley Face area includes the effects of both existing soil disturbances from past activities and the expected disturbances from the proposed activities. This analysis makes use of data from the timber stand database, road location, GIS data, and the results of past monitoring, literature searches, and discussions with other soils personnel in the Forest Service. Table 3-46 displays the estimated cumulative acres of detrimental soil disturbances within the soil analysis area. It includes all areas both inside and outside of the proposed treatment units with the exception of private lands in the analysis area. There are no Regional or Forest standards/guidelines for the amount of area impacted within an analysis area or a watershed. This information is provided to indicate the overall watershed condition and to provide a comparison of the effects by alternative. For comparison purposes, the Spotted Kah, Island Unit, and Good Creek analysis areas on the Flathead National Forest had total existing disturbance that ranged from 3 to 14 percent.

Considering only the action alternatives, Alternative C would cause the least soil impacts within the analysis area because fewer acres of land would be managed with ground based equipment. However, all alternatives are designed to meet the Region 1 Soil Quality Standards.

Table 3-46. Cumulative Effects of Past, Present, and Proposed Treatments on Soil Analysis Area by Alternative.

Alternative	Existing disturbance (cattle grazing, roads, trails and timber harvest) in acres	Proposed Disturbance Including Skid trails, Landings and Fuels Reduction Treatments in acres	Proposed Temporary Roads in acres	Total acres Disturbance / % of Analysis Area (25,500 acres in soil analysis area)
A	1794	0	0	1794 / 7.0%
B	1794	393	10	2197 / 8.6%
C	1794	290	16	2100 / 8.2%

Cumulative Effects in Activity Areas (treatment units)

The risks of cumulative effects were also assessed within each proposed activity area. All units were reviewed on the ground to quantify and qualify the effects from past timber harvest and determine if existing levels of detrimental soil disturbance exceed the Regional soil quality guides. The estimated cumulative effects for each activity area from implementation of an action alternative are in Table 3-47.

Table 3-47. Predicted Soil Detrimental Disturbance

Unit Number	Existing Detrimental Condition	Predicted Detrimental Condition – Alternative B*	Predicted Detrimental Condition – Alternative C*
1	0%	<15%	<15%
1A	0%	<10%	-
3	9%	<15%	<15%
4	0%	<15%	<15%
4A	0%	<10%	<10%
5	3%	<15%	<15%
6	0%	<15%	<15%
6A	0%	<10%	<10%
7	6%	<15%	-
8A	0%	<10%	<10%
9A	0%	<10%	<10%
10A	0%	<10%	<10%
11	0%	<15%	<15%
11A	0%	<10%	<10%
12	0%	<15%	<15%
13	1%	<15%	<15%
13A	1%	<10%	<10%
14A	0%	<10%	<10%
16	7%	<15%	<15%
16A	4%	<10%	<10%
17	0%	<15%	<15%
18	2%	<15%	<15%
19	7%	<15%	<15%
19A	7%	<10%	<10%
20	2%	<15%	<15%
21	4%	<15%	<15%
21A	3%	<10%	-
22A	6%	<10%	<10%
23	9%	<15%	-
24	4%	<15%	<15%
25	3%	<15%	<15%

Unit Number	Existing Detrimental Condition	Predicted Detrimental Condition – Alternative B*	Predicted Detrimental Condition – Alternative C*
26	16%(west), 6%(east)	>15%	<15%
27	1%	<15%	<15%
28	2%	<15%	<15%
29	0%	<15%	<15%
30	1%	<15%	<15%
30B	1%	-	<15%
31	1%	<15%	<15%
31A	2%	<10%	<10%
32	0%	<15%	<15%
33	0%	<15%	<15%
34	0%	<15%	<15%
35	1%	<15%	<15%
35B	1%	-	<15%
36	0%	<15%	<15%
37	0%	<15%	<15%
37A	0%	<10%	<10%
38	0%	<15%	<15%
39	4%	<15%	<15%
40	0%	<15%	-
41	0%	<15%	<15%
200	0%	0%	-
201	0%	0%	-
202	0%	0%	-
300	8%	8%	8%
301	3%	3%	3%
302	14%	14%	14%
304	3%	3%	3%
305	8%	8%	8%
306	12%	12%	12%
307	3%	3%	3%
308	0%	0%	0%
309	5%	5%	5%
400	3%	3%	3%
401	7%	7%	7%
403	3%	3%	3%
404	4%	4%	4%
405	1%	1%	1%
407	1%	1%	1%
408	0%	0%	0%
409	0%	0%	0%
410	0%	0%	0%
411	3%	3%	3%
412	0%	0%	0%
417	6%	-	6%
421	4%	-	4%
423	9%	-	9%
500	16%	>16%	16%

* Predicted detrimental disturbance for timber harvest units could range from 2% to 14% depending on use of optional winter logging and previous disturbance amounts.

Cumulative Effects Specific to Alternative B

Unit 26 has had past management activities that caused an unequal distribution of detrimental soil disturbance. The east portion of the unit has about six percent detrimental soil disturbance that was identified during the transects. The west portion of unit 26 has about 16 percent detrimental soil disturbance. The proposed management activities would cause the west portion of Unit 26 to further exceed the Regional Soil Standards. The east part of the unit would meet the Soil Quality Standards through implementation of the design features for soils described in Chapter 2.

Unit 500 currently exceeds the soil quality guidelines. Unit 500 in Alternative B would be treated with ground based equipment resulting in increased detrimental soil disturbances. Meeting the regional soil quality standards would require the implementation of restoration activities in this unit.

Restoration activities to improve soil conditions would include lightly ripping heavily used skid trails and landings. The goal would be to reduce soil compaction and meet the direction provided in Region 1 Supplement 2500-99-1 (See Regulatory Framework and Consistency at the end of this section). Several studies discuss the effectiveness of ripping as a soil restoration activity. Studies cited by Froehlich and McNabb (1983) showed up to 39 percent improved seedling survival and growth after tilling compacted soils. The same study showed height growth gains of 8 to 73 percent.

A publication by Dick et al. (1988) found rehabilitation treatments of subsoiling (tilling) restored biological processes that were reduced by soil compaction. In general, tilling or ripping a compacted soil improves productivity by reducing the resistance of soil to root penetration, and providing improved soil drainage and aeration to enhance seedling establishment and tree growth (Bulmer 1998, p. 10 and 13) and improve the environment for soil organisms. The goal of soil restoration is to set the stage for the soil to begin the recovery process. Soil restoration is not an immediate result of ripping, planting, or any other activity.

Cumulative Effects Specific to Alternative C

As the project is currently designed, all proposed activities in Alternative C would meet the Regional Soil Quality Standards. Unit 500 currently exceeds the regional standards. However, because this proposed unit would be treated by hand, there would have no additional detrimental soil disturbance.

Regulatory Framework and Consistency

Region 1 Soil Quality Standards - (Exhibit H-2) All proposed activities are designed to meet the Region 1 Soil Quality Standards. These standards require that soil properties and site characteristics be managed in a manner consistent with the maintenance of long-term soil productivity, soil hydrologic function, and ecosystem health.

Region 1 Supplement 2500-99-1 - Exhibit H-3 defines an activity area as a land area affected by a management activity to which soil quality standards are applied. An example is a harvest unit within a timber sale. It also states that in areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects of the current activity following project implementation and any needed restoration activities must not exceed 15 percent. In areas where more than 15 percent detrimental soil conditions exist from prior

activities, the cumulative detrimental effects from project implementation and needed restoration activities should not exceed the conditions prior to the planned activity and should move toward a net improvement in soils quality.

The rationale for accepting design features as a means of meeting Regional Soil Quality Disturbance Standards for both yarding methods is as follows:

Ground-based Yarding: Implementing the design features discussed in Chapter 2 would achieve the goal of maintaining detrimental soil disturbance at less than 15 percent. This statement is based on two sources of information: First, monitoring logging operations that utilized existing and/or new designated skid trails and various seasons of operation (Exhibits H-13, H-18, and H-17) show that designated skid trails spaced at 75 to 100 feet apart has caused less than 15 percent soil detrimental disturbance in both winter and summer on soils that are similar to those in the project area. Second, a simple mathematical demonstration, displayed in Exhibit H-22, showing the amount of ground occupied by 10 foot wide skid trails spaced at both 75 and 100 feet. Trails spaced 75 feet apart occupy 13.5 percent of a unit. Trails spaced 100 feet apart occupy 10 percent of a unit. Both figures are within the Regional Soil Quality Standards of 15 percent and leave room for additional soil disturbance associated with landings. In some cases, roads are used for landings which further reduce the amount of disturbed soil. Also, if cut-to-length harvest methods are used and the equipment operates on a heavy slash mat (18 kg/square meter), it is likely the soil will not be detrimentally compacted (Han 2006). If winter logging takes place, the amount of detrimental soil disturbance would be less, possibly as low as 2 to 8 percent.

Skyline Yarding: Implementing the design features discussed in Chapter 2 would achieve the goal of maintaining detrimental soil disturbance at less than 15 percent. This statement is based on two sources of information: First, detrimental impacts from skyline yarding are consistently below 15 percent as demonstrated in monitoring on the Flathead National Forest (Exhibits H-10 and H-12). Second, a recent review of literature on the subject (McIver and Starr 2000) found as low as 2.8 percent detrimental soil disturbance.

Forest Plan Management Direction - Forest wide standards for soil resources in the Forest Plan, page II-46, are:

1) "Ensure that all resource management activities will maintain soil productivity and minimize erosion through implementation of:

- Management direction presented in the Landtype Guidelines (Appendix Q);
- Erosion Prevention Standards (Engineering Handbook Supplement).

2) "Design or modify all management practices as necessary to protect land productivity."

The soil analysis indicates that all alternatives and all activities proposed by the alternatives would meet the Region 1 Soil Quality Standards through the implementation of management practices outlined in Chapter 2, implementation of BMPs, and restoration of landings and heavily used skid trails, if needed, to reduce the total amount of detrimental soil impacts. All Forest Plan management direction would be met by the proposed alternatives.

WILDLIFE

Introduction

The Valley Face Fuels Reduction Project area provides habitat for a wide variety of wildlife species such as white-tailed deer, mule deer, elk, gray wolf, Canada lynx, bobcats, mountain lions, striped skunks, long-tailed weasels, grizzly bears, black bears, coyotes, deer mice, pocket gophers, golden mantled ground squirrels, snowshoe hares, mountain cottontails, northern goshawks, common loons, gray jays, nuthatches, woodpeckers, mountain bluebirds, spruce grouse, hummingbirds, bald eagles, doves, hawks, owls, ravens, various bats, snakes, frogs, salamanders, and many other species (Exhibits Q-16, Rb-10, Rd-11, Rn-4, Rr-4, Rs-5, and Rt-7). The distributions and abundances of wildlife populations are largely influenced by spatial arrangement, size, and specific conditions of habitat areas.

The wildlife analysis addresses wildlife habitat and specific habitat components in and near the Valley Face Fuels Reduction Project area. Wildlife species and habitat will be evaluated in relation to the existing condition and potential conditions resulting from the proposed alternatives. The size and location of the area analyzed will vary with each species' habitat needs. The Forest Plan lists as Management Indicator Species all threatened and endangered species, sensitive species, and elk, mule deer, and white-tailed deer. These species and their associated habitat characteristics will be addressed in their appropriate sections. The bald eagle, Canada lynx, gray wolf, and grizzly bear are the threatened or endangered wildlife species occurring in the project area. Sensitive species identified for the Flathead National Forest occurring in or potentially occurring in the project area include the boreal toad, fisher, Townsend's big-eared bat, and wolverine. Old growth, snags, and downed wood are unique habitats that fulfill key habitat components and general habitat requirements for many wildlife species. These habitats will be analyzed in two separate sections. Neotropical migratory birds are addressed in a separate section that includes an analysis of riparian habitats.

Wildlife species in this area have evolved in ecosystems influenced by fire, insects, and disease, and even stand-replacement fire is critical for the long-term survival of some species (Bunnell 1995, Caton 1996, Dixon and Saab 2000, Hutto 1995, Saab and Dudley 1998). The proposed project contains three basic kinds of forest management activities that can affect wildlife use of habitat: 1) removal of overstory trees, some of which are dead and dying, 2) fuel reduction, and 3) temporary road construction. In this context, Tables 3-48 and 3-49 provide a synopsis of historical and current Management Indicator Species (MIS) distributions at the sub-basin, sub-watershed, and project area scales, and were used to help determine which species to carry forward into the analysis.

Table 3-48. Presence of wildlife and habitats in and near the Valley Face Fuels Reduction Project affected area, Flathead National Forest (Exhibits Q, Rb, Rd, Rg, Rn, Rr, RS, and Rt).

Species	Status	Historical Presence			Current Presence		
		Stillwater Sub-Basin	Sub-Watersheds	Project Area	Stillwater Sub-Basin	Sub-Watersheds	Project Area
Bald Eagle	Threatened; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Grizzly Bear	Threatened; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Gray Wolf	Endangered; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Canada Lynx	Threatened; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Peregrine Falcon	Sensitive; MIS	Yes	Yes	Unlikely	Yes	Yes	Unlikely
Flammulated Owl	Sensitive; MIS	Probable	Probable	Probable	Probable	Probable	Unlikely
Harlequin Duck	Sensitive; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Common Loon	Sensitive; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Townsend's Big-eared Bat	Sensitive; MIS	Probable	Probable	Probable	Probable	Probable	Probable
Black-backed Woodpecker	Sensitive; MIS	Yes	Yes	Probable	Yes	Yes	Unlikely
Wolverine	Sensitive; MIS	Yes	Yes	Unlikely	Yes	Yes	Unlikely
Fisher	Sensitive; MIS	Yes	Yes	Probable	Yes	Probable	Probable
Northern Goshawk	Sensitive; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Northern Leopard Frog	Sensitive; MIS	Probable	Probable	Probable	Probable	Probable	Probable
Boreal Toad	Sensitive; MIS	Yes	Yes	Yes	Yes	Yes	Yes
Northern Bog Lemming	Sensitive; MIS	Yes	Probable	Probable	Yes	Probable	Probable
Elk, Mule Deer, and White-tailed Deer	MIS	Yes	Yes	Yes	Yes	Yes	Yes
Neotropical Migrant Birds		Yes	Yes	Yes	Yes	Yes	Yes
Old Growth Species		Yes	Yes	Yes	Yes	Yes	Yes
Snags & Down Wood Habitat Species		Yes	Yes	Yes	Yes	Yes	Yes

MIS = Management Indicator Species

Table 3-49. Species-specific habitat occurrence and other issues related to the Valley Face Fuels Reduction Project, Flathead National Forest (Exhibits Q, Rb, Rd, Rg, Rn, Rr, RS, and Rt).

Species	Habitat Comments and Issues Related to Project Area
Old Growth Associated Species	Well-distributed, except very little old growth in portion of analysis area. Current old growth in three fuel-reduction units in the Proposed Action. Some areas with extensive bark-beetle activity no longer meet old growth habitat criteria.
Snags and Downed Wood Habitat Species	Large-diameter snags and current and future down wood are well-distributed in the analysis area.
Elk, Mule Deer, and White-tailed Deer	Year round use. Winter range occurs in the eastern and central portions of the project area. Includes part of the important "Bowser/Tally" Winter Range.
Bald Eagle	One pair nests just west of the analysis area; at least 4 pairs may use parts of the area for breeding season foraging. Most sightings have been near the Stillwater River. Fish, waterfowl, and carrion provide major food sources.
Black-backed Woodpecker	Not observed in the analysis area. Observed in high numbers until 1999 in the Little Wolf Fire Area 6 miles west.
Boreal Toad	Expected to be common in the Valley Face area. Scattered observations of adults; reproduction verified near analysis area. Potential breeding habitat occurs in lakes, ponds, slow streams, and ditches. Upland habitat is throughout the project area.
Canada Lynx	Potential habitat in southwest half of project area. Scattered sightings; relatively rare. Snowshoe hares appear to be common.
Common Loon	Known nesting on Bootjack and Chinook Lakes within the analysis area and several other lakes nearby.
Fisher	Potential habitat is spread across the analysis area but is somewhat fragmented. Few observations reported in and near project area.
Flammulated Owl	Single-story ponderosa pine or Douglas-fir old forest with open understory is currently rare to absent in the area.
Gray Wolf	Scattered reports, apparently foraging or traveling. Denning or rendezvous sites are not known but may occur in the future.
Grizzly Bear	Scattered reports, apparently foraging or traveling. High quality feeding habitat is naturally not abundant. No denning habitat.
Harlequin Duck	Observed once on Logan Creek at northern boundary of analysis area; closest known reproduction is about 20 miles to the north. No potential nesting habitat.
Northern Bog Lemming	Only known occurrence on Flathead National Forest is in the Bowen Creek drainage about 15 miles to the northwest. Probable sites scattered across the analysis area.
Northern Goshawk	Scattered sightings and potential habitat are well dispersed across the analysis area; nesting on USFS land near Chinook Lake.
Northern Leopard Frog	Very rare in Western Montana. Not known on the Flathead National Forest although it is likely they occurred historically (Maxell 2002). Closest reports are near Eureka, MT, and west of Kalispell, MT. Possible habitat scattered across the analysis area.
Peregrine Falcon	Two feeding observations (3 miles west and 12 miles northwest); closest known nesting 40 miles southeast. The only potential tall cliff nesting habitat on the Tally Lake Ranger District is west of Tally Lake. Surveys there have not detected peregrines.
Townsend's Big-eared Bat	Snags, bridges, and abandoned buildings in the analysis area may provide roosting habitat; wetlands may provide feeding habitat.
Wolverine	Low likelihood of wandering through; not expected to inhabit the analysis area. Closest confirmed observation 6 miles east.
Neotropical Migrant Birds	Well-distributed habitat exists for a suite of Neotropical migratory birds.

Data used in this analysis included field surveys and observation records, aerial photography, stand exams, insect and disease severity maps and data, road locations, geographical information

system (GIS) data, research literature, and personal communication with numerous individuals knowledgeable about the area. Old-growth field reviews were done primarily in 2002 and 2005. Field survey data was also used from various other surveys done within the Valley Face Fuels Reduction Project area and surrounding vicinity (Exhibit Sections Q and R).

The criteria used to determine which species not to carry forward for further analysis included lack of habitat, and lack of effects to the habitat of a species from any of the alternatives (Table 3-50; Exhibits Rs-3, Rs-4, Rs-12, Rs-15, and Rs-23). Prior to the preparation of this document, a review was conducted of District and Forest wildlife records, the U.S. Fish and Wildlife Service (USFWS) list of Federally Threatened and Endangered species on the Flathead National Forest (Exhibit Rt-1), the Forest Service Region 1 Sensitive Species List (Exhibit Rs-1), and the Montana Fish, Wildlife and Parks website (Exhibit Rg-4).

Table 3-50. Species not being included in the detailed effects analysis for the Valley Face Fuels Reduction Project, and rationale. See Exhibits Rg-1, Rs-3, Rs-4, Rs-12, Rs-15, and Rs-23 for more information.

Species	Rationale
Harlequin Duck	No potential nesting habitat. No actions would occur in or near habitat where harlequin ducks were once observed. All streams flowing away from proposed activities disappear underground upon reaching the valley floor. Therefore all of the alternatives would have No Impact on harlequin ducks.
Northern Bog Lemming	Limited potential habitat occurs within the proposed areas, but there are no recent sightings in the vicinity and no impacts on potential habitat. Therefore, all of the alternatives would have No Impact on bog lemmings or their habitat.
Northern Leopard Frog	Limited potential habitat occurs within the proposed areas, but there are no sightings in the vicinity (Maxell 2002) and no impacts on potential habitat. Therefore, all of the alternatives would have No Impact on leopard frogs or their habitat.
Peregrine Falcon	No nesting habitat in or adjacent to the proposed areas and no affect on potential prey sources, therefore all of the alternatives would have No Impact on the peregrine falcon.

OLD GROWTH HABITAT and OLD GROWTH ASSOCIATED WILDLIFE SPECIES

Introduction

Old growth forests are typically distinguished by: (1) large trees for the species and site; (2) accumulations of large dead standing and fallen trees; (3) decay or breakage of tree tops, boles, or roots; (4) multiple canopy layers; (5) wide variation in tree size and spacing; and (6) canopy gaps and understory patchiness (Helms 1998). This extensive diversity provides habitat for many plant and animal species. Snags, downed logs, rotting wood, fungi, mosses, lichens, and green tree canopy are essential for innumerable species of wildlife and plants (Carey 1996). Closed-canopy forest reduces snow depths, insulates plants and animals from cold winds, and provides protection from predators. Open understories or patches of open canopy provide foraging opportunities for prey and predatory species alike. Interior habitat shelters wildlife and plants from sun, heat, dryness, and wind; it also provides protection from some predators, competitors, and parasites. Despite their lack of interior habitat characteristics, old growth habitats along openings and roads are much more useful to old growth associated species than are early or mid-seral/structural stages.

Across any given landscape, old forests tend to achieve old growth characteristics at varying time scales and with a range of characteristics. “Old-Growth Forest Types of the Western Montana Zone” were used as the criteria to identify stands that may qualify as old growth habitat (Green et al. 1992 [updated 2005]). These types are described in the Flathead National Forest's Standardized Effects Analysis for Wildlife and Sensitive Plants and in Appendix C of the LRMP Amendment 21 Final Environmental Impact Statement (Exhibits Q-1, Q-2, and Q-3, and Q-11).

Amendment 21 to the Flathead National Forest's LRMP designated a list of 31 old growth associated wildlife species. See Exhibit Q-4 for a list of these species and their presence in the analysis area. These include sensitive wildlife species and Neotropical migrants that are “Birds of Conservation Concern” (Exhibits Rn-1). Amendment 21 also named sensitive wildlife species as Old Growth Management Indicator Species (OGMIS), seven of which represent the spectrum of old growth habitats on the Flathead National Forest (Exhibit Rg-2). The Amendment 21 decision (USDA Forest Service 1999a) deleted the marten, pileated woodpecker, and barred owl from the Forest's list of OGMIS, but effects on these species are included in this analysis.

In the context of old growth forest stands, “the inherent capability of the land is defined by our understanding of forest succession, natural disturbance, and the resulting variability in forest composition and patterns” (Flathead LRMP Amendment 21 Record of Decision). In drier forest types, selective harvest or underburning can extend the life of large-tree habitat components in some types of existing old growth, consistent with native disturbance regimes (Camp, et al. 1996, Zenner 2005). These stands typically experienced a fluctuation of closed and open canopy and mid-story conditions over time. However, tree species typical of stand-replacement fire regimes generally can survive neither underburning nor exposure to intense winds. The pattern in these moister, shadier sites typically alternated between closed-canopy forest and early seral structural stages. In essence, such older stands often had a much longer fire interval between stand-replacement fires, due to various combinations of physiography, topography, and chance. Older stands in stand-replacement fire regimes tend to be of considerable value as habitat for many species, such as boreal owls and Canada lynx. Stands exceeding average intervals for stand-

replacement events often have a considerable amount of larger-diameter snag and downed wood habitat, as well as abundant fungi, mosses, and lichens.

Many types of disturbances, such as timber harvest, road construction, blowdown, fire, or insect or disease outbreaks, can affect old growth habitat and old growth associated species. This is well illustrated by the pileated woodpecker, a "keystone" species that provides second-hand nesting structures for numerous old growth species such as boreal owls, kestrels, and flying squirrels (McClelland and McClelland 1999, Aubry and Raley 2002). A disturbance can reduce living tree canopy cover to levels below that needed by the pileated woodpecker's main food source, carpenter ants, forcing the pileated to forage and possibly nest elsewhere. Carpenter ants, which live mostly in standing and downed dead wood, can drastically reduce populations of species such as spruce budworm (Torgersen 1996), the most widely distributed and destructive defoliator of coniferous forests in Western North America.

Some effects are seen most clearly at the stand level and may affect old growth species in positive or negative ways. For example, opening the understory can have negative short-term effects on many old growth dependent species such as the pileated woodpecker, red-backed vole, or golden-crowned kinglet. Conversely, the resultant open-canopy forests tend to favor species such as the flammulated owl, northern goshawk, Hammond's flycatcher, and various nuthatches. Opening the tree canopy can also result in new regeneration of shade-intolerant tree species such as western larch, which is most commonly used for nesting by the pileated woodpecker in this area. Harvest or underburning of some late and mid seral/structural stage stands could accelerate the eventual creation of old growth in some areas (Camp, et al. 1996, Zenner 2005). The benefit of this manipulation depends on the degree of risk from natural disturbances if left untreated. A landscape approach to thinning in old growth is important in providing diversity (Lindh and Muir 2004).

Reducing downed wood and snags can remove habitat features that are essential or very important to many species, particularly marten, fisher, and pileated woodpeckers (Witmer et al. 1998, Bull et al. 2005). Retaining the bulk of the largest material apparently decreases these effects, especially if distributed irregularly (Bull and Blumton 1999, Porter et al. 2005). Conversely, high amounts of downed woody material can slow or prevent regeneration of trees. In addition, accumulations of smaller logs and branches can substantially increase the probability of intense fire, which can remove all or most of the large living trees, snags, and other elements that define old growth.

Harvest or burning in stands immediately adjacent to old growth mostly has negative effects on old growth, but may have some positive effects. Harvesting or burning adjacent to old growth can remove the edge buffer (Russell and Jones 2001). Weather-related effects have been found to penetrate over 165 feet into a stand; the invasion of exotic plants and penetration by predators and nest parasites may extend 1500 feet or more (Lidicker and Koenig 1996; Exhibit Q-17). On the other hand, adjacent management can accelerate regeneration and sometimes increase the diversity of future buffering canopy.

The occurrence of roads can cause substantial edge effects on forested stands, sometimes more than the harvest areas they access (Reed et al. 1996, Bate and Wisdom 2004). Roads that are open to the public expose many important wildlife habitat features in old growth and other forested stands to loss through firewood gathering and increased fire risk.

Effects of disturbance also vary at the landscape level. Conversion from one stand condition to another can be detrimental to some old growth associated species if amounts of their preferred habitat are at or near threshold levels or dominated by linear patch shapes and limited interconnectedness (Keller and Anderson 1992). Reducing the block sizes of many later-seral/structural stage patches can further fragment existing and future old growth habitat (Richards et al. 2002). Depending on landscape position and extent, harvest or fire can remove forested cover that provides habitat linkages that appear to be "key components in metapopulation functioning" for numerous species (Lidicker and Koenig 1996, Witmer et al. 1998).

Effects on old growth habitat and old growth associated species relate directly to two issues discussed in Chapter 2. These are Issue #1, "Old Growth Forest"; and Issue #2, "Forested Wildlife Habitat." The issue indicators used are acres of fuel reduction in old growth habitat and acres of old growth within 200 feet of new regeneration harvest where high-contrast edge is created. These issues, along with road construction and road use effects and forested connectivity concerns, were instrumental in the development of Alternative C (Exhibit E-1).

Information Sources

The assessment of current conditions and the analysis of effects on old growth habitat was done by overlaying GIS layers of old growth habitat, late-seral/structural stage stands, and formerly designated OGMIS habitat with layers showing locations of proposed vegetation manipulation and roads. All stands across the analysis area were screened for old growth characteristics. Field surveys were done for a) every stand which appeared to be close to the minimum criteria via data, b) areas that were not predicted to be old growth or close to old-growth via queries but which appeared to be old growth on aerial photographs, or c) older stands with largely Douglas-fir overstories and high amounts of mortality caused by Douglas-fir beetles (Exhibits E-1, Q-1, Q-2, Q-3, Q-6, and Q-11).

Stand-specific information about old growth habitat is found or referenced in Exhibit Q-11, including a narrative about ground-truthing and selection of old growth habitat areas. Maps are in Exhibit Q-12. Vegetation manipulation in old growth habitat is displayed in Exhibit Q-6; high-contrast edge effects in Exhibit Q-10; road construction effects in Exhibit Q-15; old growth patch and perimeter metrics in Exhibit Q-7; old growth recruitment effects in Exhibit Q-14, and connectivity conditions and effects in Exhibit Rg-7. Effects specific to former Old Growth Management Indicator Species habitats are shown in Exhibit Q-9, with boreal owl habitat considered effectively the same as that of both former OGMIS. Population diversity concerns at the Flathead National Forest and larger scales are assessed in Exhibit Rg-1. Exhibit Q-13 details compliance with Flathead LRMP Amendment 21. See also the sections on "Vegetation" and "Snags and Downed Woody Material Wildlife Habitat" in this chapter for more information about effects on understory vegetation, noxious weeds, snags, and downed logs.

Analysis Area

The analysis area for the old growth habitat, old growth associated species, and Old Growth Management Indicator Species is the Valley Face Fuels Reduction Project area (Figure 1-1, above). The area extends approximately from the Round Meadows Recreation Area in the north to the top of the Lost Creek divide above Ashley Lake in the south. The Logan Creek watershed divide is the western boundary of the project area and the valley floor is generally the extent of NFS lands on the east (Exhibit Q-12). This same area was used for the Valley Face Ecosystem

Analysis at the Watershed Scale. At approximately 35,310 acres (55 square miles), it is large enough to include the home range of numerous wildlife species that use old growth habitats and to represent the effects of fires, natural tree mortality, timber harvest, fuel reduction, and firewood cutting across the landscape. It is sufficiently large to evaluate the ability of the habitat to support populations of wildlife and plant species using old growth habitats, but small enough to not obscure the effects of the alternatives. Old growth habitats are well distributed across Forest-Service lands in most of this area, except for the northern third and the far southeast, both of which are areas where past fire history and/or regeneration harvest precludes the presence of areas of numerous large trees. All of the actions proposed in the alternatives are contained within this area. An assessment at multiple scales was also conducted to address population diversity concerns (Exhibit Rg-1). For this project, the analysis of effects on old growth habitat spans as far as 100 years, at which time areas of mature trees regenerated by this project are likely to again be used by old-growth associated wildlife species.

Affected Environment

Across the Interior Columbia River Basin (Quigley, et al. 1996), old forests have declined by 27 to 60 percent over the past 100 years and large residual trees and snags have decreased by 20 percent. Fire exclusion and timber harvest have altered the structure and composition of forests throughout the Basin, resulting in a 60 percent increase in susceptibility to insects, disease, and stand-replacing fires. These changes have contributed to declining habitat conditions for numerous species of wildlife associated with old growth forests. This same trend was found for all subbasins across the Flathead National Forest, despite their relatively high level of ecological integrity (Quigley, et al. 1996). In the Stillwater Subbasin, the departure of current conditions from reference (historical) conditions is smaller than many subbasins within the Flathead National Forest (USDA 1999a). For more information about old growth habitat conditions within the Flathead National Forest, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999) and Exhibit Rg-1. Also see the reporting done for Forest Plan Monitoring Items 68 and 69, on file at the Flathead National Forest Supervisor's Office. Natural and human-caused changes in the past century have had a dramatic effect on old growth habitat in the Valley Face area (Exhibits O-1 through O-18, P-2, Q-8, and Rg-1).

Large areas are dominated by pole-sized trees borne of large stand-replacement fires. Fifty-five years of regeneration harvesting altered the spatial distribution of old forested habitats as well as their internal integrity and forested connectivity. Although several old growth stands are adjacent to others, most of the old growth habitat patches are fragmented and include a considerable amount of edge (Figure 3-6 and Exhibits Q-7, Q-10, and Q-12). Five patches are further than 0.5 miles from other old growth habitat on Forest Service land in this and adjacent analysis areas. The largest intact patch of old growth (approximately 620 acres) is on Forest Service land northeast of the Mountain Meadows area. Areas on non-Forest Service land that may be old growth habitat are concentrated west of Pete Ridge and in the Big Lost Creek drainage.

Some of the current old growth habitat has large numbers of trees now infested with Douglas-fir beetles. Enough mortality is occurring in the large Douglas-fir trees that it is very likely that at least 304 acres are continuing to pass out of old growth status, no longer having enough large live trees to meet criteria for identifying a stand as old growth habitat (Green et al. 1992 [updated 2005]) (See the Direct and Indirect Effects of the No-Action Alternative in the Vegetation Section of this document and Exhibits Q-3, Q-5, and Q-6). These stands are identified as "Short-term Old

Growth?" in the map below. These conditions are typical of old growth habitat across the Salish Mountains.

Currently, 2,938 to 3,593 acres of NFS lands in the analysis area appear to be old growth habitat (Exhibits Q-5 and Q-12). This is 8.8 to 10.7 percent (all ownerships) and 14.6 to 17.9 percent (USFS) of the land base that is capable of producing old growth habitat in the analysis area. It is within the 75 percent range around the historic range of variability for old growth habitat (Exhibit Q-8). Approximately 800 to 1450 acres of NFS land are also in a late seral/structural stage (Exhibit Q-5) but lack old growth features such as sufficient representation of large trees or decay. The opportunity to achieve old growth conditions in the near future is limited on most of the Forest Service lands in the Valley Face Analysis Area due to recent timber harvest, high densities of sapling or pole-sized trees, or considerable amount of recent mortality in the large trees (Exhibits Q-14 and Rd-5). See the Vegetation section of this chapter for more information about stands containing larger trees and other features typical of old growth habitat.

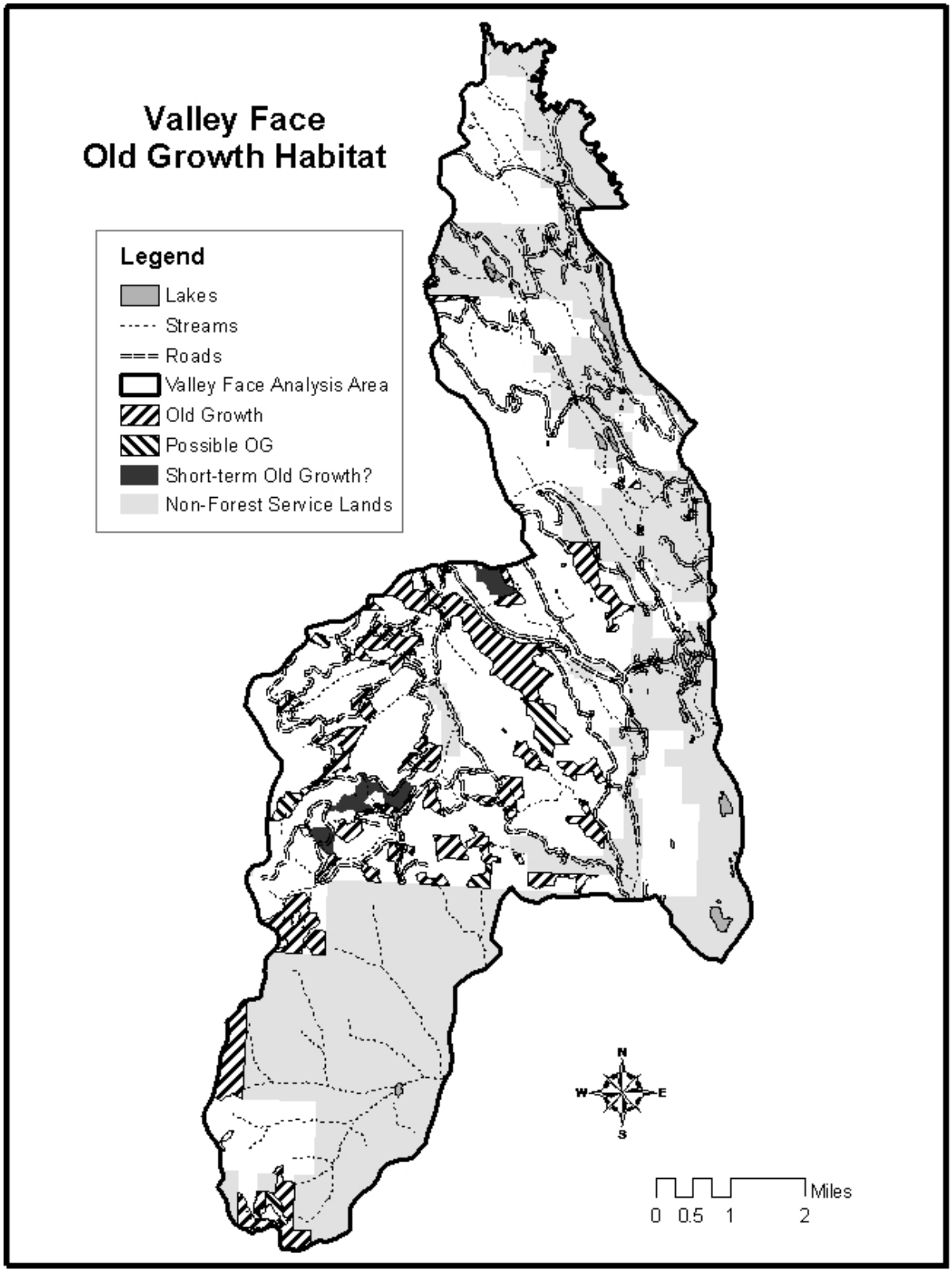
The amounts and spatial distribution of old growth habitat and other late seral/structural stage stands have varied over time and space. A comparison based on ecological sub-region data suggests the amount of old growth habitat in the Valley Face area is high relative to the historical range of variability for old growth habitat for this area (Exhibit Q-8).

