Flathead Indian Reservation Forest Management Plan

Final Environmental Impact Statement

Prepared by Tecumseh Professional Associates, Inc. for
The Bureau of Indian Affairs and
The Confederated Salish and Kootenai Tribes

Flathead Indian Reservation
Forest Management Plan

Final Environmental Impact Statement

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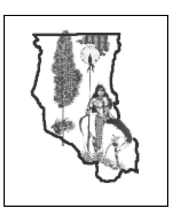
Small sections of this document have been adapted from Volume I of the Flathead Reservation Comprehensive Resources Plan. The Affected Environment Section is adapted from the Flathead Indian Reservation Draft Forest Management Plan. This document was prepared by Tecumseh Professinal Assoc., Inc. for the Bureau of Indian Affairs and The Confederated Salish and Kootenai Tribes.



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Abstract

The 1996 Flathead Indian Reservation Draft Forest Management Plan proposed a set of goals and objectives that would guide the direction of all forest-related resource management programs and activities on Indian lands within the Flathead Indian Reservation. Implementation of the draft plan represents the proposed action for this Final Environmental Impact Statement (FEIS). The FEIS documents the analysis of five alternatives, including a "no action" alternative. Notice of Intent to prepare the EIS was published in the Federal Register on January 30, 1996. The Draft EIS was available for public review on March 1, 1999.

In both the DEIS and the FEIS, Alternative 2 is the preferred alternative. It has as one of its primary goals the restoration of natural vegetative structures, processes, and functions. Among the five alternatives, Alternative 2 ranks second in extent to which it would restore historic forest conditions. Alternative 2 takes an ecosystem approach to management by focusing on the overall vegetative structure and composition of the forest rather than on individual stands.

Executive Summary

Introduction

The 1996 Flathead Indian Reservation Draft Forest Management Plan proposed a set of goals, objectives, and standards that would guide the direction of all forest-related resource management programs and activities on Indian lands[†] within the Flathead Reservation. The implementation of that plan represents the proposed action for this Final Environmental Impact Statement (FEIS).

The purpose of this EIS is to provide the public, landowners, and the Superintendent of the Flathead Agency with information on how the proposed action and the various alternatives will affect the environment. It is intended to foster informed decision making and informed public participation. An interdisciplinary (ID) team of resource specialists conducted the analysis by compiling existing-condition data, historical data, and information on ecological processes. They analyzed various human uses of the forest—everything from logging to recreation to grazing—and constructed models to predict future trends. From this, they developed specific objectives and desired condition goals for each of five alternatives. They then analyzed the environmental consequences of each alternative. This information was presented in the Draft Environmental Impact Statement (DEIS), which was released for public review on March 1, 1999. A total of 104 individuals or organizations commented on the DEIS. The ID team reviewed the comments and made a number of changes in the DEIS. Some involved factual corrections, others were substantive changes based on suggestions made by commenters. Still others expanded on information that was presented in the DEIS. Because the changes in response to comments did not involve significant modifications to any of the alternatives and did not require the addition of new alternatives, we are circulating only the comments, responses, and changes to the DEIS. The complete FEIS is available upon request from:

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[†]Indian lands are lands held in trust for indiviual Indians or for the Tribes.

Changes Between the Draft and the Final EIS

- Under Alternatives 2 and 3, habitat effectiveness for elk will be improved in the Nonlethal and Mixed Fire Regimes by reducing the miles of open road from 5 miles of open road per square mile to 4 miles of open road per square mile.

- Under Alternative 2, 100% of the road sections that are severely degrading aquatics will be abandoned rather than 80%.

- The Water and Fish section of the Affected Environment chapter has been expanded to include updated information on fluvial geomorphology, water quality, wetlands, and monitoring.

- A socio-economic section has been added to the Affected Environment chapter.

- An objective on the safe use of herbicides has been added, as has an objective on the restoration and maintenance of the chemical, physical, and biological integrity of streams.

- Information on the trail-use fee system has been added to clarify the fact that the fee will apply only to the use of the groomed snowmobile tails and new cross country ski trails in the North Missions Landscape.

- The fact that the lynx has been proposed for listing as a threatened species has been added to appropriate sections, and the analysis of the environmental consequences of the alternatives has been expanded to include information on the impacts on lynx and their habitat.

- The Water section of the Environmental Consequences chapter has been expanded to improve the disclosure of the hydrological effects of the alternatives.

- Maps of Reservation waterbodies and bull trout and cutthroat trout distribution have been included.

- The Cumulative Impacts and Unavoidable Significant Impacts Resulting from Project Implementation sections of the NEPA Considerations chapter have been expanded to include more information on stream impacts from road construction and road abandonment.

- Two appendices have been added, one on the Tribes’ snag policy, the other on the Tribes’ Best Management Practices or BMPs.

The Proposed Action

The Confederated Salish and Kootenai Tribes propose to revise and implement the 1996 Flathead Indian Reservation Draft Forest Management Plan. The Proposed Action takes an interdisciplinary, ecosystem approach to forest management and seeks to restore and maintain the long-term ecological integrity of the Reservation's forests in a manner consistent with Tribal values.

The Management Approach of the Draft Plan

The 1996 Flathead Indian Reservation Draft Forest Management Plan differs from past management plans in several ways. First, it views the entire forest as the context for management rather than the individual parts. It focuses on the diversity of forest structures and how they function across relatively large areas. Second, it emphasizes the importance of key elements or processes like fire—the natural forces that shaped the forest and created the basic pattern or mosaic our plant and animal communities evolved with. Third, it establishes policies and objectives to restore or mimic natural processes. The goal is to sustain forests as diverse, productive, and resilient ecosystems.

Ecosystem management views people as an integral part of the forest community. It integrates economic and biological concerns so that each builds on and benefits the other. More important, ecosystem management takes the long view by merging what the current generation desires for itself and its children with what our scientific understanding tells us is biologically and physically possible over the long term.

The ecosystem management actions proposed in the 1996 draft forest plan—a combination of timber harvest, pre-commercial and commercial thinning, and prescribed fire—are designed to restore the forest, not all the way back to its pre-European contact condition, but to move it in a more ecologically sustainable direction, one that more closely resembles the precontact. Besides providing the disturbances needed to maintain a healthy forest, the ecosystem management approach will maintain timber revenues and jobs for Tribal members.

In the draft plan, the Reservation is divided into six landscapes based on physical features such as topography, soils, geology, climate, watersheds, vegetation types, and administrative designations. The six landscapes are the North Missions, Missions, Jocko, Southwest, West, and Salish Mountains. These are further divided into four fire regimes based on the kind of fire behavior that occurred during precontact times. Although fire exclusion policies have changed the fire behavior and vegetation within these zones, precontact fire regimes reveal basic information about how our ecosystems functioned before the days of fire suppression. The fire regimes are: Nonlethal, Mixed, Lethal, and Timberline.

Purpose and Need

The purpose of the Flathead Indian Reservation Forest Management Plan is to provide long-term direction for the Tribes' forest resources. The plan describes resource management practices and levels of resource production. It establishes management standards, allocates land, and prescribes management practices to achieve balanced forest ecosystems.

The Proposed Action is needed to:

1. Satisfy Tribal goals and objectives.
2. Ensure that management activities are compatible with sustainable forest ecosystems.
3. Balance Tribal cultural, social, economic, and environmental values.
4. Establish a basis for an adaptive management and monitoring process that incorporates Tribal member values.

A Brief Summary of the Alternatives

Alternatives 1, 2, 3, and 5 are all *action alternatives*. The action alternatives, as defined by the National Environmental Policy Act, represent a departure from past management. They have been developed to meet the purpose and need of the proposed action and to respond to the issues identified in the scoping process. Alternative 4, the *No Action Alternative* would continue the management practices of the last forest management plan, which was prepared in 1982 and adopted in 1987. A No Action Alternative is included to provide a benchmark against which to evaluate the four action alternatives.

Among the action alternatives, Alternatives 1, 2, and 3 are similar in two respects. First, they have restoration as one of their primary goals. That is, they seek to restore, to varying degrees, more natural structures, processes, and functions to the forest in order to achieve more sustainable conditions over the long term. Second, all three take an ecosystem approach to management; they focus on the overall vegetative structure and composition of the forest rather than on individual stands or the needs of individual species. Of the three, Alternative 1 seeks the highest levels of restoration. It is therefore the *Environmentally Preferred Alternative*. Alternative 2 ranks second with respect to restoration. Alternative 3 ranks third. Alternative 5 takes a passive approach to management. Timber harvesting would be limited to salvage operations after natural fires, windthrow, or insect and disease outbreaks. Nature would be the primary restorative force, although fire suppression activities would continue. Brief descriptions of each of the alternatives follow.

Alternative 1—Full Restoration

The overall goal of this alternative is to use an ecosystem-management approach to aggressively restore, to the extent possible, pre-European forest conditions. Silvicultural treatments would be designed to reverse the effects of fire exclusion and undesirable forest practices of the past and would mimic natural disturbances in size and frequency. Managers would rely heavily on prescribed fire and would seek to restore grasslands, woodlands, and riparian zones; reduce livestock impacts; reduce road densities; visually rehabilitate areas heavily impacted by geometrically shaped clearcuts; protect some roadless areas from future roading; designate some new wilderness; and establish Limited Public Access Areas. Alternative 1 is the *Environmentally Preferred Alternative*.

Alternative 2—Modified Restoration

The primary goal of this alternative is to balance the restoration of pre-European forest conditions with the needs of sensitive species and human uses of the forest. Silvicultural treatments would be designed to reverse the effects of fire exclusion and undesirable forest practices of the past. Prescribed fire would be a major tool. Harvesting would mimic natural disturbances as much as possible; however, restoration would be balanced against present-day uses of the forest, the needs of sensitive wildlife species, and watershed concerns. This alternative would restore some grasslands, woodlands, and riparian zones; reduce livestock impacts; reduce road densities; protect some roadless areas from future roading; and designate some new wilderness, although these measures would be less extensive than under Alternative 1. Alternative 2 would also visually rehabilitate areas heavily impacted by geometrically shaped clearcuts and establish Limited Public Access Areas. Alternative 2 is the *Proposed Action* (the 1996 Draft Forest Plan with updates and revisions made in response to modeling refinements and new information). Alternative 2 is also the *Preferred Alternative*.

Alternative 3—Restoration Emphasizing Commodities

A primary goal of this alternative is to use intensive forest management practices to maximize forest-related income and employment. Managers would emphasize the production of wood products and other forest commodities. While this alternative would use an ecosystem management approach to restore pre-European forest structures, restoration efforts would be balanced against the need to maximize income and employment and reduce harmful forest insect infestations and diseases. Livestock impacts and road densities would be reduced and riparian zones would be restored to a functional level. This alternative would also visually rehabilitate areas heavily impacted by geometrically shaped clearcuts and establish Limited Public Access Areas.

Alternative 4—No Action

This is the No Action Alternative. It would continue the management practices established under the last-approved forest management plan, which was prepared in 1982 and adopted in 1987. Under this alternative, harvest activities would be moderately intensive and modified by best management practices and applicable Federal and Tribal policies, ordinances, laws, and directives. Managers would focus their efforts on individual stands rather than at the landscape level and would not attempt to restore historic forest structures. Livestock impacts would not change and road densities in currently roaded areas would remain about the same. Roadless areas would not be protected from future roading, and no new wilderness would be designated.

Alternative 5—Custodial

The goal of this alternative is to allow natural processes other than fire to control the future direction of the forest. Current fire suppression policies would remain in place. Forest management would consist almost exclusively of salvaging dead and dying timber after fires, wind storms, or insect and disease outbreaks. Over time, road densities would drop to about half their current level as roads are overtaken by vegetation. Initially, grazing levels would see little change, but over time grazing opportunities would decline as access dropped off. Modest restoration work would occur in riparian zones. No new roads would be constructed anywhere for harvesting purposes, and no new wilderness would be designated.

The Preferred Alternative

The *Preferred Alternative* is Alternative 2. This alternative is known as the modified restoration alternative and is essentially the 1996 Draft Forest Management Plan with updates and revisions based on modeling refinements and new information. It was selected because of all the alternatives it best achieves the fulfillment of the purpose and need statement and because it does the best job of balancing cultural, social, ecological, and economic concerns. Major features of the alternative are described in the paragraphs that follow.

Goal and General Description

The primary goal of this alternative is to balance the restoration of pre-European forest conditions with the needs of sensitive species and human uses of the forest. Silvicultural treatments would be designed to reverse the effects of fire exclusion and undesirable forest practices of the past. Prescribed fire would be a major tool. Harvesting would mimic natural disturbances as much as possible; however, restoration would be balanced against present-day uses of the forest, the needs of sensitive wildlife species, and watershed concerns. This alternative would restore some grasslands, woodlands, and riparian zones; reduce livestock impacts; reduce road densities; protect some roadless areas from future roading; and designate some new wilderness. Alternative 2 would also visually rehabilitate areas heavily impacted by geometrically shaped clearcuts and establish Limited Public Access Areas.

Vegetation

This alternative would balance efforts to restore forest structures and processes with social, economic, and environmental concerns. Harvest activities would, for the most part, be designed to mimic the size, timing, and location of natural disturbances.

Alternative 2 would have the second highest level of prescribed burning and the second greatest number of restoration acres. A total of 49,466 acres of grassland, woodland, and parklike stands in the Nonlethal and Mixed Fire Regimes would receive restoration and maintenance treatments over the long term.