The amount of edge between forested and early-seral/structural stage stands across the drainage is extensive (Exhibit Q-12). Currently, there are 36 separate patches of old growth habitat, averaging 81 acres in size (Exhibit Q-7). If you add the areas of apparent old growth that have not been field verified, both the number of patches and the average size increase. Primarily due to past logging activity, most of the existing old growth forest stands across the Valley Face area are abutted by "high contrast edge" (Exhibit Q-10). Wetlands and rocky areas create some of the edge, but numerous regeneration harvest units are adjacent to many of the old growth patches. This has created areas of blowdown and reduced the "interior integrity" of these stands, reducing (though not negating) their value as old growth habitat. The largest circular-shaped portion of old growth habitat, northeast of Mountain Meadows, is about 137 acres (Exhibit Q-7).

The disturbance history of the past 10 to 60 years may not have provided the spatial distribution and percentage of forest stand ages typical of natural processes (Exhibit P-2). Dense understories and mid-story canopies are largely the result of 60 years of effective fire suppression, increasing the risk of stand-replacing fire in old growth habitat. Structures and processes typically provided by fire appear to be inadequately represented for some species. In addition, late seral/structural stage habitat for old growth dependent species may be less than desired in terms of amount, shape, size, distribution, and connectivity. The trend in harvesting late-seral/structural stage forests has slowed considerably, but fuel accumulation and insects and disease have accelerated.

Forested connections between old growth patches have been narrowed or severed by past timber harvest. Approximately 20 forested linkages are less than 650 feet wide; nine are less than 300 feet wide (Exhibit Rg-7). These widths are important because effective corridors should be wide enough to "contain a band of habitat unscathed by edge effects" relevant to species that rarely venture out of their preferred habitats (Lidicker and Koenig 1996 and Exhibit Q-17). All patches of old growth habitat are connected via forested habitat, although some of them are as narrow as 150 feet where they are adjacent to seedling or sapling stands (Exhibit Q-12). Landscape-wide data based on ecological sub-region data metrics for connectivity appear to be illustrative of the

Figure 3-6. Current Old Growth Habitat. In the Valley Face Analysis Area, 15 to 18% of National Forest System land capable of producing old growth is currently functioning as old growth habitat.



local trend (Exhibit Q-8). Mean and median distances between patches of younger stands have decreased. Patches of older forests invariably have become farther apart. Scattered across the area are eight large patches of early-seral/structural stage habitat that require travels of 1.2 to 2.0 miles to cross in some directions (Exhibit Rg-7). In the past, stand-replacing fires left mosaics of habitats affected by various fire severities. In mixed-severity fire regime areas, the forested cover patches themselves probably were much more persistent, as most stands may have functioned as forested cover despite fairly frequent underburns. Connectivity cover was most persistent along riparian zones in both fire regimes.

The relatively dense network of roads in the analysis area makes old growth dependent species vulnerable to road mortality, trapping, firewood cutting, and other disturbance. See the "Snag and Downed Woody Material Wildlife Habitat" in this chapter for additional information.

Numerous wildlife species make use of old growth habitat in the Valley Face area. Exhibits Q-4 and Q-16 display occupation by old growth associated species and provides more information about these species' habitat components, population trends, and risk factors. Before the LRMP Amendment 21 decision of January 1999 (Exhibit Q-4), Old Growth Management Indicator Species (OGMIS) habitat was designated throughout this area. Monitoring results and other sightings suggest that all four of these species are relatively common (Exhibit Q-16). Well distributed across the analysis area, 5,722 acres were formerly designated to meet the habitat needs of pileated woodpeckers and barred owls; for marten, 1,578 acres were designated, although much of this overlapped with pileated woodpecker/barred owl habitat. For more information, see exhibits Q-9, Q-18, Rd-9, and Rg-3.

Additional information about the ability of components of old growth to provide habitat for wildlife species can be found in other sections of this chapter such as "Vegetation"; "Snags and Downed Woody Material Wildlife Habitat"; and "Sensitive, Threatened, and Endangered Wildlife Species."

Environmental Consequences

Direct and Indirect Effects of Alternative A

Alternative A is expected to sustain habitat for old growth associated species over the short term, but it includes no active recruitment of old growth, nor protection of old growth stands from insect, disease, or stand-replacement fire.

No additional actions, such as timber harvest, fuel reduction, or temporary road construction, are proposed with this alternative. This would leave existing old growth habitat plus other developing stands across the analysis area to continue with relatively natural processes. In the Valley Face area, many acres of forests have current or recent infestations of Douglas-fir bark beetle and in some cases Douglas-fir root rot. In some of these stands, so many of the large trees may die that the stands no longer function as old growth habitat. About 304 acres are old growth habitat that may not function as old growth habitat in the near future (Exhibits Q-3 and Q-5).

Across the landscape, the risk of fire would increase as dead trees fall and new understory growth contributes fine fuels. Indirectly, taking no action to reduce fuels would increase the potential for stand-replacing fires to occur, which could result in large areas of decreased suitability or unsuitable old growth habitat. The level of effects would depend on the size and intensity of wildland fire. Downed logs, shading from snags, and lack of seed sources may delay the

regeneration of new trees in some stands. Shade-tolerant tree species would likely dominate, with little or no potential for regeneration of western larch, which is preferred by numerous wildlife species for nesting. However, deadfall and snags are an extremely valuable element of old growth habitat, with no known upper limit of quantity and requiring many years to create. Areas with a substantial amount of new deadfall provide structural diversity and downfall trees. However, intact forests are much more effective in sheltering wildlife and plants from edge effects than are blowdown areas.

This alternative sustains habitat for viable populations of old growth associated species over the short term. This array of effects would have positive aspects for some species and negative ones for others, depending on the intensity of effects, and their varying spatial and temporal scales. Refer to the Vegetation and Fire and Fuels sections of this chapter for more information.

Direct and Indirect Effects of Alternatives B and C

Timber Harvest in Old Growth Habitat and Mature Stands

In Alternative B, three stands (Units 8A and 40, totaling 118 acres) would have regeneration timber harvest in what is now old growth habitat (Table 3-51). Only Unit 8A would be harvested under Alternative C. In these stands, old growth status is uncertain due to progressing mortality from Douglas-fir beetles and root disease. The harvest would occur only if these stands no longer meet the minimum definitions in "Old-Growth Forest Types of the Western Montana Zone" (Exhibit Q-1). These stands are shown as "Short-term Old Growth?" on Figure 3-6. See also Exhibits E-1 and Q-6.

Table 3-51. Proposed Action Timber Harvest in Areas that Currently Appear to be Old Growth Habitat, but which would be Manipulated Only if No Longer Old Growth (Exhibits E-1, Q-6).

Unit #/, Stand	Acres	Year of Origin; Old Growth Habitat Type Group; Dominance Type; Elevation; Aspect; Condition	Prescription and Retention level
8A; 81803047 81803051	59	1794 and 1815; Cool and Moist Old Growth Habitat Type Group (E); Western Larch and Douglas-fir; 4,750 feet; South and SE aspect Larch are healthy but most of the large trees are Douglas-fir and many have Douglas-fir beetle and root disease, some pileated woodpecker sign on snags.	Commercial Timber Harvest; Skyline shelterwood with underburning; Moderate Dispersed Retention.
40; 81701008	59	1820; Moderately Warm and Dry Old Growth Habitat Type Group (B); 4,100 feet; Undulating terrain; Western Larch and Douglas-fir; Few larch, although healthy, almost all of the large trees are Douglas-fir with Douglas-for beetle and root disease, pileated woodpecker seen in unit and there is much foraging sign.	Commercial Timber Harvest; Tractor-based shelterwood with excavator piling; Moderate Dispersed Retention.

Both alternatives would move numerous pole-sized and mature stands toward old growth habitat by reducing fuels while retaining most or all of the larger wind-firm and fire-resistant trees. However, regeneration harvest (Light Dispersed Retention and Moderate Dispersed Retention) in Alternative B would occur in about 470 acre of mature forests, which would reduce these habitats by six percent across the analysis area (Exhibit Q-14). In Alternative C, this would be reduced to 412 acres (6%). Many of these stands appear to not be progressing toward old growth habitat, as they currently exhibit considerable mortality from insects or disease, and/or high levels of recent blowdown (Rd-5). Some mature stands that would be regenerated currently exhibit relatively little

of this mortality; harvesting these stands would delay future old growth recruitment and would not contribute toward providing habitat for numerous species in both the short and long term.

Fuel Reduction in Old Growth Habitat

In Alternative B only, understory fuel reduction using hand tools is proposed within four stands of old growth habitat (Table 3-52). After this treatment, the stands would continue to meet the three minimum criteria for old growth habitat (age and density of large trees, and stand basal area; Green et al. 2005 and Exhibit Q-1) and retain most of the "associated characteristics." Hand-slashing in the understory of one of these stands (Unit 201) would be expected to maintain and extend the duration of its old growth characteristics due to its drier habitat nature and natural fire regime (Exhibit Q-6). However, three of the stands (Units 200 and 202) have a relatively mesic nature and naturally long fire intervals. In these stands, reducing the associated characteristics, such as canopy layering, downed wood, and decay (Green et al. 2005), may reduce the value of this moister old growth as wildlife habitat. Research findings are generally clear on the benefits of ecosystem and habitat restoration and fuel-reduction thinning in drier old growth types (Spies et al. 2005, Zenner 2005).

Table 3-52. Proposed Action Understory Fuel Reduction in Areas of Confirmed Current Old Growth Habitat (Alternative B only; Exhibits E-1, Q-6).

Unit #; Stand	Acres	Year of Origin; Old Growth Habitat Type Group; Dominance type; Elevation; Aspect; Condition	Prescription and Retention level
200; 81702035 81702073	69	1798; Moderately Cool and Moist Old Growth Habitat Type Group (G); Shade-intolerant mixed-species; 3700 feet; NE aspect; Grand fir (up to 9" DBH) are dying out, small amount of Douglas-fir beetle, wetlands in stand, some pileated woodpecker sign on spruce, very little past evidence of fire.	Non-commercial Understory Fuel Treatment; Heavy Dispersed Retention
201; 81002017	7	1865; Cool and Moderately Dry Old Growth Habitat Type Group (H); Western Larch and Douglas-fir; 4100 feet; S and SE aspects; Scattered Douglas-fir beetle-caused mortality and root-rot pockets.	Non-commercial Understory Fuel Treatment; Heavy Dispersed Retention
202; 81702089	50	1798; Optimum Temperature and Moisture Old Growth Habitat Type Group (D); Shade-intolerant mixed-species; 3800 feet; NE aspect; large old trees with dense pole-sized mid-story, pileated woodpecker sign on large old stumps, much past evidence of fire.	Non-commercial Understory Fuel Treatment; Heavy Dispersed Retention

New High-contrast Edge and Forested Connectivity

New high-contrast edge would be created when stands adjacent to old growth habitat are converted from late or mid-seral/structural stage to the early seral/structural stage (Exhibit Q-10). Alternative C would create new high-contrast edge immediately adjacent to old growth habitat only where urban interface fuels are a concern (Units 13A, part of 14A, and 17). During alternative development, all other units that would have had this effect were considered for a heavier retention level. Where this was not possible, most of the units were dropped or unit boundaries were pulled back 300 feet from old growth stand boundaries, unless the new edge has already formed due to blowdown or is rapidly forming due to extensive Douglas-fir beetle and root rot (Exhibits E-1 and Q-10). Alternative B would have regeneration harvest directly adjacent to a total of four miles of a variety of types of old growth habitat, as shown in Table 3-53. The units involved are 1, 1A, 3, 4, 4A, 9A, 10A, 11, 12, 13A, 14A, 16A, 17, 19, and 41. Unit 29

would be very close to old growth habitat. Units 6A, 8A and 40 are adjacent to old growth habitat but have very high levels of recent mortality in their large trees and thus are already allowing edge effects to occur. Removing an intact mature forest directly adjacent to old growth would cause the loss of a variety of habitat features along the edge.

Table 3-53. New High-contrast Edge (Regeneration Harvest) along Old Growth Habitat (Exhibit Q-10) (Exhibit Q-17).

Type of New High-contrast Edge along Old Growth Habitat	Alternative B	Alternative C
Immediately adjacent to old growth habitat	3.0 miles = 111 ac	0.46 miles = 17 ac
Immediately adjacent to uncertain/possible old growth habitat	0.1 miles = 2 ac	0.00 miles = 0 ac
Immediately adjacent to short-term old growth habitat	0.7 miles = 25 ac	0.00 miles = 0 ac

In both Alternatives B and C, an additional 0.4 miles of new early seral stands (Units 1, 3, 10A, and 12) would be created along old growth habitat but across preexisting roads, which already provide edge effects. Tree planting and removal of dead and downed trees would accelerate redevelopment of future buffering habitat. Many wind-firm live trees and snags would be left, maintaining available current canopy cover and habitat features such as future nesting trees. Edge effects due to temporary road construction are discussed below.

Alternatives B and C would sever or narrow forested connections in places that appear to serve as important wildlife travel corridors (Exhibit Rg-7) for travel from one patch of old growth habitat to another. These are ridgelines or forests along riparian areas, although no riparian habitat would be entered. Forested cover would not be maintained where the harvest units are located such that they would sever or substantially narrow travel connections until the stands regained a forested overstory (Table 3-54). In Alternative B, these are all or parts of Units 1, 1A, 3, 4, 5, 6, 6A, 8A, 9A, 10A, 11A, 12, 16A, 21, 27, 31, 31A, 35, 37, 37A, 38, and 41. For Alternative C, the list of Units is the same except that Units 1A, 21, 21A, and 40 have been dropped or modified in a way that prevents connectivity effects, and reshaping Unit 41 reduced its effects. Leaving larger-diameter snag and downed-wood “legacy material” as required by the Forest Plan's Amendment 21, would improve the ability for recovering stands to provide connectivity.

Table 3-54. Connectivity Effects, expressed as number of occurrences (Exhibit Rg-7).

Alternative	Ridgeline Connection Effects		Riparian Connection Effects	
	Narrows	Severs	Narrows	Severs
A (No Action)	0	0	0	0
B (Proposed)	7	7	18	1
C	6	6	14	1

Temporary Road Construction

In Alternative B, proposed Temporary Road 10 would cut through 2500 feet of old growth stands to access Unit 40, which would harvest 59 acres that appear to be rapidly passing out of old growth. 1300 feet of the distance would be adjacent to old growth expected to maintain its habitat characteristics (Exhibit Q-15). This may require the harvest of up to one half acre of old growth habitat, although the road would be located to minimize impacts to old growth to the extent feasible. This road was dropped from Alternative C for multiple reasons.

Precommercial Thinning and Shrub and Tree Planting

Pre-commercial thinning on 437 acres would have little or no short-term effect on old-growth wildlife. In the long term, this would be expected to affect the tree species composition and growth in positive ways. In both action alternatives, shrubs would be planted in and near some harvest units near riparian areas if funding is available. This would enhance feeding, nesting, and hiding cover for a wide variety of wildlife species that also use old growth habitats.

Effects on Former Old Growth Management Indicator Species

In both action alternatives, nine percent of the formerly designated (but still functional) marten denning habitat and eight percent of the marten feeding habitat would be regeneration harvested (Exhibit Q-9). Most of this would occur in the Twin Lakes area (Units 27 and 29), where additional potential marten habitat is available nearby to the west. Both action alternatives would treat fuels non-commercially in one to five percent of this marten feeding habitat and zero to one percent of denning habitat. Some prey species used by marten would increase while others would decrease (Bull and Blumton 1999). The retention of snags and downed wood, as described in the "Snag and Downed Woody Material Wildlife Habitat" section of this chapter, would help maintain habitat function for marten over the short and long term (Porter et al. 2005). According to previous standards (LRMP Implementation Note #2), the marten habitat blocks would still be functional for marten and the species that were under its Management Indicator Species "umbrella" (Warren 1990, Fisher and Wilkinson 2005). No roads would be built through formerly designated marten habitat.

The areas formerly designated for pileated woodpecker and barred owl habitat would also have regeneration harvest in four percent of nesting habitat and 9 to 18 percent of feeding habitat (Exhibit Q-9). The greatest effect would be in areas north and south of Chinook Lake, possibly making those acres unusable for pileated woodpecker and barred owl nesting for at least 50 years. This would be due to Units 31, 32, and 35. From 0.7 to 0.9 miles of temporary road would be built through or alongside formerly designated pileated woodpecker feeding habitat proposed for regeneration harvest. The formerly designated pileated woodpecker/barred owl habitat blocks north and south of the Chinook Lake area would no longer meet previous standards for pileated woodpecker or barred owl and the species that were under their Management Indicator Species "umbrella." However, there would still be sufficient habitat for these species, well-distributed within and between these blocks, for persistence of these species (Exhibit Q-9).

Cumulative Effects

Timber harvest patterns across the Interior Columbia River basin of eastern Washington and Oregon, Idaho, and western Montana have caused an increase in fragmentation of forested lands and a loss of connectivity within and between blocks of habitat. This has isolated some wildlife habitats and reduced the ability of some wildlife populations to move across the landscape, resulting in long-term loss of genetic interchange (Lesica 1996, Quigley et al. 1996).

Past fires, timber harvest, and conversion to agriculture on national forest, corporate, and private lands across the analysis area have resulted in a complex matrix of forested interior habitat, edge, ecotones, and openings in various stages of succession. Past regeneration harvest across varying ownerships converted former old growth into stands of seedlings, saplings, or pasture for livestock (Exhibit Q-8). Other timber harvest removed all or most of the larger trees from numerous stands, especially in the lower elevations. In many Forest Service stands, some of the

larger trees were left, largely to provide seed sources or shelter for regenerating tree seedlings. After harvest, however, the tree densities and amounts of standing and downed dead wood were typically much less than would be left by natural processes, and the large live trees were often later removed. In many places across the analysis area, past timber harvest and roading created a substantial amount of "edge effect," where sun, wind, predators, competitors, etc., can penetrate further into what was previously interior forest.

Aside from 201 acres of precommercial thinning now under contract, no vegetation management activities are planned on national forest lands in the analysis area in addition to those proposed in the action alternatives. Timber harvest and road construction in the adjacent Logan Creek drainage is expected to continue under the 2004 Logan Creek Ecosystem Restoration Project Record of Decision.

Firewood cutting along open roads has further decreased snags and downed logs vital for many species using old growth habitats (Bate and Wisdom 2004). Across the analysis area, open roads facilitate access for firewood cutters, decreasing the snags and downed woody material important for many wildlife and plants using old growth habitat, as described in the "Snags and Downed Woody Material Wildlife Habitat" section of this chapter and in Exhibits Rd-1 and Rg-8.

Fire suppression efforts may have contributed to increased understory growth and denser mid-canopy trees (Lesica 1996), making foraging more difficult for species such as flammulated owls and northern goshawks. This has also increased the risk of stand-replacing fire in old growth forests.

Other cumulative effects on wildlife using old growth habitats are varied. Probably due to trapping, lynx were extremely scarce in the first half of the century in Montana, with specimen records restricted to two western counties. The analysis area is part of MDFWP's Region 1, which now has an annual trapping quota of one lynx and one fisher. There have been no reports of wildlife feeding on calves or other livestock and no predator control efforts are anticipated. Recreation activities are somewhat limited, but may include hunting, hiking, boating, camping, snowmobiling, cross-country skiing, horseback riding, motorized trail use, and bicycling. All of these can disturb or displace wildlife. Driving on roads can cause some collision-related injuries or mortalities to wildlife. Road and trail construction and maintenance often involve the felling of hazard trees and snags from an adjacent swath. Human settlement occurs on most of the private lands, and subdivision continues to increase, which can cause a direct loss of old growth habitat or indirect effects on wildlife from dogs left at large. Livestock grazing on the now inactive Chinook allotment and on private lands has likely altered understory plants in some old growth stands.

Overall, it appears the potential habitat in which old growth associated species feed, breed, and otherwise persist in the Valley Face area has been reduced over the past few decades (Exhibit Q-8). The affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. For more information, see the "Sensitive, Threatened, and Endangered "Wildlife Species," Vegetation," "Hydrology," "Fire and Fuels," and "Soil" sections in this chapter, as well as Exhibit Rg-9.

Regulatory Framework and Consistency

The Forest Service is required by the National Forest Management Act (NFMA) 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 USC 1604(g)(3)(B). To implement NFMA, the Forest Service's regulations, implemented on January 5, 2005, state that "the overall goal of the ecological element of sustainability is to provide a framework to contribute to sustaining native ecological systems buy providing ecological conditions to support diversity of native plant and animal species in the plan area. This will satisfy the statutory requirement to provide for diversity of plant and animal communities based on suitability and capability of the specific land area in order to meet multiple use objectives," 36 CFR 219.10(b). A goal under the Flathead's Long-Range Management Plan (LRMP), as directed in Amendment 21 (USDA Forest Service 1999a), is to "ensure that Forest Service actions do not contribute to the loss of viability of native species."

Another goal in Amendment 21 is to "maintain and recruit old growth forests to an amount and distribution that is within the 75 percent range around the median of the historical range of variability. Where current conditions are below this amount, actively manage to recruit additional old growth."

For species associated with old growth forests, Amendment 21 has objectives to "maintain ecological processes and provide for natural patch size distribution" and to "manage landscape patterns to develop larger old growth patch sizes where needed to satisfy wildlife habitat requirements." Across the landscape, "sufficient retention of forest structure (large diameter live trees, snags, and coarse woody debris)" should be left to provide for future wildlife movement through the matrix surrounding old growth forests.

Standards given in Amendment 21 include managing for wildlife dependent on old growth by protecting old growth forest consistent with the Vegetation Standard Section H6. Vegetation management within old growth shall be limited to actions necessary to: (1) "maintain or restore old growth composition and structure consistent with native succession and disturbance regimes"; or to (2) "reduce risks to sustaining old growth composition and structure." For example, in warm-moist and cool-moist Potential Vegetation Groups, "large multistory or single-story conditions and shade intolerant species such as western larch, western white pine, ponderosa pine, and Douglas-fir" are to be maintained or restored. On these sites, the standard is to "reduce tree density and the proportion of shade tolerant species such as grand fir and subalpine fir in areas where fire exclusion has altered stand composition and structure."

At the landscape level, there is a standard to "prescribe landscape treatments that protect old growth forests from disturbances that threaten old growth composition and structure." This standard also states "treatments within existing old growth may be appropriate where current insect and disease conditions pose a major and immediate threat to other stands." Sufficient mid-seral/structural stage stands are to be maintained to allow for recruitment of old growth within the historical range of variability, emphasizing old growth development "in stands that are most likely to persist under native disturbance regimes, and that provide a patch size and pattern most advantageous to old growth associated wildlife species."

The Flathead LRMP Amendment 21 named all sensitive wildlife species as Management Indicator Species, seven of which represent the spectrum of old growth habitats on the Flathead

National Forest (Exhibit Rg-2). These are the bald eagle, flammulated owl, boreal owl, black-backed woodpecker, fisher, Canada lynx, and northern goshawk. Conditions favorable to these species would generally also benefit other old-growth associated species found within the analysis area, such as brown creepers, Townsend's warblers, winter wrens, and northern flying squirrels, all of which are considered under the umbrella of MIS evaluation. The Flathead National Forest formerly used the pileated woodpecker, barred owl, and marten as Management Indicator Species (MIS) to represent species dependent on old growth stand characteristics. Amendment 21 replaced these by designating all sensitive wildlife species as Management Indicator Species and by developing a list of old growth associated species (Exhibits Q-4 and Rg-2).

Implementation of all alternatives would comply with the standards contained in the Forest Plan related to old growth. However, Alternatives A and B would not respond as well as Alternative C to the objectives and overall goals of old growth management on the Flathead National Forest. See Exhibit Q-13 for more information.

SNAGS AND DOWNED WOODY MATERIAL WILDLIFE HABITAT

Introduction

Snags, broken-topped live trees, downed logs, and other woody material are required by a wide variety of wildlife species for nesting, denning, roosting, perching, feeding, and cover. Within the Flathead National Forest, 42 species of birds and 10 species of mammals depend on cavity habitat for nesting, feeding, or shelter (Exhibits Rd-2 and Rd-4). These include threatened and sensitive wildlife species (Tables 3-48 and 3-49) and Neotropical migrants that are "Birds of Conservation Concern" (Exhibit Rn-1).

The number, species, size, and distribution of available snags strongly affect many species of wildlife (Bull et al. 1997, Bunnell et al. 2002). An insufficient number of suitable snags may limit or eliminate populations of cavity-using species (Thomas et al. 1979, Saab and Dudley 1998). Because most cavity-using birds eat insects, they can substantially reduce tree mortality and damage caused by forest pest insects (Torgersen et al. 1990, Torgersen 1996, Jackman 1975, Bull, et al. 1997). Snags with old nesting cavities, broken tops, and decay are most likely to be used (Bull, et al. 1986). Although smaller creatures can use many sizes of dead trees, larger birds and mammals require larger snags. The larger the diameter of the snag, the less the nestlings are crowded and the better they are protected from weather and predators. In the Valley Face area, western larch and black cottonwood snags appear to receive the most use by wildlife, with little use of spruce, subalpine fir, and lodgepole pine. This may be related to the fact that these latter species, live or dead, have less resistance to windthrow. In managed stands, clumped trees and snags tend to favor species that excavate cavities, while dispersed trees and snags tend to favor secondary cavity users (Bunnell et al. 2002). The various species of cavity nesters also appear to use different microhabitats. For these reasons, homogenously managed stands are likely to not provide habitat for many species (Hutto 1995b).

Downed trees and other downed woody material are also critically important for many species and for maintaining forest health (Bull 2002, Bull et al. 2005). Downed logs and stumps are required for resting and denning, are vital for hunting below the snow in winter (Buskirk and Ruggiero 1994), and are used as travel cover, particularly when living plant cover is sparse. Marten often den and forage in the under-snow cavities that occur under downed logs (Bull and Blumton 1999, Witmer et al. 1998). Canada lynx dens in the Seeley-Swan area are associated with abundant woody debris, usually large diameter logs. Several amphibians and reptiles make use of large woody debris for shelter and breeding sites (Bull, et al. 1997). Many ant species that need large-diameter downed logs prey on substantial numbers of tree defoliating insects such as western spruce budworm (Torgersen and Bull 1995). Larger-diameter downed trees are generally most important because they provide stable and lasting structures as well as better protection from weather extremes (Bull 2002). Longer pieces provide better runways, shelter under suspended logs, and access to under-snow habitats. A variety of sizes and decay classes are needed in downed wood "in order to conserve functional processes that foster sustainable forest ecosystems" (Torgersen and Bull 1995).

Timber harvest, fuel reduction, insects, disease, fires, and firewood cutting can directly affect the availability and use of snag and downed wood habitat. Harvest activities often create large accumulations of downed woody material. However, this is generally of smaller diameter, and

much of it is cleared from the forest floor for fuel hazard reduction and future tree regeneration. Removal of intact, wind-firm snags such as western larch and Douglas-fir has greater impacts on wildlife species than removal of non-windfirm snags such as lodgepole pine. Stand-replacing wildland fires dramatically increase the availability of snag and downed wood habitat features unless they are consumed by reburn.

Effects on snag and downed wood habitat are directly related to one issue discussed in Chapter 2: Issue #2, "Forested Wildlife Habitat." The No-Action Alternative could affect this habitat through an increased probability of stand-replacement fire. The action alternatives would remove some snags and downed woody material from proposed timber harvest and underburning units. It is prohibitively difficult to artificially restore snags or downed logs, and natural restoration of snag or downed wood habitat can take decades or even centuries.

Information Sources

Existing conditions and effects on snag and downed wood habitat were analyzed by evaluating the live tree and downed wood retention levels prescribed for the timber harvest and fuel reduction units (Exhibit Rd-3). Vulnerability to loss via firewood cutting was assessed via a GIS analysis that modeled areas within 200 feet of roads (Exhibit Rd-1). For a description of edge effects on these habitat features in old growth habitats, see the "Old Growth Habitat and Old Growth Associated Wildlife Species" section of this chapter. Population diversity concerns at the Flathead National Forest and larger scales are assessed in Exhibit Rg-1. This analysis covered the standing and downed dead wood resource in terrestrial areas. See the "Aquatic Species" section of this document for consideration of "coarse woody debris" recruitment in aquatic systems.

Analysis Area

The analysis area for the snag and downed wood wildlife habitat resource is the Valley Face Fuels Reduction Project Area (Figure 2-1, above). This is the same area used for old growth habitats. It is large enough to include the home range of numerous wildlife species using snag and downed woody material habitats and is representative of effects of fires, natural tree mortality, timber harvest, and firewood cutting across the landscape. It is sufficiently large to evaluate the ability of the habitat to support populations of wildlife and plant species using dead wood habitats, but small enough to not obscure effects of the alternatives. All snag habitat attributes are distributed across this area and all of the actions proposed in the alternatives are contained within this area. A larger-scale assessment was also conducted to address population diversity concerns (Exhibit Rg-1). For this project, the analysis of effects on snag and downed wood habitat spans as far as 50 years, enough time for some of the trees left in the units to fall or to acquire decay and other characteristics that make them useful to many wildlife species.

Affected Environment

Large durable snags are believed to have decreased substantially west of the Continental Divide in Montana (Hillis et al. 2003; Exhibit Rd-9). Losses from timber harvest and firewood cutting have been sizeable and widespread. In addition, there has been a dramatic decline in low to moderate severity fires, which are important for the recruitment of large snags and for increasing snag durability (ibid).

The character of snag and downed wood habitat varies dramatically across the Valley Face area, largely depending on recent disturbance history (Exhibit Q-8). Fire was the dominant disturbance in the watershed prior to timber management, and extensive areas of snag habitat often occurred in areas dominated by a stand-replacing fire regime. In mixed-severity fire regime areas, underburns occasionally killed large trees and stand-replacement fires were infrequent. Large larch snags are still well distributed across the area from fires early in this century. In recent decades, the mountain pine beetle was at epidemic levels in lodgepole pine, causing substantial mortality in mature stands. Currently, bark beetles and fungal root diseases are impacting a variety of conifer species on many acres, particularly Douglas-fir. "Recruitment snags" (live trees) are abundant across the landscape, although in many stands desirable tree species for snags are sparse or do not occur. This would include dense pole-sized stands, which have few trees expected to provide either the green tree component or future high-quality snags for cavities and feeding. See the Vegetation section of this chapter and Exhibit Q-8 for more information.

Past logging has reduced the availability of snags and large downed logs. About a third of the analysis area, all ownerships combined, has been clear-cut or seed-tree harvested (Exhibit P-2). Most timber harvesting activities left few snags and large pieces of downed wood, particularly when lodgepole pine stands were harvested. Where past logging created abrupt edges, blowdown is common. The Valley Face area is likely to have a snag situation very similar to the adjacent Logan Creek Analysis Area, where 11,243 acres of regenerated stands (18 percent of the analysis area) have no snags visible on recent aerial photographs. Nevertheless, overall snag and downed wood habitat may be more available than in the past, as snags are visible in 73 percent of the unharvested areas in the Logan drainage (Exhibit Rd-8).

Firewood cutters can remove dead trees from about 14 percent of Forest Service land, where over 2,700 acres of forest are within 200 feet of roads that are open either yearlong or in July and August of each year (Exhibit Rd-1). Monitoring of short-term road opening in 1998 revealed many large snags can be protected from firewood cutting through tree paint and metal signs, but old growth habitat components may still be reduced.

For quantifying downed wood habitat in the Valley Face area, we used data collected in the Good Creek drainage, adjacent to the north and ecologically similar to the Valley Face area (Table 3-55 and Exhibit Rd-3). An analysis of downed wood data collected across the Good Creek analysis area for the evaluation of fuel hazard shows that the amounts of downed wood are highly variable across the landscape, ranging from less than one ton per acre to over 130 tons per acre. The distribution of sizes, species, and condition of downed wood also vary dramatically within and between stands, forest types, seral/structural stages, and fire regimes. "Late" seral-structural stage corresponds to the areas of high-quality downed log habitat; "mid" seral-structural stage corresponds to the areas of moderate-quality downed log habitat (Exhibit Rd-3). These levels are not indicative of historical conditions because they reflect many years of fire suppression, tree harvest, and firewood cutting across the landscape.

Table 3-55. Downed wood habitat conditions in the adjacent Good Creek drainage extrapolated to the Valley Face area.

Down Wood Habitat Class	Average Tonnage	% of USFS Lands	% of non-USFS Lands	% of All Lands
Mid-seral/ structural forest	19.7 tons per acre (>8 tons per acre 11 to 30" diameter)	60%	58%	59%
Late-seral/ structural forest	30.9 tons per acre (>17 tons per acre 11 to 30" diameter)	22%	18%	21%

Numerous wildlife species make use of snag and downed wood habitat in the Valley Face area (Exhibits Rd-2 and Rd-11). Exhibits Q-4 and Q-16 display occupation by old growth associated species. For more information about dead wood habitat conditions across the Flathead National Forest, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibits Rd-9, Rg-1, and Rg-3.

Environmental Consequences

Direct and Indirect Effects of Alternative A

No additional actions, such as timber harvest, fuel reduction, or temporary road construction, are proposed with this alternative. This would leave snag and downed wood habitat across the area to continue with relatively natural processes, along with fire suppression, occasional felling of hazard trees, and firewood gathering.

The array of effects would have positive aspects for some wildlife species and negative for others, depending on the intensity of the effects, as well as on varying spatial and temporal scales. Wind-firm snags would fall, taking one to over 100 years, depending on variables such as tree species, size, soil moisture, slope position, topography, wind patterns, and buffering by other standing trees or snags. Trees would continue to succumb to Douglas-fir beetles and other insects and diseases. In the absence of windstorms or wildland fire, most stands dominated by dead and dying trees would gradually unravel, with few trees or snags standing in these stands after 10 to 50 years. However, even in some of the relatively high mortality areas, enough western larch and Douglas-fir would likely survive to provide both the green tree component and future high-quality snags for cavities and feeding. Downed logs, shading from snags, and lack of seed sources would delay the development of new trees in some stands, with little or no potential for regeneration of western larch, which is preferred by numerous wildlife species for cavity nesting. The probability of stand-replacing wildland fire would increase in such areas as dead trees fall and new understory growth contributes more fine fuels, as discussed in the “Vegetation” and “Fire and Fuels” sections of this chapter. Such fire would increase the availability of snag habitat over the short term, along with the reduction of living tree canopy over large areas. Large stand-replacement fires would favor species associated with recent burns and the resulting large numbers of snags and woody debris.

Preliminary research suggests that about half of the snags within 200 feet of roads are felled for firewood, especially when screening cover has been removed (Bate and Wisdom 2004). Large snags of western larch, ponderosa pine, and Douglas-fir are very rare in such corridors in northwest Montana. No additional road closures are planned with implementation of this or any alternative. This would leave valuable snag and downed wood habitat vulnerable to firewood cutting along open roads as shown in the Table 3-56. Firewood cutting is prohibited within 300 feet of any stream, river, or lake on the Tally Lake Ranger District (Exhibit Rd-7). This should help protect snags and downed logs, particularly along Lost Creek.

Table 3-56. Vulnerability to loss of snag and downed wood habitat on USFS land in forested stands due to firewood cutting (Exhibit Rd-1)

Alternative	Total acres within 200' of open roads	Mid-seral/structural Stage and Late-seral/structural Stage Stands		
		Acres within 200' of open road	% of area within 200' of open road	% of this habitat across analysis area
A	2731 ac	2085 ac	76%	7.4%
B and C		1827 ac	67%	6.5%

Direct and Indirect Effects of Alternatives B and C

These alternatives are discussed together due to the similarity of their effects on the snag and downed wood habitat resource. They propose timber harvest in 2778 to 3275 acres of mid-seral/structural forest and 212 to 471 acres of late seral/structural forest, as shown in Table 3-57. The "late" seral-structural stage corresponds to the areas of high-quality downed log habitat; "mid" seral-structural stage corresponds to the areas of moderate-quality downed log habitat. Regeneration harvest (LDR and MDR in Table 3-57), would remove forested cover needed by many species using snags and downed wood, although the larger "legacy" material would persist into the next forest grown on these sites. Heavy retention areas would remain functional habitat for most of these species. Retention levels for live trees were increased in some units in Alternative C, which would result in additional snags over time.