The Nonlethal Fire Regime would be managed to restore and maintain old, moderate- and closed-canopied stands of ponderosa pine. Restored parkland areas would contribute less to commercial timber harvest over the long term. Parkland restoration would receive moderate emphasis in the wildland-urban-intermix hazard-reduction zone. The amount of old growth would increase. Bark beetle impacts would be reduced as would root rot, mistletoe, and budworm. Silvicultural treatments would be prioritized as follows: (1) uneven-aged treatments (2) underburns (3) temporary even-aged treatments (4) no treatment. Entry periods would be 10 to 20 years.

In the Mixed Fire Regime managers would emphasize very open stands and mature stands with moderate to closed canopies of mostly pine and/or larch. Early-seral stands would occupy from 0 to 25% of the fire regime. The levels of root rot, mistletoe, and budworm would be reduced. The amount of old growth would increase. Silvicultural treatments would be prioritized as follows: (1) uneven-aged and permanent even-aged treatments (2) temporary even-aged treatments and underburns (3) no treatment. Entry periods would be 15 to 30 years.

In the Lethal Fire Regime, early-seral stands would occupy between 15 to 40% of the forest. Lodgepole pine and spruce and fir old growth would increase. Silvicultural treatments would be prioritized as follows: (1) permanent even-aged treatment (2) uneven-aged treatments and no treatment. Entry periods would be 20 to 40 years. At higher elevations, periodic fires would be reintroduced to about half of the whitebark pine habitats.

Fifty percent or less of the forest products damaged by fire, insects and disease, or windthrow would be salvaged. Post and pole management would occur on 5,000 acres on a 40-year rotation.

For Alternative 2, the vegetation model predicts an annual harvest of 700 thousand board feet of ponderosa pine and 17.4 million board feet of other species for the first thirty-year period. This would result in an estimated Tribal harvest income of $4.3 million. Of the total volume, 2 to 3 million board feet would be set aside for Indian loggers in small sales and paid permits.

Fire

This alternative would have the second highest level of smoke emission from prescribed burning. An estimated 3,000 to 4,000 acres a year would receive prescribed burn treatments. Restoration activities would decrease the overall wildfire risk. A moderate emphasis would be placed on wildland-urban intermix education and hazard reduction. Fire Management would designate areas where a modified suppression response strategy would provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit would be covered by an agency fire plan.

Grazing

Management would focus on improving and maintaining the biodiversity of existing grassland types. Grazing would be managed to restore grasslands to a fair or better condition and nonfunctional and at-risk riparian areas to a fully functional condition. Noxious weeds would be aggressively managed on 80% of infested areas.

Wildlife

Big game summer and winter ranges would be restored by reducing road densities and livestock impacts. Reducing the level of fragmentation in all fire regimes would receive a high priority. Big game habitat effectiveness would be increased by reducing road densities to 3 miles of open road per square mile in the Lethal Fire Regime and to 4 miles of open road per square mile in the Nonlethal and Mixed Fire Regimes.

Water and Fish

Total road densities would be the third lowest of all the alternatives. One hundred percent of road sections that are severely degrading aquatics would be abandoned using full road rip, some recontouring, and the removal of all culverts and bridges. A full range of channel complexity would occur over 70% of channel length, and 80% of water pollution sources would be removed. Alternative 2 also includes objectives to restore cutthroat trout to two drainages and bull trout to one.

Recreation, Scenery, and Transportation

The scenery of areas heavily impacted by geometrically shaped clearcuts would be restored, and the scenic integrity of all landscapes would be protected through the use of buffers, natural shaped openings, green tree retention, seed tree cuts, shelterwood cuts, and the blending of clearcuts with surrounding vegetation. Seven roadless areas totalling 33,210 acres would remain unroaded. Four areas totaling 26,969 acres would be protected as wilderness. Trail and campsite maintenance would be enhanced.

Culture

Limited Public Access Areas would be established throughout the Reservation to provide a variety of natural areas and recreational settings that Tribal members can use for solitude, cultural activities, and recreational pursuits.

Major Features of the Alternatives

Major Feature	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Modeled Acres[1]					
Available	218,378	240,654	267,253	267,253	267,253
Restricted	31,637	38,347	41,468	41,468	41,468
Unavailable	186,919	161,053	126,312	126,312	126,312
Restoration & Maintenance				N/A	N/A
Grassland	16,742	13,644	2,400		
Woodland	14,953	7,992	3,422		
(Total of above acres modeled outside of the Vegetation Model)	(24,500)	(16,236)	(2,400)		
Parklike	30,613	27,830	12,999		
Protected Roadless Acres			N/A	N/A	N/A
With Roadless Harvest	56,922	21,886			
Without Roadless Harvest	11,323	11,323			
New Wilderness Acres	38,191	26,969	N/A	N/A	N/A
Cluster Groups Emphasized[2]				This is not an Ecosystem Management Alternative[3]	This is not an Ecosystem Management Alternative
Nonlethal Fire Regime	A2, F/G, J/K	A1, A2, F/G, J/K	A1, A2, F/G, J/K		
Mixed Fire Regime	A, C/D, F/G, J/K	C/D, F/G	A, C/D, F/G		
Lethal Fire Regime	A, C/D, F/G, J/K, E/I/H/L	A, C/D, F/G, J/K, E/I/H/L	A, C/D, F/G, E/I/H/L		
Whitebark Pine Habitat	Reintroduce fire on 75% of whitebark pine habitats	Reintroduce fire on 50% of whitebark pine habitats	Reintroduce fire on 25% of whitebark pine habitats	No reintroduction of fire	No reintroduction of fire

[1] Modeled acres do not equal total forest acres due to slivering and other reductions that occurred in the development of GIS data themes.
[2] Includes cluster groups that are desired as common (occupying 15 to 19% of a fire regime) or major (occupying 30% or more of a fire regime) components in the fire regime.
[3] Non-ecosystem management alternatives do not emphasize seral cluster groups. Seral cluster groups do result from management actions under these alternatives, but usually not at the levels desired in the ecosystem management alternatives.

Major Features of the Alternatives

Major Feature	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Silvicultural Systems Emphasized[4] Nonlethal Regime Mixed Regime Lethal Regime	 UB>U>T UB=P>U>T P>U	 U>UB>T U=P>T=UB P>U	 U=T>UB U=T=P>UB P>U	 U>T>UB U=T=P>UB P>U	N/A Salvage and wildfire are the only treatments available
Silvicultural Tools (1) Systems used (2) Intermediate entries	(1) Even- and uneven-aged, prescribed fire and wildfire management (2) Underburns & mechanical site prep.	(1) Even- and uneven-aged, prescribed fire & wildfire management (2) Underburns, mechanical site prep., & restricted use of herbicides, fertilizers & pruning	(1) Even- and uneven-aged, prescribed fire and wildfire management (2) Underburns, mechanical site prep., herbicides, fertilizers & pruning	(1) Even- and uneven-aged (2) Minimal underburns, mechanical and chemical site prep., fertilizers & pruning	(1) Salvage cuts (2) Minimal mechanical site prep.
Salvage (Percent Recovery)	20% or less	50% or less	80% or more	95% or more	95% or more. Access may limit salvage in later years
Entry Periods Non-lethal Fire Regime Mixed Fire Regime Lethal Fire Regime	 5 to 30 20 to 40 25 to 50	 10 to 20 15 to 30 20 to 40	 15 tp 20 15 to 25 15 to 30	 15 to 20 15 to 20 15 to 20	 as determined by natural disturbances
Harvest (mmbf/yr)[5] Period 1 Period 2 Period 3 Period 5 Period 8 Period 11	 13.5 15.4 15.6 15.9 16.5 18.3	 18.1 19.0 17.0 19.4 18.1 19.4	 15.6 16.8 17.4 18.1 20.5 22.9	 22.0 23.4 22.3 22.8 24.0 24.0	 3.0 3.0 3.0 3.0 3.0 3.0

[4] Treatment codes are: U = uneven-aged management, T = temporary even-aged management, P = Permanent even-aged management, UB = underburning and thinning, and NT = no treatment.

[5] The economic impact analysis in this document is based on short term and long term averages rather than the ten-year periods shown here. The short term is the average harvest over the first thirty years; the long term is the average harvest over the last 90 years of the planning time frame.

Major Effects of the Alternatives

Vegetation

Effects on Vegetation Structure, Density, and Species

The alternatives that would best restore the vegetative patterns, structures, densities, and species characteristic of the pre-European settlement era are Alternatives 1, 2, and 3, respectively.

Effects on Sustainability

In our analysis, ecosystem sustainability is measured by the ability of an alternative to restore the structure and composition of forest vegetation to pre-contact conditions. Pre-contact conditions are those likely to have occurred prior to settlement of the Reservation by people of European descent. Alternative 1 is predicted to be the most sustainable alternative.

Effects on Succession

The general successional trends predicted for the key cluster groups within each fire regime are as follows:

Nonlethal Fire Regime

Alternatives 1 and 2 are predicted to increase mature, open-canopied stands of ponderosa pine. All of the alternatives are predicted to increase old stands of ponderosa pine with moderate and closed canopies. All the alternatives except Alternative 2 are predicted to increase mature, moderate- and closed-canopied stands of ponderosa pine. All of the alternatives are expected to reduce the acres of young, open-canopied ponderosa pine stands. All of the alternatives except Alternative 5 are predicted to decrease mature and old stands of Douglas-fir.

Mixed Fire Regime

All alternatives are projected to increase young, moderate- and closed-canopied stands of ponderosa pine and western larch. Under all the alternatives mature, moderate- and closed-canopied stands of ponderosa pine and western larch are predicted to increase. All of the alternatives are projected to increase old, moderate- and closed-canopied stands of ponderosa pine and western larch. All of the alternatives are projected to decrease young, mature, and old, open-canopied stands of ponderosa pine and western larch.

Lethal Fire Regime

All of the alternatives are projected to increase young, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce. All of the alternatives except Alternative 5 are predicted to increase mature, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce. All of the alternatives are projected to decrease young, mature, and old, open-canopied stands of western larch, lodgepole pine, and spruce. All of the alternatives are projected to decrease old, moderate- and closed-canopied stands of western larch and spruce. All of the alternatives except Alternative 5 are predicted to decrease mature and old, moderate- and closed-canopied stands of grand fir and alpine fir.

Effects on Old Growth

Alternatives 1, 2, and 3 would produce old-growth patterns, structures, densities, and species composition that are more similar to the pre-contact era than Alternatives 4 and 5. Clusters that provide old-growth ponderosa pine and western larch increase under all alternatives.

Effects on Clearcutting

Acres clearcut during the short term are projected to be highest under Alternative 2, followed by Alternatives 3, 4, 1, and 5. Over the long term, Alternative 2 is expected to have the most clearcut acres, followed by Alternatives 1, 3, 4, and 5.

Effects on Lodgepole Pine Availability

Two factors control the availability of lodgepole pine: access and the volume of lodgepole growing in the forest. Access, the primary factor affecting availability, would be greatest under Alternative 4. The vegetation model projected a small increase in Cluster Group C/D under Alternative 4. That cluster group includes most of the lodgepole pine harvested by Indian loggers.

Fuels Management and Air Quality

Harvest Prescriptions

The effects of the alternatives on fuels and air quality depend on the acres receiving harvest treatments. Over the long term, the acres receiving timber harvest treatments are predicted to increase under Alternative 4. Under Alternatives 2 and 3, the acres harvested are expected to trend upward slightly. Under Alternative 1 they are expected to decrease over both the short- and long-term periods. Under Alternative 5, the acres harvested are predicted to drop by nearly 75 percent. Alternatives 1, 2, and 3 would emphasize fuels management and the restoration of encroached areas.

Prescribed Fire and Smoke Emissions

Prescribed fire treatments and annual smoke emissions would increase under Alternatives 1, 2, and 3. During the long-term period, prescribed fires are also predicted to increase under Alternative 4 because of the relatively high levels of timber harvesting and broadcast burning that would occur. Broadcast burns, which have the highest emission-production rates, would be emphasized under Alternatives 1, 2, and 3. Pile and burn treatments would likely decrease under all alternatives except Alternative 4, primarily because uneven-age harvest acres are expected to decline. Most of the alternatives are predicted to increase the amount of underburn treatments to achieve encroachment, restoration, and maintenance objectives. The highest levels of underburn acres would occur under Alternatives 1 and 2. Alternative 5 would have the lowest levels.

Air Quality Impacts
The emission model assessment suggests that emissions from prescribed fires would cause temporary impacts on local air quality. The modeling also suggests that total suspended particulate levels may not exceed National Ambient Air Quality Standards if prescribed fires are conducted under appropriate smoke management guidelines for smoke dispersal. The local area typically has good spring and early fall smoke dispersal weather conditions even though overall burn days are expected to decline by about 10 to 12 percent in the short term (USFS, 1994). Daytime heating and general westerly wind flows help to raise smoke plumes high into the atmosphere and then disperse them rapidly. Prescribed fires are not attempted during the unfavorable atmosphere and wind flow conditions of fall and winter. Local topography also favors good smoke dispersion above sensitive valley population centers and view areas. Problems could occur however with emissions sliding down slopes into populated areas during unfavorable nighttime conditions.

Visibility
The modeling suggests that visibility could be degraded by emissions from prescribed fires. It is inferred that decreased visibility could also occur under some alternatives due to more intense wildfire episodes. Increased haziness would likely result from the increased level of prescribed burning that would occur under Alternatives 1, 2, and 3. These potential episodes would be temporary in nature, but would occur more frequently than wildfires.

Fuels Management
Alternatives with the highest levels of fuels management and prescribed fires would likely be better at restoring pre-contact structures and compositions. Alternatives 1 and 2 would be the most successful at restoring grassland, ponderosa pine, western larch, and large tree components, which would reduce the fuel loadings and emission production levels from large, severe wildfires. Alternatives 4 and 5 would tend to produce denser forest structures that would be more prone to crown-fire conditions. Crown fires have higher emission production levels. Wildfires would occur more frequently, burn with higher intensity, and be of larger size and longer duration. Wildfires would also be more apt to occur during the summer when weather conditions are unfavorable for smoke dispersion.