Table 3-57. Acres of Timber Harvest and Fuel Reduction Relevant to Snags and Downed Wood Habitat across the Analysis Area, in acres (Exhibit Rd-3).

Alt.	Acres, Mid-seral/structural Stage				Acres, Late-seral/structural Stage			
	LDR	MDR	HDR	HAR	LDR	MDR	HDR	HAR
B	216	2,655	189	215	7	413	50	0
C	186	2,137	240	215	4	306	102	0

Post-treatment tree retention levels: LDR = Light dispersed retention, MDR = Moderate dispersed retention, HDR = Heavy dispersed retention, and HAR = Heavy Aggregated retention.

All live and dead larch and ponderosa pine greater than 18 inches at DBH would be left standing, unless this would compromise safety. Many wind-firm green trees would be left unharvested except in some stands with Douglas-fir beetle concerns. This would help maintain green overstory over the short term. It should also help ensure that an adequate amount of cavity habitat and large woody material are available over time. In some stands, planted western larch, Douglas-fir, and ponderosa pine would provide future higher-quality snags than the lodgepole pine, subalpine fir, and spruce that are expected to regenerate naturally. All snags deemed to be hazardous could be felled in these areas, although they would be left on-site. All Douglas-fir greater than 25 inches DBH would be retained, unless they are infested with Douglas-fir bark beetles at the time of marking, or where leaving them would compromise safety. Douglas-fir beetles are known to occur at relatively high levels in several units (Exhibit Rd-5). Efforts would be made to protect high-quality snags for wildlife, but skyline corridors and other safety concerns would necessitate felling some of them. No snags or logs would be salvaged from the Riparian Habitat Conservation Areas (RHCAs) in either alternative. Additional snags are expected as the retained trees die over time. Some of the live trees left in harvest units may also be unintentionally killed by post-harvest underburning, but would not be removed by this proposal. Bark beetle populations may decrease, and thus fewer new snags created by bark beetle infestations would be expected over the larger landscape in the next few years, as described in the Vegetation section.

Wherever present, at least 32 downed logs per acre that are at least 20 feet long and are 9 to 20 inches in diameter at the large end would be left evenly distributed across the units. If there are too few large logs, 6 to 9 inch diameter logs may be substituted to reach this number of pieces. Wherever present, at least 15 downed logs per acre that are greater than 20 inches in diameter and at least 6 feet long would be left evenly distributed across the units. Snags that are felled for safety concerns would be left. A range of 5 to 23 tons per acre of the largest available downed material is expected in most units, depending on the existing and potential vegetation of the sites and the proximity to private lands. Generally, the lesser amounts would be the result on dry sites,

or in stands where the bulk of the trees are smaller-diameter, or in the urban interface. The patchy nature of many treatment areas should also help maintain the diversity of dead-wood habitat wildlife species (Machmer 2002).

This project is expected to reduce the potential for stand-replacing fires across the landscape (See the "Vegetation" and the "Fire and Fuels" sections of this chapter). In some areas the green canopy cover would be more likely to remain intact; in other areas fire-resistant trees such as western larch and Douglas-fir would be more likely to survive fires.

Most of the new construction of specified and temporary roads would pass through mid and late seral/structural forests, requiring the felling of snags and any other hazard trees in and along the travel corridors. The effect of road construction in old growth forests is discussed in the section of this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species."

The action alternatives would not provide additional protection of dead wood habitat features through access management changes. Regeneration harvest would reduce the acreage of currently forested habitat within this zone (Table 3-53, above; Exhibit Rd-1). Other actions included in these alternatives would not measurably affect snag and downed wood habitats.

Cumulative Effects

Throughout the Interior Columbia River Basin, densities of large-diameter snags (>21 inch DBH) have been reduced in roaded areas with a history of timber sales (Hann, et al. 1997; Hessburg, et al. 1999; Quigley, et al. 1996, Haynes et al. 2001). However, habitat estimates for the pileated woodpecker based on the Regional nest tree habitat model shows that nest site habitat is abundant and well distributed across the Northern Region and the Flathead National Forest (Samson 2005; Exhibit Rs-20). Fire suppression efforts, salvage of fire-killed or insect-infested trees, beetle control efforts, firewood harvest, and prior harvest of extensive areas of dead and dying lodgepole pine and fire-killed trees have reduced the habitat potential for species that rely on dead and downed wood in northwest Montana (Harris 1999).

In the Valley Face area, past timber harvest across the various ownerships has converted many stands containing large live and dead trees into stands of seedlings or saplings, or into pasture or hayfields. In many Forest Service stands, some of the larger trees were left, largely to provide seed sources or shelter for regenerating tree seedlings. After harvest, however, the tree densities and amounts of standing and downed dead wood were typically much less than would be left by natural processes, particularly in stand-replacement fire regimes, and the large live trees were often later removed. In many places across the analysis area, past timber harvest and roading created a substantial amount of "edge effect," where sun, wind, predators, competitors, etc., can penetrate further into what was previously interior forest. Aside from 201 acres of pre-commercial thinning now under contract, no vegetation management activities are planned on national forest lands in the analysis area in addition to those proposed in the action alternatives. Timber harvest and road construction in the adjacent Logan Creek drainage is expected to continue under the 2004 Logan Creek Ecosystem Restoration Project Record of Decision.

Across the analysis area, firewood cutters have removed many of the large snags from within 200 feet of open roads, as well as some of the downed logs (Bate and Wisdom 2004, Exhibit Rd-1). Across all ownerships, in summer at least 99 miles across the analysis area are open to public or private motorized use for an Open Road Density (ORD) of 1.8 miles per square mile. At least 87 miles are open from fall to spring, with an ORD of 1.6 (Exhibit Rg-8). These numbers are likely

to be low, however, due to the many miles of roads and driveways on private land. Looking only at Forest Service land, there are 65 miles open in summer (ORD = 2.1), and 54 miles open from fall to spring (ORD = 1.7). In order to provide additional opportunities for firewood cutting, the Tally Lake Ranger District has opened 33 miles of roads in the adjacent Logan Creek area that are normally closed yearlong. In the summers of 1997 and 1998, 25.3 miles were opened in the upper Logan drainage; 7.7 miles were opened just south of Star Meadows in 2000 and 2001. Together, these temporary openings exposed 1560 additional acres to loss of snag and downed wood habitat. Higher-quality wildlife habitat snags were marked; monitoring in these areas has shown cooperation with efforts to protect these valuable habitat elements.

Other cumulative effects on wildlife using snag and downed wood habitats are varied. Human settlement occurs on most of the private lands, and subdivision continues to increase, which can cause a direct loss of snag and downed wood habitat or indirect effects on wildlife from dogs left at large. Other actions would have minor or negligible effects on snags and downed wood habitat. These include precommercial thinning, tree and shrub planting, noxious weed treatment, livestock grazing, and most forms of recreation. Road maintenance and the construction and maintenance of trails would cause some hazard trees to be felled and fallen trees to be cleared from travel ways.

The affected environment described above has been shaped by past and present cumulative effects to these habitats. These effects would be cumulative to those discussed above for each alternative. For more information on cumulative effects relevant to snags and downed wood habitat, see the "Old Growth Habitat and Old Growth Associated Species," Riparian and Wetland Habitat," "Vegetation," "Hydrology," "Fire and Fuels," and "Soil" sections in this chapter. The analysis for Flathead National Forest's Forest Plan Amendment 21 individually assessed the viability of old growth associated species and many others that use snags and downed wood habitat (USDA Forest Service 1999a)." See also Exhibits Rd-9, Rg-1, Rg-3, and Rg-9.

Regulatory Framework and Consistency

The Forest Service is required by the National Forest Management Act (NFMA) 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 USC 1604(g)(3)(B). To implement NFMA, the Forest Service's regulations, implemented on January 5, 2005, state that "the overall goal of the ecological element of sustainability is to provide a framework to contribute to sustaining native ecological systems by providing ecological conditions to support diversity of native plant and animal species in the plan area. A goal under the Flathead's Long-Range Management Plan (LRMP), as directed in Amendment 21 (USDA Forest Service 1999a), is to "ensure that Forest Service actions do not contribute to the loss of viability of native species."

Direction specific to snag and downed wood habitat is also provided by the Flathead's Forest Plan Amendment 21. Sufficient vegetation structure is to be retained, including large diameter trees, in timber harvest areas other than personal-use firewood permits. To comply with Amendment 21, the retention amount must be consistent with native disturbance and succession regimes and provide for long-term snag and coarse woody debris recruitment, essential soil processes, species habitat (including feeding and dispersal habitat for small mammals and birds), and long-term structural diversity of forest stands. In the absence of a site-specific landscape analysis to derive retention levels for this standard, minimum retention levels apply beyond 200 feet from roads open to the public. These are as shown in Table 3-58, and include a requirement for five live

replacement trees over 12 inches DBH for each snag over 20 inches DBH. If existing snag densities are below the following densities, live trees are to be retained as future snags where possible.

Table 3-58. Forest Plan Amendment 21 Snag and Downed Wood Standards.

Potential Vegetation Group	Snags per acre		Live Replacement trees >12" DBH	Pieces of downed wood >6 feet long/acre	
	12-20" DBH	20+" DBH		9-20" diameter	20+" diameter
Dry	2	1	5	15	10
Moist	6	2	10	32	15
Cold	6	1	5	30	15

All alternatives would comply with standards in the Flathead LRMP for general nongame wildlife and snag and downed wood habitat, as described in Chapter 2 under Features Common to Action Alternatives (Exhibits Rd-3 and Rd-10). In addition, few large live trees would be harvested, as the Valley Face Fuels Reduction Project emphasizes retention of the largest trees (unless infested with Douglas-fir beetles) and removal of the understory and/or mid-story trees. Unharvested live trees would be available to provide fairly uniformly distributed future snags. Site-preparation prescriptions would be designed to maintain as much of the larger downed material as possible and practicable, given other resource objectives such as fire hazard reduction and reforestation, and trees retained after harvest would provide recruitment of future downed wood.

RIPARIAN AND WETLAND WILDLIFE HABITAT

Introduction

Riparian habitats occur along lakes, rivers, streams, springs, and seeps where the vegetation and microclimate are influenced by year-round or seasonal water and associated high water tables. Most plant and animal species in these areas are more productive and diverse than on nearby uplands, making these areas very important to many wildlife species.

Timber harvest, insect epidemics, and fire can have great impacts on wildlife species using riparian habitats. These generally involve changes in the amount and types of vegetative cover and in the quantity and quality of water. When these habitats are disturbed, protection from weather extremes can be lost, as can hiding cover, which is especially important around such riparian features as elk wallows. Some changes in seral/structural stage distribution within riparian zones can benefit wildlife by promoting diversity of habitats over the long term. Other effects on riparian habitats can include changes in plant species composition, water temperature, shading, surface humidity, streamside erosion, water quality, and predator-prey interactions (Exhibit Rr-2).

Many wildlife species visit riparian areas daily to drink, forage, bathe, and relieve thermal stress. Within the Flathead National Forest, 36 bird, four mammal, three reptile, and two amphibian species are recognized as dependent upon riparian marsh habitat; 23 bird, seven mammal, and four amphibian species are recognized as dependent upon forested riparian areas (LRMP, Planning record 219.12[g], 1980). These include threatened and sensitive species (bald eagle, harlequin duck, common loon, western toad, northern leopard frog), and some Neotropical migrants that are “Birds of Conservation Concern” (Exhibit Rn-1).

Deciduous riparian habitats cover less than one percent of the western United States, yet are the primary breeding grounds of over 60 percent of the passerine bird species (Tewksbury, et al., 1998). Snags located near water have a high degree of use for nesting by species like wood ducks, goldeneyes, and tree swallows. Many species depend on riparian areas as travel corridors, and continuous forested cover within the zone can be critical for use of an area by a species such as the fisher. Other wildlife depend on water quality factors, such as the harlequin duck and common loon, which must have clear, clean water for their aquatic food sources.

Effects on wildlife using riparian habitats tie to Issue #2: “Forested Wildlife Habitat.” For more information about effects analysis methods, conclusions, and cumulative effects, see the “Hydrology,” “Aquatic Species,” and “Vegetation” sections of this chapter.

Information Sources

Effects specific to riparian wildlife habitat were evaluated by overlaying GIS-generated maps of riparian landtypes with proposed activities. See also the “Aquatic Species” and “Hydrology” sections of this chapter. Wildlife population diversity concerns at the Flathead National Forest and larger scales are assessed in Exhibit Rg-1.

Analysis Area

The analysis area for riparian and wetland wildlife habitat is the Valley Face Fuels Reduction Project Area (Figure 2-1, above). This is the same area used for old growth and dead wood habitats. It is large enough to include the home range of numerous wildlife species using riparian habitats and is representative of effects of fires, natural tree mortality, timber harvest, firewood cutting, and other factors across the landscape. It is sufficiently large to evaluate the ability of the habitat to support populations of wildlife and plant species using riparian habitats, but small enough to not obscure effects of the alternatives. All of the actions proposed in the alternatives are contained within this area. For this project, the analysis of effects on riparian and wetland habitat spans as far as 100 years, at which time areas regenerated by this project are likely to again provide forested cover in riparian habitat corridors.

The vegetative condition and wildlife use within a zone in and around riparian features is discussed in this section. Physical conditions of the streams, wet meadows, ponds, seeps, and springs are further described in the “Hydrology” and “Aquatic Species” portions of this chapter. See Exhibit Rr-3 for a map of potential habitat for riparian wildlife species. A larger-scale assessment was also conducted to address wildlife population diversity concerns (Exhibit Rg-1).

Affected Environment

Riparian wildlife habitats in the Valley Face Creek area appear to be functioning well, with numerous and well-distributed ponds, seeps, and streams providing a diversity of habitats (Exhibit Rr-3). There are nearly 1140 acres of Riparian Habitat Conservation Areas (RHCAs), as defined by Riparian Landtypes (Flathead National Forest 1995a) and buffering from streams. Open water areas total about 170 acres including Bootjack Lake. The largest marshy areas are in Mountain Meadows and upper Beaver Creek drainage. About 680 acres of these are willow and sedge communities with fine silty soils. Another 635 acres are also relatively flat, but dominated by Engelmann spruce, subalpine fir, or black cottonwood. About 143 acres are associated with seeps, springs, or wet depressions. The others vary from 5 to 39 percent slopes and are nearly all dominated by subalpine fir.

Forested riparian cover is nearly continuous across much of the analysis area. Riparian wildlife habitat extends beyond riparian landtypes, to a distance that varies by species (Semlitsch 1998). Nearly 83 percent of the Valley Face area is within one-quarter mile of a stream, pond, or other riparian feature, a zone that is generally regarded as “key use” habitat for white-tailed deer (Exhibit Rr-1). For more information, see the “Hydrology” and “Aquatic Species” sections of this chapter.

Wildlife species reported to be using riparian habitats in the analysis area include gray wolf, mountain lion, river otter, moose, white-tailed deer, mule deer, elk, black bear, beaver, coyote, muskrat, pine squirrel, bald eagle, osprey, red-tailed hawk, common loon, Canada goose, Barrow's goldeneye, common goldeneye, bufflehead, ring-necked duck, mallard, common raven, ruffed grouse, northern flicker, American robin, tree swallow, golden-crowned kinglet, black-capped chickadee, long-toed salamander, boreal (western) toad, western chorus frog, pacific tree frog, and spotted frog.

For more information about riparian wildlife habitat conditions across the Flathead National Forest, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA Forest Service 1999a) and Exhibit Rg-1.

Environmental Consequences

Direct and Indirect Effects of Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. This would leave riparian habitat across the analysis area to continue with relatively natural processes, as described for old growth habitat and for water resources. Riparian areas with heavy tree mortality and blowdown would provide structural diversity, downfall trees, and a few long-standing snags of species and sizes valuable to wildlife. Downed logs, shading from snags and lack of seed sources may delay the recovery of new trees in stands with high levels of dead trees for an additional 10 to 20 years (See the "Vegetation" section of this chapter). The probability of fire would increase in such areas as dead trees fall and new understory growth contributes fine fuels. For more information about the effects of no action on riparian areas, see the “Hydrology” and “Aquatic Species” sections of this chapter.

Direct and Indirect Effects of Alternatives B and C

No vegetation manipulation would occur within Riparian Habitat Conservation Areas or riparian landtypes (Exhibits F-1 and Rr-3). In both Alternative B and C, Temporary Road 9 would require installation of a culvert to cross a creek approximately 200 feet downstream of the wetland that has the highest known diversity of amphibian species in the Valley Face area (spotted frogs, chorus frogs, tree frogs, and long-toed salamanders)(Exhibit Rr-4). This culvert would also be upstream about 2000 feet of another wetland known to support common goldeneye ducklings year after year. Neither of these wetland areas matches habitat needs for leopard frogs or northern bog lemmings (Exhibits Rs-4 and Rs-12). For information about sedimentation and other potential effects and benefits of harvest, fuel reduction, road construction, and road repair, see the “Hydrology” and “Aquatic Species” sections of this chapter.

All snags and downed logs would be left in riparian and wetland areas, maintaining important habitat components. Most large wind-firm live trees and snags would remain standing in all of the harvest and burning units. Removal of smaller-diameter wood, tree planting, and precommercial thinning would accelerate regeneration of green canopy cover. Unit 31 in Alternatives B and C would sever a connection that is close to the top end of a relatively low-elevation draw and not wet enough to be an RHCA. Connectivity along riparian habitat corridors would be narrowed to less than 300 feet wide in up to 18 places (Exhibit Rg-7).

In both action alternatives, shrubs would be planted in and near some harvest units near riparian areas if funding is available. This would enhance big game forage, feeding and nesting sites for songbirds, and hiding cover values for a wide variety of wildlife species. The other actions in these alternatives, including watershed and fisheries enhancement measures, are not expected to have negative impacts on riparian habitat areas or the species using them. See the “Hydrology,” “Aquatic Species,” “Old Growth Habitat and Old Growth Associated Wildlife Species,” and “Snags and Downed Woody Material Wildlife Habitat” sections of this chapter for more information.

Cumulative Effects

Many cumulative effects relevant to riparian wildlife habitat were discussed above for old growth and snag/downed wood habitats, including past fires, timber harvest, road construction, and access for firewood cutting and furbearer trapping. In addition, fish stocking is some of the creeks and lakes has altered species composition. Trapping of beavers and destruction of beaver dams has reduced the size of wetlands and other flooded areas. Past, ongoing, and planned timber harvest and further cumulative effects relevant to riparian habitats are discussed in sections on "Hydrology," "Aquatic Species," "Old Growth Habitat and Old Growth Associated Wildlife Species," and "Snags and Downed Woody Material Wildlife Habitat" in this chapter, and in Exhibit Rg-9. The affected environment described above has been shaped by past and present cumulative effects to these habitats. These effects would be cumulative to those discussed above for each alternative.

Regulatory Framework and Consistency

The Forest Service is required by the National Forest Management Act (NFMA) 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 USC 1604(g)(3)(B). To implement NFMA, the Forest Service's regulations, implemented on January 5, 2005, state that "the overall goal of the ecological element of sustainability is to provide a framework to contribute to sustaining native ecological systems buy providing ecological conditions to support diversity of native plant and animal species in the plan area. A goal under the Flathead's Long-Range Management Plan (LRMP), as directed in Amendment 21 (USDA Forest Service 1999a), is to "ensure that Forest Service actions do not contribute to the loss of viability of native species." All alternatives are consistent with these biodiversity requirements for wildlife species using riparian habitats (Exhibit Rg-1).

For information about and consistency with INFISH requirements, Montana's House Bill 731 (the Streamside Management Zone act), and other regulatory requirements specific to aquatic systems, see the "Hydrology" and "Aquatic Species" sections of this chapter.

COMMONLY HUNTED BIG GAME

Introduction

The three most common ungulates (white-tailed deer, mule deer, and elk) are used as Management Indicator Species for the commonly hunted big game species (LRMP II-21). At the forest level, meeting these species' habitat needs indicates that the needs of species such as black bear, moose, and mountain lion will also be met. Their basic habitat needs of cover, forage, and security are similar and may be altered by human actions in similar ways (Joslin and Youmans 1999, Witmer et al. 1998). During the formulation of the Flathead Forest Plan, it was assumed that standards designed for elk would also be adequate for mule deer because they both tend to use similar habitats. White-tailed deer are more closely associated with riparian features, and since nearly 83 percent of the Valley face area is within one-quarter mile of water (Exhibit Rr-1), the habitat analysis for this project also applies to white-tailed deer.

Timber harvest, major insect epidemics, and fire typically remove or alter hiding and thermal cover used by large mammals. In many situations, these disturbances create temporary foraging areas with associated increases in diversity and edge, which typically allows for proliferation of big game species (Dusek, pers. comm. 2005, Exhibit Rb-12). In northwest Montana, the extent that large animals will make use of a natural or man-made opening depends on an animal's experience, seasonal forage quality, proximity of security cover, presence of roads, and intensity of human use. Openings can decrease ungulates' ability to travel within their home ranges, as well as making them more vulnerable to predation and hunting. When sufficient downed woody material, residual understory trees, and wind-firm live trees and snags are available, timber harvest can maintain adequate hiding cover values.

Research findings and management guidelines for these species are generally consistent. A study of white-tailed deer summer habitat use for the Tally Lake Ranger District (Morgan 1993; Exhibit Rb-5) indicated that minimal impact would result from timber harvest on northern aspects, ridge tops, sites greater than 2450 feet from riparian zones, and in elevations below 3477 feet and above 4938 feet. Morgan also stressed the value of immature and pole-sized timbered stands. Research indicates that white-tailed deer prefer to have hiding cover within approximately 165 feet, and elk approximately 500 feet (Thomas and Toweill 1982). Timber management to optimize deer habitats in western Montana "should emphasize perpetuation or enhancement of habitat diversity" (Mackie, et al. 1998). Spring, summer and fall months are important periods when ungulates give birth to and nurse calves and fawns, grow antlers, build body condition, accumulate fat for enduring the winter months, and endure the stress of the big game hunting season. Mature Douglas-fir stands provide critical fawn-rearing habitats (Pac, et al. 1991) and should be associated with high-quality foraging areas and security.

Hunters can displace elk from preferred habitats to larger, less diverse patches of cover (Lyon and Canfield 1991). During hunting season, elk appear to require contiguous, nonlinear hiding cover patches over 250 acres in size and more than one-half mile from open roads (Hillis et al., 1991) in order for the elk population to provide continued hunter opportunity and a diverse bull age structure (Youmans 1991).

The quality and quantity of wintering habitat influences ungulate population size and health. These habitats are often south-facing areas with large trees to intercept snow, along with breaks in the tree canopy that allow growth of ground-level forage (Thomas et al. 1979). Harsh winter

weather and deep snow can cause intense crowding onto small portions of winter range. The importance of preserving these "critical" areas is well known, yet they typically provide little available forage, and thus non-critical winter range may also be very important.

Effects on Commonly Hunted Big Game tie directly to one issue discussed in Chapter 2: Issue #2, "Forested Wildlife Habitat." The issue indicator is the number of acres of loss of important winter thermal cover. The No Action Alternative could also affect their habitat across the analysis area through changes in the probability for intense wildland fire.

Information Sources

The effects on elk, mule deer, and white-tailed deer are discussed in relationship to acres and the spatial arrangement of hiding and thermal cover lost, as well as ease of human access. The analysis was done through GIS analysis of the different types of vegetation management proposed (Exhibits P-4, Rb-8, and Rb-9). Hunting season security values were derived through GIS procedures that detected areas of continuous cover further than one-half mile from open roads (Exhibit Rb-1). Road information can be found in Exhibit Rg-8. Effects on connectivity cover are in Exhibit Rg-7.

Analysis Area

The analysis area for commonly hunted big game is the Valley Face Fuels Reduction Project area (Figure 2-1, above). It is large enough to include the home range of big game species and to represent the effects of fires, timber harvest, and motorized access across the landscape. It is sufficiently large to evaluate the ability of the habitat to support populations of big game and the species under their MIS "umbrella," but small enough to not obscure the effects of the alternatives. For this project, the analysis of effects on old growth habitat spans as far as 100 years, at which time areas regenerated by this project are likely to regain thermal cover value.

Hiding cover, summer thermal cover, available water, security areas, and foraging areas are distributed across these drainages, with much of the winter range occurring on warmer, drier slopes. Since nearly 83 percent of the area is within one-quarter mile of riparian features (Exhibit Rr-1), conditions across the whole area are representative of habitats within such "key use" areas for white-tailed deer. It is sufficiently large to evaluate the ability of the habitat to support populations of these species, but small enough to not obscure effects of the alternatives. All of the actions proposed in the alternatives are contained within this area. Elk Habitat Analysis Units (HAU) were determined for the Flathead National Forest by wildlife biologists from the Forest and Montana Department of Fish, Wildlife, and Parks. Four HAUs were used in this analysis. An additional assessment was also conducted to address population diversity concerns at the Forest scale (Exhibit Rg-1).

Affected Environment

The area provides year-round habitat for populations of elk, mule deer, white-tailed deer, and all of the species represented in LRMP direction by Commonly Hunted Management Indicator Species (Exhibit Rb-10). Throughout the analysis area, white-tailed deer use of the analysis area is extensive due to the amount of important winter range habitat, the intact riparian cover, the existing stands of conifer trees, and the abundance of available forage in past timber harvest units and in meadows. This is despite the fact that many recently regenerated timber stands are large in

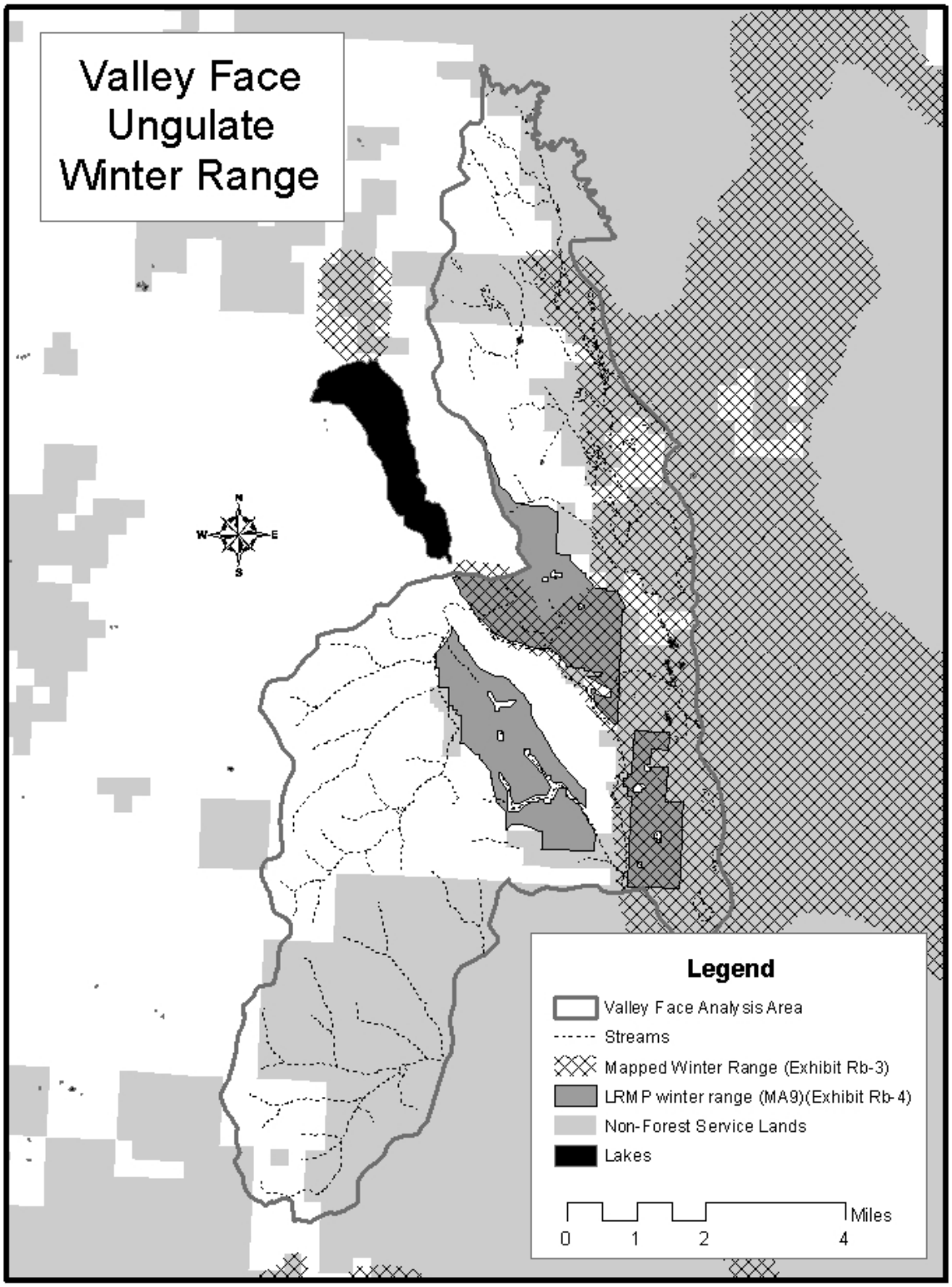
the key use zones for white-tailed deer (Exhibit Rr-1). Elk and mule deer that use the analysis area are relatively common and their populations are thought to be stable. The steeper, rocky terrain of high-quality mule deer habitat is uncommon in the area, although mule deer are often observed in these drainages. Moose use of the area is also relatively extensive; many riparian sites in the analysis area support vegetative types preferred by moose (Exhibit Rr-3). Mountain lion and black bear are also frequently reported.

Ungulate winter range occurs along the eastern edge and center of the analysis area (Exhibits Rb-3 and Rb-4). Most of this is used by white-tailed deer, but portions also have winter use by elk and mule deer. The bulk of the "Bowser/Tally" white-tailed deer winter range is in the Valley Face area (Figure 3-7; Exhibit Rb-3). This winter range has been called the most significant in Montana and winter deer densities there can be very high. About a third of the deer that use the highly productive Hunting District 102 winter in this small area, which is only about two percent of the size of the hunting district (Dusek, pers. comm. 2005; Exhibit Rb-12). On Forest Service land, the "Bowser/Tally" area roughly matches the 900-acre Pete Ridge MA 9 (white-tailed deer) winter range management area as mapped for the Forest Plan (USDA Forest Service 1985). Other MA 9 winter range in the Valley Face area occurs on Pilot Knob (2,000 acres) and east of Mountain Meadows (1,800 acres), but these areas seem to be much less used in winter than the Pete Ridge area (Dusek, pers. comm. 2005; Exhibit Rb-12). From 50 to 68 percent of these three areas provide thermal cover; forage habitat appears to be very limited in the Pete Ridge area and plentiful in the Mountain Meadows Winter Range (Exhibit Rb-4).

Available hiding and thermal cover is plentiful and evenly distributed across the analysis area (Exhibit Rb-8). About 78 percent of the analysis area currently functions as hiding cover and/or thermal cover; only natural openings and recently regenerated areas do not. About 12,500 acres are sapling or shrub hiding cover (Exhibit Rb-8). The fire history of the analysis area indicates that large patches of cover were usually available, particularly along divides and benches. Based on extrapolations from the fire history analysis of the adjacent Good Creek area, hiding cover may have typically varied from 58 to nearly 100 percent. Local use by elk probably declined immediately after large stand-replacing fires, then rebounded as forage increased dramatically, unless tree downfall became too thick for much plant growth or foraging.

Past timber harvests have narrowed or severed forested connections (Exhibits Q-17, Rb-9, and Rg-7). Several forested linkages are less than 650 feet wide; some are less than 300 feet wide. Seven large patches of early-seral/structural stage habitat that have not yet regained hiding cover value for big game are scattered across the analysis area, requiring travels of up to two miles to cross in some directions. See the "Old Growth Habitat and Old Growth Associated Wildlife Species" section of this chapter for more information about forested connectivity.

Figure 3-7. Flathead LRMP Winter Range Management Areas and MDFWP Mapped Winter Range.



In the Salish Range, the primary foods for white-tailed deer from spring through fall are forbs, grasses, and shrubs. Most (98%) of the spring, summer, and fall foraging habitat (mostly openings) has hiding cover nearby (Exhibit Rb-9). About 633 acres appear to support elk foods but are over 600 feet from hiding cover and are thus less likely to be used by elk.

The maintenance of security during the hunting season is of particular concern for elk (Table 3-59). Big game harvest data indicate a declining representation of branch-antlered bulls, an indication of excess vulnerability. The analysis area contains all or parts of four elk hunting season security areas (Exhibit Rb-1), which are defined as at least 250 acres of cover, all farther than one-half mile from an open road. The security areas are well distributed across the analysis area. Some of the security areas are less effective because they contain roads open to motorized use in the summer, closing just before hunting season. Hillis et al. (1991), whose recommendations are to be applicable to the Flathead National Forest, recommended that at least 30 percent of an elk herd's area should provide hunting season security area for elk.

Table 3-59. Existing Hunting Season Elk Security Area, by Elk Habitat Analysis Unit (Exhibit Rb-1).

Elk Habitat Analysis Unit (HAU)	Acres in HAU	Approximate Hunting Season Security Area Acres (and % of HAU)	Comment
Lost Creek	13,677	~700 acres (5%)	East of Mountain Meadows.
Rhodes Draw	14,805	~4,500 acres (30%)	Assumes no motorized use in upper reaches of Rhodes Draw. Most of the HAU is private land.
Round Meadow	9,062	~2,000 acres (22%)	~2,000 acres of elk security in this HAU are in the adjacent Logan analysis area.
Twin Lakes Kuhn Wildlife	16,018	~1,500 acres (9%)	Pete Ridge with some of the state land to the east. About half of the HAU is private land.

The road mileages and densities on lands administered by the Forest Service in the analysis area are as shown in Table 3-60. Road restrictions in the analysis area are generally effective (Exhibit Rg-6). See the "Snags and Downed Woody Material Wildlife Habitat" section of this chapter and Exhibit Rg-8 for road miles and densities on other ownerships.

Table 3-60. Road densities across Forest Service Lands in the analysis area based on GIS lengths (Exhibit Rg-8).

Travel Management Category	Road Miles	Road Density
Open in summer	65 miles	2.1 miles per square mile
Open fall through spring (includes hunting season)	54 miles	1.7 miles per square mile

Moist sites are also an important characteristic of elk habitat. Numerous seeps and springs are well distributed across the analysis area meeting the definition of "elk moist sites" as defined by the LRMP and Lyon, et al. (1985). There are about 144 acres that appear to match most elements of these special habitats (Exhibits Rr-3 and Rb-7), although only about half of them consist of more remote, upper-drainage perched sites, which provide the best habitat. Such sites apparently include some elk wallows.

Environmental Consequences

Direct and Indirect Effects-Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. This would allow ungulate habitat across the analysis area to continue with relatively natural processes. If no further timber harvest, prescribed burning, or wildland fire occurs over the next 15 years, about 95 percent of the area would function as hiding cover and the availability of high-quality grazing and browse forage would decline. The probability of intense fire would continue to increase in some areas as dead trees fall and new understory growth contributes fine fuels. Such a fire would result in the loss of extensive areas of cover. Indirectly, this alternative could decrease thermal cover in important winter range, due to increased beetle activity and risk of stand-replacing wildfire, as described in the "Vegetation" and "Fire and Fuels" sections of this chapter. Thermal cover changes would have the greatest effect in the "Bowser/Tally" Winter Range on and beyond the eastern edge of the analysis area (Exhibit Rb-3).

Although it would be limited by the locations of open roads and natural permanent openings, the available hunting security area is expected to increase over the next 15 years, as most of the harvested and/or burned stands would have regrown hiding cover (Exhibit Rb-1). Even so, the area may not meet the bull harvest objectives in the Statewide Elk Plan (MDFWP 2004, Exhibit Rb-11). Across all ownerships, in summer at least 99 miles across the analysis area would continue to be open to public or private motorized use for an Open Road Density (ORD) of at least 1.8 miles per square mile. At least 87 miles are open during hunting season and spring, with an ORD of 1.6 (Exhibit Rg-8).