Alternatives 1, 2, and 3 would require an increase in fire management funding and staffing to meet prescribed fire acre targets. Alternatives 4 and 5 may result in a slight decrease in fire management staffing for fuels management, but this staffing could be balanced by an increased need for more fire suppression manpower due to increased fire risk.

Wildfires
Alternatives 4 and 5 would be most likely to produce vegetative fuel loading conditions that would result in more wildfires. This would affect more of the local area with haze. It can be inferred that the higher concentrations of suspended particulates would reduce visibility in affected areas (more so than prescribed fires) and the effect would be of longer duration. In general, this analysis indicates that wildfire impacts on air quality may be greater in magnitude than emissions from prescribed fires. The Flathead Agency follows smoke management guidelines that only permit prescribed fires during weather and fuel moisture conditions that are the most favorable for the dispersion of smoke.

Forest and Stand Health

Alternatives 1, 2, and 3 have similar desired condition goals for vegetative structural diversity and are therefore predicted to have somewhat similar levels of most pathogens over both the short- and long-term periods. The effects of these three alternatives on forest pests like mistletoes, root rot complexes, and defoliators would be greatest in the Nonlethal Fire Regime and least in the Lethal Fire Regime. The effort to mimic pre-contact forest conditions and the expanded use of fire as a management tool would help to reduce overall pest levels.

Stand health can be estimated by the abundance of the Cluster Group E/I/H/L, which is especially susceptible to pathogens. Based on this criteria, the vegetation model predicts that of Alternatives 4 and 5, Alternative 4 would have a higher level of stand health. The stands that Alternative 4 would target for harvest would be those with the most significant pathogen problems. However, little attention would be paid to overall forest structure. The model predicts that Alternative 5 would have a low level of stand health. Under Alternative 5 the forest would be allowed to grow. There would be very little harvest and minimal use of prescribed fire. The model predicts that under these conditions, there would be a gradual shift towards climax conditions, making the forest more vulnerable to pathogens.

Grazing

Roads

Abandoned roads would result in a loss of forage and access to forage over the long term as trees and shrubs reclaim the road bed. Alternative 5 would result in the lowest *total* road density, followed by Alternatives 1, 2, 3, and 4, respectively. The abandonment methods that would be used under Alternative 1 would have the most impact on livestock access, followed by Alternatives 2, 3, 4, and 5 respectively.

Temporary road closures can benefit livestock by reducing conflicts with recreationists and other forest visitors. *Open* road densities decrease the most under Alternatives 1 and 5. Reductions proposed under the other alternatives are for the most part modest and would likely have minor impacts on livestock grazing.

Desired and Predicted Forage Potential

Based on desired condition goals, Alternative 3 would have the highest forage potential in both the Nonlethal and Mixed Fire Regimes, followed by Alternatives 1 and 2, respectively. In the Lethal Fire Regime, Alternative 1 ranks highest, followed by Alternatives 2 and 3. The vegetation model estimates less forage potential overall than might be expected from the desired condition. It also shows that there is probably little difference in forage potential between the five alternatives. The only exception is in the Nonlethal Fire Regime where Alternatives 1 and 2 are predicted to have a greater forage potential, due in part to grassland and woodland restoration efforts and increases in underburning.

Range and Riparian Condition
Alternative 1 would manage for the best range and riparian ecological conditions, followed by Alternatives 2 and 3, 5, and 4.

Weeds
Alternative 1 would aggressively manage noxious weeds on 90% of infested areas. Alternatives 2, 3, and 4 would be less aggressive in their approach and would manage 80% of infested areas. Alternative 5 would be the least aggressive.

Wildlife

Thermal Cover
Under Alternatives 1 and 2, changes in the Nonlethal Fire Regime would benefit old-growth wildlife and increase winter range for elk and mule deer. Some habitat loss is expected for white-tailed deer. In the Mixed and Lethal Fire Regimes, forest carnivores and many birds and small mammals could benefit from increases in thermal cover. Under Alternative 3, projected increases in thermal cover in the Nonlethal Fire Regime, when combined with the lower emphasis the alternative places on prescribed fire, could improve habitat for forest edge species, while negatively affecting species requiring old-growth ponderosa pine habitat. Predicted increases in thermal cover in the Lethal Fire Regime could increase habitat quality for some big game species. Predicted increases in fragmentation could decrease habitat connectivity for forest carnivores and some bird species, while favoring wildlife found in forest edge habitats. The vegetation model predicts that thermal cover will increase under Alternative 4. However, under the first ten years of the 1982 plan, thermal cover decreased on the commercial forest base. (This discrepancy is explained in the vegetation section of Chapter 4 under the heading *Limitations*.) Alternative 4 is also predicted to result in a lower potential for old-growth species and increased fragmentation. Thermal cover is predicted to increase under Alternative 5. Wildlife diversity is expected to decrease over time, although some old-growth species would benefit.

Hiding Cover
Significant increases in hiding cover are predicted under Alternatives 1 and 2 in the Mixed and Lethal Fire Regimes, while slight decreases are predicted for the Nonlethal Fire Regime. Increases in hiding cover could allow for better use of the total range by big game species. Under Alternative 3, increases in hiding cover are predicted in all fire regimes. This could increase habitat utilization for big game but may favor white-tailed deer over elk and mule deer in the Nonlethal Fire Regime. Under Alternative 4, increases in hiding cover are predicted, but any benefits to big game from this increase may be negated by increased fragmentation and higher road densities. Under Alternative 5, hiding cover is predicted to increase during the short-term. Over the long term, however, the vegetation model predicts that the highest quality hiding cover will decrease due to the low level of forest management activities, although increases in layering and density in some stands should provide some hiding cover. If road densities drop as expected under this alternative, hiding cover will be less critical for big game.

Large Snag Density

Large-snag densities would be closest to pre-contact levels under Alternatives 1 and 2, but restoration would take considerable time. Old-growth wildlife species including many songbirds, raptors, and small mammals would benefit from the restoration of old-growth forest structures. Conditions under Alternative 3 would be similar except the emphasis on uneven-aged forest management over prescribed fire and thinning in the Nonlethal Fire Regime would not fully restore pre-contact conditions of habitat structure or the spatial patterns favorable to some old-growth wildlife species. The vegetation model predicts increases in snag habitat under Alternative 4. However, under the first ten years of the 1982 plan, large snag densities decreased on the commercial forest base. Intensive forestry, including short rotation-age management and the priority placed on forest health, did not allow conditions of high snag densities to develop. Large-snag densities would increase over time under Alternative 5, as would habitat for old-growth wildlife.

Down Woody Debris

Under Alternatives 1 and 2, habitat restoration activities would increase the amount of down woody debris in the Mixed and Lethal Fire Regimes. However, down woody debris is expected to decrease in the Nonlethal Regime. The increases would provide habitat for many birds, small mammals, reptiles, and amphibians and would substantially increase wildlife diversity. Under Alternative 3, down woody debris would increase in all fire regimes. The Nonlethal Fire Regime would have more than was present during pre-contact times because only a limited amount of prescribed fire would be used in restoration efforts. These conditions would maintain habitat for some species of birds and small mammals. Under Alternative 4, down-woody-debris habitat would decrease due to intensive forest management. Fragmentation of existing down-woody-debris habitat would increase. Habitat for small mammals, birds, reptiles, amphibians, and forest carnivores would be at very low levels. Under Alternative 5, down-woody-debris habitat goals would be met in all fire regimes and provide abundant habitat for many wildlife species. Some conflicts with salvage logging could be expected.

Early-Seral/Forage

Early-seral/forage habitat is predicted to be highest under Alternative 1. It would increase in all fire regimes except the Lethal Regime, where it would gradually decrease over the long-term. Habitat for big game, some bird species, and bears would increase. Under Alternative 2, early-seral/forage habitat would also increase but not as much. Fragmentation would gradually decrease over time. Winter ranges would be rejuvenated by reintroducing fire. Under Alternatives 3 and 4, early-seral/forage habitat would gradually decrease in all fire regimes. This would result in less available forage for certain birds, small mammals, big game, and bears. Increases in fragmentation and road densities will cause losses in security habitat and may reduce the availability of some early-seral/forage areas. Early-seral/forage habitat would be the lowest of all the alternatives under Alternative 5 due to the low-level of forest management. The loss would lower wildlife populations and overall wildlife diversity. However, species requiring dense and mature structures or old-growth forests would benefit.

Habitat Fragmentation

Under Alternative 1 fragmentation would decrease and forest connectivity would be restored in mid- and upper-elevation forests. Under Alternative 2, clearcuts designed to address stand health problems may increase fragmentation slightly in some parts of the Mixed and Lethal Fire Regimes, which could further exacerbate problems for wildlife species that require large contiguous forest patches. Under Alternatives 3 and 4, fragmentation is predicted to increase slightly in some areas. Under Alternative 5, the low level of harvesting expected to occur would result in less open habitat and species diversity during the long-term period, although fragmentation would likely decrease. Habitat fragmentation is also analyzed during project planning. A computer program known as FRAGSTAT (McGarigal and Marks, 1994) is used to analyze the extent of fragmentation on each particular project. The Wildlife Management Program assists in the design of timber sales to reduce fragmentation.

Threatened, Endangered, and Sensitive Species

On the Flathead Indian Reservation four species of terrestrial wildlife are currently listed by the Endangered Species Act: peregrine falcon (endangered), bald eagle (threatened), Rocky Mountain wolf (endangered), and grizzly bear (threatened). The lynx has been proposed for listing as a threatened species. All alternatives would meet the intent of the Endangered Species Act. (The affects of the alternatives on bull trout are discussed in the fisheries section.) Some of the activities that would be carried out under Alternatives 1 and 2 could impact potential eagle habitat, although over time, restoration activities could improve eagle habitat by increasing the number of large ponderosa pine trees. Alternatives 1 and 2 would generally improve grizzly bear habitat. Foraging habitat for lynx would increase from the existing situation under Alternatives 1 and 2, while denning habitat would decrease.

Under Alternative 3, intensive forest management practices within bald eagle habitat could reduce potential roosting and nesting cover. The high road densities predicted under this alternative will result in less security for grizzly bears and may increase bear mortality. Scarification practices to decrease vegetative competition and increase germination of conifers may result in a loss of berry-producing shrubs, a critical food source for grizzly bears. Large downed logs provide bears with insects and larvae. Downed logs may decrease as a result of intensive fuels management and conversion of the forest to early- and mid-seral stages. Impacts on wolves are not likely to occur through habitat alterations. Anticipated increases in white-tailed deer abundance may result in parts of the Reservation becoming more attractive to wolves. There would be an increase in lynx foraging habitat and a decrease in denning habitat under Alternative 3.

Under Alternative 4, we anticipate the loss of some foraging habitat for wintering bald eagles in the Nonlethal Fire Regime. Logging to alleviate forest health problems could threaten the integrity of eagle habitat in some areas. Grizzly bears and their habitats would be affected in parts of the Jocko, Missions, and North Missions Landscapes under Alternative 4. These impacts would be caused by habitat losses from certain logging and stand improvement activities, poor grazing practices, and an ineffective road management policy. Continued densification of the forest at low and mid elevations and intensive timber stand improvement practices in key berry-producing habitat would eliminate potential forage habitat for bears. High road densities within the forest and urban interface areas could lead to more human-bear conflicts, which may well increase bear mortality. A lack of big game security habitat in some landscapes caused by high road densities and an ineffective road management policy could indirectly affect wolf populations. Alternative 4 would result in a slight increase in foraging habitat for lynx, and a slight decrease in denning habitat.

The forest would become denser under Alternative 5, and that could improve eagle habitat over the short term by increasing roosting cover in the forests surrounding Flathead Lake. However, winter foraging habitat would be lost. Grizzly bears would loose foraging habitat as the forest becomes denser. Decreases in road density would increase bear security, but without forage habitat, bears may not benefit. Wolf and white-tailed deer populations could increase under this alternative along mountain foothills and urban interface zones as hiding cover increases. Under Alternative 5, lynx foraging habitat would increase, as would lynx denning habitat.

Water

Watershed Condition and Aquatic and Riparian Impacts

Alternatives 1, 2, and 3 are designed to address aquatic and riparian ecosystem concerns. All three alternatives are expected to result in overall improvements in watershed condition. Aquatic and riparian ecosystems should also improve. Alternative 4 incorporates overall watershed concerns, but does not explicitly address aquatic and riparian ecosystems. Activities initiated under Alternative 4 are expected to maintain current watershed conditions or lead to further degradation. Alternative 5 would result in an overall improvement of watershed conditions, however aquatic and riparian impacts associated with grazing would not improve.

Sediment Loading

Sediment loading from roads would decrease incrementally under Alternatives 1, 2, and 3. Sediment loading under Alternative 4 would also decrease if the ongoing improvements occurring on the road network continue. Under Alternative 5, there would be a significant long-term decrease in sediment loading from roads.

Nutrient Loading

Fugitive dust and smoke significantly contribute to increases in nutrient loads in waterbodies, particularly open waterbodies like Flathead Lake. Alternatives 1, 2, and 3 call for an increase in prescribed burning, which will likely cause incremental increases in nutrient loading from airborne sources.

Grazing Impacts

Rangeland grazing, where livestock have unrestricted access to aquatic environments, can severely degrade instream water quality, inchannel habitat, and riparian conditions. Alternative 1 would increase livestock management efforts and seek to restore nonfunctional and at-risk riparian areas to their highest level of functionality. Grazing activities under this alternative have the potential to significantly improve aquatic conditions. Alternatives 2 and 3 would also increase livestock management efforts and would seek to restore riparian areas to a fully functional level. There should be incremental improvements in aquatic conditions under these two alternatives. Under Alternatives 4 and 5, aquatic conditions impacted by grazing are not expected to improve.