Direct and Indirect Effects Alternatives B and C

Compared to Alternative C, Alternative B would temporarily negate and reduce more cover used by ungulates, including thermal cover on winter range and hiding cover along roads, and would affect more elk moist sites. Conversely, Alternative B's treatment in Unit 500 would be more beneficial to wintering white-tailed deer than in Alternative C. Overall, there could be an effect on ungulate species' movements or habitat use patterns, but no appreciable change would be expected in ungulate population numbers or their availability to hunters or predators, or as carrion.

Tables 3-61 and 3-62 display the amounts of hiding and thermal cover that would be removed or altered by commercial harvest, fuel treatment, and pre-commercial thinning in Alternatives B and C. Slash levels would not impede ungulate movement. These alternatives generally follow Morgan's recommendations (Exhibit Rb-5). An uncut buffer would be left around all riparian areas. Both action alternatives propose to retain most of the large wind-firm trees and snags in all units and some of the smaller trees, which would help provide cover over time. As big game animals are common in the area year-round, some disturbance and displacement is likely to occur.

Table 3-61. Vegetation Treatment that would Temporarily Negate Cover Values for Large Mammals (In these areas, retention levels would be Light or Moderate Dispersed Retention (LDR or MDR) or Heavy Aggregated Retention (HAR); Exhibit Rb-8).

Alt.	Acres of Cover Removed		% Cover Remaining Across Analysis Area		
	Hiding Cover	Hiding/Thermal Cover	Hiding Cover	Hiding/Thermal Cover	Total Cover
A	0 ac	0 ac	35.4%	42.4%	77.8%
B	1,393 ac	2,156 ac	31.5%	36.3%	67.8%
C	1,335 ac	1,555 ac	31.6%	38.0%	69.6%

Table 3-62. Vegetation Treatment that reduce the Effectiveness of Cover Values for Large Mammals (In these areas, retention levels would be Heavy Dispersed Retention (HDR); Exhibit Rb-8).

Alternative	Acres of Cover Altered		% Cover Altered Across Analysis Area	
	Hiding Cover	Hiding/Thermal Cover	Hiding Cover	Hiding/Thermal Cover
A	0 ac	0 ac	0.0%	0.0%
B	23 ac	217 ac	0.2%	1.5%
C	52 ac	292 ac	0.4%	2.0%

These three alternatives would have positive and negative effects on the availability of forage, although this is not limited in the Valley Face area due to past timber harvest and land conversion. Most of the regeneration treatments would be expected to stimulate grass and shrub species. Supplemental shrub planting in or near harvest units may be implemented if funding is available. This would enhance big game forage, feeding and nesting sites for songbirds, and hiding cover values for a wide variety of wildlife species. However, numerous regeneration units would be located adjacent to recently harvested areas that have not yet regrown hiding cover (Exhibit Rb-9), creating new areas of forage unavailable to elk.

Both alternatives would apply patch thinning to a total of 75 acres within Unit 500. This is in the Forest Service part of Pete Ridge "Bowser/Tally" white-tailed deer winter range (Exhibits Rb-3 and Rb-4). This would create one- to 10-acre openings in dense stands of mostly pole-sized trees, leaving the larger trees. No more than 40 acres of this would occur in the denser portion of this unit (Stand 810-04-002) that now functions as thermal cover. In the Salish Range, primary winter foods for white-tailed deer are, by far, Oregon grape, Douglas-fir needles and twigs, and apparently also tree lichens that fall to the ground (Dusek, pers. comm. 2005; Exhibit Rb-12). The proposed treatment area (Exhibit Rb-13) seems to currently provide little other than lichens for food, as the saplings and shrubs that try to grow are chewed to nubbins by deer. In Alternative B, the treatment would be done via a commercial, tractor-based removal with excavator piling to treat the slash, resulting in 5 to 40 percent tree canopy densities. Due to soils concerns, in Alternative C this would be done non-mechanically, with hand-piling of slash, leaving canopy densities averaging 60 percent. Except in the areas of dense saplings, the commercial treatment is expected to provide a greater benefit to white-tailed deer, due to greater growth of shrubs in the short-term and the development of future thermal cover trees in the long term.

Across LRMP Management Area 9, from 851 to 1,004 acres of vegetation management would occur (Exhibit Rb-4). Although all of the treatment areas now function as hiding cover, all or part of several units (totaling 597 to 750 acres) would occur in areas that also qualify as winter thermal cover. In Alternative B, this would be Units 17, 18, 21, 21A, 22A, 23, 26, 39, 40, 41, 400, 401, 421, 423, and 500. The list is the same for Alternative C, except that Unit 21A was dropped, and Units 21 and 23 were changed to understory fuel reduction only and became Units 421 and 423. Temporary Roads 6 and 10 (Alternative B only) would remove additional cover. After

treatment, these winter range areas would all have 42 to 58 percent thermal cover and at least 11 percent foraging habitat (Table 3-63).

Table 3-63. Thermal Cover in Forest Plan Management Area 9 Winter Range Areas. Exhibit Rb-4).

Management Area 9 Winter Range	% Thermal Cover		
	Existing	Alternative B	Alternative C
Mountain Meadow	50.1%	40.0%	42.4%
Pete Ridge	54.6%	50.0%	50.0%
Pilot Knob	68.6%	56.0%	58.5%

About a quarter of the proposed vegetation management would occur on the area mapped as the "Bowser/Tally" winter range, which was mapped during interagency efforts in February 1993. Thousands of relocations of radio-collared deer in this area are being analyzed by Montana Fish, Wildlife, and Parks (Exhibit Rb-3). About 1,000 acres of proposed treatments overlap with areas predicted to have relatively high white-tailed deer winter use based on these known winter deer locations (Exhibit Rb-3). This involves Units 13, 19, 19A, 20, 23 (which is 423 in Alternative C), 25, 26, 27, 29, 30, 31, 31A, 34, 35, 37, 37A, 41, 307, 405, 409, and 500 and Temporary Roads 7, 11, and 12. During the development of Alternative C, all of these units were considered for modification to address the concern that regeneration harvest and some of the commercial thins would temporarily negate winter thermal cover value. Consequently, the area where thermal cover would be negated by these units was reduced in Alternative C. The acreage of understory fuel reduction treatments was increased in some of these areas, in which thermal cover is often retained and winter range habitat values would be more likely to be extended over time through reduced risk of stand-replacement fire and insect epidemic. Timber harvest, fuel reduction activities, and temporary road construction and obliteration would not occur in important winter range between December 1 and April 15 for big game winter range security.

Montana FWP predicted white-tailed deer winter use in some parts of the analysis area to be 10 times as great as in the remainder of the area (Exhibit Rb-3). In Alternative B, about 420 acres of shelterwood harvest and moderate-retention commercial thinning in Units 19, 19A, 25, 27, 29, 30, and 31A would likely have the greatest effect on wintering deer since they would temporarily negate thermal cover values in these high-use areas. In Alternative C, the extent of this effect would be reduced to 308 acres, as Unit 19 would be changed to a heavier retention of large trees and the acreage of Unit 30 would be reduced.

Major forested connections would be severed or substantially narrowed in several places (Exhibits Rb-8 and Rg-7). This would vary from 27 (Alternative C) to 33 connections (Alternative B), along with numerous additional places where connectivity would be severed, but a reasonable alternative forested route would remain. In some areas, removing dead trees may improve travel conditions for ungulates, as high densities of trees would otherwise continue to fall to the ground and might slow travel.

Several commercial harvest units would remove cover, leading to a net decrease of security area in Alternatives B and C (Exhibit Rb-1). Elk security area may not be sufficient to meet the Statewide Elk Plan objectives for bull harvest (MDFWP 2004, Exhibit Rb-11). All public road closures would remain in effect during operations.

Harvest and fuel reduction (Units 24 and 412 in Alternatives B and C; Units 200 and 202 in Alternative B only) would occur adjacent to or would slightly overlap four areas that appear to be "elk moist sites" that are either known or suspected to function as wallows (Exhibit Rb-7). Part of

Temporary Road 5 would be constructed next to one of these sites. These proposed activities can displace elk from these sites, as well as remove screening cover.

Visual buffers for ungulate cover and security are an issue along some of the more heavily used roads. Roads 542 and 913 would abut portions of Unit 21 and 23. In Alternative C, these were changed to Units 421 and 423; both understory fuel treatment, partly for this concern.

Timber harvest would occur in some units that get relatively heavy elk use, including during wintertime. These are Units 35, 37, 37A, and 38. In Alterative C, the northeast edge of Unit 35 was renamed Unit 35B and changed to a commercial thin. Elk may be displaced from these areas during operations and may use them less until hiding cover is reestablished.

Cumulative Effects

Past fires, timber harvest, and salvage harvest on national forest, corporate, and private lands across the analysis area have resulted in a complex matrix of forested interior habitat, edge, ecotones, and openings in various stages of succession. Past timber harvest and fires converted a considerable amount of the hiding and thermal cover into seedling stands. Most of the stands regenerated by timber harvest have progressed to hiding cover, although many of these were pre-commercially thinned, reducing the quality of cover for approximately five or 10 years. Another 201 acres of such thinning is ongoing on NFS lands. Timber harvest and road construction in the adjacent Logan Creek drainage is expected to continue under the 2004 Logan Creek Ecosystem Restoration Project. Fire suppression has largely been beneficial to ungulates in this area, as it maintains dense cover in a network of foraging habitat existing in natural openings or created by timber harvest.

Numerous recreational opportunities across the analysis area, including motorized trail riding and even hiking, can cause displacement of big game species. Big game hunting takes a proportion of the ungulate population every year (Exhibit Rb-10), as do road collisions, and predation. Some snowmobiling and cross-country skiing occurs in areas heavily used by deer in winter, but the most important portions (about 1,500 acres) are closed to motorized over-snow travel. Tree harvest has removed hiding and screening cover along open and closed roads. Open road densities are as described above for the existing situation and in Exhibit Rg-8. Human population and access are dramatically increased over historical conditions. Increasing subdivision of private land has permanently altered habitats and displaced deer and elk from prime areas. Dogs that run free kill many deer directly or by wasting their energy reserves, particularly in winter (Sime 1999). On NFS land, ease of human access has stabilized over the last decade or so, as new roads built for logging are generally reclaimed or closed soon after use.

White-tailed deer are more adaptable to large landscape fragmentation and roading than are elk, and they probably have not been impacted as directly from past human activities. Overall, past harvest and fires have improved available food sources for white-tailed deer. Across the analysis area, as well as across the bulk of the Tally Lake Ranger District, white-tailed deer numbers appear to be climbing, despite high hunting permit numbers and relatively easy motorized access.

A reasonably foreseeable action would be measures to control tansy ragwort and other weed species, which would have positive effects on ungulates by improving forage availability. Livestock grazing on NFS lands has been at low intensity, but has altered forage availability in the past. On private land, grazing and fencing for wild and domestic animals has reduced forage and altered movement patterns. Predator control in the early part of the last century reduced or

negated the selective pressures provided by predators. Beaver control reduced the amount of wetland habitat that white-tailed deer and elk often prefer.

These species' affected environment described above has been shaped by past and present cumulative effects. Past, ongoing, and planned timber harvest and further cumulative effects relevant to big game species are discussed in sections on "Riparian and Wetland Wildlife Habitats," "Old Growth Habitat and Old Growth Associated Wildlife Species," and "Snags and Downed Woody Material Wildlife Habitat" in this chapter, and in Exhibit Rg-9. These effects would be cumulative to those discussed above for each alternative.

Regulatory Framework and Consistency

Flathead National Forest LRMP Amendment 21 establishes a Forest-wide goal to "provide appropriate habitat and access to maintain desired hunting, fishing, and viewing opportunities, in coordination with the Montana Department of Fish, Wildlife, and Parks." The Flathead LRMP has identified white-tailed deer, elk, and mule deer as Commonly Hunted Big Game Management Indicator Species (MIS) that use general forest habitat. Conditions favorable to these species would generally also benefit other big game species, such as moose, black bear, and mountain lion, which are considered under the umbrella of Forest-level MIS evaluation.

The MDFWP includes habitat goal recommendations in their big game management plans, specifically the Statewide Elk Plan (MDFWP 2004, Exhibit Rb-11). LRMP Amendment 21 has an objective to provide sufficient habitat to contribute towards meeting the objectives of MDFWP's management plans. The State elk plan calls for an increase in elk population in the Salish Elk Management Unit, which includes the Valley Face area. It has been recommended that for a stable or increasing population and for opportunities to maintain or harvest large bull elk, at least 30 percent of an elk herd unit should be in hunting season security area (USDA Forest Service 1993; Hillis, et al. 1991). The Habitat Management Strategies for this area emphasize the need for consideration of elk security and hunter access in planning activities (MDFWP 2004, Exhibit Rb-11). The LRMP Amendment 21 objective to provide sufficient habitat to contribute toward meeting the objectives of MDFWP's management plans is met by all action alternatives.

Moist sites are also identified as an important characteristic of elk habitat and management considerations have been outlined in the LRMP (pages II-22 and 23). These apply to all management areas, in accordance with the following selected recommendations from the Coordinating Elk and Timber Management, Final Report of the Cooperative Elk-Logging Study, 1970-1985, January 1985 (Forest Plan Appendix DD):

a. "Moist sites," composed of specific habitat types, topographic situations, and elevations, would be managed according to the habitat type moist site recommendations.

b. Areas with "Moist Sites" would be managed during the elk use period, with open road densities that average one mile or less per square mile.

c. "Security Areas," composed of areas associated with the moist sites that provide security and other necessary components of elk summer habitat, would be managed according to the security area recommendations.

In both "Moist Sites" and "Security Areas," slash in managed stands would be reduced to levels that do not impede elk movement.

Standards for moist sites would be met by all alternatives, despite the effects of nearby harvest and road construction.

The main Forest Plan goal for MA 9 winter range is to provide the size, age, diversity, and distribution of cover and forage suitable for elk and mule deer winter habitat. MA 9 allows for timber harvesting to improve or maintain the relationships of cover to forage; elk summer range habitat management direction relates to "moist site" and security areas protection. Forest Plan standards for the gray wolf include a restriction of logging in "important winter ranges" between December 1 and April 15 each year. The Forest Plan considers Management Area 9 (MA9) ungulate winter range to be acceptable when 50 percent of the area contains winter thermal cover (a stand of evergreen trees having a minimum height of 60 feet and a minimum crown canopy of 70 percent). These standards are met in all alternatives, except in one regard. In Alternatives B and C, Unit 21 would bring the percent of hiding cover below the 50 percent minimum in the Mountain Meadow MA 9 winter range area. To do this would require a project-specific Forest Plan amendment. See also Exhibits Rb-3, Rb-4, and Rb-6. A long-range activity schedule for MA 9 lands in the project area is in preparation (Exhibit Rb-6)

All alternatives are consistent with biodiversity requirements for wildlife species. The analysis for LRMP Amendment 21 assessed the forest-level viability of elk and mule deer (USDA Forest Service 1999a). Regardless of scale, species viability is not a concern for elk or deer. These species are habitat generalists, and all indications are that healthy populations are well distributed across the western states, Montana, and the Flathead National Forest. In Montana and on the Flathead National Forest, this is evidenced by liberal hunting seasons administered by the Montana Department of Fish, Wildlife, and Parks. In northwest Montana the rapid recovery of the gray wolf is also evidence of substantial ungulate populations, which comprise their primary food source. See Exhibit Rg-1 for more information.

SENSITIVE, THREATENED, AND ENDANGERED WILDLIFE SPECIES

Introduction

Tables 3-48 and 3-49 in the Wildlife Introduction Section summarized the current conditions for sensitive, threatened, and endangered wildlife species.

Three wildlife species that occur on the Flathead National Forest are federally listed as threatened: grizzly bear, bald eagle, and Canada lynx. The gray wolf is listed as endangered. The United States Fish and Wildlife Service (USFWS) concurs with the list of species that "may occur" in the analysis area (Exhibit Rt-1). All four threatened or endangered species will be covered in this chapter, with the subsection for grizzly bear combined with that for the gray wolf. A Biological Assessment for Threatened and Endangered Wildlife Species was prepared (Exhibit Rt-11). If the final project design changes so as to have effects on threatened or endangered species other than those described in the Biological Assessment, or if new information becomes available that reveals impacts not considered in the Biological Assessment, a revision or amendment would be required. Informal consultation with USFWS consisted of phone and e-mail conversations with Katrina Dixon in 2006 (Exhibit Rt-2). Consultation was completed with a Biological Opinion issued by the USFWS (Exhibit Rt-21).

Sensitive wildlife species (Tables 3-48 and 3-49, above) are those that show evidence of a current or predicted downward trend in population numbers or habitat suitability that would substantially reduce species distribution. The Regional Forester identified 12 sensitive wildlife species on the Flathead National Forest (Exhibit Rs-1). The boreal (western) toad is included in the "Aquatic Species" portion of this chapter. The peregrine falcon, harlequin duck, northern leopard frog, and northern bog lemming are sensitive wildlife species that will not be affected by this project and thus will not be discussed further (Table 3-48, above; Exhibits Rg-1, Rs-3, Rs-4, Rs-12, Rs-15, and Rs-23). The Biological Evaluation for Sensitive Wildlife Species has been incorporated into the text of this document, with a separate signature page in the project file (Exhibit Rs-3).

This section on Sensitive and Threatened Wildlife Species is divided into separate subsections for each species or group of species. Information about the Regulatory Framework and Regulatory Consistency for all of these species is at the end of the section.

Information Sources

Information sources used for the assessment of current conditions and the analysis of effects varied considerably by species. The description of these sources and analysis methods is provided in the "Introduction" section for each of the species detailed below.

Analysis Areas—Sensitive and Threatened Wildlife Species

The analysis area for direct and indirect effects on all sensitive and threatened wildlife species is the Valley Face Fuels Reduction Project area (Figure 2-1, above). It is large enough to include the home range of these species and is representative of effects of fires, natural tree mortality, timber harvest, firewood cutting, and other factors across the landscape. All habitat attributes used by these species are distributed across this area, within the bounds of natural physiographic variation. It is sufficiently large to evaluate the ability of the habitat to support populations of these species,

but small enough to not obscure effects of the alternatives. All of the actions proposed in the alternatives are contained within this area. A larger-scale assessment for each of these species was also conducted to address population diversity concerns (Exhibit Rg-1). As discussed below, two Canada Lynx Analysis Units were used in addition to the Valley Face Analysis Area, and a larger analysis area for grizzly bear included denning habitat in the Whitefish Range. The temporal span of the effects analysis for threatened, endangered, and sensitive wildlife varies by species, as described below.

Introduction—Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is federally listed as a threatened species on the Flathead National Forest. Timber harvest, underburning, and other vegetation manipulation can impact current and potential nesting habitat by removing nest trees and screening cover. Away from their nests, bald eagles are most likely to feel the effects of timber harvest and insect epidemics through indirect effects on their food sources, such as through changes in habitat quality for an aquatic prey species. Also, disturbance of eagles may increase and the availability of perch or roost trees or security near foraging sites may decline. Stand-replacing fire spreading to nest stands can eliminate potential nest trees and associated live vegetation and perches. Understory fires can create snags used for nesting or perching and can increase the chances that a forested stand would persist.

In Montana, bald eagles nest in stands containing very large trees with uneven canopy structure and in direct line of sight of a large river or lake generally less than one mile away (Montana Bald Eagle Working Group 1994). Bald eagles are opportunistic feeders. They prey on fish, waterfowl, and small mammals; steal food from other predators; and scavenge carrion. During the breeding season, important foraging habitat may be ten miles or further from their nest.

Effects on bald eagles tie most strongly to Issue #2: “Forested Wildlife Habitat” due to the regeneration of potential nesting habitat. This analysis evaluates whether some harvest operations, underburning, and temporary road construction could alter potential nesting habitat, disturb foraging bald eagles, and/or affect their aquatic prey base downstream. Effects were determined by overlaying a GIS layer of potential habitat with proposed unit and temporary road locations (Exhibits Rt-5 and Rt-6). Open road information can be found in Exhibit Rg-8. See also the section on “Riparian and Wetland Wildlife Habitat” in this chapter. For this project, the analysis of effects on bald eagles spans as far as 100 years, at which time areas of potential nesting habitat that would be regenerated by this project are likely to be used by bald eagles.

Affected Environment—Bald Eagle

The Valley Face area is located in the Pacific States Bald Eagle Recovery Area and in Management Zone 7 (Upper Columbia Basin), which includes all of Montana west of the Continental Divide. This zone is in the middle of the core population and produces more than half of the eaglets in the state (Exhibit Rg-1). In the 2005 nesting season, there were 149 active bald eagle nests in western Montana (Exhibit Rt-7). Bald eagle populations and productivity are increasing in Zone 7, as well as across the state (Exhibit Rg-1). Population growth has been attributed largely to the substantial reduction of environmental contaminants. There are six known nesting pairs in the Salish Mountain portion of the Tally Lake Ranger District and Stillwater State Forest. Five active bald eagle nests are within ten miles of the Valley Face area, to the northwest, northeast, west, and southwest. One of these nests (Exhibit Rt-7) is along the Stillwater River

about one third of a mile east of the analysis area boundary. No nests are known between the project area and Flathead Lake. The Salish Mountains are not a documented migratory route, nor are there historical or currently known areas in the Valley Face area where bald eagles congregate to roost or feed.

The only water body in the analysis area that is large enough to support bald eagle nesting is the Stillwater River, along the area's far northeast edge. Although about 4000 acres of the Valley Face analysis area is close enough to the river, only 248 acres currently meet all of the nest stand characteristics (Exhibit Rt-5). The relatively dense network of roads in the analysis area provides many opportunities for foraging on roadkills, while also posing a hazard to the eagles themselves (Exhibit Rg-8). For more information about this species and its habitat at various scales, including that of the Flathead National Forest, see Exhibit Rg-1.

Environmental Consequences—Bald Eagle

Direct and Indirect Effects--Alternative A – No Action

No additional actions such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation are proposed with this alternative. Indirectly, taking no action to reduce fuels and tree mortality from Douglas-fir beetles would increase the potential for stand-replacing fires to occur, which could indirectly result in areas of decreased suitability or unsuitable habitat associated with possible nesting along the Stillwater River. The level of effects would be dependent on the size and intensity of such a wildland fire. No road work to improve aquatic habitat would occur, which would mean habitat conditions for fish species—eagles' primary food source in this area—would not improve.

Direct and Indirect Effects--Alternatives B and C

None of the action alternatives would involve vegetation manipulation in current known bald eagle nesting habitat (Exhibit Rt-5). Regeneration timber harvest would occur in 6 acres of one potential nest stand (a small part of Unit 28) south of Bootjack Lake and one half mile west of the Stillwater River. Understory fuel reduction would occur on 5 acres of another stand (Unit 403). Proposed temporary road construction would all be more than 0.2 miles from potential habitat. Indirectly, timber harvest and underburning would reduce the fire hazard to potential nesting stands associated with the Stillwater River, as described in the "Fire and Fuels" section of this chapter. Best Management Practices road repair and culvert replacements would have positive benefits for bald eagle food sources. Shrub planting in and around some harvest units near riparian areas would enhance habitat values for a variety of species preyed upon by bald eagles.

Bald eagle foraging activity may overlap with potential disturbance due to harvest, underburning, thinning, temporary road construction, or other activities. Several units are near past bald eagle observations (Exhibit Rt-6). The effects of possible displacement are expected to be minor because many high-quality foraging sites are closer to Logan Creek and the Stillwater River.

The proposed project would have no negative direct, indirect, or cumulative effects to bald eagle roosting, migrating, or wintering habitat, nor would it have any anticipated effects on mortality risk.

Cumulative Effects

Cumulative effects on bald eagles are varied. Timber harvesting has increased the availability of upland prey while decreasing roost sites, screening cover, and potential nest trees. There are corporate and other private lands in the vicinity where timber management has occurred, as well as residential lands. Timber harvest and road construction in the adjacent Logan Creek drainage is expected to continue under the 2004 Logan Creek Ecosystem Restoration Project Record of Decision. There have been no reports of bald eagles feeding on calves or other livestock. No further predator control efforts are anticipated although past eagle mortalities in the area may have been due to lead poisoning. Recreation activities in the area that could disturb bald eagles include boating, fishing, hiking, camping, hunting, and cycling. Motor vehicles can kill or injure bald eagles, particularly when they are heavy and lethargic from consuming road-kill deer.

Historically, bald eagle habitat in and near the Valley Face area was probably much as it exists now, except nesting habitat adjacent to the Stillwater River apparently had relatively frequent low-severity ground fires with occasional large, stand-replacing crown fires. It was probably rare for this section of the Stillwater River to not encompass some nesting habitat within one mile of several points. Bald eagle habitat conditions in the analysis area appear to be stable. Although unlikely, if active bald eagle nesting is discovered in any proposed harvest or burn unit, activities would be modified, if needed, to protect nest stand conditions and maintain reproductive efforts.

This species' affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. Past, ongoing, and planned timber harvest and further cumulative effects relevant to bald eagles are discussed in sections on "Hydrology," "Aquatic Species," "Old Growth Habitat and Old Growth Associated Wildlife Species," and "Snags and Downed Woody Material Wildlife Habitat" in this chapter, and in Exhibit Rg-9. For an assessment of this species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1.

Introduction—Black-backed Woodpecker

The black-backed woodpecker (*Picoides arcticus*) is a USFS Region One sensitive species that lives in boreal and montane conifer forests in Alaska, Canada, and the northern lower 48 states (Dixon and Saab 2000, Exhibit Rs-9). In western Montana, black-backed woodpeckers may depend on one- to six-year-old burns with a resultant abundance of beetles and wood-boring insects (Hejl and McFadzen 2000; Hitchcox 1996; Caton 1996; Hutto 1995a, Hutto 1995b), although they have been known to use areas with high numbers of bark beetles (Dudley 2005). Population spurts associated with large fires and insect epidemics may be necessary for maintaining black-backed woodpecker populations across the landscape (Hutto 1995a and 1995b, Dixon and Saab 2000). Evidence suggests the black-backed woodpecker is increasing in numbers in the United States (as cited in Dixon and Saab 2000).

Effects on black-backed woodpeckers have a tie to Issue #2: "Forested Wildlife Habitat." Direct harvest effects are limited to removal of trees that are now or could be used as nesting and foraging sites in the event of future wildland fire and/or insect epidemics (Exhibit Rs-10). Indirect effects focus on the reduction of fire hazard across the landscape. Open road density calculations are given in Exhibit Rg-8. Also see sections in this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat,"

and on "Riparian and Wetland Wildlife Habitat." For this project, the analysis of effects on black-backed woodpeckers spans as far as 80 years, at which time areas regenerated by this project are likely to be mature enough to provide nesting or feeding habitat.

Affected Environment—Black-backed Woodpecker

Habitat for the black-backed woodpecker is abundant and well distributed across the Northern Region and by Forest (Samson 2005; Exhibit Rs-20). In addition, habitat amounts may increase as fires and insect outbreaks continue to increase in size (Zack 1994, Gallant et al. 2003, Hessburg and Agee 2003). Between 2001 and 2004, approximately 200,000 acres in over 70 fires burned on the Flathead National Forest, creating a substantial amount of black-backed woodpecker habitat. Less than five percent of this habitat was salvage harvested or is proposed for salvage harvest, leaving the vast majority of black-backed woodpecker habitat in large tracts. (Exhibits Rg-1 and Rs-6). In USFS Region One from 2000 to 2003, estimates of black-backed woodpecker habitat in burn areas range from 13,675 to 887,850 acres or enough habitat for up to 4,490 pairs (Samson 2005). From 24,690 to 751,429 acres of insect-infested areas may provide habitat for up to an additional 4,224 pairs (Samson 2005).

In recent decades, the mountain pine beetle was at epidemic levels in lodgepole pine in the Valley Face area, causing substantial mortality in mature stands. Currently, bark beetles are killing a variety of conifer species, particularly Douglas-fir on many acres throughout the area. See the Vegetation section of this chapter and Exhibit P-1 for more information.

Black-backed woodpeckers have not been reported in the analysis area and none were observed during old growth field surveys and other field work done for the Valley Face project (Exhibit Q-11). Between 1994 and 2004, Region One Landbird Monitoring transects have located this species on the Tally Lake Ranger District only near Sylvia lake (1996 and 2000) and Ashley Mountain (1995). They were last reported close to the area in 1993, nesting in stands of lodgepole pine infested with mountain pine beetles in the adjacent Logan Creek drainage (Exhibit Rs-5). It is likely the mountain pine beetle epidemic areas across the Valley Face area supported elevated levels of black-backed woodpeckers for about five years after the epidemic peaked in 1986 or 1987. Based on the amount of lodgepole-dominated forest in the Valley Face area, this could recur within this decade. No stands currently support recent post-fire black-backed nesting or feeding habitat (Rs-10).

There has not been a major fire in the watershed for over 75 years. Prior to the advent of modern wildland fire suppression practices in the 1930s, the normal fire regime for the area was typified by relatively infrequent, large fires. Between the years of 1889 and 1931, approximately 15 percent of the Valley Face area burned. Since 1936, only 85 acres have burned in the area as a result of 126 identified and suppressed fire starts. Black-backed woodpeckers were seen frequently in the Little Wolf fire area ten miles to the west from 1995 to 1999, including nesting observations (Exhibit Rs-5). About 30 percent of the land in the Valley Face area was regeneration harvested in the past 30 years, and offers little or nothing in the way of potential black-backed woodpecker habitat for at least 50 more years. As stated above, most of these stands have no visible snags at all, a very different condition from that left by most wildland fires.

Areas that would provide ideal black-backed woodpecker habitat in the case of a large wildland fire are extensive and well distributed across the analysis area. Sections on "Snags and Downed Woody Material Wildlife Habitat" and "Old Growth Habitat and Old Growth Associated Wildlife

Species" further discuss the potential of the area to provide components of black-backed woodpecker habitat. For more information about this species and its habitat at various scales, including that of the Flathead National Forest, see Exhibits Rg-1, Rg-3, and Rs-24.

Environmental Consequences—Black-backed Woodpecker

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, or temporary road construction, are proposed with this alternative. Indirectly, taking no action to reduce fuels would increase the potential for stand-replacing fires to occur. This could result in large areas of highly suitable habitat for this species, depending on the size and intensity of such a wildland fire. The vulnerability of potential nest tree loss to firewood cutting is discussed in the section on "Snag and Downed Woody Material Wildlife Habitat" in this chapter.

Direct and Indirect Effects--Alternatives B and C

These alternatives would reduce the likelihood of the creation of new post-fire habitat for black-backed woodpeckers. Due to the lack of recent post-fire habitat in or near any of the proposed activities, implementation of either of the action alternatives would not remove any current potential post-fire feeding or nesting habitat for black-backed woodpeckers. Timber harvest will remove many trees infested with Douglas-fir beetles, particularly in Units 5, 6, 6A, 8A, 12, 17, 40, and 41. Many other infested areas would be left intact, as described in the Vegetation section of this document and Exhibit P-14. It will also remove some potential future nesting and feeding trees on approximately 3746 acres in Alternative B (Exhibit Rs-10). Due to dropping or modifying harvest units for other concerns, loss of potential future nest and feeding trees would occur on 3,190 acres in Alternative C. In all action alternatives, trees killed by prescribed underburns are not proposed for salvage and thus could become habitat for black-backed woodpeckers. The action alternatives, especially Alternative B, would reduce the chance of large stand-replacing fire, as shown in the "Fire and Fuels" section of this chapter. Other actions, including temporary road construction and shrub planting, would not have measurable effects on this species.

Cumulative Effects

Across the Interior Columbia River Basin, moderate or strong declines in unburned habitats used by black-backed woodpeckers were projected in nearly 70 percent of watersheds (Wisdom, et al. 2000). The most widespread declines were in the northern and far eastern parts of the Columbia River Basin. Moderate or strong declines were projected in over 90 percent of watersheds within the Northern Glaciated Mountains (Wisdom, et al. 2000). The natural pattern of beetle outbreaks has been altered through silvicultural and fire management practices. Silvicultural practices directed at maximizing wood production by harvesting trees before they are susceptible to bark beetle attacks and salvage logging of beetle-infested, fire-killed, and wind-killed trees reduced the occurrence of beetles in some areas. Fire management policies have lengthened natural fire regimes and allowed more frequent occurrences of beetles (Wisdom, et al. 2000).

Across the Flathead National Forest, large acreages of black-backed woodpecker habitat were created by wildland fires such as the Little Wolf Fire (1994), the Red Bench Fire (1988), the Moose Fire (2001), and the Robert Fire (2003), and by extensive acreages of trees killed by insects or disease. Dead trees were salvaged from Forest Service and State lands in these fire

areas, at levels determined to be compatible with population diversity concerns for this species (Exhibit Rg-1).

Fire suppression has been the greatest factor limiting the current distribution of potential habitat in the analysis area, with a smaller effect from firewood cutting. Across the analysis area, open roads continue to provide access for firewood cutters, decreasing snags potentially used by black-backed woodpecker as feeding and nesting sites, as discussed above in the section on "Snag and Downed Woody Material Wildlife Habitat."

The black-backed woodpecker's affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. Past, ongoing, and planned timber harvest and further cumulative effects relevant to black-backed woodpeckers are discussed in sections on "Old Growth Habitat and Old Growth Associated Wildlife Species" and "Snags and Downed Woody Material Wildlife Habitat" in this chapter, and in Exhibit Rg-9. For an assessment of this species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1.

Introduction—Canada Lynx

The Canada lynx (*Felis lynx*) is a disturbance-dependent species (Ruggiero, et al. 2000). In the Northern Rockies, lynx evolved with a fire regime that created new foraging opportunities in young stands and along edges, while leaving behind a mosaic of travel connections and dense older stands with downed wood. Koehler (1990), Ruediger et al. (2000), and Ruggiero et al. (2000) describe the lynx's habitats as:

> Feeding Habitat: Lynx typically forage in areas that support their primary prey, the snowshoe hare. These are most often early successional sapling forest or older stands with a dense layer of saplings and lower branches. Cover and browse are maximized at both the ground level and at varying snow depths throughout the winter. Hares usually begin to recolonize sapling areas six to seven years after succession is reinitiated.
>
> Denning Habitat: Lynx most often den in mesic old growth or mature forest, some of which also qualifies as feeding habitat.
>
> Other Habitat: Lynx use forested cover for traveling between denning habitat and feeding habitat. Lynx seem to prefer to move through continuous live forest and frequently travel along forested saddles, ridges, and riparian areas.

The lynx is federally listed as a threatened species on the Flathead National Forest. The elimination of cover for this species and its primary prey, the snowshoe hare, can have negative short-term effects on lynx (Koehler and Aubrey 1994). This is especially true where large openings are created without leaving travel connections between pockets of dense young forest and older forests used for denning. The causes of this include timber harvest, precommercial thinning, and wildland fire. Stands up to about 15 years old, while unsuitable to lynx in the short term, are needed to provide foraging habitat in the future. Similarly, after a short-term loss of habitat value, precommercial thinning may extend the duration of hare use because hares are believed to return to the stand for a longer time after thinning (Squires, per. comm. 1998). Timber harvest or salvage generally reduces downed woody material, while often accelerating regeneration of the green canopy cover used by lynx and its prey. An insect epidemic or fire can

provide a great influx of downed logs, providing denning sites and cover for lynx kittens. Non-target trapping mortality is correlated with ease of human access into an area during prime trapping season. Human activity in spring and summer, especially motorized use, may force lynx to move kittens.

Following information found in Ruggiero et al. (2000), primary lynx habitat in the Rocky Mountains and on the Flathead National Forest includes lodgepole pine, subalpine fir, and Engelmann spruce. Moist Douglas-fir types are considered secondary habitat that can support squirrels, an alternate prey species for lynx during periods when snowshoe hare densities are low. In Montana west of the Continental Divide, lynx habitat is primarily subalpine fir habitat types, generally between 4000 and 7000 feet (Exhibit Rt-20).

Effects on lynx tie directly to two issues discussed in Chapter 2. These are Issue #1: "Old Growth Forest" and Issue #2: "Forested Wildlife Habitat." The No Action Alternative could affect lynx habitat through increased probability of intense fire. Reducing impacts on Canada lynx was part of alternative development (Exhibit E-2). For this project, the analysis of effects on Canada lynx spans as far as 100 years, at which time areas regenerated by this project are likely to be used for denning habitat.