Cumulative levels of alteration to streamflow patterns

Potential forest management influences on streamflows are expected to improve for all alternatives except Alternative 4. Alternative 5 will have the least influence on streamflows, followed by Alternatives 1 and 2.

Water Quality Conditions

Water quality will improve with Alternatives 1, 2, and 5. Improvements will be less under Alternative 3. Alternative 4 will see the fewest improvements.

Aquatic Ecosystem Conditions
Improvement in aquatic ecosystems will be greatest under Alternatives 1, 2, and 5. Some improvement will occur under Alternative 3, and there would be very limited improvement under Alternative 4.

Fisheries

Substrate Condition
Substrate condition should improve under Alternatives 1 and 5. This prediction is based on anticipated reductions in road miles, improvements in road standards, and improvements in bank stability resulting from adjustments in grazing management. At best, only small improvements are expected under Alternative 2. Alternatives 3 and 4 are predicted to result in further degradation of substrate condition due to increases in road miles and smaller investments in road improvements.

Riparian Condition
Riparian condition should improve the most under Alternative 1, followed by Alternatives 2, 3, and 5. These improvements would be the result of improvements or changes in livestock management or, in the case of Alternative 5, reductions in road access. Alternative 4 would perpetuate the current condition.

Fisheries
Alternative 1, which would have the least impact on the aquatic condition, has the potential to improve channel dimension and fish habitat. While the aquatic biological potential would improve, it would not reach the level of the pre-contact era. One of the objectives of this alternative is to restore four populations of native species. This should be achievable with the predicted improvement in aquatic condition and investments in restoration.

Alternative 2 would have the third greatest impact on the aquatic condition. Aquatic biological potential would likely be maintained at current levels or could increase with increased mitigation. Alternative 2's restoration objective is to reestablish three populations of native species. This should be achievable if, as predicted, the aquatic condition is maintained or improved, and the proper investment is made in restoration.

Alternative 3 would have the second greatest impact on the aquatic condition. Aquatic biological potential would likely decrease, and may even jeopardize the continued viability of some fish populations. The objective to restore two populations of native species may be achievable; many of the predicted impacts are not large in magnitude, and their spatial distribution could benefit specific native populations.

Alternative 4 is expected to have the greatest impacts on the aquatic condition. Aquatic biological potential would likely decrease, and may jeopardize the continued viability of some fish populations.

Alternative 5 would have the fourth greatest impact on the aquatic condition. Like Alternative 1, this alternative also has the potential to improve channel dimension and fish habitat relative to the existing condition. While aquatic biological potential would likely increase, it would not improve to the level of the pre-contact era.

Threatened Species

On the Flathead Indian Reservation, the bull trout is currently listed by the Endangered Species Act as a threatened species. Of the five bull trout populations on the Reservation, the population that resides in the Jocko and Flathead Rivers is most subject to influence by forestry activities. The reductions in roads and grazing predicted for Alternatives 1 and 5 should improve conditions for bull trout and allow for the maintenance or restoration of segments of this population. Alternative 2 is not likely to appreciably improve conditions for bull trout, but it is also not likely to foreclose any options for restoration or for the maintenance of the population. Alternatives 3 and 4 would continue to reduce the quality of habitat for bull trout and would require that the impacts be addressed from a spatial standpoint to protect specific bull trout habitats.

Transportation

Total Road Density

Total road density is the number of miles of all roads (both open and closed) per square mile. Current total road density is about 5.9. This figure is predicted to decrease slightly under Alternative 1, remain the same under Alternative 2, and increase slightly under Alternative 3. The total road density is expected to increase to 7 miles of road per square mile under Alternative 4 and drop to about 3 miles of road per square mile under Alternative 5.

Open Road Density

Open road density is the number of miles of open road per square mile. Open road densities are expected to decrease significantly in all fire regimes under Alternative 1. Under Alternative 2, moderate decreases are expected in the Nonlethal, Mixed and Lethal Regimes. Alternative 3 would result in densities similar to Alternative 2 except that densities in the Lethal Fire Regime would be slightly higher. Under Alternative 4, open road densities are expected to decrease slightly in all fire regimes. Under Alternative 5, open road densities are expected to decrease substantially in all fire regimes.

Scenery and Recreation

The Scenic Impact of Roads

Roads have a major impact on scenery. Alternative 5 would decrease total road densities the most, and so it would have the least impact on scenery. It would be followed by Alternatives 1, 2, 3, and 4, respectively. All the alternatives except Alternative 4 would require new roads to meet Scenic Integrity Levels (SILs). Meeting SILs would reduce the visual impact of roads.

Recreational Access

Open road densities (as opposed to total road densities) would decrease the most under Alternatives 1 and 5. Alternative 2 also proposes a decrease in the Lethal Fire Regime. Otherwise, the reductions proposed are modest.

Alternatives 1, 2, and 3 would establish Limited Public Access Areas in five Reservation landscapes. These areas would decrease recreational access and opportunities for non-Tribal members but increase the quality of recreational experiences for Tribal members.

Trails and Campsites

Alternatives 1 and 2 call for the most aggressive trail and campsite maintenance and monitoring programs. Alternatives 1, 2, and 3 would enhance winter recreational opportunities with the addition of cross-country ski and groomed snowmobile trails. They would also add two new interpretive trails and develop and implement a fee system for trail use on new cross-country ski and groomed snowmobile trails in the North Missions Landscape, the revenues from which would help to fund the trail maintenance program in this landscape.

Roadless and Wilderness Areas

Only Alternatives 1 and 2 would protect unroaded acreage from future roading. Alternative 1 would prohibit roading on 68,245 acres in ten unroaded areas. Alternative 2 would prohibit roading on 33,118 acres in eight unroaded areas. Only Alternatives 1 and 2 would designate more wilderness acreage; Alternative 1 would add 38,191 acres of Tribal wilderness. Alternative 2 would add 26,969 acres.

Naturalness of the Forest

The forest structures that would result from the implementation of Alternatives 1, 2, and 3 would appear more natural and function more naturally than the existing forest. Over the long term, Alternative 1 would likely result in the most "natural" appearing forest, followed by Alternatives 2 and 3. Harvesting activities under Alternatives 1, 2, 3, and 5 would meet Scenic Integrity Levels (SILs), and Alternatives 1, 2, and 3 would visually rehabilitate selected areas that have been heavily impacted by geometrically shaped clearcuts.