Lynx Analysis Units (LAUs) were used to assess the effects of the alternatives on lynx and lynx habitats, considering information found in the Lynx Conservation and Assessment Strategy (Ruediger, et al. 2000). Effects of vegetation manipulation and temporary road construction were determined by overlaying coverages of potential lynx habitat with proposed unit and road locations (Exhibit Rt-10). Whether units would retain current habitat status or change to temporary non-lynx habitat depended on the prescribed retention levels and types and amounts of leave trees (Exhibit Rt-8 and Rt-10). All harvest and fuel reduction activities were modeled as occurring simultaneously. Precommercial thinning was not analyzed as it would not occur in lynx habitat. Open road information is in Exhibit Rg-8. See also the sections on "Snag and Downed Woody Material Wildlife Habitat" and "Old Growth and Old Growth Associated Wildlife Species" in this chapter. Evaluation of potential effects considered the Canada Lynx Conservation Assessment and Strategy (Lynx Biology Team 2000, Exhibit Rt-15).

Affected Environment—Canada Lynx

Lynx range over much of Canada, Alaska, and the northern edges of the lower 48 states, although the only population strongholds in the United States are in Washington State, western Montana, and possibly northern Idaho (Claar, et al. 1999). Lynx inhabit national forest lands in USFS Region One and are scattered throughout western Montana (USFWS 1998). Trapping and sighting data from Idaho and Montana suggest a downward or stable trend in population since the mid-1980s.

Lynx and their sign have been recorded in and near the analysis area (Exhibit Rt-7). Snowshoe hares, the primary prey of lynx, appear to be very common throughout the Tally Lake Ranger District, particularly along roads, in moderately dense sapling-to-pole sized stands, and in some older stands. Numerous snowshoe hares and their tracks have been seen across the analysis area. Species that may compete with lynx for prey have also been observed across the area.

Two Lynx Analysis Units (LAUs) are partially within the Valley Face area, consistent with a forest-wide protocol developed in November 1999 (Exhibit Rt-8). Both the Lost Tally and Ashley Herrig LAUs are in "moderate" functioning condition (Exhibit Rt-19). Delineation of "lynx

habitat," above 4,100 feet in this area, has been finalized through consultation with the USFWS. The low-elevation land in the northern and eastern portions that make up 63 percent of the Valley Face analysis area is not "lynx habitat" (Exhibit Rt-16). The approximately 87 square mile area of the two LAUs is about the size of two typical home ranges for female lynx in relatively fragmented portions of northwestern Montana and eastern Washington (Koehler 1990, Koehler et al. 1979, USFWS 1998a) and is representative of effects of timber harvest, precommercial thinning, fires, and firewood cutting across the landscape. The analysis area is in a major watershed proposed as a "Primary Lynx Conservation Area" by the Interagency Forest Carnivore Committee (Exhibit Rt-19).

A comparison of current amounts of older forest compared to reference historical conditions shows that the amount of older forest which can be found in the Valley Face analysis area today is within the historical range of what would be expected (Exhibits P-11, P-12, P-13, and Q-8). There is sufficient denning habitat within the area to support a recovering lynx population. The current situation for structural stages which would be expected to provide snowshoe hare habitat is also within the range of reference historical conditions.

Tables 3-64 and 3-65 summarize the current situation of potential habitat for lynx (Exhibit Rt-8), using descriptions from Ruggiero, et al. (2000) and from the Canada Lynx Conservation Assessment and Strategy (Lynx Biology Team 2000). The mosaic of successional stages of forests is largely the result of timber management activities in the area. Currently, from 15 to 25 percent of lynx habitat, by LAU, is in early seral/structural stage condition and too young to be of use for lynx ("temporary non-lynx habitat"). Sapling foraging habitat appears to be limited in the Ashley Herrig LAU. This is supplemented by foraging opportunities in some of the multi-storied later-seral stands that also qualify as denning habitat. Over most of the lynx habitat in the area, denning habitat is well distributed and many acres of heavy tree mortality can provide future structures for denning (Exhibit Rt-18). Most patches of denning habitat have feeding habitat nearby, with the possible exception of the southern area of the Ashley Herrig LAU. Although Douglas-fir beetles have killed many of the larger trees, this natural disturbance did not change any areas to unsuitable habitat.

Table 3-64. Calculation of Suitable Lynx Habitat by Lynx Analysis Unit, and display of Temporary Non-lynx Habitat (i.e. recent stand-initiation areas) (Exhibit Rt-8).

Lynx Analysis Unit	Potential Habitat for Lynx (Acres or % of suitable habitat by LAU)				
	Acres in LAU	Permanent Non-lynx Acres	Suitable Habitat Acres	Potential Lynx Habitat %	Temporary Non-lynx Acres (and % of suitable)
Ashley Herrig	31,988 ac	10,596 ac	21,392 ac	67%	5,436 ac (25.4%)
Lost Tally	23,739 ac	12,678 ac	11,061 ac	47%	1,647 ac (14.9%)

Table 3-65. Calculation of Lynx Habitat Components by Lynx Analysis Unit and Percentage of suitable habitat within each LAU (Exhibit Rt-8). (Understory Feeding Habitat is also either denning or "other").

Lynx Analysis Unit	Current Potential Lynx Habitat (and % of suitable habitat in each LAU)			
	Sapling Feeding	Understory Feeding	Denning	Other
Ashley Herrig	990 ac (4.6%)	At least 385 acres	2,846 ac (13.3%)	11,964 ac (55.9%)
Lost Tally	2,310 ac (14.3%)	2,219 ac (13.7%)	4,006 ac (24.8%)	8,945 ac (55.4%)

According to an earlier analysis of lynx habitat connectivity at a larger scale, potential lynx habitat in the Valley face area is in a 653,700 acre "clump" of potential habitat that includes no lynx habitat separations wider than 300 feet (Exhibit Rt-7). This covered all ownerships of land in a 1.1 million acre "window" analyzed by GIS. This "clump" includes the bulk of the Tally Lake

Ranger District; with broad connections with national forest land to the south and east, and across State land to the north. Refer to Exhibit Rg-7 and the section on "Old Growth Habitat and Old Growth Associated Wildlife Species" in this chapter for more information about the existing condition in terms of connectivity.

Environmental Consequences—Canada Lynx

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. The availability of denning and hiding sites would gradually increase, as would habitat used by numerous species preyed on by the lynx. In lieu of fire or other stand-replacing disturbance, feeding habitat would gradually diminish in quality and quantity. The high fuel loading in many stands would increase the chance of large hot fires in adjacent areas, which could have mixed results for lynx habitat. Stand-replacement disturbances are more likely to occur under this alternative, which would have the greatest and longest negative effect on potential denning habitat. However, this alternative would likely create the greatest amount of long-term future potential denning habitat, as there are many acres with high levels of tree mortality (Exhibit Rt-18). Ecological disturbances are often favorable to lynx, but the net effects could be negative in such a heavily managed landscape.

Direct and Indirect Effects--Alternatives B and C

About 833 acres of the commercial harvest and fuels treatment in Alternative B and 593 acres in Alternative C would occur within stands identified as lynx habitat (Exhibits Rt-8 and Rt-10). Table 3-66 displays the amount of current habitat that would be converted to temporary non-lynx habitat. Sapling feeding habitat would not be affected because all precommercial thinning was dropped from areas of lynx habitat during alternative development (Table 3-67, Exhibit E-2). In both alternatives, Unit 302 appears to overlap sapling feeding habitat for lynx, but this would be avoided during implementation of thinning.

Table 3-66. Temporary Non-lynx (Unsuitable) Habitat and its Increase through Timber Harvest and Fuels Treatment as a percent of suitable habitat across the Analysis Area (Exhibit Rt-8 and Rt-10). The numbers given are acres of change, with resultant percent of each type of habitat in parentheses. Assumes all vegetation manipulation occurs simultaneously.

Alternative	Temporary Non-lynx Habitat (Unsuitable), increase in acres (and resulting Percentage of suitable habitat within each LAU*)	
	Ashley Herrig LAU (21,392 ac)	Lost Tally LAU (11,061 ac)
A	+ 0 ac (25.4%)	+ 0 ac (14.9%)
B	+ 144 ac (26.1%)	+ 539 ac (19.8%)
C	+ 115 ac (25.9%)	+ 424 ac (18.7%)

* = Percent of LAU does not include "permanent non-lynx habitat" such as dry Douglas-fir habitats, open water, and open rocky areas.

Table 3-67. Change in Potential Lynx Habitats through Vegetation Management. The numbers given are acres of change. Exhibit Rt-8 and Rt-10 include a breakdown of this information by Lynx Analysis Unit. Assumes all vegetation manipulation occurs simultaneously.

Alternative	Denning	Sapling Feeding	Understory Feeding *	Other
B	- 330 ac	- 0 ac	- 32 ac	- 343 ac
C	- 265 ac	- 0 ac	- 0 ac	- 288 ac; + 13 ac (Net = - 275 ac)

* = Understory feeding habitat is also denning or other/travel habitat.

The loss of denning habitat would be partially balanced in that the removal of fuels would reduce the probability of fire spreading to remaining denning habitat of higher quality. In addition, tree planting and the removal of smaller-diameter downed wood in harvest units would accelerate regeneration into sapling stands preferred by snowshoe hares and hunting lynx. However, Alternative B would regenerate about 32 acres of mature forests with sapling understories and low conifer limbs (parts of Units 5 and 21A), negating their value as lynx feeding habitat until saplings occupy the sites. This would not occur in Alternative C.

The ability of lynx to travel across the analysis area would be most affected by commercial harvest, road construction, and human access. The effects of cover loss on travel routes are discussed in the section above on "Old Growth Habitat and Old Growth Associated Wildlife Species." About one third of the temporary road construction would cut through areas of potential lynx habitat (Exhibit Rt-8), although all of these roads would be closed to motorized public access during and after implementation of the proposal.

Site preparation and fuel reduction would remove potential den sites. On the other hand, it would also accelerate regeneration of green canopy cover and reduce the probability of fire spreading to lynx habitat of higher quality. Tree and shrub planting in and near some harvest units would enhance habitat values for lynx and a variety of their prey species.

In any one location, lynx presence may overlap with potential disturbance due to harvest, thinning, burning, road construction, or other activities. Most of the denning patches would have commercial harvest or non-commercial fuel reduction directly adjacent. If active lynx denning is discovered in any proposed harvest or burn unit, activities would be modified if needed to protect denning stand conditions and maintain reproduction efforts.

Other aspects of this alternative would not be expected to affect lynx. Temporary roads and skid trails are not expected to receive use by over-snow recreationists. For more information on effects relevant to the lynx, see the sections of this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species" and "Snag and Downed Woody Material Wildlife Habitat."

Cumulative Effects

Fire suppression, timber harvest, regeneration practices, and pre-commercial thinning have altered the availability of lynx denning habitat, prey habitat, and forested connectivity. This is discussed in general in the sections on "Old Growth and Old Growth Associated Wildlife Species" and "Snag and Downed Woody Material Wildlife Habitat" in this chapter and for Canada lynx in Exhibit Rt-20. Suitable denning and feeding habitat has been harvested across national forest, corporate, and private lands, typically leaving low amounts of snags and large downed wood (Exhibit Rg-1). In past harvest units, snowshoe hares recolonized habitat as sapling trees filled in. Past pre-commercial thinning occurred on approximately 1,186 acres on lynx habitat, most likely reducing the density of snowshoe hares. No vegetation management activities are planned on lynx habitat on national forest lands in the analysis area in addition to those proposed in the action alternatives. Timber harvest and road construction in the adjacent Logan Creek drainage is expected to continue under the 2004 Logan Creek Ecosystem Restoration Project Record of Decision. Livestock grazing on private land in the upper elevations of the project area may have affected prey availability for lynx.

Lynx were apparently much more common during pre-European times. Probably due to trapping, lynx were extremely scarce in the first half of the last century in Montana, with specimen records

restricted to two western counties. The lynx is still listed as a furbearer in Montana but the trapping is closed. No further predator control efforts are anticipated although lynx may have been affected by this in the past. Roads constructed across the analysis area have facilitated access for trappers and firewood cutters. Firewood cutting along open roads has decreased downed logs important for lynx and their prey species. Across all ownerships, in summer at least 99 miles across the analysis area are open to public or private motorized use for an Open Road Density (ORD) of 1.8 miles per square mile. At least 87 miles are open from fall to spring, with an ORD of 1.6 (Exhibit Rg-8). These numbers are likely to be low, however, due to the many miles of roads and driveways on private land. Looking only at Forest Service land, there are 65 miles open in summer (ORD = 2.1), and 54 miles open from fall to spring (ORD = 1.7). Recreation activities in the area that could disturb lynx include boating, fishing, hiking, camping, motorized trail use, and cycling. Snowmobile access, which can provide easy winter access for trappers and possibly competitors, is generally limited on Forest Service lands in the analysis area, due to short seasons and relatively shallow snows, and to legal closures in important ungulate winter range areas. The analysis area is close to several population centers and is easily accessed. Most of the residents in the analysis area live there year round and subdivision and construction appear to be accelerating. Brushing of saplings along roadsides on most USFS roads in lynx habitat has reduced their value to snowshoe hares; beaver control has reduced the amount of moist habitat that supports other prey species.

This species' affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative with those discussed above for each alternative. Cumulative effects relevant to Canada lynx are further discussed in sections on "Old Growth Habitat and Old Growth Associated Wildlife Species" and "Snags and Downed Woody Material Wildlife Habitat" in this chapter, and in Exhibit Rg-9. For an assessment of this species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1.

Introduction—Common Loon

The common loon (*Gavia immer*) is a USFS Region One Sensitive species. Loons are totally dependent on water and are exceedingly awkward on land. They typically nest on lakes larger than 20 acres, in shallow bays with vegetative cover. Fish make up about 90 percent of a loon's diet, and clear water is required for their underwater foraging technique. The quality and quantity of water flowing into loon lakes affects their ability to support prey species as well as influences the water clarity. Water level fluctuations during nesting season can flood a nest or leave it high and dry, both of which are likely to cause abandonment. During the nesting season, Montana's loons are extremely sensitive to human disturbance.

Timber harvest, insect epidemics, and fire can affect common loons by altering the quantity and quality of water flowing into their nesting lakes. Effects on common loons do not tie directly to any of the issues in Chapter 2. Harvest in action alternatives could cause disturbance of loons nesting at Bootjack Lake. For this project, the analysis of effects on loons spans as far as 10 years, at which time actions with the potential for disturbing loons would be complete. For more information about effects analysis methods, conclusions, and cumulative effects, see the "Hydrology" and "Aquatic Species" sections of this chapter and Exhibit Rg-9.

Affected Environment—Common Loon

The southern edge of the loon's breeding range extends into the United States across many of the eastern states and into the Rocky Mountains. Northwest Montana supports nearly all of the loon reproduction in the western United States. The original extent of the population is unknown, although populations have declined with the settlement of the west. Currently, there are around 60 successfully breeding pairs and approximately 200 birds in the total Montana population (Evers 2004). Loon chick fledging rate in this area suggests slightly increasing population (Exhibit Rs-21).

Bootjack and Chinook Lakes appear to be the only water bodies in the analysis area to have had successful loon reproduction (Exhibit Rs-5). Bootjack Lake has produced at least 11 chicks since 1994; Chinook Lake had successful nesting until 1997 but no loons have been observed there since. Loons are often observed on Twin Lakes. Baney, Bowser, Cliff, Lore, and Northwestern Lakes have also been monitored for loon occupancy, but without observations. In general, the water quality in the Valley Face area is good, with monitoring suggesting healthy conditions for fish and other aquatic life, although many streams submerge before reaching the valley floor. The closest loon nesting lake downstream of the watersheds in the Valley Face area is nearly 30 air miles and would not be affected by any alternative. See the "Water Resources" and "Aquatic Species" sections of this chapter for more information. For more information about this species and its habitat at various scales, including that of the Flathead National Forest, see Exhibit Rg-1.

Environmental Consequences—Common Loon

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. Indirectly, taking no action to reduce fuels would increase the potential for stand-replacing fires to occur, which would have negative effects on loons. Depending on the size and intensity of a stand-replacing fire, it could cause a short-term increase in water yield that could cause stream channel erosion and sediment and nutrient delivery to lakes.

Direct and Indirect Effects--Alternatives B and C

Proposed treatment near Bootjack Lake could disturb nesting loons. Both alternatives include Unit 409, which would treat fuels by hand-slashing, hand-piling, and burning piles in a narrow 13-acre strip about 150 feet from the lake. The trees and shrubs between Unit 409 and Bootjack Lake are expected to continue to provide a visual barrier. An area identified as Unit 30 (Alternative B) and Unit 30B (Alternative C) is less than 400 feet and upslope of Bootjack Lake. Both units would have commercial timber harvest with a greater amount of tree retention in Alternative C. To avoid disturbance of nesting loons on Bootjack Lake, this work (Units 30, 30B, and 409) would not be implemented between late April and late July. In total, these alternatives would involve regeneration harvest or fuel reduction in 3,354 to 3,879 acres and build 3.2 to 5.3 miles of temporary roads, very little of which is upstream of known loon nesting habitat. Predicted changes in water yield associated with all of the action alternatives are within recommended limits. None of the actions in either alternative would cause effects that would travel downstream to Bootjack Lake or any other lake that could support loons. See the "Water Resources" and "Aquatic Species" sections of this chapter for more information.

Cumulative Effects

A considerable amount of nesting habitat has been lost due to the development of shoreline areas on low-elevation lakes nearby, such as Ashley Lake, Whitefish Lake, Skyles, Blanchard, and Lower Stillwater Lake. Besides direct loss of nesting and nursery habitat, loon reproduction tends to be most seriously affected by disturbance from recreationists. Public education focused on loons and bald eagles has been used on nesting lakes since at least 1988 in cooperation with the Montana Loon Society. Fish stocking in Bootjack Lake may have altered the availability of prey, but this lake continues to support a relatively productive loon territory.

Cumulative effects relevant to common loons are further discussed in sections on "Hydrology" and "Aquatic Species" in this chapter and in Exhibit Rg-9. This species' affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. For an assessment of this species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1.

Introduction—Fisher

The fisher (*Martes pennanti*) is also a USFS Region One sensitive species. This larger, weasel-like predator has a strong affinity for forested riparian habitats (Witmer et al. 1998). Such areas are vulnerable to habitat fragmentation due to factors such as fire, timber harvest, and timber salvage (Powell and Zielinski 1994). Fishers avoid insular patches of forested habitat and may require forested riparian travelways between feeding and denning sites (Heinemeyer and Jones 1994, Witmer et al. 1998; Exhibit Rs-7). They rarely stray far from streams or other wet sites. Areas of otherwise suitable habitat can be isolated when cover in travelways between home ranges is removed (Fisher and Wilkinson 2005).

In the Northern Rockies, fishers evolved under a disturbance regime that created numerous openings in a matrix of mature forested habitats. The conversion of some percentage of older age classes to younger age classes can promote a diversity of prey species and thus have long-term benefits for fisher populations (Jones 1991). A pulse of large logs on the ground due to fire or insect epidemics can provide denning structures and cover for fisher and several prey species, but these areas are likely to be avoided until the living canopy cover again exceeds 40 percent. Fishers would likely avoid stands up to 50 years old and probably not select them until 80 to 100 years for lodgepole pine or 120 to 160 years for mixed conifers (Jones 1991). Fishers are apparently tolerant of human activity, but the ease of human access into an area correlates with fisher mortality through direct or incidental trapping (Claar, et al., 1999). The average home range for a female fisher in this area is expected to be about 15 square miles (Jones 1991, Heinemeyer and Jones 1994). See Exhibit Rs-7 for more information about this species.

Effects on fishers tie to two issues discussed in Chapter 2. These are Issue #1: "Old Growth Forests," and Issue #2: "Forested Wildlife Habitat." The No Action Alternative could affect fishers through increased probability of intense wildland fire and resulting loss of forested riparian habitat. The action alternatives could remove downed woody material and canopy cover used by fisher and their prey. In some stands, this would accelerate regeneration of higher-quality potential habitat, as long as sufficient dead material was left to provide habitat features (Witmer et al. 1998). The effects to the fisher were analyzed using GIS-generated predicted habitat (Exhibit Rs-8). Forested riparian connectivity was defined as pole-sized or larger tree canopies in

a zone that extends 200 feet (91 meters) away from riparian features such as lakes, ponds, wetlands, and streams. This data layer was superimposed on digitized layers depicting the proposed units. Spatial effects were determined by overlaying the map of predicted habitat with alternative maps (Exhibit Rs-8). Open road density calculations are given in Exhibit Rg-8. See also the sections in this chapter on "Snags and Downed Woody Material Wildlife Habitat" and "Old Growth Habitat and Old Growth Associated Wildlife Species." For this project, the analysis of effects on fishers spans as far as 100 years, at which time areas regenerated by this project are likely to again be used by fisher.

Affected Environment—Fisher

There have been several attempts to reintroduce fishers in Montana, including one effort about 25 years ago just three or four miles to the northwest of the analysis area. In 1995, an unconfirmed fisher was reported near Pilot Knob, within the analysis area. This species has also been reported three times in the Griffin Creek drainage, about 10 miles to the west of the analysis area. Forest Service files also contain one possible report of fisher tracks in the Miller Creek drainage about 8 miles northwest of the Valley Face area, although these could have been the tracks of a large male marten. For these sightings, plus historical and trend information, see Exhibits Rs-5 and Rs-7.

In defining potential fisher habitat for this analysis, only intermediate forests (pole-sized and immature) and older forests (mature and old growth) within 300 feet of riparian features were included. The intermediate forests conservatively approximate winter habitat, while the older forests are likely summer habitat. Within 300 feet of water, there are 5,224 acres of pole and immature forests and 1,615 acres of mature and old growth forests (Exhibits Q-17 and Rs-8). Forested connectivity within and beyond 300 feet of riparian features is sufficient for the bulk of the Valley Face area to be available as fisher habitat (Exhibits Rg-7 and Rs-8). This connectivity has been severed or narrowed by past timber harvest in some areas. In particular, these are two locations along the upper reaches of Lost and Big Lost Creeks. Forested saddles may contribute to connectivity for dispersal (Powell and Zielinski 1994) and thus the analysis of forested connectivity in uplands as well as riparian zones was also used for the fisher. The analysis area appears to support sufficient habitat for four female fisher home ranges. It appears the current distribution of habitat for fishers would allow dispersal to continue between remaining home range areas within the analysis area and in neighboring areas. Suitable denning and feeding habitat occurs in adjacent drainages.

Sections on "Snags and Downed Woody Material Wildlife Habitat," "Old Growth Habitat and Old Growth Associated Wildlife Species," and "Riparian and Wetland Wildlife Habitat" further discuss the potential of the area to provide habitat components. For more information about this species and its habitat at various scales, including that of the Flathead National Forest, see Exhibits Rg-1, Rg-3, and Rs-25.

Environmental Consequences—Fisher

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. In lieu of fire or other stand-replacing disturbance, the availability of denning and hiding sites would generally increase, as would habitat used by numerous species preyed on by the fisher. The high fuel loading in some stands

would increase the chance of large hot fires in adjacent areas, increasing the potential for destruction or isolation of fisher habitat. Such wildfires would be less acceptable than if the area had experienced little or no timber harvesting in the past.

Direct and Indirect Effects--Alternatives B and C

These alternatives would harvest in potential preferred fisher habitat as shown in Table 3-68. From 237 acres (Alternative C) to 271 acres (Alternative B) of potential fisher habitat would be lost until the stands are pole-sized. About 173 acres would also be harvested or treated for fuel reduction, but in such a way that fisher habitat value would be retained at a reduced quality because these areas have sufficient living forested canopy to retain short-term habitat value after harvest. In most units, all or numerous wind-firm live trees and snags would be left standing thus helping to maintain the potential for future fisher habitat. Fuel reduction and site preparation would remove potential den sites. However, this along with precommercial thinning and tree and shrub planting would also accelerate regeneration of green canopy cover and reduce the probability of fire spreading to fisher habitat of higher quality. Connectivity along riparian habitat corridors would be narrowed to less than 300 feet wide in up to 18 places (Exhibit Rg-7), but it would still enable the area to function as fisher habitat. One forested riparian corridor would be severed, but this is about one third of a mile from the top end of a relatively low-elevation draw.

Table 3-68. Potential Fisher Habitat and Vegetation Management Effects by Alternative (Exhibit Rs-8).

	Alt. A	Alt. B	Alt. C
Total Potential Habitat	8,748 ac	8,476 ac	8,511 ac
Change from Mid- to Early-seral/structural	n.a.	240 ac	213 ac
Change from Late- to Early-seral/structural	n.a.	32 ac	24 ac
Habitat loss as % of current potential habitat	n.a.	3.1%	2.9%

From 1.2 to 1.6 miles of temporary road construction would pass through potential fisher habitat areas. This would temporarily negate fisher habitat value throughout the width of the road corridor until well after the roads were reclaimed. Other actions proposed in this project would not affect fishers. Due to the extent of other potential habitat for fisher across the analysis area, the viability of the current potential and future home ranges are not likely to be reduced further by any alternative.

Cumulative Effects

The fisher's status in the Western United States has been thought to be "precarious and declining" (Witmer et al. 1998), apparently due to habitat alteration and overexploitation. The lack of fisher trapping records from 1920 to 1960 indicates this species may have been extirpated from Montana at one time. Reintroductions occurred in the late 1950s, and fishers have since been documented in much of the Flathead National Forest. Hillis and Lockman (2003; Exhibit Rs-25) mapped fisher habitat in USFS Region One, concluding that fisher habitat occurs at historically normal levels at both the Flathead National Forest and Region One scales.

Fire suppression and timber harvest in the analysis area have altered the availability of denning habitat, forested connectivity, and prey habitat for fisher. Fires and past timber harvest in the analysis area resulted in a complex matrix of edge, ecotones, microhabitat sites, and openings in various stages of regeneration. Some suitable denning, feeding, and travel habitat has been harvested across national forest, corporate, and private lands. Even during the 1970s and 1980s,

when timber harvest was intensive, riparian zones were generally avoided, which could explain why habitat loss and fragmentation were not greater (Hillis and Lockman 2003; Exhibit Rs-25). Logging will likely continue on private land.

As discussed above for Canada lynx, open roads facilitate access for trappers and firewood cutters, potentially decreasing fisher populations and the downed logs important for fisher and their prey species (Exhibit Rd-1). The analysis area is part of MDFWP's Region 1, which has an annual quota of one fisher harvested through trapping.

This species' affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. Cumulative effects relevant to fishers are further discussed in sections on "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat, and "Riparian and Wetland Wildlife Habitat" in this chapter, and in Exhibit Rg-9. For an assessment of this species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1. Exhibit Rs-25 is an assessment of the fisher and its habitat at level of USFS Region One.

Introduction—Flammulated Owl

Flammulated owls (*Otus flammeolus*) are a USFS Region One sensitive species. In western Montana and Idaho, the tiny flammulated owl often nests in older, open, and relatively dry mixed-species forests. These stands nearly always support ponderosa pine, but sometimes have large Douglas-fir instead. Flammulated owls prey on small birds, moths, and grasshoppers for at least part of their life cycle. These prey species use more open stands or are more vulnerable to flammulated owls in such stands. Special habitat features used by flammulated owls include large-diameter trees with cavities at least as large as those made by northern flickers, as well as small openings used for foraging (Exhibit Rs-14). Home ranges in this area are expected to average about 37 acres (McCallum 1994).

Timber harvest, fire, and fire suppression can affect this species in both positive and negative ways. Timber harvest and stand-replacing fire can destroy nest structures and prey supplies. Flammulated owls disappear from stands after the large tree component is removed (Hayward and Verner 1994). On the other hand, frequent low-intensity fire in ponderosa pine/Douglas-fir stands can maintain open conditions required by flammulated owls (McCallum 1994). Flammulated owls have been located in selectively logged stands where the logging was relatively light and where numerous large trees and pockets of smaller trees remained, although the elimination of understory trees would remove thickets needed for foraging, roosting, singing, and cover (Wright, Hejl, and Hutto 1997).

Effects on flammulated owls tie to Issues #1: "Old Growth Forest," and #2: "Forested Wildlife Habitat," as discussed in Chapter 2. Vegetation manipulation in action alternatives could remove nesting structures in some stands, while recreating potential habitat for this species in others. Potential flammulated owl habitat was identified as late-seral/structural stage forests that have warm dry habitat types and Douglas-fir or ponderosa pine overstories (Exhibit Rs-2). This was electronically overlaid with proposed units and temporary roads. For this project, the analysis of effects on flammulated owls spans as far as 100 years, at which time areas regenerated by this project are likely to be used by this species.

Affected Environment—Flammulated Owl

Habitat modeling done by the Northern Region suggests that habitat for the flammulated owl is abundant and well-distributed in USFS Region One (Samson 2005). This species and its habitat appears to be well distributed and abundant on today's landscape. As part of the 2005 Forest Service Regional survey effort, flammulated owls were detected on 4.9 percent of the survey plots on the Forest (Rs-5). On the Flathead National Forest, flammulated owl habitat is naturally limited, based on the species' distribution map from the Montana Heritage Program (MHP 2006) and Samson's 2005 and 2006 analyses of Northern Region habitat.

It is unknown whether flammulated owls inhabit the Valley Face analysis area. Call-back surveys for this species were done in June 2002 in the most likely habitat areas in the adjacent Logan Creek area (Exhibit Rs-5). In June 1992, one flammulated owl was heard calling in the Wolf Creek drainage, about 12 miles west of the analysis area on the Kootenai National Forest. The next closest observations were of three or four owls about 20 miles to the southwest. These owls were located in mixed conifer stands dominated by Douglas-fir, western larch, and lodgepole pine, so it is assumed that flammulated owls may nest in the Valley Face area.

Approximately 2,435 acres across the analysis area meet the description of areas where owls were found nearby (Exhibits Rs-2 and Rs-5), although none of these stands are dominated by mature or old growth ponderosa pine. The potential habitat is concentrated in a swath that runs northwest to southeast across the center of the analysis area. It comprises seven percent of the analysis area, but it is likely most of this now has mid-story and understory vegetation that reduces or negates habitat value for the flammulated owl. Assuming a home range of 40 acres (McCallum 1994), there are 42 home ranges well distributed across the analysis area, 33 of which are on NFS lands (Exhibit Rs-2). Fire suppression in the Valley Face area has resulted in a high percentage of older forests becoming filled in with thick understories and mid-stories. This increases the risk of extensive tree mortality due to stand-replacing fire or pathogens. Approximately 28 percent of the analysis area, mostly in the lower elevations, appears to be capable of supporting flammulated owl habitat in the future (Exhibit Rs-2). For more information about this species and its habitat at various scales, including that of the Flathead National Forest, see Exhibits Rg-1, Rg-3, and Rs-26.

Environmental Consequences—Flammulated Owl

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. Continued accumulation of plant growth in the understory and mid-story would further reduce habitat value while increasing the chances potential nest structures would be consumed by stand-replacing fire. Large Douglas-fir trees are likely to continue to succumb to Douglas-fir beetles at a rate that could reduce the quality of flammulated owl habitats.

Direct and Indirect Effects--Alternatives B and C

The action alternatives would apply some stand-replacement harvest, commercial thinning, and understory fuel reduction in potential habitat for flammulated owls (Table 3-69). Approximately 145 acres (Alternative C) to 200 acres (Alternative B) of this would occur in stands that have the large tree and relatively dry site conditions used by this species, but none would occur in stands that currently have high potential for current use by flammulated owls. In Alternative B,

shelterwood harvest in Units 19 and 19A would temporarily negate the habitat value of two potential home ranges. In Alternative C, the prescription for Units 19 and 19A changed to a high-density commercial thin, which would most likely retain habitat value as long as patches of shrubs and saplings are left. Negative effects on potential flammulated owl habitat would be reduced in both alternatives because silvicultural prescriptions have been designed to retain many or all of the larger, wind-firm trees wherever they exist, and also some of the understory and mid-story trees. Understory burning, piling, or thinning treatments would probably have a direct short- and long-term benefit to flammulated owls. In general, vegetative manipulation that would open up stands and remove understory vegetation would benefit flammulated owls in the long term, although harvesting itself has the potential of removing nest trees. If active flammulated owl nesting is discovered in any proposed unit, activities would be modified, if needed, to protect nest stand conditions and maintain reproduction efforts.

Table 3-69. Harvest and Burning Prescriptions in Current Potential Habitat for Flammulated Owls, in acres (Exhibit Rs-2).

Prescription	Alt. A	Alt. B	Alt. C
Commercial Thin	0 ac	15 ac	118 ac
Understory Fuel Reduction	0 ac	55 ac	4 ac
Understory Treatment Total*	**0 ac**	**70 ac**	**122 ac**
Seed Tree with reserves	0 ac	7 ac	4 ac
Shelterwood with Reserves	0 ac	116 ac	20 ac
Stand Replacement Total	**0 ac**	**123 ac**	**24 ac**

* Potentially beneficial to flammulated owls over a shorter duration.

An additional 1,081 to 1,328 acres of treatments such as precommercial thinning, fuel reduction, and stand replacement harvest are proposed on other lands capable of supporting flammulated owls some time in the future. Such treatments would most likely be beneficial to this species in the long term. In Alternative B, 0.3 miles of temporary road would be constructed in current potential habitat for flammulated owls. Approximately 1.3 miles (Alternative C) to 1.6 miles (Alternative B) of temporary road would be constructed on land capable of supporting flammulated owls some time in the future, all of which would have shelterwood harvest. This long-term capability would be maintained after these roads are restored.

Cumulative Effects

Fire suppression and timber harvest have altered the availability of habitat with large trees and open understories in the Valley Face area. The absence of large fires during the past 75 or more years has resulted in denser, more closed canopies with more patches of Douglas-fir regeneration in the understory than typically occurred. Parts of the analysis area in the mixed-severity fire regime were likely dominated by open-understory large tree habitat. In many stands, fire suppression has contributed to increased understory growth and denser mid-canopy trees, making foraging more difficult for flammulated owls. Across national forest, corporate, and private lands, past timber harvest of old growth Douglas-fir stands removed suitable nesting habitat (Exhibit Q-8). Firewood cutters have eliminated important snag habitat components. This species' affected environment described above has been shaped by past and present effects cumulative to those discussed above for each alternative. Cumulative effects relevant to flammulated owls are further discussed in sections on "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat, and "Neotropical Migratory Birds" in this chapter, and in Exhibit Rg-9. For an assessment of this species' viability at the Forest level, see

the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1. Exhibits Rs-20 and Rs-25 provide assessments of the flammulated owl and its habitat at level of USFS Region One.

Introduction—Gray Wolf and Grizzly Bear

The gray wolf (*Canis lupus*) and the grizzly bear (*Ursus arctos horribilis*) are federally listed as threatened species on the Flathead National Forest. They are considered together because they are both wide-ranging species that could potentially occur in any part of the Valley Face analysis area, and they could be affected in similar ways by proposed activities.

For wolves, adequate prey base and security from risk of mortality are the two major components that provide survival and recovery value (USFWS 1987, Witmer et al. 1998). Wolves in the central Rocky Mountains appear to select landscapes with relatively lower elevation and flatter terrain. Habitat preferences appear to relate more to prey than to cover. The predominant prey of wolves in the northern Rockies is white-tailed deer, with lesser amounts of moose, elk, beaver, and smaller animals. Many biologists believe that the large white-tailed deer population in Western Montana has kept livestock kills by wolves low. Ungulate winter ranges, usually located in valley bottoms, are a critical factor for wolf survival. Within their home ranges in and near Glacier National Park, wolves concentrated their hunting in wintering areas of white-tailed deer (Kunkel and Pletscher 2001). Wolves commonly den in undisturbed sites, usually within 400 yards of water. A wolf pack will usually move up to six miles to a number of rendezvous sites, typically meadows, until the pups can travel with adults. Another important habitat component appears to be corridors for travel and dispersal, typically with vegetative cover and shallow snow. The effect of timber harvest and insect epidemics on wolves is best defined by effects on its prey, much of which depend on early seral/structural stage stages interspersed with cover, shelter, and water. Although lesser-used roads and trails can facilitate wolf travel, frequently used roads can reduce wolf habitat security and increase the potential for accidental or illegal mortality (Thiel 1985). See Exhibit Rt-12 for more information.

When grizzly bears are away from denning habitat or other areas that provide sufficient food and security, the effects of actions like timber harvest, fires, and insect epidemics are mostly limited to displacement and changes in the availability of cover. Roads have facilitated easy human access into grizzly bear habitat. The grizzly bear study in the Swan Mountains of Montana (Mace and Waller 1997, Mace et al. 1999) demonstrated relationships between roads and grizzly bear habitat use patterns. Bears tended to avoid roads, especially those open to motorized traffic. Bears are most vulnerable in areas with many roads and limited cover and escape habitat (Claar 1999). Fire and vegetation management can eliminate cover for security and thermal regulation and short-term changes in food availability (Witmer et al. 1998). See Exhibit Rt-13 for more background information.

Effects on wolves and grizzlies tie most strongly to one issue discussed in Chapter 1. This is Issue #2: "Forested Wildlife Habitat." In the short term, timber harvest and fuel reduction would reduce available cover and connectivity in some stands. These activities would enhance hiding cover quality in some of these stands over the long term. The effects of the alternatives on these species were largely evaluated through the analysis for their major prey species, due to similarities of needs for security and cover. See the "Commonly Hunted Big Game" section of this chapter, as well as the portions on connectivity in the "Old Growth Habitat and Old Growth Associated Wildlife Species" section. For this project, the analysis of effects on gray wolves and grizzly

bears spans as far as 20 years, at which time areas regenerated by this project are likely to provide hiding cover. In addition, human activities associated with this project that could disturb or displace bears or wolves would have ceased.

Affected Environment—Gray Wolf and Grizzly Bear

In the contiguous 48 states, only five areas in mountainous regions of Washington, Idaho, Montana, and Wyoming currently contain populations of wolves. The Northwest Montana Wolf Recovery Area (USFWS 1987) includes the Valley Face area. Aside from the human element, wolf habitat quality has remained high throughout northwest Montana. Wolf population trend is upward, as the recolonizing population in northwestern Montana continues to expand. There are now several wolf packs in Montana, with some travel between Canada and the United States. The Valley Face area has sufficient prey year-round to support denning wolves, although no wolf dens have been recorded there or on any other part of the Tally Lake Ranger District. Possible pack activity was located in the upper Griffin drainage in 2003, less than 5 miles southwest of the Valley Face area, and a rendezvous site was detected in upper Sheppard drainage in 1998, about 15 miles to the west. This and other wolf observations in and near the analysis area are in Exhibit Rt-7.

Potential wolf prey is plentiful and well distributed in the Valley Face area. These are primarily ungulates (white-tailed deer, mule deer, moose, and elk), and beaver. Ungulate populations, especially white-tailed deer, appear to be at healthy numbers, particularly in the winter (Exhibits Rb-3 and Rb-10). No specific ungulate calving or fawning sites have been identified in the analysis area, as these appear to be dispersed. Moose, beaver, and several smaller prey species are also yearlong residents. Several beaver ponds are scattered throughout the Valley face. For more information about potential wolf prey species, see sections in this chapter on “Commonly Hunted Big Game” and “Riparian and Wetland Wildlife Habitat.”

The Valley face area is outside the Grizzly Bear Recovery Zone identified in the Grizzly Bear Recovery Plan (USFWS 1993, p. 59). Federal lands within the proposed project area are designated in the LRMP as unoccupied grizzly bear habitat (II-24). However, grizzly bears are reasonably expected to occur in the northern third of the Valley Face area (Exhibits Rt-13 and Rt-17).

The Occupation-beyond-NCDE portion of the Valley Face analysis area is not considered “traditional prime habitat” (Tim Manley, pers. comm. 2005). Overall, the forage values for grizzly bears are moderate to low, the availability of travel corridors between forage areas is fair to good, and cover patches are abundant and well dispersed. No known or suspected denning habitat occurs in the analysis area or elsewhere in the Salish Range (Tim Manley, pers. comm. 2005; Exhibit Rt-7). Radio-collared grizzly bears using the Salish Range den in the Whitefish Range. No geographic or man-made barriers exist within the area that would preclude grizzly bear movements to adjacent populations or Recovery Areas. Most of the grizzly bear reports in and near the Valley Face analysis area (Exhibits Rt-7 and Rt-17) are in the Round Meadows area, although this is only a fraction of the sightings as reported on the Whitefish Range to the east in the NCDE. In spring 2002 and 2003, a sow grizzly with two young frequented the northeast portion (Tim Manley, pers. comm. 2005). Most likely, the rest of the observations were single bears that also denned in the Whitefish Range and wandered westward in search of food.

The relatively dense network of roads in the analysis area provides many opportunities for bears and wolves to forage on roadkills, while also posing a danger to the bears and wolves themselves. Across all ownerships, in summer at least 99 miles across the analysis area are open to public or private motorized use for an Open Road Density (ORD) of 1.8 miles per square mile. At least 87 miles are open from fall to spring, with an ORD of 1.6 (Exhibit Rg-8). These numbers are likely to be low, however, due to the many miles of roads and driveways on private land. Looking only at Forest Service land, there are 65 miles open in summer (ORD = 2.1), and 54 miles open from fall to spring (ORD = 1.7). For the situation across the larger cumulative effects area for these species, see the Cumulative Effects section below, which include information about road densities by Geographic Unit.

Environmental Consequences—Gray Wolf and Grizzly Bear

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. The lack of new openings and canopy thinning mean less forage available for prey eaten by wolves and grizzlies. Indirectly, taking no action to reduce fuels would increase the potential for stand-replacing fires to occur, which could result in large areas of decreased suitability or unsuitable habitat, and possibly mortality associated with heat intensity. The level of effects would be dependent on the size and intensity of such a wildland fire. See the "Commonly Hunted Big Game" section of this chapter for more information.

Direct and Indirect Effects--Alternatives B and C

Timber harvest, fuel reduction, and temporary road construction in these alternatives would affect cover used by large mammals such as wolves or grizzlies and their prey, as discussed in the section in this chapter on "Commonly Hunted Big Game." The short-term loss of hiding cover would occur on from 2,890 (Alternative C) to 3,549 acres (Alternative B) (Table 3-58, above, and Exhibit Rb-8), and includes several units that would sever or narrow important forested connections (Table 3-51, above, and Exhibit Rg-7). There would be an eventual increase in the quality of hiding cover in many harvest units. However, several commercial harvest units remove hiding cover, leading to a net decrease in Alternatives B and C hunting season security habitat usable by wolves, grizzlies, and several of their prey species. The prescriptions for retaining many large live trees, as well as snag and downed wood retention, would both help provide some cover in the units. In both action alternatives, shrubs would be planted in and near some harvest units near riparian areas if funding is available. This would enhance big game forage, feeding and nesting sites for songbirds, and hiding cover values for a wide variety of wildlife species.

Temporary displacement of individual animals might occur during preparation or implementation of activities. There would be no direct or indirect effects on wolves or grizzlies from disturbance to key habitat areas such as den sites, rendezvous sites, or whelping sites in or beyond the area where this project is proposed.

The action alternatives are not expected to have any direct, indirect, or cumulative effects to grizzly bear denning habitat or high quality food sources. As a result of the action alternatives, there should be an increase in the quality of forage for ungulates. Seeding and shrub planting would not be expected to attract bears into areas where there would be an increase in mortality risk. Due to disturbance and displacement, there could be a minor effect on prey species' habitat

use patterns, but not their population levels or availability as prey. Other prey items such as beavers would not be affected.

Based on the nature and duration of the proposed project, the mortality risk for both wolves and grizzly bears would remain low-to-moderate. If gray wolf denning or rendezvous sites are identified in the project area in the future, existing Flathead LRMP standards and guidelines would be implemented to ameliorate potential adverse effects. The same would be true of grizzly bear dens, although this is extremely unlikely.

Cumulative Effects

The cumulative Effects analysis area for the grizzly bear and gray wolf is the Mountain Meadow-Rhodes Draw, Tally Lake-Round Meadow, and Whitefish Geographic Units, as delineated in the Forest Plan (Exhibits Rg-5 and Rt-17). This 206 square-mile area extends from the 8th parallel just north of Olney, east to the Whitefish Divide, southeast along the divide past Haskill Basin, south to the town of Whitefish, then further south and west along the edge of the Salish Range to include the Rhodes Draw drainage, north to Johnson Peak, and northeast to near Olney.

The Valley Face area contains established human activities and developments including roads, extensive timber harvest, and numerous recreational opportunities. Subdivision and development of private lands, as well as increased human pressure in the form of recreation, hunting, firewood gathering, and other activities, are likely to continue. See the "Commonly Hunted Big Game" section of this chapter for information about factors such as hiding cover for large mammals, secure habitat, and roads. Human access, available cover, and public attitudes largely determine mortality risk to wolves and grizzly bears (Witmer et al. 1998). In consideration of habitat conditions, human use, human dwellings, roaded access, and the number of reported observations, the mortality risk to wolves and grizzlies is considered low-to-moderate.

Cover in the cumulative effects area is fragmented because much of the land base has been harvested or converted in some manner and is within various stages of regeneration. There are no active timber harvesting operations on national forest lands in the analysis area, although the Beaver Lakes South Fuels Reduction Project would reduce or in some areas temporarily negate hiding cover usable for species like wolf or bear, but these species would still be able to travel across the area and find carrion and some other foods (Exhibit Rt-14). The 2004 Logan Creek Ecosystem Restoration Project is underway in the far western edge of the cumulative effects area. The USFWS Biological Opinion for the Logan project is in Exhibit Rt-14. A precommercial thinning project, described in the introduction to this chapter, is underway in the area, which would also reduce the quality of some areas of cover. Logging will likely continue on private land.

Across the analysis area, open and closed roads facilitate human access, contributing to the risk of mortality or displacement (Exhibits Rg-5, Rg-8, and Rt-17). The densities of open roads on Forest Service land are shown in Table 3-70. Any road that is open seasonally or yearlong is considered as open, as these roads would be open during all or part of grizzly bears' non-denning season (April 1 to November 20). This definition is equivalent to "unrestricted road," as used in the Flathead LRMP. Restricted roads are physically closed yearlong by a gate, berm, or revegetation. Between 1992 and 2005, 2.2 miles of new system roads have been constructed on the Tally Lake Ranger District, while 11.1 miles of system roads were decommissioned. Administrative uses of closed roads for reforestation or road-related work may also affect grizzly bear use of the area.

These and other activities such as routine road maintenance, watershed improvements, trail reconstruction, and measures to control weeds are foreseeable and scheduled to occur.

Table 3-70. Open Road Densities by Geographic Units (GUs) in the Cumulative Effects Area to Compare with Forest Plan Direction (Rg-5 and Rt-17).

	Mountain Meadow-Rhodes Draw	**Tally Lake-Round Meadow**	**Whitefish**
Acres, All ownerships	23,674 acres	38,655 acres	(69, 616 acres)
Acres, USFS only	23,674 acres	20,569 acres	(10,378 acres)
Maximum Flathead N.F. LRMP Open Road Density by Geographic Unit	1.8 to 2.2 miles/square mile	1.8 to 2.2 miles/square mile	n.a.
Existing Unrestricted Road Density by Geographic Unit	1.3 miles/square mile	1.8 miles/square mile	0.1 miles/square mile
Existing Restricted Road Density by GU	(0.4	(0.5	(0.0
Total Unrestricted miles allowed under Road Density Standard	52 to 63 miles	58 to 71 miles	n.a.
Existing Unrestricted miles in each GU	49.0 to 49.5 miles	56.3 to 56.9 miles	15.2 to 15.3 miles
Existing Restricted miles in each GU	16.5 to 16.7 miles	14.8 to 15.0 miles	4.1 miles

There are no Flathead Forest Plan road density standards for the 69,616-acre Whitefish Geographic Unit, less than one percent of which is USFS lands (the Holbrook and Beaver Lake areas) outside the NCDE. The paved road from Whitefish up to the Big Mountain Base Area, along with a short spur road to Holbrook Overlook, zigzag through the Holbrook area. This creates an open road density of 6.8 miles/square mile in this 157-acre area of USFS land. The USFS's 519-acre Beaver Lake area is unroaded except for a cluster of roads in the northwest corner, resulting in an open road density of 1.1 miles/square mile. Across all FS lands in the Whitefish GU, the ORD is 0.14 miles/square mile. Across all ownerships, the Whitefish GU has 317 miles of known roads, with additional miles of driveways and other roads on private lands. About 21 miles of Highway 93 is in this GU along the southern and western edge.

There have been some grizzly and wolf mortalities due to management removal, mistaken identity, and highway mortality in and near this area. There is also potential for grizzlies and wolves to be killed or injured on the 24 miles of railway that run along the southern and western edge of the Whitefish Geographic Unit, outside of the Occupation-beyond-NCDE portion of the Action Area. This stretch of track averages between one and two trains per hour (Waller 2005). An inactive Forest Service livestock allotment ("Chinook") occurs partially in the analysis area, and grazing occurs on private land. There has been no indication of wolves or grizzlies preying on stock in this area, and no predator control efforts are ongoing or anticipated.

There is no mandatory food storage order in or beyond the Occupation-beyond-NCDE Area outside the recovery zone, but its conditions are generally applied to USFS permitees, particularly those involving camping. However, food conditioning of grizzly bears occurs on private lands adjacent to the Forest and the potential for adverse impacts to grizzly bears on the Forest does exist. Although Brown Bear Resources (2003; Exhibit Rt-3) identified no grizzly bear attractants in the Tally Lake Ranger District, they itemized 47 attractant sites (garbage, food, grease traps, or animal feed) in and near the larger cumulative effects area used for grizzly bears and wolves. This included the town of Whitefish, half of which is in the analysis area. The population of this town has been growing by about eight percent per year, with approximately 600 houses per square mile over its 4.5 square miles. Whitefish and the surrounding area also has innumerable garbage cans, bird feeders, livestock feeders, pet bowls, orchards, apiaries, etc. Other attractants listed in the

Action Area include garbage at the Big Mountain base area, dumpsters, campgrounds, restaurants, and schools. It is expected that agriculture and other vegetation alteration would continue on adjacent private holdings. This may result in management elimination of some grizzlies and a reduction of natural food sources.

No geographic or man-made barriers exist within the analysis area that would preclude wolf or grizzly bear movements to adjacent populations or Recovery Areas. For more information about these species and their habitats at various scales, including that of the Flathead National Forest, see Exhibit Rg-1.

No alternatives of the proposed project are expected to have any direct, indirect, or cumulative effects to grizzly bear or wolf denning habitat or high quality food sources. The grizzly bears' and gray wolves' affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. Cumulative effects relevant to gray wolves and grizzly bears are further discussed in sections in this chapter on "Commonly Hunted Big Game," "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat, and "Riparian and Wetland Wildlife Habitat," and in Exhibit Rg-9. For an assessment of these species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1.

Introduction—Northern Goshawk

Northern goshawks (*Accipiter gentilis*) are a USFS Region One sensitive species. They are a mid-sized raptor most closely associated with mature and older conifer or conifer/aspen forests. Goshawks prey on a variety of medium-sized forest birds and mammals, and their foraging habitat is typically forests with relatively open understories (Reynolds et al. 1992, Squires and Ruggiero 1996, Beier and Drennan 1997, Greenwald et al. 2005). Hayward and Escano (1989) found nest sites in northwest Montana were often located in even-aged, single-storied, mature forest stands with a high canopy closure of widely spaced large trees. The density of small trees is also relatively low in nest stands, and the forest floor is relatively clear of woody debris (Squires and Ruggiero 1996). In the Northern Rockies, minimum patch size for nest stands is 25 acres with 125 acres being optimum (Warren 1990); an average of 30 acres has been recommended for nest stands in the southwestern United States (Reynolds et al. 1992). Alternatively, Reich et al. (2004) determined that goshawk populations may be more limited by territoriality and prey density than by nest habitat availability. A post fledgling-family area of approximately 420 acres has been recommended for goshawks in the southwestern United States (Reynolds et al. 1992). Estimates of the goshawk's home range vary from 500 to over 6000 acres. See Exhibit Rs-17 for more information.

Regeneration harvest can have an impact on goshawks by removing suitable nesting trees and decreasing the size of nesting stands, although it can also create forest edges and smaller openings that goshawks can use. Intermediate harvest and/or underburning can have a positive effect on goshawk habitat if a landscape-based approach is used (Squires and Ruggiero 1996, Graham et al. 1997, Finn et al. 2002). Understory treatment and intermediate harvest can maintain or create more favorable conditions over time for goshawks as the resulting stands develop structural diversity (Reynolds et al. 1992). This is particularly true if stands are managed for canopy closure values above 40 percent canopy levels (Beier and Drennan 1997) and if patches are left unharvested (Finn et al. 2002). Conversely, Drennan and Beier (2003) concluded that

management to provide for a more open stand condition may not be justified in terms of how goshawks select habitat, stressing the importance of leaving large trees, snags, downed logs, woody debris, and the herbaceous layer. Stand-replacement fire or insect epidemics can eliminate or create the various elements of goshawk habitat, depending on the size and severity of the disturbance. Human avoidance around the nest during the nesting season is important, but some timber cutting may be allowed outside the breeding season (Lŏhmus 2005). Other recommendations exist for nesting, post-fledging, foraging, and prey species for southwestern goshawks (Reynolds, et al. 1992). These have been questioned (Greenwald et al. 2005) based on an incomplete review of more recent goshawk literature (Exhibit Rs-17).

Effects on northern goshawks tie to two issues discussed in Chapter 2. These are Issue #1: "Old growth forest" and Issue #2: "Forested Wildlife Habitat." Potential goshawk habitat was identified as northerly or easterly facing and relatively flat three-storied or continuous story mid or late-seral/structural stands with a canopy cover of 25 percent or greater (Exhibit Rs-16). Land with these attributes was electronically overlain with proposed units and temporary road construction. For more information about effects analysis methods, conclusions, and cumulative effects, see the "Old Growth Habitat and Old Growth Associated Wildlife Species" section of this chapter. For this project, the analysis of effects on goshawks spans as far as 100 years, at which time areas of potential nesting habitat regenerated by this project are likely to be suitable for nesting habitat.

Affected Environment—Northern Goshawk

The 1998 U.S. Fish and Wildlife Service (USFWS) review of goshawks in the western United States found that although forest management has changed the vegetation characteristics throughout most of the west, the goshawk continues to be well-distributed throughout its historical range without evidence of substantial population declines (Kennedy 1997, Clark 1998). A 2003 assessment of potential goshawk habitat across USFS Region One (Exhibit Rs-27) found at least 68 percent of the Region's sixth-code Hydrologic Units have sufficient habitat for goshawks. USFS Region One modeling (Samson 2005; Exhibit Rs-20), based on research results involving goshawk nesting, post fledging, and foraging habitat, and using Forest Inventory and Analysis (FIA) information, demonstrated that northern goshawk habitat is abundant and well-distributed by National Forest. In addition, the comparison of the relative forest composition and structure in 1938 to1942 to current conditions shows a major trend favorable to the goshawk (Samson 2005).

In 2005, apparent goshawk nesting was observed in the Valley Face area (Exhibit Rs-5), with observations of goshawks recorded in that same stand for several years running. Call playback surveys done in the adjacent Logan Creek area for this species in 2002 did not detect any goshawks (Exhibit Rs-5) despite abundant habitat. Over the past decade on the Tally Lake Ranger District, goshawk observations were common enough that most were not recorded. A 2005 survey of northern goshawk presence in USFS Region One showed a high rate of goshawk presence in roaded areas (Exhibit Rs-5).

Across the analysis area, about 6,900 acres appear to provide goshawk nesting and foraging habitat (Exhibit Rs-16), with the largest continuous patch at 2,191 acres. About 53 percent of potential goshawk habitat has a canopy cover of 60 percent or greater, and is thus more likely to be used for nesting, although the known nesting stand is more open than this. Throughout the

area, additional foraging habitat is available in adjacent stands and small openings. Forest Service land in the analysis area could theoretically support four pairs (Exhibit Rs-16). All four have six or more potential nest stands that have 60 percent or greater canopy cover; well over 420 acres of post-fledgling family area; and 5,400 acres of foraging area; as per Reynolds et al. (1992) recommendations. Both nesting and foraging habitat are well distributed throughout the analysis area.

Fire suppression in the Valley Face area has resulted in a high percentage of older forests becoming filled in with dense under-stories and mid-stories. This increases the risk of extensive tree mortality due to stand-replacing fire or pathogens. It also makes some stands less desirable for species such as the goshawk. See the "Fire and Fuels" section of this chapter for more information about trends regarding stands containing larger trees and open understories. For more information about this species and its habitat at various scales, including that of the Flathead National Forest, see Exhibits Rg-1, Rg-3, Rs-17, and Rs-27.

Environmental Consequences—Northern Goshawk

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, or temporary road construction are proposed with this alternative. Thus, this alternative would have no direct effect on existing goshawk habitat. Vegetative conditions would continue to respond to normal growth conditions, providing a mosaic of forested habitats. Indirectly, as time goes on, understory growth would decrease habitat suitability for foraging opportunities. This is particularly true in the lower- to mid-elevation ranges. In addition, taking no action to reduce fuels would increase the potential for stand-replacing fires to occur, which could indirectly result in large areas of unsuitable habitat.

Direct and Indirect Effects--Alternatives B and C

Most resident goshawks are likely to experience some habitat loss at a small or site-specific scale. Regeneration harvest and temporary road construction (Exhibit Rs-16; Table 3-71) would remove suitable nesting habitat, although in some cases it may create forest edges and smaller openings that goshawks could use for foraging. The largest continuous patch of potential forested goshawk habitat would not be affected by either alternative (Exhibit Rs-16). Intermediate harvest and/or fuels reduction should have a positive effect on goshawk habitat. Shrub planting in and near some harvest units near riparian areas would enhance habitat values for a variety of species preyed upon by goshawks. Other actions included in these alternatives would not be expected to affect goshawks. While harvest was ongoing, activity near an active nest site could cause temporary avoidance or abandonment, depending on the length and intensity of activity. If a nest is located in a unit, operations will cease until activities can be rescheduled or modified.

Under both alternatives, all four of the potential home range areas would have sufficient nesting and foraging habitat after treatment to remain functional territories, using Reynolds et al. 1992 as a guide. This analysis is detailed in Exhibit Rs-16. However, the known goshawk nesting stand (Exhibit Rs-5) in the northernmost potential home range would be affected by Units 31 and 32 in ways that are inconsistent with recommendations in Reynolds et al. (1992) for southwestern goshawks. As displayed in Exhibit Rs-16, this includes reductions in canopy cover and tree density and in the availability of nearby post-fledgling habitat, all of which apparently affects prey availability.

Table 3-71. Harvest and Burning Prescriptions in Potential Habitat for Northern Goshawk (Exhibit Rs-16).

Prescription	25-59% Canopy Cover			60% Canopy Cover		
	Alt. A	Alt. B	Alt. C	Alt. A	Alt. B	Alt. C
Understory Fuels Reduction	0 ac	149 ac	188 ac	0 ac	46 ac	50 ac
Commercial Thin	0 ac	384 ac	119 ac	0 ac	215 ac	351 ac
Pre-commercial Thin	0 ac	159 ac	159 ac	0 ac	0 ac	0 ac
Total Acres Intermediate Treatment	**0 ac**	**592 ac**	**466 ac**	**0 ac**	**261 ac**	**401 ac**
Seed Tree with Reserves	0 ac	0 ac	0 ac	0 ac	0 ac	0 ac
Shelterwood with Reserves	0 ac	265 ac	236 ac	0 ac	310 ac	197 ac
Total Acres Stand Replacement	**0 ac**	**265 ac**	**236 ac**	**0 ac**	**310 ac**	**197 ac**
Clearing for Temporary Roads	**0 ac**	**2 ac**	**2 ac**	**0 ac**	**4 ac**	**1 ac**

The abundance of several prey species would temporarily decline as a result of proposed changes in habitat structure, but it is unlikely that any species would markedly decline at the scale of a goshawk home range. Species that would have the sharpest localized population declines are tied to the denser stands of mature trees and thickets of seedling and sapling conifers. These animals would shift primarily to untreated reserves in and adjacent to the project area. Species likely to decline in treated areas are the ruby-crowned kinglet, white-breasted nuthatch, pine squirrel, and brown creeper. Shelterwood harvest would reduce the density of pine squirrels—a primary prey item—and make parts of the project area less inviting to foraging goshawks. The treated areas would continue to support a variety of suitable prey species (hairy woodpeckers, robins, Townsend's solitaires) and local goshawks might continue to exploit it. Most of the treatments are likely to enhance goshawk habitat value over the long term. For more information on effects relevant to goshawk prey species, see the sections of this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species" and "Snag and Downed Woody Material Wildlife Habitat."

Cumulative Effects

Cumulative effects on northern goshawks are very similar to those of flammulated owls, as described earlier in this chapter. The goshawk's affected environment described above has been shaped by past and present cumulative effects. Cumulative effects relevant to northern goshawks are further discussed in sections in this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species" and "Snags and Downed Woody Material Wildlife Habitat,", and in Exhibit Rg-9. For an assessment of this species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1. Exhibits Rs-20 and Rs-27 provide assessments of the northern goshawk and its habitat across USFS Region One.

Introduction—Western Big-eared Bat

The Western (Townsend's) big-eared bat (*Plecotus townsendii*) is a USFS Region One sensitive species. This species forages on insects high in living forest canopy near wet meadows (Dobkin, et al. 1995; Exhibit Rs-18). Caves, tree cavities, rock outcrops, buildings, or mines may provide sites for roosting, communal nurseries, or winter hibernation (Reel, et al. 1989; Tuttle and Taylor 1994). Timber harvest, insect epidemics, fires, and road construction and maintenance can affect this species through soil compaction, changes in vegetative cover, or by altering the quantity and quality of water flowing into wet meadows. In addition, timing of recruitment of large woody material into wetland edges can be altered. Snags used as roosting structures can be removed.

Harvest in action alternatives could necessitate the felling of snags used by bats for roosting. Potential foraging sites for Western big-eared bats were identified as Riparian Landtypes NL1A and NL1E (Exhibit Rr-3). These are nearly level riparian habitats in flat valley bottoms and with relatively fine substrates. This riparian type was electronically overlain with proposed units and temporary roads. For more information about effects analysis methods, conclusions and cumulative effects, see the "Hydrology," "Aquatic Species," "Riparian and Wetland Wildlife Habitat," and "Snags and Downed Woody Material Wildlife habitat" sections of this chapter. For this project, the analysis of effects on western big-eared bats spans as far as 50 years, enough time for some of the trees left in the units to acquire decay and other characteristics that make them useful to bats as roosts.

Affected Environment—Western Big-eared Bat

In the Valley Face area, about 990 acres may provide feeding sites for western big-eared bats (Exhibit Rr-3). This potential habitat is defined as nearly level wet areas with substrates of medium sand or finer material. It is well distributed throughout the analysis area, and nearly all of it is adjacent to pole-sized or older forests. There are nearly 70 wet meadow sites ranging from 0.4 to 187 acres (Exhibit Rr-3). For more information, refer to the "Aquatic Species" and "Snags and Downed Woody Material Wildlife Habitat" sections of this document.

The western big-eared bat has a widespread distribution, but is uncommon to rare; a notable decline has been reported in the western United States (Dobkin, et al. 1995). Western big-eared bats are distributed throughout western North America in a wide variety of forest types, with isolated populations further east. It has not been recorded in the Valley Face area, and potential roosting habitat has not been surveyed for bat occupancy. Abandoned mines in the adjacent Logan drainage were surveyed for bats but none of this species were found. Western big-eared bats were found in bat surveys at numerous locations on the adjacent Kootenai National Forest in 1993. A broad survey in 2005 did not capture any western big-eared bats in western Montana (Hendricks and Maxell 2005, Exhibit Rs-5). Nevertheless, the species may be present. Roosting habitat may be provided by abandoned mines or by abandoned buildings on private land. There appears to be sufficient snag roosting habitat near numerous wet meadow feeding areas. Across the analysis area, numerous wet meadow sites have adjacent potential feeding and roosting habitat for the bat, with insect numbers apparently at endemic levels. See Exhibit Rs-11. For more information about these species and their habitat at various scales, including that of the Flathead National Forest, see Exhibit Rg-1.

Environmental Consequences—Western Big-eared Bat

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. Thus, this alternative would have no direct effect on western big-eared bats. Indirectly, taking no action to reduce fuels would increase the potential for stand-replacing fires, which could result in areas of less suitable or unsuitable habitat and possible fatalities. The level of effects would be dependent on the size and intensity of such a wildland fire. See the "Water Resources, "Aquatic Species," and "Riparian and Wetland Wildlife Habitat" sections of this chapter for more information.

Direct and Indirect Effects--Alternatives B and C

As described in the "Riparian and Wetland Wildlife Species" and "Aquatic Species" sections of this chapter, no vegetation manipulation would occur in or immediately adjacent to potential feeding habitat for the western big-eared bat (Exhibit Rr-3). In addition, no harvest or fuel reduction is planned close enough to these areas to alter the availability of downed wood recruitment. In both Alternative B and C, Temporary Road 9 would require installation of a culvert to cross a creek approximately 200 feet downstream of one wetland and about 2000 feet and one existing culvert upstream of another wetland. This would not be expected to alter the availability of mosquitoes and other insects eaten by bats. All action alternatives would include Riparian Habitat Conservation Areas (RHCAs; Flathead National Forest 1995) as a design feature to meet INFISH guidelines for managing riparian habitat. This includes riparian buffers on all streams, ponds, or springs/seeps, none of which would be adversely affected by proposed alternative activities. The other actions in these alternatives are not expected to have negative impacts on riparian habitat areas or the species using them. See the "Aquatic Species," "Water Resources," "Riparian and Wetland Wildlife Habitat," and "Snags and Downed Woody Material Wildlife Habitat" sections for more information.

Cumulative Effects

Past timber harvest, road construction and maintenance, fires, and fire fighting have likely affected western big-eared bat habitat in this area as well as across the Flathead National Forest. Fires probably rarely burn in this species' wetland foraging habitat, although water quality and quantity varies after large fires upstream. Motorized access has greatly facilitated the removal of potential roost snags for firewood. Beaver dams also provide a flux of habitat availability; past beaver trapping may have affected habitat availability where beavers may not have recolonized. Bat roosts provided by mines and bridges are relatively new developments. Any abandoned mine on NFS land that is considered for closing for safety reason is always checked for bats beforehand. Livestock grazing is likely to continue in the USFS allotment and on private lands, and may have had past effects in riparian areas. Management Area designations, INFISH regulation, SMZ management, etc., would ameliorate any past downward trend caused by timber harvest or roading. Logging and roading will likely continue on private land in and near the analysis area. See the "Water Resources," "Aquatic Species," "Riparian and Wetland Wildlife Habitat," and "Snags and Downed Woody Material Wildlife Habitat" sections for more information about cumulative effects on these and similar habitats.

These species' affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. Cumulative effects relevant to western big-eared bats are further discussed in sections in this chapter on "Hydrology," "Aquatic Species," "Riparian and Wetland Wildlife Habitat," "Old Growth Habitat and Old Growth Associated Wildlife Species," and "Snags and Downed Woody Material Wildlife Habitat," and in Exhibit Rg-9. For an assessment of these species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1.

Introduction—Wolverine

Wolverines (*Gulo gulo*) are a USFS Region One sensitive species. Remoteness and isolation from human impacts and a diverse prey base seem to be the most important habitat components

(Witmer et al. 1998). Adults are mostly solitary and range widely over a variety of habitats, with home ranges in Montana averaging 150 square miles (Exhibit Rs-19). The literature suggests wolverines readily avoid human activity (Ruggiero, et al. 1994). With few exceptions, wolverine dens described to date have been located in alpine, subalpine, taiga, or tundra habitat. Reports of dens in low elevation, densely forested habitats are rare (Magoun and Copeland 1998). Wolverines feed primarily on rodents and carrion, although they eat berries, insects, fish, birds, and eggs when available. Movements to lower elevations during winter may be to take advantage of ungulate mortalities on winter ranges (Butts 1992). Trapping and roadkill mortality of wolverines is thought to be additive to natural mortality (Krebs et al. 2004). New genetic data (Tomasik and Cook 2005) suggest that gene flow between wolverines in North America has declined since historic times.

Potential wolverine dispersal habitat was identified as the entire analysis area. GIS was used for quantification of potential disturbance of wolverines and changes in cover, as described in the "Commonly Hunted Big Game" section of this chapter. See also the portions on connectivity in the "Old Growth Habitat and Old Growth Associated Wildlife Species" section. For this project, the analysis of effects on wolverines spans as far as 20 years, at which time areas regenerated by this project are likely to provide hiding cover. In addition, human activities associated with this project that could disturb or displace wolverines would have ceased.

Affected Environment—Wolverine

There is no suitable wolverine denning habitat (large, isolated tracts of land supporting a diverse prey base) in the Valley Face area, and no observations have been reported there (Exhibit Rs-5). Possible wolverines were seen along Brush Creek divide in August 1996 (about 15 miles to the west) and in lower Squaw Meadows drainage (about 15 miles to the southwest). This may have been a young, dispersing individual. The location of one harvested in 1990 was given as "Good Creek." Another in 1978 was reported as harvested at "Tally Lake," which could be anywhere on the Tally Lake Ranger District. There have been confirmed sightings over the past five years in Whitefish Divide, five miles to the northeast across the Stillwater Valley, and in the drainages of the North and Middle Forks of the Flathead River in Glacier National Park, upper Grave Creek, and Ten Lakes area. These are the closest suspected denning habitats, all of which have a considerable amount of ungulate winter range nearby. For information about the distribution of vegetative cover and wolverine foraging opportunity, see the "Vegetation," "Old Growth and Old Growth Associated Wildlife Species," and "Commonly Hunted Big Game" sections in this chapter. For more information about this species and its habitat at various scales, including that of the Flathead National Forest, see Exhibits Rg-1, Rg-3, and Rs-28.

Environmental Consequences—Wolverine

Direct and Indirect Effects--Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. Overall, availability of carrion and other food sources would not be measurably affected. The availability of hiding sites used during dispersal would gradually increase. The fuel loading in many stands would increase the chance of large hot fires in adjacent areas, which could have mixed results for wolverines. Stand-replacement disturbances are more likely to occur under this alternative, which would have the greatest and most-enduring effect.

Direct and Indirect Effects--Alternatives B and C

These alternatives would harvest and/or reduce fuels in approximately 3350 (Alternative C) to just over 3900 acres (Alternative B). Some of this would remove hiding cover and some may create forest edges and smaller openings. Considering the large scale of wolverine dispersal, these effects would not be measurable, nor would availability of carrion and other food sources be measurably affected. Harvest activities would not be conducted in or near any wolverine denning habitats. The probability of large stand-replacing wildland fires would be reduced. For more information on effects relevant to the wolverine, including temporary road construction, see the sections of this chapter on "Commonly Hunted Big Game," "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snag and Downed Woody Material Wildlife Habitat," and "Fire and Fuels" sections of this chapter.

Cumulative Effects

The wolverine is vulnerable where it occurs across the Columbia River Basin, due to its low population densities and dependence on remote habitat (Witmer et al. 1998). Past timber harvests altered habitat characteristics by reducing the amount of small mammal habitat (down logs/snags) and construction of roads, which allowed relatively easy access for trapping opportunities. These past management activities have also provided early successional foraging habitats for big game, on which wolverine scavenge, and easier access for hunters. Prior to fire suppression and timber management, elk and deer populations were dependent upon natural disturbances to create openings that provided the early successional growth favored by foraging ungulates. Human developments such as hiking trails and road development within the area probably had more far-reaching effects by increasing human access into once remote areas. Snowmobile use may also have had effects on winter prey species by providing pathways for other predators to access a limited winter wolverine prey base.

This species' affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative. Cumulative effects relevant to wolverines are further discussed in section on "Old Growth Habitat and Old Growth Associated Wildlife Species" in this chapter, and in Exhibit Rg-9. For an assessment of this species' viability at the Forest level, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1. Exhibit Rs-28 is an assessment of the wolverine across USFS Region One.

Regulatory Framework and Consistency

National Forest Management Direction is 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 USC 1604(g)(3)(B). To implement NFMA, the Forest Service's regulations, implemented on January 5, 2005, state that "the overall goal of the ecological element of sustainability is to provide a framework to contribute to sustaining native ecological systems by providing ecological conditions to support diversity of native plant and animal species in the plan area." 36 CFR 219.10(b). A goal under the Flathead's Long-Range Management Plan (LRMP), as directed in Amendment 21 (USDA Forest Service 1999a), is to "ensure that Forest Service actions do not contribute to the loss of viability of native species." All alternatives would comply with this direction. See the analysis of forest-level viability of

threatened and endangered wildlife species for Flathead National Forest's Forest Plan Amendment 21 and Exhibit Rg-1.

Threatened and Endangered Wildlife Species

Threatened or endangered status affords a species and its habitat special protection from adverse effects resulting from federally authorized or funded projects. It is the responsibility of the Forest Service to design activities that contribute to the recovery of listed species in accordance with recovery plans developed as directed by the Endangered Species Act (ESA) (50 CFR part 402). The Flathead National Forest's Amendment 21 to the LRMP has a goal to "provide sufficient habitat to promote the recovery of threatened and endangered species and conserve the ecosystems upon which they depend." Section 9 of the Endangered Species Act of 1973, as amended, requires threatened and endangered species be protected from "harm" and "harassment" wherever they occur, regardless of recovery boundaries.

The Proposed Action and its alternatives comply with Section 9, ESA of 1973 as amended, Flathead National Forest LRMP as amended, and all finalized recovery documents and recommendations listed below. A Biological Assessment for Threatened and Endangered Wildlife Species will be prepared for the Preferred Alternative (Exhibit Rt-11) prior to the decision. U.S. Fish and Wildlife Service consultation is in Exhibit Rt-2; concurrence or Biological Opinion will be in Exhibit Rt-21. If any active nesting, denning, or rendezvous sites for threatened or endangered wildlife species are discovered in any proposed harvest or fuel reduction unit, area of road construction or similar activity, activities would be modified, if needed, to protect habitat conditions and maintain reproductive efforts.

Gray Wolf – The Gray Wolf in Montana is classified as endangered and is protected under the Endangered Species Act. Strategies to protect and recover populations in Montana are outlined in the Northern Rocky Mountain Wolf Recovery Plan (USFWS 1987; adopted as Forest Plan Appendix PP). The Valley Face area is in the Northwestern Montana Wolf Recovery Area identified in the Northern Rocky Mountain Wolf Recovery Plan (USFWS 1987). Management direction applicable to the project area from the USFWS includes maintaining an adequate prey base for wolves and minimizing mortality risk for wolves without unnecessary land use restrictions. Gray wolves are also legally protected under the Lacey Act (1901). Forest Plan direction includes II 34-38; Amendments 8, 11, and 12; and Appendix PP. Amendment 21 includes standards that are listed below:

a. Wolf habitat needed to meet recovery goals includes available prey (especially elk, deer, and moose) and security.

b. In general, logging activities should not be conducted in or near known or highly suspected dens and rendezvous sites, ungulate calving/fawning areas, or in "important winter ranges" between December 1 and April 15 each year.

Grizzly Bear – The grizzly bear is classified as Threatened in Montana and is protected under the Endangered Species Act. The analysis area is outside the recovery zone known as the Northern Continental Divide Grizzly Bear Ecosystem (USFWS Grizzly Bear Recovery Plan 1993). It is listed in the LRMP as "unoccupied grizzly bear habitat," based on habitat suitability combined with lack of consistent grizzly observations. However, grizzly bears are reasonably expected to occur within part of the Valley Face area (Exhibit Rt-13). Forest Plan direction includes pages II-24 through II-33 and Amendments 8, 9, and 11. Interagency Grizzly Bear Guidelines (1986) were

adopted as Forest Plan Appendix OO. Numerous aspects of LRMP direction that apply to the Valley Face area are positive for grizzly bears (Exhibit Rt-17).

Bald Eagle – The bald eagle is classified as Threatened in Montana and is protected under the Endangered Species Act. The U. S. Fish and Wildlife Service proposed to delist this species since July 1999. Strategies to protect and recover bald eagle populations in Montana are outlined in the Pacific Bald Eagle Recovery Plan (USFWS 1986; adopted as Forest Plan Appendix RR), the Montana Bald Eagle Management Plan (MBEMP, Montana Bald Eagle Working Group 1986; adopted as Forest Plan Appendix QQ, and MTBEWG 1994) and the Habitat Management Guide for Bald Eagles in Northwestern Montana (MBEWG 1991). Bald eagles are also legally protected under the Migratory Bird Treaty Act (1918), the Bald Eagle Protection Act (1940), and the Lacey Act (1901). Forest Plan direction includes pages II-23 #5; III-53 #2, 3; and III-83 #6, Amendments 8, 11 and 13. The analysis area is in Management Zone 7 (Upper Columbia Basin) of the Pacific Bald Eagle Recovery Area identified in the Pacific Bald Eagle Recovery Plan. Management direction for Zone 7 involves identifying and protecting nesting, feeding, perching, roosting, and winter/migration areas. Direction also includes stabilizing water fluctuations, maintaining and enhancing prey populations, and monitoring or regulating human disturbance. See Exhibit Rt-4 for more information.

Lynx – A Canada Lynx Conservation Assessment and Strategy has been finalized (Lynx Biology Team 2000; Exhibit Rt-15). In February 2000, the Forest Service and the Fish and Wildlife Service entered into the Canada Lynx Conservation Agreement, which was re-signed in May 2005. The contiguous United States population segment of the lynx, including Montana, became a threatened species on March 24, 2000. In October 2000, the U.S. Fish and Wildlife Service issued a biological opinion on the effects of National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on Canada lynx in the contiguous United States. The Forest Service and Bureau of Land Management are proposing to amend land management plans for 18 national forests and four BLM units in the northern Rocky Mountains to include measures to conserve Canada lynx. This includes the Flathead National Forest. The management direction proposed for the Northern Rockies Lynx Amendment for National Forests in the Northern Rockies is largely based on the Lynx Conservation Assessment and Strategy. For more information about these documents, see Exhibit Rt-15.

Threatened Wildlife Species Determination Statements:

A. Bald Eagle – Based upon the location and nature of the proposed project and the analysis of potential impacts and cumulative effects, a determination of "May affect -- not likely to adversely affect" has been determined for bald eagle for all alternatives.

B. Gray Wolf – Based upon the location and nature of the proposed project, and the analysis of potential impacts and cumulative effects, a determination of "May affect -- not likely to adversely affect" has been determined for gray wolf for all alternatives.

C. Grizzly Bear – Based upon the location and nature of the proposed project, and the analysis of potential impacts and cumulative effects, a determination of "May affect -- not likely to adversely affect" has been made for grizzly bear for all alternatives.

D. Canada Lynx – Based upon the location and nature of the proposed project and the analysis of potential impacts and cumulative effects, a determination of "May affect -- not likely to adversely affect" has been made for the Canada lynx for Alternatives A and C, which are consistent with

the recommended standards and guidelines found in the Canada Lynx Conservation Assessment and Strategy (LCAS; Lynx Biology Team 2000). Depending on consultation with the USFWS, the determination for lynx for Alternative B could be "May affect -- likely to adversely affect." Alternative B is not fully consistent with LCAS recommendations. See Exhibit Rt-15.

Sensitive Wildlife Species

Federal laws and direction applicable to sensitive species include the National Forest Management Act (NFMA 1976) and Forest Service Manual 2670. Amendment 21 to the Flathead's LRMP has standards to conduct analyses to review programs and activities to determine their potential effect on sensitive species and to prepare a biological evaluation. It also states "adverse impacts to sensitive species or their habitats should be avoided. If impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole will be analyzed. Project decisions will not result in loss of species viability or create significant trends towards federal listing."

If any active breeding, nesting, or denning sites for sensitive wildlife species are discovered in any proposed harvest or burning unit, area of road construction or similar activity, activities would be modified, if needed, to protect habitat conditions and maintain reproductive efforts.

Sensitive Wildlife Species Determination Statements:

In accordance with FSM 2673.42, determinations have been made as to the degree of impact the proposed activities may have on sensitive species (Table 3-72 and Exhibit Rs-3, which includes a summary for each species). Along with Chapter 1, Chapter 2, and the sub-section above on each species, these determination statements meet the requirements of the Biological Evaluation for Sensitive Wildlife Species. These determination statements are for the segment of the population using the analysis area. Exhibit Rg-1 provides diversity determinations for this project when evaluated at larger spatial scales including that of the Flathead National Forest. These statements are based on available information on the distribution, presence/absence from the project area, habitat requirements, and management strategies for these species, as well as the project design and location.

Table 3-72. Biological Evaluation Determinations for Sensitive Wildlife Species (Exhibit Rs-3).

	Alternative		
Sensitive Wildlife Species	**A**	**B**	**C**
Black-backed woodpecker	BI	MIIH	MIIH
Boreal toad	MIIH	MIIH	MIIH
Common loon	MIIH	MIIH	MIIH
Fisher	MIIH	MIIH	MIIH
Flammulated owl	MIIH	MIIH	MIIH
Harlequin duck	NI	NI	NI
Northern bog lemming	NI	NI	NI
Northern goshawk	MIIH	MIIH	MIIH
Northern leopard frog	NI	NI	NI
Peregrine falcon	NI	NI	NI
Western big-eared bat	MIIH	MIIH	MIIH
Wolverine	MIIH	MIIH	MIIH

BI = "Beneficial Impact"; NI = "No Impact"; MIIH = "May Impact Individuals or Habitat but will not likely result in a trend toward federal listing or reduced viability for the population or species."

NEOTROPICAL MIGRATORY BIRDS

Introduction

The United States portion of the Northern Rockies Bird Conservation Region has 28 species listed as "Birds of Conservation Concern" (USFWS 2002, Exhibit Rn-1; Table 3-73). These species are migratory and non-migratory birds that are not designated as federally threatened or endangered that represent the highest conservation priorities. Two of these are sensitive wildlife species on the Flathead National Forest, and three are listed as old-growth associates (Exhibit Q-4). Some are not known or suspected to use habitats on the Flathead National Forest.

Table 3-73. Birds of Conservation Concern in the Flathead Basin (See Exhibit Rn-1 for more information).

Species	Status *	Relative Abundance in the Flathead
Ferruginous Hawk	t	Rare
Golden Eagle	B	Uncommon
Peregrine Falcon	B; Sens	Rare
Prairie Falcon	t	Rare
Yellow Rail	t	Rare
American Golden-Plover	t	Rare
Snowy Plover	No record	(NA)
Mountain Plover	No record	(NA)
Solitary Sandpiper	t	Uncommon
Upland Sandpiper	t	Rare
Whimbrel	t	Rare
Long-billed Curlew	B	Uncommon
Marbled Godwit	t	Rare
Wilson's Phalarope	B	Common
Yellow-billed Cuckoo	No record	(NA)
Flammulated Owl	B; Sens; OG	Occasional
Black Swift	B	Rare
Lewis's Woodpecker	B; OG	Occasional
Williamson's Sapsucker	b	Uncommon
Red-naped Sapsucker	B	Common
White-headed Woodpecker	t	Rare
Loggerhead Shrike	t	Occasional
Pygmy Nuthatch	B; OG	Common
Virginia's Warbler	No record	(NA)
Brewer's Sparrow	b	Uncommon
McCown's Longspur	No record	(NA)

* Status: B = Direct evidence of breeding; b = Indirect evidence of breeding; t = No evidence of breeding; Sens = Flathead National Forest Sensitive Species; OG = Old growth Associated Species

Two habitats are especially important to bird species. Riparian habitat, because of the availability of water and variety of plant communities, supports elevated numbers and diversity of bird species. Old growth habitat has the highest density and diversity of birds nesting in tree cavities (McClelland and Schmidt 1995). Snags, broken-topped live trees, downed logs, and other woody material are required by a wide variety of these species for nesting, denning, roosting, perching, feeding, and cover.

Bird populations that breed in the western United States appear to be suffering from forest fragmentation in breeding habitat (Hejl et al. 1995), and harvest and excessive tree mortality further contributes to short-term fragmentation (Rotenberry et al. 1995, Hejl et al. 2002). Problems associated with forest fragmentation include overall habitat loss, increase in high-

contrast edge habitat and edge effects, isolation effects, and increased vulnerability to predators (Finch 1991; Turcotte and Desrochers 2003). Moreover, brown-headed cowbirds benefit from forest fragmentation, particularly where livestock graze within about five miles, and this species has a strong negative impact on many Neotropical migratory birds. Cowbird use more than doubled in an old growth stand treated for fuel reduction (Bull et al. 1995). However, when sufficient downed woody material, residual understory trees, and wind-firm live trees and snags are available, timber harvest can maintain adequate habitat values. For more information, see Exhibit Rn-2.

Effects on Neotropical Migratory Birds relate directly to two issues discussed in Chapter 2. These are Issue #1, "Old growth forests"; Issue #2, "Forested Wildlife Habitat." The No Action Alternative could also affect their habitat across the Valley Face area through changes in the probability for intense wildland fire. The action alternatives would remove vegetation used as nesting and feeding substrates and as cover.

Information Sources

The effects on Neotropical migrants are discussed via analysis presented in this chapter in the sections on "Old Growth Habitat and Old Growth Associated Species," "Snags and Downed Wood Material Wildlife Habitat," and "Riparian and Wetland Wildlife Habitat." The flammulated owl has a separate section under "Sensitive, Threatened, and Endangered Wildlife Species." No impacts on the peregrine falcon would be expected (Exhibit Rs-23). The USFS Northern Region Songbird Monitoring Program (Hutto 1995a, Hutto and Young 1999, Hutto and Young 2002, Young and Hutto 2002) has provided data on population trends, habitat relationships, and effects from past management activities for Neotropical migratory birds breeding in western Montana. These have been combined to determine population trends on a continental, regional, statewide, or physiographic region scale. Wildlife population viability concerns at the Flathead National Forest and larger scales are assessed in Exhibit Rg-1. For this project, the analysis of effects on Neotropical migratory birds spans as far as 100 years, at which time areas of mature trees regenerated by this project are likely to again be used by birds associated with older forested stands.

Analysis Area

The analysis area for the Neotropical migratory birds is the Valley Face Fuels Reduction Project area (Figure 1-1, above). It is large enough to include the spring, summer, and fall range of numerous individuals of each of these migratory bird species and is representative of the effects of fires, natural tree mortality, timber harvest, fuel reduction, and firewood cutting across the landscape. All habitat attributes are distributed across this area, with some natural clumping of features like drier forests and large wetlands. It is sufficiently large to evaluate the ability of the habitat to support these species, but small enough to not obscure the effects of the alternatives. Old growth habitats are well distributed across Forest-Service lands in most of this area, except for the northern third and the far southeast, both of which are areas where past fire history and/or regeneration harvest precludes the presence of areas of numerous large trees. All of the actions proposed in the alternatives are contained within this area. An assessment at multiple scales was also conducted to address population diversity concerns (Exhibit Rg-1).

Affected Environment

The existing conditions of habitats important for migratory birds are described in the sections of this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat," and "Riparian and Wetland Wildlife Habitat." Additional information is provided for the flammulated owl in a separate part of the section on "Sensitive, Threatened, and Endangered Wildlife Species." Overall, the area provides a considerable diversity of these habitats. Of the 28 species listed as "Birds of Conservation Concern" listed above in Table 3-70, few have been documented in the analysis area (Exhibit Rn-4). Parts of the adjacent Logan Creek analysis area that seem to meet their habitat needs were surveyed for the peregrine falcon and the flammulated owl, but none were detected (Exhibit Rs-5). Most of the others use habitats that are rare or nonexistent in the analysis area, and five others are not expected to occur anywhere in the Flathead National Forest (Exhibit Rn-1).

For more information about wildlife habitat conditions across the Flathead National Forest relevant to Neotropical migrants, see the Final Environmental Impact Statement for the Flathead's LRMP Amendment 21 (USDA 1999a) and Exhibit Rg-1.

Environmental Consequences

Direct and Indirect Effects of Alternative A

No additional actions, such as timber harvest, fuel reduction, temporary road construction, or road rehabilitation, are proposed with this alternative. The direct and indirect effects on habitats important for migratory birds are described in the sections of this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat," "Aquatic Species," and "Riparian and Wetland Wildlife Habitat." Additional information is provided for the flammulated owl in a separate part of the section on "Sensitive, Threatened, and Endangered Wildlife Species." Overall, this alternative would leave habitats across the analysis area to continue with relatively natural processes. Areas with heavy tree mortality and blowdown would provide structural diversity, downfall trees, and a few long-standing snags. Downed logs, shading from snags, and lack of seed sources may delay the recovery of new trees in stands with high levels of dead trees (See the "Vegetation" section of this chapter). In some stands, there would be little chance for recruitment of large trees. The probability of fire would increase in such areas as dead trees fall and new understory growth contributes fine fuels.

Direct and Indirect Effects of Alternatives B and C

For both action alternatives, there will be disturbances and some bird mortality associated with proposed activities. Logging and fuel reduction may cause nest failure and death to both adults and young when activities occur during the nesting season. Because of higher soil moistures in the spring and early summer, most of the logging and fuel reduction would occur during other times of the year. However, in the warmer and drier habitat types and in lower elevations, logging may overlap with the nesting period. Prescribed burning may also cause bird mortality, depending on a number of factors such as timing, uniformity of fuels, and severity of burning. Mortality of adult songbirds is usually considered minor, but the eggs and young of ground and shrub nesters are vulnerable to spring fires. The majority of the proposed burns would be completed before or

after the nesting season. Nest parasitism by cowbirds may increase in fuel reduction areas (Bull et al. 1995) and adjacent to regenerated stands.

Other direct and indirect effects of the action alternatives on habitats important for migratory birds are described in the sections of this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat," and "Riparian and Wetland Wildlife Habitat." Additional information is provided for the flammulated owl in a separate part of the section on "Sensitive, Threatened, and Endangered Wildlife Species." Most large wind-firm live trees and snags would remain standing in all of the harvest and fuel reduction units. Removal of smaller-diameter wood, tree planting, and precommercial thinning would accelerate regeneration of green canopy cover. In all action alternatives, shrubs would be planted in some harvest units near riparian areas if funding is available. This would enhance feeding and nesting sites for songbirds. The other actions in these alternatives are not expected to have negative impacts on migratory birds.

Cumulative Effects

Cumulative effects relevant to migratory birds are described in the sections of this chapter on "Old Growth Habitat and Old Growth Associated Wildlife Species," "Snags and Downed Woody Material Wildlife Habitat," and "Riparian and Wetland Wildlife Habitat." Additional information is provided for the flammulated owl in a separate part of the section on "Sensitive, Threatened, and Endangered Wildlife Species." Saab and Rich (1997) list threats, species, and relevant habitats of concern on the scale of the Columbia River Basin. See Exhibits Rg-9, Rn-1, and Rn-2 for more information about cumulative effects on these species. The Affected environment for migratory birds described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for each alternative.

Regulatory Framework and Consistency

On January 10, 2001, President Clinton signed Executive Order (E.O.) 13186, "Responsibilities of Federal Agencies To Protect Migratory Birds." On January 7, 2001, the USDA Forest Service and the USDI Fish and Wildlife Service signed a Memorandum of Understanding to complement the Executive Order. The 1988 amendment to the Fish and Wildlife Conservation Act mandates the U.S. Fish and Wildlife Service to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." To carry out this mandate, the U.S. Fish and Wildlife Service published "Birds of Conservation Concern 2002," which recommends that its lists be consulted in accordance with E.O. 13186. The Migratory Bird Treaty Act covers many ground-nesting and shrub-nesting birds. Some migratory birds are covered by state hunting regulations; others are protected by non-game status by the Montana Department of Fish, Wildlife, and Parks.

There are currently no Flathead Forest Plan Standards specific to migratory birds. The flammulated owl and the peregrine falcon are sensitive species, and are discussed in this document and in other sections of the Project Record (Exhibits Rs-2, Rs-3, and Rs-23). Upon review of the information regarding Neotropical migratory birds here and in the project record (Exhibit Rn-1), no substantial loss of migratory bird habitat is expected from the implementation of any of the action alternatives.

RECREATION

Introduction

Recreational opportunities occurring within the analysis area most likely to be affected by this proposal include hiking/horse/bike trails, cross-country ski trails, and other various motorized and non-motorized activities. Some of these activities are concentrated in particular areas while others are dispersed along the roads, streams, and in general forest areas.

Information Sources

Information for this analysis was gathered through observations made during routine maintenance and surveys of recreation facilities. Trail locations and improvements were cataloged using GPS equipment and software. Road mileages reported were gathered through use of the Flathead National Forest's GIS database.

Analysis Area

The analysis of the recreation resource will focus on recreational activities specific to National Forest System lands within the analysis area boundary described on the maps in Chapter 2. The time frames for this analysis are from the beginning of implementation of activities to their conclusion in approximately 2014.

Affected Environment

The Recreation Opportunity Spectrum (ROS) is used as a means of describing recreational settings and activities (USDA Forest Service 1986). ROS classifies the Valley Face analysis area within a spectrum from semi-primitive motorized to rural. Visually, much of the area is culturally modified but attractive in appearance with moderate evidence of the sights and sounds of man. What facilities there are have been located in concentrated developed areas and integrated into the natural environment. Interaction between users is high in developed areas and low to moderate in the general forest area. Open forest roads and maintained trails provide the focus for most year-round recreational activities (e.g., pleasure driving, wildlife viewing, fishing, biking, hunting, snowmobiling, firewood gathering).

Areas of Special Recreational Interest in the Valley Face Analysis Area

Recreational areas marked with an asterisk (*) have the potential to be directly or indirectly affected by features of the action alternatives; the other recreational areas are listed for informational purposes only.

Trails

***Round Meadow Trails.** There are twelve miles of interconnecting trails used for cross-country skiing and snowshoeing in the winter and hiking, biking and horse riding in the summer. This trail system is heavily used by valley residents and visitors. There is a large parking area with restroom and information sign at the trailhead. One of the cutting units is adjacent to the trail system.

Trail #800 Tally/Ashley. Trail 800 is the longest trail on the Tally Lake District with both motorized and non-motorized access. This trail provides for several types of users i.e. hikers, mountain bikers, horse riders, and motor cycles. There are several access points which make this a versatile trail.

Trail #458 Tally Ridge. This trail is located above Tally Lake on the east side. It is a non-motorized trail that connects with the Stove Pipe Canyon Trail #196. Use on Trail 458 is light. The Bar W Ranch is under permit to offer guided rides on the trail between July 15 and September 30th.

***Trail #196.** Trail 196 Stovepipe Canyon is a popular trail that accesses the south end of Tally Lake. This trail is non-motorized. Bar W Ranch is under permit to offer horse rides on a limited basis for small parties up to four riders on this trail.

Other Routes. There are several old logging roads and trail routes in the Valley Face analysis area that residents use to access national forest lands. These old roads and trail routes are not system trails and have not been recorded or listed as district trails. Any future management of these routes will be very limited.

OHV Motorized Use

Off Highway Vehicles (OHV) and other motorized use would continue on open forest roads providing they are street legal according to the State of Montana regulations. Opening the forest through fuel reduction would not increase legal off road use because of the new national OHV Policy. The OHV policy requires each national forest or ranger district to designate roads, trails, and areas open to motor vehicle use, by class of vehicle. There are no closed roads designated for OHV use in the Valley Face analysis area.

Fishing

Although fishing is not frequently observed within the area, there are opportunities available for the angler. Bootjack Lake provides a fishing opportunity as well as Lost Creek. In addition, Forest Service roads within Valley Face provide convenient access to many of the other District's streams and lakes outside of the analysis area. Fishing in Valley Face can be characterized by a feeling of solitude that is provided by the reduced number of anglers.

The only stream with a recreational fishery is Lost Creek. This stream has numerous small-sized brook trout, mostly around four inches long. Although the fish are plentiful and anglers may keep 20 brook trout per day, Lost Creek receives relatively little fishing pressure.

Snowmobiling

There are no managed or groomed snowmobile trails within the analysis area, and there is little data available on use patterns. During some years, residents within the project area must rely on snowmobiles as a means of ingress/egress to their property. Snowmobiling by non-residents occurs at modest levels.

Open/Closed Roads

The majority of recreation within the analysis area occurs on roads, both open and closed. Primary activities associated with the use of the road system include pleasure driving, hunting, snowmobiling, berry picking, OHV users, mountain biking, and firewood gathering.

Roads are primarily used for firewood gathering. The network of roads open year-round and seasonally, along with the supply of dead lodgepole pine, offers firewood gathering opportunities for the surrounding communities of Whitefish, Kalispell, and Olney. The increasing number of year-around and seasonal residents in the Mountain Meadows, Cliff Creek and along the Valley Face area also utilize the roads for firewood gathering.

The open and closed road system in the Valley Face analysis area is an essential part of big game hunting season. Road use is high during this time of year around throughout Valley Face because it connects with the interior roads on the Tally Lake District. The spring bear season also sees higher levels of road use, but to a lesser degree than the fall hunting season. The open road system allows hunters to access areas by motorized vehicles from where they may continue on by non-motorized means, either traveling cross-country or on roads that have been closed seasonally or year-around. The closed road system provides easy walking, horseback riding, or mountain biking access that facilitates game retrieval.

Undeveloped Areas

Within or near the project area, there are no undeveloped lands identified as inventoried roadless areas in the 1977 Roadless Area Review and Evaluation process (RARE II). In addition, there are no congressionally designated wilderness areas, research natural areas, or wild sections of designated wild and scenic rivers. There are no undeveloped lands greater than 1000 acres in size in the Valley Face area that have the potential to provide natural or remote recreation experiences. Exhibit L-2 describes our process to determine that no areas like this exist in this planning area.

Environmental Consequences

Direct, Indirect, and Cumulative Effects Specific to Alternative A

Alternative A does not propose any new activities and does not change current management in the project area. Recreation resources would not be affected by implementation of Alternative A.

Direct, Indirect, and Cumulative Effects Specific to Alternative B and C

Hiking and Trail Access

In Alternatives B and C there would be timber harvest operations in unit 37 that touch on a small segment of trail in the Round Meadows area. This activity would not impact the long-term use nor change the character of the trail.

The Stovepipe Canyon Trail is in the vicinity of Unit 39. Alternative C proposes slightly more commercial thinning with moderate retention than in Alternative B. This activity would open the views to the south in both action alternatives but the trail tread and location would be protected.

No other impacts to existing designated trails on the District would occur in either of the action Alternatives B and C.

OHV

There would be no change in OHV access, designated trails or use in alternatives B and C. OHV riders would continue to be allowed on open Forest Roads provided they are street legal.

Fishing Opportunities

In both action alternatives, fishing opportunities would continue to be available at Bootjack Lake and Lost Creek. Neither action alternative changes the access or fishing opportunities.

Snowmobile

Snowmobile use would not be affected by this proposal.

System Road Changes under Alternatives B and C

There are no new system roads proposed in either alternative. The existing roads that provide access in private land and to the general forest area will not change. Road access will not affect the developed recreation opportunities that exist on the District. The use of district roads for hunting and driving for pleasure would continue with no change in access. Firewood, mushrooms and other forest products gathering opportunities are the same in Alternatives B and C. However, the Forest Service can temporarily open closed roads specifically for these types of gathering opportunities when this does not substantially impact wildlife conservation measures or the management of other resources. There will be a small amount of new temporary road constructed for timber removal. However, these will be immediately reclaimed and should not create a noticeable change in access.

Regulatory Framework and Consistency

The Forest Plan (pg. II-21, #1, #2, #10, #11, #13) established Forest-wide recreation goals that relate directly to the Valley Face analysis. Listed here are the goals and objectives that provide the framework for managing the recreation resources in the Valley Face area.

- #1 Use the ROS (Recreation Opportunity Spectrum) as a guide to provide the full array of recreation opportunities of the Forest.
- #2 Encourage Forest visitors not desiring a wilderness setting to use non-wilderness National Forest System lands which can provide for their recreation needs.
- #10 As per Executive Order 11644, through the Flathead National Forest Travel Planning Direction (Appendix C), and in conformance with the ROS designations for specific areas, designate use restrictions on roads, trails, and specific areas along with designating areas for ORV (Off-road Vehicle) use.
- #11 Retain the existing capacity of National Forest developed recreation sites on the Flathead National Forest during the next 10 years.
- #13 System trails located in resource development areas must be included in the project environmental analysis.

The LRMP management areas specific to recreation affected in the Valley Face area involve 2A, 2C, and 15B. The proposed activities in all alternatives comply with the recreation standards and guidelines for these MAs. Particulars of LRMP consistency are listed below.

- Management Area 2A emphasizes semiprimitive, nonmotorized recreation opportunities. There are no activities proposed in MA 2A.
- Management Area 2C emphasizes roaded, natural appearing recreation opportunities. There are no activities proposed in MA 2C.
- Management Area 15B emphasizes timber management with special consideration for cross-country skiing use of the area. All proposed activities are consistent with this consideration.

The 2001 Off-Highway Vehicle Record of Decision and Plan Amendment for Montana, North Dakota, and Portions of South Dakota amended the Flathead Forest Plan to prohibit cross-country travel unless specifically designated as open. There are no designated routes with the Valley Face area and all proposed activities in Valley Face action alternatives are consistent with this amendment.

VISUALS / SCENERY

Introduction

The topography of the Valley Face area was shaped by the continental ice mass that left behind a landform of scoured and rounded mountains. These mountains are typically forested with dense stands of timber that offer limited natural texture, color, line, and variety in shape. Some natural openings occur on south and west aspects and along ridge tops. These landscapes are referred to as "common" landscapes where landforms and features are not of unusual or spectacular scenic quality. One unique feature in the Valley Face area includes the area of rock outcrops and cliffs visible from Highway 93 and the Tally Lake road.

The Valley Face landscape can be viewed from an infinite number of viewpoints when traveling through the area. There are also many viewing opportunities from homes and roads located within and adjacent to the area. The main viewing of the area is looking to the west from Highway 93 between Kalispell and Church Drive.

Information Sources

Information for the visuals and scenery resource were gathered systematically from established viewpoints. These viewpoints are described in greater detail below.

Analysis Area

The analysis area for the visual and scenic resources includes the area described for the vegetation resource plus the viewpoints that extend to the east of the analysis area along Highway 93. For this analysis, several potential viewing locations were considered. Five viewpoints were chosen as representative of the range of views of the area and are the basis for analysis and modeling of the various alternatives. These viewpoints are described in detail below. The time frames for this analysis are from the beginning of implementation of activities to a point in the future when grass, shrubs, and small trees are established in areas disturbed by treatments, approximately 2020.

Affected Environment

Introduction and Regulatory Framework

Analysis and evaluation of the visual resource for this project applies a process described in Landscape Aesthetics, A Handbook for Scenery Management (USDA Forest Service 1995a). This system provides for the evaluation of physical features of the landscape called scenic attractiveness classes together with the levels of concern people have for scenery. This information is synthesized to develop Scenic Integrity Levels (SILs). The Flathead Forest Plan established Scenic Integrity Levels for each Management Area (called Visual Quality Objectives or VQOs in the Forest Plan). The proposed actions are within a variety of management areas. The following table shows Scenic Integrity Levels established in the Plan. The guidelines for meeting these levels are described in the Landscape Aesthetics Handbook.

Refer to the Forest Plan for locations of the various Scenic Integrity Levels. In general, the visible parts of the project area are specified as High, Moderate, Low, and Very Low SILs. The Forest Plan identifies the assigned scenery levels for each of the Management Areas. This information is displayed in the following table for the Management Areas present in the Valley Face area.

Table 3-74. Scenic Integrity Levels for Management Areas

Scenic Integrity Levels	Description
High	Refers to landscapes where the valued landscape character "appears intact." Deviations may be present but must repeat form, line, color, texture, and pattern common to the character so completely that they are not evident. Previously referred to as "retention."
Moderate	Refers to landscapes where the valued landscape character "appears slightly altered." Noticeable deviations must remain visually subordinate to the landscape character being viewed. Previously referred to as "partial retention."
Low	Refers to landscapes where the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. They should be compatible or complementary to the landscape character. Previously referred to as "modification."
Very Low	Scenic Integrity "appears heavily altered." Deviations may strongly dominate the landscape character. They may not be appropriate in shape, edge effect, or patterns. However, deviations must be shaped and blended with landforms so that elements such as unnatural edges or landings do not dominate the composition. Previously referred to as "maximum modification."
Unacceptably Low **	This scenic integrity level refers to landscapes where the valued landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern, or scale from the landscape character. Landscapes at this level of integrity need rehabilitation. This level should only be used to inventory existing integrity. It must not be used as a management objective.

** There are no areas in Valley Face classed at this Scenic Integrity Level.

Table 3-75. Scenic Integrity Level by Management Area (i.e., visual goals for Management Areas as outlined in the Forest Plan).

Management Area	Emphasis/Location	Scenic Integrity Levels
2A	Dispersed Recreation	High
2C	Dispersed Recreation (trail corridors)	High
7	Roaded Timber Lands in Visually Sensitive Areas	Moderate
9	White-tailed Deer Winter Range	Moderate
12	Riparian Areas	Moderate
15	Timber Production with Roads	Low to Very-Low
15B	Timber Production with consideration for X-C skiing	Low to Very-Low
17	Riparian Areas with Timber Production	Moderate

Historical Conditions and Existing Conditions

The analysis area has been subject to natural wildland fires for the last several thousand years. Fire history studies indicate much of this landscape burned in a series of large stand-replacing wildland fires and smaller mixed severity fires. Over time, these areas have become densely forested. Stand replacement fires created large openings while mixed severity fires tended to create open stands of fire tolerant tree species. Currently, patterns or modifications to the landscape due to fire are not evident to the average visitor since no large wildland fires have occurred in the analysis area for well over 100 years (please refer to the Fire and Fuels Section of this chapter).

Since the early 1900s man has modified the scenery of the Valley Face area. The first logging began in the lower elevations on the more gentle terrain. Large Douglas-fir and western larch trees were harvested to meet the demand for railroad ties. More intensive timber management activities and associated road building began in the 1960s. Road construction and harvesting has taken place since then in most drainages, with the majority occurring in the 1970s and 80s. Wildland fire control has also played a significant role in changes to the scenery.

Timber harvesting has created some obvious alterations to the landscape. In most areas the effects of timber harvesting meet the scenery intent of the Forest Plan. Topography and existing vegetation adjacent to roads combine to screen views of much of the project area. The Scenic Attractiveness Class is rated as typical (common) to the Forest. Based upon review of the Forest Plan, the concern or sensitivity level for the scenery is rated as high to moderate.

Viewpoint Descriptions

Viewpoints used for this analysis were selected based on the number of potential viewers, proximity to Forest Plan management areas with moderate to high SILs, and possible vegetation treatment as described in the alternatives. These points are all located on roads that are open to public use yearlong. The following describes the viewpoints that will be used for further analysis of the effects of proposed management activities on the scenery in the area. A viewpoint location map is available for review in Exhibit I-1.

Viewpoint One – Highway 93 and the junction of Church Drive. This is a Forest Plan monitoring viewpoint. Looking west from the Flathead Valley, this area is seen as a backdrop. This area is also seen from many other roads and residences in the valley. Timber harvest from past years is obvious, especially on private/corporate lands.

Viewpoint Two – The Tally Lake road (913) from the junction of 2920 (Pilot Knob) to the Mountain Meadow road (542). The only evidence of land management is the road itself and firewood cutting activities (stumps and debris).

Viewpoint Three – Farm to Market Road from the junction of Highway 93 to the junction of the Star Meadow Road near the Round Meadow Ski Area. Looking west from the viewpoint, past timber management activities are evident only at the junction of the Farm to Market Road and Highway 93.

Viewpoint Four – Star Meadow Road near Round Meadow Ski Area. Vegetation treatments are proposed directly adjacent to a high-use road in Forest Plan MA 7. The viewpoint is a small length of the Star Meadow Road just west of the cattle guard looking towards Unit 35.

Viewpoint Five – Mountain Meadow Road (542) from the junction of 2948 to the junction of 2956. Vegetation treatments are proposed directly adjacent and near an open road in Forest Plan MA 9.

The following table shows the existing conditions for the viewpoints in the project area.

Table 3-76. Viewpoint existing conditions.

Locations	Existing Visual Condition Rating / SIL
Viewpoint One	Moderately Altered / Low
Viewpoint Two	Intact / High to Moderate
Viewpoint Three	Slightly Altered / Moderate
Viewpoint Four	Intact / High to Moderate
Viewpoint Five	Slightly Altered / Moderate

Other Viewpoints

The existing visual condition of other portions of the project area, as viewed from many travel routes, meets the Scenic Integrity Levels as shown in the LRMP. A variety of silvicultural practices from clearcuts to partial cuts have been implemented throughout much of the area.

The option of using the upper slopes of Big Mountain as a viewpoint was considered and some analysis was done using maps, digital photography, and aerial photography. The main viewing attraction from this point consists of the Flathead Valley and Whitefish Lake. From Big Mountain, portions of the Valley Face area seen include Reid Divide and Pilot Knob. Many harvest units are evident during the winter months when blanketed by snow that would not be readily seen during summer months. In general, most of the harvesting seen from Big Mountain meets Forest Plan Scenic Integrity Levels (SILs) of low/very low for Management Area 15. Some contrasting horizontal and vertical lines created by roads and geometrically shaped harvest units are evident.

The viewpoint from Big Mountain was not carried forward into the analysis primarily due to the long viewing distance (approximately 14 to 20 miles), and the variety of changes to the vegetation form proposed over the entire landscape in the Valley Face project. Changes to the scenery in the Valley Face area as seen from Big Mountain would, for the most part, be unnoticed even under the Proposed Action Alternative that removes the most vegetation from the landscape.

Environmental Consequences

Each of the action alternatives involves prescriptions and management activities that would result in a change from the existing character of the area. All of the activities of the proposed action alternatives are designed to meet the scenery levels as designated in the Flathead Forest Plan.

The following information describes the short-term effects or changes as a result of implementation of the action alternatives as seen from the viewpoints.

Techniques to lessen visual impacts would be applied to meet the guidelines of the various levels of scenic integrity as shown in the Forest Plan. These measures are also employed to manage the landscape in order to meet the scenery goals for the short-term (up to four years) and long-term time frames.

Openings created by timber harvest and road construction have impacts on scenery. These impacts are brought about by contrasts created between natural forested landscapes and managed landscapes. These contrasts consist of changes in color, form, line, and texture of the soil and vegetation that have effects that are based on human perception. Past human activity has affected the scenery in the Valley Face area to varying degrees.

Effects on scenery from timber harvest and related activities would vary in duration and intensity corresponding to the tree cover left on site after harvesting. The seed tree reserve (light retention) silvicultural method leaves the least amount of vegetation and therefore creates contrasts between natural and managed landscapes. This can vary depending on the viewers' location, steepness of the slope, and the position of the harvested area on the slope. Shelterwood, group selections, and commercial thinnings (moderate to heavy tree retention) leave more vegetation and appear more natural over time and add variety to the scenery. This is especially true when these methods are used adjacent to older harvested areas.

The longest lasting visual disturbance is caused by soil exposure and displacement from road construction, tractor skid trails, and skyline corridors. The appearance of road construction depends upon topography, presence or lack of screening vegetation, the color contrast between soil and undisturbed areas, and the ability to restore or revegetate road cuts and fill areas. Roads constructed through or along the tops of clearcuts typically stand out when viewed in the foreground or middle ground viewing zones. Given time, revegetation of visible road cut and fill slopes, as well as trees growing in the timber harvest openings, can ameliorate the soil/vegetation contrast situation. Opportunities to minimize impacts to the scenery are greatest on tractor ground (slopes 40 percent and less) because unit size, configuration, and silvicultural prescriptions can be manipulated more effectively to screen disturbances.

The effects of harvest on scenery can also be influenced by the seasonal changes in vegetation condition and seasonal color contrast. Viewing opportunities can exist in winter months when deciduous plants have shed their foliage, while these same opportunities would not exist in the summer months when dense foliage can obstruct views. Changes in autumn color patterns draw attention to harvested areas that may not contain the same colors as surrounding timber stands. This is especially true in stands that have been regenerated with western larch. Harvested areas with less than 30 percent tree cover draw attention when snow covered. Harvest units that are inconspicuous other times of the year can totally dominate a landscape during the winter months.

Disturbances to vegetation and soil begin to recover almost immediately. The duration of this process is directly related to the extent of disturbance. In two or three years, herbaceous vegetation would cover most sites. Within 25 to 30 years, tree cover would grow to the point where many roadside views are screened and the impact on the scenery would be generally unnoticed except for variances in tree heights. While harvested areas would rehabilitate over time, roads would continue to impact the scenery.

Direct and Indirect Effects of Alternative A (No Action)

Due to no removal of vegetation or prescribed burning, the process of forest succession would continue. The areas that have been heavily to moderately altered by past timber harvesting would blend into the landscape over time, but they would retain much of their current form and line for several decades. This is assuming the area remains unaffected by wildland fire. Tree mortality from insects and disease would be more evident in much of the area than if one of the action alternatives were implemented. Alternative A would not reduce the risk of stand-replacing wildland fire. Fuels would continue to build up from tree mortality and undergrowth creating a higher risk of catastrophic fire than the action alternatives. In the event of such an occurrence, visual change to the landscape would be dramatic. This change may be naturally appearing, but fires of large magnitude may be visually unappealing to some viewers, and could create vast expanses of even-aged stands with little visual diversity that would exist for many decades.

Direct and Indirect Effects Common to Both Action Alternatives

The direct and indirect effects to scenery for Alternatives B and C as seen from the critical viewpoints are discussed below. In the short term, implementation of these alternatives would create changes to the visual condition of the project area. Openings in the canopy of various sizes resulting from seed tree and shelterwood harvests would be visible. The prescriptions call for leaving a wide range of trees per acre, thus softening the changes from existing conditions. The proposed treatment areas would be interspersed throughout the canopy of the forested areas.

Photos of viewpoints and those areas potentially affected are located in Exhibit I-2. A list of units visible from the viewpoints is located in Exhibit I-3.

Viewpoint 1. Several proposed timber harvest areas were evaluated for their possible visual impact from this viewpoint. The long viewing distance, sun angles, and haze often make viewing difficult. Units 1, 1a, 4, and 4a could not be seen from this viewpoint due to obscuring hills in the middleground. A small portion of unit 12 in MA 7 could possibly be visible but was located on a flat saddle and out of view due to large trees positioned in front of the unit. Units 16 and 16A are low enough on the landscape, small treatments, adjacent to existing past treatments, and on gentle slopes thus making them difficult to discern. Unit 40, only proposed in Alternative B, may be discernable but the large amount of residual trees in this shelterwood would be difficult to locate. Unit 500 on Pilot Knob proposes to treat small portions of areas that would be too small and at too low an angle to be discernable. Corresponding moderate and low SILs to their Forest Plan Management Areas in each of these proposed treatments would be achieved. If Unit 40 is visible from this viewpoint, effects to the visual resource would possibly be less in Alternative C than Alternative B.

Viewpoint 2. Three proposed vegetation treatment areas were evaluated for their possible visual impact: Units 22A, 23, and 41. Unit 23 in Alternative B became Unit 423 in Alternative C. Each of these units are in Forest Plan MA 9 and have a SIL objective of moderate. Foreground viewing of the areas immediately adjacent to the Tally Lake road were all that were available as views of middleground and background areas are obscured by roadside vegetation. Proposed treatments are shelterwood harvests (22A and 41), a commercial thin (23), and understory fuels reduction (400, 401, and 423). Thinning and understory fuel reduction easily meet objectives for a moderate and possibly a high SIL. Shelterwood harvests meet the moderate SIL in the foreground when some small trees are retained, larger leave trees are not regularly spaced, and logging slash is removed (USDA Forest Service 1995a). As a result of less vegetation removal in Unit 423 in Alternative C than Unit 23 in Alternative B, the visual impact of treatments in Alternative C from this viewpoint would be less than Alternative B.

Viewpoint 3. Two units proposed for seed tree harvests can be seen from this viewpoint: Units 38 and a portion of Unit 37. No other treatments are visible. These units are located in Forest Plan MA 7 and have a SIL objective of moderate. Background viewing of these units would be evident from the viewpoint. The proposed treatment areas are on gentle to moderate slopes facing the viewpoint making for favorable angles of viewing. Most of Units 37 and 38 are only visible for short distances when viewed between gaps in the foreground vegetation. Unit 38 when viewed from the junction of Farm to Market Road and Highway 93 would appear as only a thin, elongated opening and match the pattern created from timber harvest activity from the mid 1990s to the north. The portion of Unit 37 that is visible from Farm to Market Road contains a higher portion of western larch and Douglas-fir leave trees than the remainder of the unit. These leave

trees would create more of a shelterwood harvest appearance and met moderate SIL objectives. Also, this is a "dynamic" view with short viewing periods in that most viewers would be in moving vehicles along Farm to Market Road. Treatments viewed from this point are the same for both action alternatives, therefore the visual impacts are the same.

Viewpoint 4. The proposed treatment in both action alternatives for Unit 35 is a shelterwood timber harvest. This unit is located in Forest Plan MA 7 and has a SIL objective of moderate. Shelterwood harvests meet the moderate SIL in the foreground when some small trees are retained, larger leave trees are not regularly spaced, and logging slash is removed (USDA Forest Service 1995a). A large rock cut slope above the road obscures Unit 35 from some viewing. Proposed vegetation treatments are consistent with fuels reduction work conducted on adjacent private property. Treatments viewed from this point are the same for both action alternatives, therefore the visual impacts are the same.

Viewpoint 5. Foreground viewing of the areas immediately adjacent to the Mountain Meadows road were all that were available as views of middleground and background areas are obscured by roadside vegetation, with the exception of Unit 17. A small portion of this unit can be viewed as a middleground scene from the junction of Roads 542 and 2948. All timber harvest activities along this road are shelterwood treatments (13, 17, 21, and 21A) and non-commercial treatments include sapling thinning and understory fuel treatments (305 and 421). Each of these units are in Forest Plan MA 9 and have a SIL objective of moderate. Shelterwood harvests meet the moderate SIL in the foreground when some small trees are retained, larger leave trees are not regularly spaced, and logging slash is removed (USDA Forest Service 1995a). The middleground view of Unit 17 also meets a moderate SIL under these circumstances. Sapling thinning and understory fuel reduction easily meet objectives for a moderate and possibly a high SIL, particularly when treated vegetation is removed. As a result of less vegetation removal in Units 17, 21, and 21A in Alternative C than in Alternative B, the visual impact of treatments in Alternative C from this viewpoint would be less than Alternative B.

Cumulative Effects of the Action Alternatives

As mentioned earlier in this section, past harvest, road construction, and other management activities have placed unnatural shapes and textures on the landscape in several areas. Visibility of some of these features will continue.

Encouraging natural and planted western larch in the shelterwood and seed tree units would help add interest with a difference in color and texture, especially as viewed from the middleground and background. Regeneration of both conifers and broadleaf species would help screen out views of stumps and debris within five to ten years.

Regulatory Consistency

Regulatory Framework for Visuals/Scenery was discussed on the first and second pages of this section.

The No Action alternative and the proposed activities in the action alternatives would comply with the visual resource objectives in the Forest Plan for all management areas.

HERITAGE RESOURCES

Introduction

Heritage resources involve the conservation of archeological, cultural, architectural, and historic sites and artifacts. This section describes the existing heritage resource conditions of the Valley Face area and how the no action and action alternatives would affect the various components of this resource. The effects analysis focuses on those areas where potentially ground-disturbing activities, such as timber harvesting, are proposed. Activities that only involve the use of hand crews and no heavy equipment, such as prescribed burning, would typically not receive consideration from heritage resource personnel.

Information Sources

The Flathead National Forest is taking a multi-phase approach to cultural resource compliance [36 CFR 800.3(c)] for the Valley Face analysis. This is possible because of the site-specific nature of cultural resources and cultural resource compliance. The first phase is a reconnaissance level inventory of known cultural resources and a sampling of areas with a high probability for the occurrence of additional cultural resources. A pre-survey files search for information on previously recorded heritage sites in the proposed project area is also conducted. This phase includes initial consultation with the Confederated Salish and Kootenai Tribes to identify any concerns they may have regarding traditional cultural properties, traditional use plants, and areas of spiritual importance in the analysis area. The second phase occurs prior to actual project implementation and requires a thorough inventory of all proposed undertakings so as to locate, record, and evaluate the historical significance of any identified heritage resources. It is at this time that Section 106 consultation with the Montana State Historic Preservation Office (MtSHPO) would be completed to determine the historic significance and National Register eligibility of any identified sites, potential project effects to such sites, and methods for avoidance or management of adverse effects. The Region One Programmatic Agreement (R1PA) between the USDA Forest Service, the MtSHPO, and the Advisory Council for Historic Preservation (ACHP) provides a streamlined consultation process.

The field inventory strategy is defined in the Site Inventory Strategy (SIS) (Exhibit K-1) and involves pedestrian reconnaissance in areas proposed for future timber harvest or other ground-disturbing activity. Regardless of the degree or type of harvesting prescription, heritage resource personnel inventory the affected areas based upon topography with "high probability areas" (ridge tops, peaks, stream terraces) receiving 100 percent coverage, "medium probability areas" (slopes less than 30 percent, rock outcrops, erosional surfaces) receiving 40 percent coverage, and "low probability areas" (slopes in excess of 30 percent, north-facing slopes, heavily timbered slopes with abundant deadfall and understory) receiving 10 percent coverage.

Any heritage resource sites discovered during the two-part inventory are recorded and their National Register eligibility status evaluated in consultation with MtSHPO.

Analysis Area

The analysis area for heritage resources, which encompasses all lands within the boundaries of the Valley Face project area defined in Chapter 1, was selected because all proposed management activities would occur within this area. The effects on heritage resources would not extend

beyond the project boundary. The time frames for this analysis are from the beginning of implementation of activities to their conclusion in approximately 2014.

Affected Environment

Previously Identified Heritage Resources

Prior to the two-phase inventory, the forest's Heritage Resource staff conducted an in-house files search for information on known, previously recorded heritage resources in the Valley Face analysis area. General Land Office plat maps, BLM Land Status Records, historic forest maps, and the forest's cumulative site and survey atlas were all referenced for site information.

The file search identified 24 recorded historic sites in the Valley Face drainage. Of these, there were two recorded prehistoric sites and six historic period sites in or near the analysis area. There have been at least 88 previous cultural resource inventories in the analysis area.

Results of Survey Methodology

As of this writing, a complete pedestrian inventory for discovery of important cultural resources has not been completed for the entire Valley Face analysis area. Previous inventories located one Indian scarred tree site in the analysis area. Treatment methods to protect the scarred trees have been developed in consultation with the MtSHPO and the CSKT. Additional known cultural sites are located outside areas of potential effect. Surveys have been and will continue to focus on areas proposed for ground-disturbing activities, such as timber harvest units and road construction. Additional field review would occur during the snow-free periods beginning in 2006 within boundaries of the proposed ground-disturbing areas.

Discussions with the Confederated Salish and Kootenai Tribes (CSKT) have not identified any concerns in the project area. Consultation with the CSKT will continue.

Environmental Consequences

As described in the regulatory framework section above, the Forest Service is required under several statutes to protect and manage cultural sites. These requirements are carried forward in the Flathead Forest Plan standards for heritage resources (Forest Plan, pages II-18 to II-21).

Heritage resource inventories are required by the Forest Plan prior to all ground disturbing projects in order to locate and identify historic or Native American sites or artifacts. Once sites or artifacts are identified in a project area, protective measures are carried out that would ensure preservation of the values associated with the site.

Heritage resources can be diminished in value by any change in their historical, architectural, archaeological, or cultural character. Adverse impacts to heritage resource sites can result in damage or complete destruction of the sites; effects of this damage may be irreversible.

Direct and Indirect Effects of the No Action and Action Alternatives

Implementation of the No Action alternative would neither directly nor indirectly affect cultural resources because there would be no change to the integrity of important cultural resources as a result of no activities being implemented. Implementation of an action alternative would also neither directly nor indirectly affect cultural resources because there would be no change to the

integrity of important cultural resources as a result of avoidance or mitigation of activities in the vicinity of heritage resources. An exception to these two statements is the threat of wildland fire. Failure to reduce fuels as proposed in the action alternatives would increase the potential for severe wildland fire, increasing the potential for adverse effects by fire to heritage resources through and beyond the Valley Face area; particularly cambium-peeled trees, trails, structures, and combustible artifacts. Wildland fire also increases the risk of site looting and vandalism due to exposure through lack of vegetative cover.

Although the field inventory will be completed prior to specific project implementation, adherence to the regulations for implementing the National Historic Preservation Act ensures that important cultural resources are identified prior to project implementation and that project effects are identified and either avoided or mitigated through project redesign. Site significance and project effects are determined through consultation with MtSHPO and the CSKT.

It is recognized that even the most intensive field surveys may not locate all cultural sites. The portions of this project that would be implemented through a timber sale contract under any action alternative would include the "B6.24# Protecting of Cultural Resources" clause which enables the Forest Service to modify or cancel a timber sale contract to protect heritage resources, regardless of when they are identified.

Cumulative Effects

There would be no cumulative effects to identified heritage resources in the Valley Face analysis area from any past, present, and reasonably foreseeable activities as presented at the beginning of this chapter. However, any such effects would be identified as part of the consultation process with MtSHPO and the CSKT and appropriate avoidance or moderating measures would be developed.

Regulatory Framework and Consistency

The USDA Forest Service is mandated to comply with the National Historic Preservation Act of 1966 (NHPA) [Public Law 89-665]. "Section 106 of the NHPA requires that Federal agencies with direct or indirect jurisdiction over Federal, federally assisted, or federally licensed undertakings afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity for comment on such undertakings that affect properties included in or eligible for inclusion in the National Register of Historic Places (NRHP) prior to the agency's approval of any such undertaking" [36 CFR 800.1]. Historic properties are identified by a cultural resource inventory and are determined as either eligible or not eligible for the National Register. Eligibility is reviewed, and concurrence given, by MtSHPO. Sites that are determined eligible are then protected in-place or adverse impacts must be mitigated. This process takes place prior to any decisions relative to the project.

The Flathead National Forest operates under the terms of the R1 Programmatic Agreement between Region One of the Forest Service, the MtSHPO, and the Advisory Council for Historic Preservation. The Programmatic Agreement provides a streamlined process for complying with section 106 of the National Historic Preservation Act as amended (NHPA). The efficiencies provided by the PA should allow more time for the Forest Heritage program to fulfill the Forest's responsibilities under section 110 of NHPA.

The Confederated Salish and Kootenai Tribes of Montana (CSKT) have reserved treaty rights under the Hellgate Treaty of 1855. These include hunting, gathering, and grazing rights. The Forest Service also has obligations under the American Indian Religious Freedom Act (AIRFA) of 1978 to "protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian" [Public Law 95-442]. Executive Order 13007 of 1996 further directs federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting such sites.

The Confederated Salish and Kootenai Tribes of Montana have been identified as a tribal group concerned about the management of heritage resources on the Flathead National Forest. The tribes were contacted in the initial planning stages of the Valley Face Fuels Reduction Project in order to establish lines of communication between the two parties, to advise them on the scope of the undertaking including potential effects, and to make their resource concerns (if any) an official part of the project record. Consultation with recognized tribal governments is further defined and required by the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 [Public Law 101-106], the 1992 amendments to the National Historic Preservation Act (NHPA), and the 1999 revisions to the implementing regulations in 36 CFR Part 800; Protection of Historic Properties.

The Flathead Forest Plan incorporates the requirements under the following statutes: the National Historic Preservation Act of 1966 (as amended) and the American Indian Religious Freedom Act (1978). Forest Plan standards applicable to this project which reflect the mandates under the above statutes include:

Inventory procedures: Cultural resource inventories will be conducted on all ground disturbing projects that are generated, licensed, permitted, or allowed to occur by the Forest Service.

Evaluation procedures: Identified cultural resources will be evaluated in relation to published criteria for eligibility to the NRHP.

Protection/preservation measures: Known, significant cultural resource sites on the Forest will be protected from inadvertent or intentional damage or destruction.

Coordination/consultation procedures: The Forest will make an effort to coordinate cultural resource issues and concerns with appropriate Native American groups, other Federal and State agencies, the historical and archaeological communities, and the general public.

Protection of historic and prehistoric heritage resources is prescribed in a number of laws including the National Historic Preservation Act of 1966 (as amended in 1980). Implementing regulations for the NHPA are codified in 36 CFR 800. Forest Plan standards and guidelines are designed to meet the requirements of these regulations. All Valley Face project alternatives are consistent with the laws and regulations listed above and incorporated into the requirements of the Flathead Forest Plan. Section 106 compliance and consultation with MtSHPO for this project has been completed.

ECONOMICS

Introduction

This section presents a description of the economic environment that could be potentially affected by the proposed action and its alternative, along with an estimate of what those effects might be. The focus is on the economic relationship of the Flathead National Forest to the economy within and around the Forest and the economic influence of goods and services the Forest provides.

Information Sources

Information for this section was gathered primarily from the Research and Analysis Bureau of the Montana Department of Labor and Industry and the Bureau of Business and Economic Research (BBER) at the University of Montana. Population data were provided by the U.S. Census Bureau. Economic efficiency inputs (revenues and costs) were derived from 1) the Region 1 transaction evidence appraisal system (timber revenue), and 2) cost information provided by various resource specialists on the Forest from recent experience with similar projects.

The evaluation of direct, indirect, and cumulative effects on economics used the most recent and available information, as well as data related to past, present, and reasonably foreseeable events that have occurred or may occur in the economics analysis area. Applicable past and present, and foreseeable events described in the "Scope of the Analysis" section of Chapter 1 were considered during the evaluation of the affected environment. The condition of the affected environment, together with applicable reasonably foreseeable events as described in the above-mentioned section, were considered during the analysis of the environmental effects of the alternatives. The listed events that are not specifically analyzed or mentioned in the following discussion were considered to have no potential effect on the economics resource.

Analysis Area

The proposed action and its alternatives are located in the economic influence area of Flathead, Lake, Lincoln and Sanders Counties, Montana. The designation of the four county economic influence area was based on the multiple criteria suggested in the Forest Service Economic and Social Analysis Handbook (FSH 1909.17) and (USDA Forest Service 1988). This economic impact area is also consistent with the Flathead National Forest plan revision. Criteria include the location of the economic center, wood processing facilities, residences of the forest products industry workforce, and the center of spending for retail and wholesale goods and services. The time frames for this analysis are from the beginning of implementation of activities to the completion of the last reforestation survey in approximately 2018.

Affected Environment

No key issues associated directly to economics were identified, although issues involving the amount of timber harvested are closely related. Other issues such as motorized access and quality of the environment are somewhat related.

The following effects indicators were used to focus the economic analysis and disclose relevant environmental or social effects:

- Effects on Employment

- Effects on Labor Income
- Effects on Revenue Sharing
- Effects on Economic Efficiency

The Economic Community

The Flathead National Forest includes parts of six Montana counties: Flathead, Lincoln, Lake, Missoula, Powell, and Lewis and Clark. About three-fourths of the area of the forest and most of the economic effects of Forest programs and projects occur in Flathead County. The forest has lesser effects in Lake County and only minimal effects in the other four counties.

The Flathead National Forest is an important part of the Northern Continental Divide Ecosystem, which covers most of northwest Montana. This area has substantial economic value on a regional, national, and international scale when recreation and tourism, wildlife, and aesthetic values are considered along with a substantial timber management program. However, it is beyond the scope of this analysis to evaluate markets for all these resources because they have not been identified as substantial economic issues in respect to the proposed action. The emphasis is on the economic effects that the proposed action and the alternatives would have on the timber industry and economic communities that would be primarily affected.

Timber Industry Trends

Historical Production and Capacity

Historically, annual timber harvest from National Forest System land in Montana peaked at greater than 800 million board feet at the end of the 1960s. In the period of 2000 to 2004 the timber harvest dropped to the general vicinity of 100 million board feet per year or slightly greater than 10 percent of the past peak level (USDA Forest Service 2004).

In 1998, of the 293 million board feet of timber delivered to processing facilities in Flathead County, approximately 38 million board feet, or less than 13 percent, came from National Forest system land (Keegan et al. 2001).

Since 1980, Flathead County has had the largest wood products manufacturing industry of any county in Montana. Since 1976, the county's capacity to process saw timber has varied from a low of 265 million board feet (Scribner rule) at the present to a high of 395 million board feet in 1983. Actual saw timber processed since 1976 has varied from a low of 185 million board feet in 1982 to a high of 332 million board feet in 1988. Processing facilities utilization capacity has varied from a low of 51 percent in 1982 to a high of 97 percent in 1999. The year 2000, the last year for which there are data, was at 94 percent of capacity. The plywood industry in Montana is presently at 93 percent of plant capacity. County level information on the plywood industry is generally not available because of data disclosure constraints (Keegan et al. 2001).

The percentage of milling capacity that is actually used or remains available for use affects the demand for logs and is a variable effecting log prices, which in turn, affects the quantity of logs supplied to mills.

Timber Industry Outlook

After low levels during the first six months of 2003, wood products prices increased substantially through the summer of 2004 and have remained steady through the end of 2005 (Exhibit N-1).

The upward surge in prices was attributable to a number of factors including, high domestic lumber consumption, a weaker U.S. dollar with less imports, and increased foreign demand.

A survey of primary wood producers point to moderately good demand and prices well into 2006 (BBER 2005, Exhibit N-2). Factors contributing to maintaining demand include interest rates remaining low, domestic wood products consumption is expected to remain high, increased foreign demand, and a further decline in the value of the dollar against most major currencies. An agreement with Canada setting quotas on softwood lumber imports could positively impact lumber prices. On the negative side, uncertainty over log supply remains a major and perhaps growing issue.

The estimated total sales value of the state's primary wood and paper products in 2004 was $1.2 billion, substantially more than in 2003. Despite the high prices in the second half of the year, mill closures, raw log availability, as well as other production cut backs led to reduced production, employment and wages for the year (BBER 2005, Exhibit N-2).

At the end of 2004 estimated total employment in the wood products industry was about 9,100 workers, down about 100 from the previous year, and worker earnings adjusted for inflation were slightly higher. Lumber production in the state in 2004 was estimated at one billion board feet, down slightly from 1.07 billion board feet in 2003. Mirroring conditions in the housing industry, the log home industry experienced increased sales, reversing a downward trend.

Because of a decade-long decrease in federal timber harvest, timber availability remains a major issue for Montana's forest products industry even as wood products markets improve in the longer-term. Salvaged timber from burned areas could increase the volume of available timber. Recent work done by the University of Montana researchers indicates that millions of acres of timberlands in the state are in need of ecosystem and fire hazard treatment and could provide – as a profitable by-product – a sustainable flow of timber considerably above current harvest levels (Keegan and Morgan 2005).

Environmental Consequences

Effects of Alternatives on Employment and Income

Timber Harvesting and Forestry Services

The activity of timber harvesting, as proposed, has the potential to create a substantial amount of employment and income. These effects are both direct (workers employed in the forest products industry and government) and indirect (jobs and income created from the local spending of the forest products industry and government and the spending of industry's and government employees). The effects on employment and income have the potential to affect the other economic variables such as economic structure, unemployment, and wages.

Recent analysis in northwest Montana (Keegan 2002; Stockman and Montag 2005) shows that the processing of one million cubic feet (MMCF) of timber by a sawmill generates a total of approximately 50 job years[1] and $1,449,700 in labor income. This includes direct, indirect, and induced jobs[2] and labor income. These jobs and income include direct jobs and income in

[1] A job year is a job that lasts the equivalent of one year. For example 10 job years could be 10 jobs for one year or one job for 10 years or any combination thereof.
[2] A job can be full-time or part-time, seasonal or permanent. It is not a "full-time equivalent."

logging, wood processing, and transportation; jobs supporting these industries; and jobs and labor income generated from the spending of the workers. The following table is a summary of the maximum potential effects to total employment and labor income in the four county economic impact area from the harvest and processing of timber proposed in the two action alternatives, with the greatest number of jobs and labor income attributable to Alternative B. The no action alternative, Alternative A, would not produce any jobs or labor income.

Table 3-77. Employment and Labor Income from Timber Harvest and Processing

Alternative	Timber Volume (MMCF)	Job Years	Labor Income (MM$)
A	0	0	0
B	3.41	310	$8,771,000
C	2.65	240	$6,839,000

Both action alternatives would spend approximately the same amount of money on service contracts to perform artificial tree and shrub regeneration, fuels reduction, and precommercial thinning. This would produce between approximately 41 to 46 job years and $670,000 to $750,000 in labor income (see following table). A few additional jobs and income would be generated from weed management activities associated with the timber harvest. Refer to Exhibit N-3 for how these figures were calculated. The no action alternative, Alternative A, would not produce any jobs or labor income.

Table 3-78. Employment and Labor Income from Forestry Service Contracts

Activity	Alternative A	Alternative B	Alternative C
Acres/Cost of Tree and Shrub Planting	0	1860 / $232,500	1445 / $180,600
Acres/Cost of Precommercial Thinning	0	437 / $142,000	437 / $142,000
Acres/Cost of Non-commercial Fuel Reduction	0	382 / $229,500	349 / $214,650
Acres/Cost of Non-commercial Downed Fuel Reduction	0	128 / $28,800	128 / $28,800
Total Jobs from Service Contract	0	46.1	41.3
Total Labor Income from Service Contract	0	$749,600	$670,500

In addition to the jobs and income generated by timber harvesting and service contracts, there would be jobs and income also generated by associated timber management activities. These include slash disposal, site preparation, and subsequent surveys. History shows that there is a good chance that a substantial amount of the economic effects of reforestation activities could occur outside of the Flathead County area, depending on the origin of service contractors and crews.

These potential jobs and income described above would be spread over approximately a four-year period from 2008 to 2014.

Revenue Sharing from Flathead National Forest Programs

Revenues from National Forest programs are distributed to counties annually in accordance with several Federal acts. Historically, the Twenty-five Percent Fund Act has been the greatest source of funds. However, the enactment of the Secure Rural Schools and Community Self-Determination Act of 2000 (Public Law 106-393) has substantially changed the revenue distribution. The Payment in Lieu of Taxes Act (PILT) also distributes funds to counties based on the amount of federal land in each county. This amount is normally reduced by other certain payments (including 25 percent funds) paid in the prior year. The PILT fund program is administered by the Bureau of Land Management.

Under the Twenty-five Percent Fund Program, 25 percent of all funds generated from certain National Forest programs are paid to the state in which National Forest System lands are located. The funds generated by each Forest are distributed to each county in which the Forest is located in proportion to the amount of Forest land in each county. The location of the project within a particular Forest generating the revenue does not matter.

The amount distributed from the Twenty-five Percent Fund is based on certain receipts, including special use fees, recreation fees, minerals returns, grazing fees, and timber sales. In Montana two-thirds of the dollars received go to the counties' general fund for road maintenance, while the remaining one-third goes to public schools. For the Flathead National Forest, timber sale receipts have historically composed about 85 percent of the Twenty-five Percent Fund payments returned to counties. The following table shows how the payments have been distributed to Flathead National Forest counties (arising from all National Forests within those counties) in the past 5 years, with fixed annual payment projections from 2001-2006.

Table 3-79. Distribution of Twenty-five Percent Fund and Secure Rural Schools Act Payments (thousand $) by County

Year	Flathead	Lake	L and C	Lincoln	Missoula	Powell	Total
1997	$636	$48	$380	$3,388	$545	$318	$5,315
1998	$909	$72	$566	$3,651	$613	$394	$6,205
1999	$506	$39	$216	$4,008	$297	$186	$5,252
2000	$361	$24	$211	$3,181	$264	$155	$4,196
2001-6	$1,481	$118	$417	$5,586	$695	$450	$8,747

PILT payments are made to local governments to supplement other receipt-sharing programs such as the Twenty-five Percent Fund. PILT payments may be used for any government purpose; they are not limited for use in roads and schools. Generally, the more 25 percent funds received, the less would be the PILT payments. However, the formula is complex, and varies from county to county, and will not be explained in the document. A complete explanation of the PILT provisions and revenue sharing can be found in Schuster, 1995 and 1996.

Due to declining Forest Service timber revenues in the west, Congress enacted the Secure Rural Schools and Community Self-Determination Act of 2000 (Public Law 106-393) to supplement the Twenty-five Percent Fund Act. This allowed electing counties to base their Twenty-five Percent Fund payments on an average of the highest three years payments from 1986 to 1999. If elected, counties would receive the newly calculated payment instead of what would have been normally received under the Twenty-five Percent Fund Act. This would provide level payments over the election period regardless of what the Forest revenues were for the present period. All

counties receiving payments based on Flathead National Forest programs have elected the new option. This election will remain in effect through 2006. As can be seen in the above table, this election will make a substantial difference in payments.

Reauthorization of Public Law 106-393 for another five years is currently proposed in Congress. There is widespread public support for this reauthorization and it is assumed the authorization will be in effect for at least another five years. Final language for the reauthorization will not be known until late summer or early fall of 2006. If Public Law 106-393 is not reauthorized, counties would return to payments based on the 25 percent fund.

Effects of Alternatives on Revenue Sharing

As all counties have made the election for even-payments under Public Law 106-393 and are assumed to continue this election under reauthorization, changes in Forest Service revenues would have no effect through 2011 on payments-to-counties. Although Forest Service revenues change from alternative to alternative in this proposal, payments-to-counties, including PILT payments, would not change. It is assumed the majority of revenue generating parts of the proposed project would be completed by the end of 2011. Therefore the proposed project would have no effect on payments to counties.

Economic Efficiency Analysis

The economic efficiency of each action alternative was analyzed using the present net value (PNV) of revenues and costs anticipated during the life of the project (until regeneration surveys are completed in 10 years). PNV can be viewed as the lump sum of money the decision maker would have in hand as a result of committing forest resources to a particular alternative. The following assumptions were used in the PNV analysis:

a) This analysis determines the net economic returns of various alternatives based on amenity resource costs and benefits which can easily be measured in dollar terms. Other resources that are more difficult to assign a dollar value (e.g., wildlife, water, air) were not considered.

b) Net values were determined for the year 2008. Future monetary values were discounted four percent per year. The harvest schedules for each alternative were distributed over the years 2008 through 2014.

c) The revenues and costs are those related to the sale of timber and timber sale preparation, implementation, administration, post-sale treatments, and noncommercial fuel treatments. A complete list of revenues and cost cash flows by alternative are presented in Exhibit N-4. Revenue and cost data were developed specifically for this project and reflect current levels for this geographic area.

d) Stumpage values by alternative were estimated using the Region 1 timber appraisal system. These timber prices were then used in the Forest Service economics analysis model Quick-Silver (Vasievich et al. 2002) to determine revenues, costs, present net value, and revenue/cost ratios.

The following table shows a summary of the volume offered, total PNV cost, total PNV revenue, PNV, and Revenue/Cost ratio. Documentation for the calculations of the values presented in the table are found in Exhibit N-5.

Table 3-80. Summary of Discounted Costs and Revenues for the Project Period

Economic Parameter	Alt. A	Alt. B	Alt. C
Timber Volume (MMBF)	0	15	12
Timber Volume (CCF)	0	34,050	26,547
Total PNV Cost	0	$933,875	$815,813
Total PNV Revenue	0	$2,103,969	$1,647,605
Present Net Value	0	$1,170,094	$831,791
Revenue / Cost Ratio	0	2.25	2.02

Examination of total PNV shows that alternatives with the largest timber volumes harvested tend to generate the highest return. Of the action alternatives, Alternative B realizes the greatest monetary return with Alternative C showing the least although they are very similar. Alternative A, the no action alternative, would not produce any revenue or generate any costs.

Regulatory Framework and Consistency

Forest Plan direction is to provide a sustained yield of timber products that is cost effective and responsive to the needs of the local economy (USDA Forest Service, 1985). Alternative A would not be consistent with this Forest Plan direction. Both action alternatives offer varying levels of timber harvest and are consistent with being responsive to the needs of the local economy.

Civil Rights and Environmental Justice

None of the action alternatives are expected to negatively affect the civil rights of consumers, minority groups, low-income groups, women, or Indian tribes. Subsistence activities would not be disproportionately reduced for any of the identified groups. The Flathead Indian Reservation is 50 miles from the project area. The effect of the action alternatives on wildlife that may be used for subsistence is discussed in the wildlife section of this chapter. No environmental health hazards are expected to result from implementation of any alternative. Income levels in Flathead County are slightly higher than average for the state of Montana but 87 percent of the national average (U.S. Department of Commerce 2006), and this project should not disproportionately affect one income group over another (Exhibit N-6).

This project is in compliance with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." Environmental Justice issues were considered in all steps of the NEPA process, including public participation, alternative development, determining the affected environment, project design, and analysis of environmental consequences. At no step were minority, low-income, or tribal populations negatively affected by any of the proposed actions in any of the alternatives.