Silvicultural Prescriptions

Timber harvesting has a major impact on scenery. Harvesting under Alternative 5 would be limited to salvage operations and would have a minimal impact on scenery providing no natural disasters occurred in the viewshed. The vegetation model predicts that among the remaining four alternatives, Alternative 1 would emphasize underburning and thinning more than the other alternatives. Alternative 2 ranks first in the acres that would undergo even-aged treatments. Alternative 4 ranks first in uneven-aged treatments. Alternative 1 would have the longest reentry periods, followed by Alternatives 2, 3, and 4, respectively. Alternative 1 would also have the least obtrusive type of site preparation and has the lowest level of salvage recovery, followed by Alternatives 2, 3, and 4, respectively. In addition, Alternative 1 would produce the most smoke from planned burns, followed by Alternatives 2, 3, 4, and 5 respectively.

Woodland and Interior Sod Restoration

Over the short term, woodland and interior sod (grassland) restoration will have negative impacts on scenery. Over the long term, however, these restoration efforts will enhance scenery. Only Alternatives 1 and 2 would restore grasslands and woodlands. Alternative 1 would restore 16,912 acres, while Alternative 2 would reclaim 8,653.

Riparian Restoration

Riparian areas are important to recreationists. Alternative 1 would restore the most riparian acreage, followed by Alternatives 2, 3 and 5, and 4, respectively. Fishing opportunities are also important to recreationists. Alternative 1 calls for the most fish restoration work, followed by Alternative 2.

Grazing

Alternative 1 would have the most positive visual impact on grazing lands, followed by Alternatives 2, 3, 5, and 4, respectively.

Culture

Roads

Road closures would have a net benefit on cultural resources and forest-based cultural activities, as long as appropriate cultural access is maintained. Alternative 5 would result in the highest number of roads being closed, followed by Alternatives 1, 2, and 3 and 4, respectively. Only Alternatives 1, 2, and 3 would have a mechanism to protect cultural access.

New roading can have significant negative impacts on cultural resources. Alternative 4 would result in the most new roading, followed by Alternatives 3, 2, 1, and 5 respectively.

Roadless and Wilderness Areas

Maintaining the roadless status of some of the existing roadless areas and protecting other lands as wilderness would benefit the cultural resources of the Tribes. Alternative 1 would maintain 68,245 acres of existing roadless country in ten areas. Helicopter logging would be allowed in all but two of them. Alternative 1 would also designate 29,814 acres in two areas as Tribal wilderness and add another 8,377 acres to existing wilderness. Alternative 2 would prohibit roading on 33,118 acres in eight existing roadless areas and designate 22,416 acres in two areas as Tribal wilderness. It would also add 4,553 acres to existing wilderness. None of the other alternatives would designate either roadless or wilderness areas.

Limited Public Access Areas

Designating Limited Public Access Areas—portions of the forest in which certain types of use or access is limited to Tribal members—are considered essential to the cultural well being of the Tribes. Alternatives 1, 2, and 3 would establish five new Limited Access Areas scattered throughout the Reservation. Alternatives 4 and 5 would establish no new Limited Public Access Areas.

Restoration of Native Communities

The restoration and maintenance of native plant communities would benefit the culture of the Tribes. Alternative 1 has the highest levels of restoration and maintenance associated with it, followed by Alternatives 2, and 3, respectively. Alternatives 4 and 5 do not seek to restore native plant communities.

Silvicultural Systems

Silvicultural systems that result in a forest that appears and functions in a natural way are the most desirable from a cultural resources perspective. When listed in the order of their ability to emulate natural disturbance regimes and therefore produce more natural forest structures, Alternative 1 comes first, followed by Alternatives 2 and 3, respectively. Alternatives 4 and 5 would not simulate pre-European disturbance regimes.

Intermediate Entries

The use of herbicides and chemical fertilizers in the forest is of major concern. Alternatives 5 and 1 would not use chemicals during intermediate entries. Alternative 2 would include the restricted use of herbicides and fertilizers, and Alternatives 3 and 4 would use them as silvicultural tools during intermediate entries.

Grazing

Grazing at higher elevations or in culturally sensitive areas has significant adverse impacts on cultural resource uses. Alternative 1 would reduce the impacts associated with livestock grazing the most. It is followed by Alternatives 2, 3, and 4 and 5, respectively.

Fisheries Restoration

Restoring native cutthroat trout and bull trout populations is a high priority from a cultural resource perspective. Alternative 1 envisions the most fish restoration work, followed by Alternative 2.

Economic and Socio-Economic

Economic Return and Employment

Short term economic returns are highest from Alternative 4, followed in order by Alternatives 2, 3, 1, and 5, respectively. Tribal Forestry staffing would remain about the same for Alternatives 1 through 4, at about 96 people. Alternative 5 would reduce forestry staffing to about 37 people, 33 of whom would be fire fighters. Total employment, both direct and induced, would be about 490 for Alternative 4, 400 for Alternative 2, 370 for Alternative 3, 330 for Alternative 1, and 200 for Alternative 5. Over the long term (through 2089) Alternative 4 would produce the most income and jobs, followed in order by Alternatives 3, 2, 1, and 5.

Economic Costs

Road closures through obliteration would not have a significant effect on any alternative except Alternative 5, where it would reduce revenues by about 9%. The increased costs of reintroducing fire to the ecosystem combined with predicted road closures would reduce Tribal income by about 4.2% for Alternative 1, 3% for Alternative 2, 2.8% for Alternative 3, 0.7% for Alternative 4, and 16.9% for Alternative 5.

Indian Logging

Indian logging would be promoted regardless of alternative and would vary directly with the total harvest for each alternative. However, income from Indian logging to the Tribes would likely continue to lag behind non-Tribal logging. Small business set asides for Indian loggers would be highest under Alternative 3, followed by Alternatives 2 and 1 and 4, respectively. Under Alternative 5, most harvesting would be done by Tribal members, although volumes would be dictated by natural events because timber harvesting would be limited to salvage operations.

Grazing and Recreation

Alternative 4 would likely produce the most economic return and jobs from grazing, followed by Alternatives 3, 2, and 1, respectively. Under Alternative 5, grazing would produce less income and fewer jobs over the long term. Recreation income to the Tribes is likely to decline under Alternatives 1, 2, and 3 as Limited Public Access Areas are established in all landscapes.

Communication and Education

Every alternative has objectives designed to improve communication between the public and the Departments of Forestry and Natural Resources and to enhance education about forest management. Management priorities should improve as the Tribal Departments of Forestry and Natural Resources increase their understanding of public needs. Similarly, the public's satisfaction should improve as they understand more about the factors affecting management decisions. Communication between the Departments of Forestry and Natural Resources and other Tribal programs should improve. An objective of all the alternatives is to develop and implement a comprehensive education action plan on fire's role and fire use in pre-contact ecosystems. The decision maker's and the public's understanding of fire should improve under this program. Alternatives 1, 2, 3, and 4 have objectives to develop interpretive trails at Boulder and Swartz Lake and to install "Points of Interest" at Valley Creek and Saddle Mountain. These improvements should enhance the public's knowledge of resource management. There is another objective to develop and fill a public information officer position. Opportunities to listen to the public would increase and the public's level of satisfaction should improve through an effective public information program.

Chapter One
Introduction

Contents

Chapter One Introduction

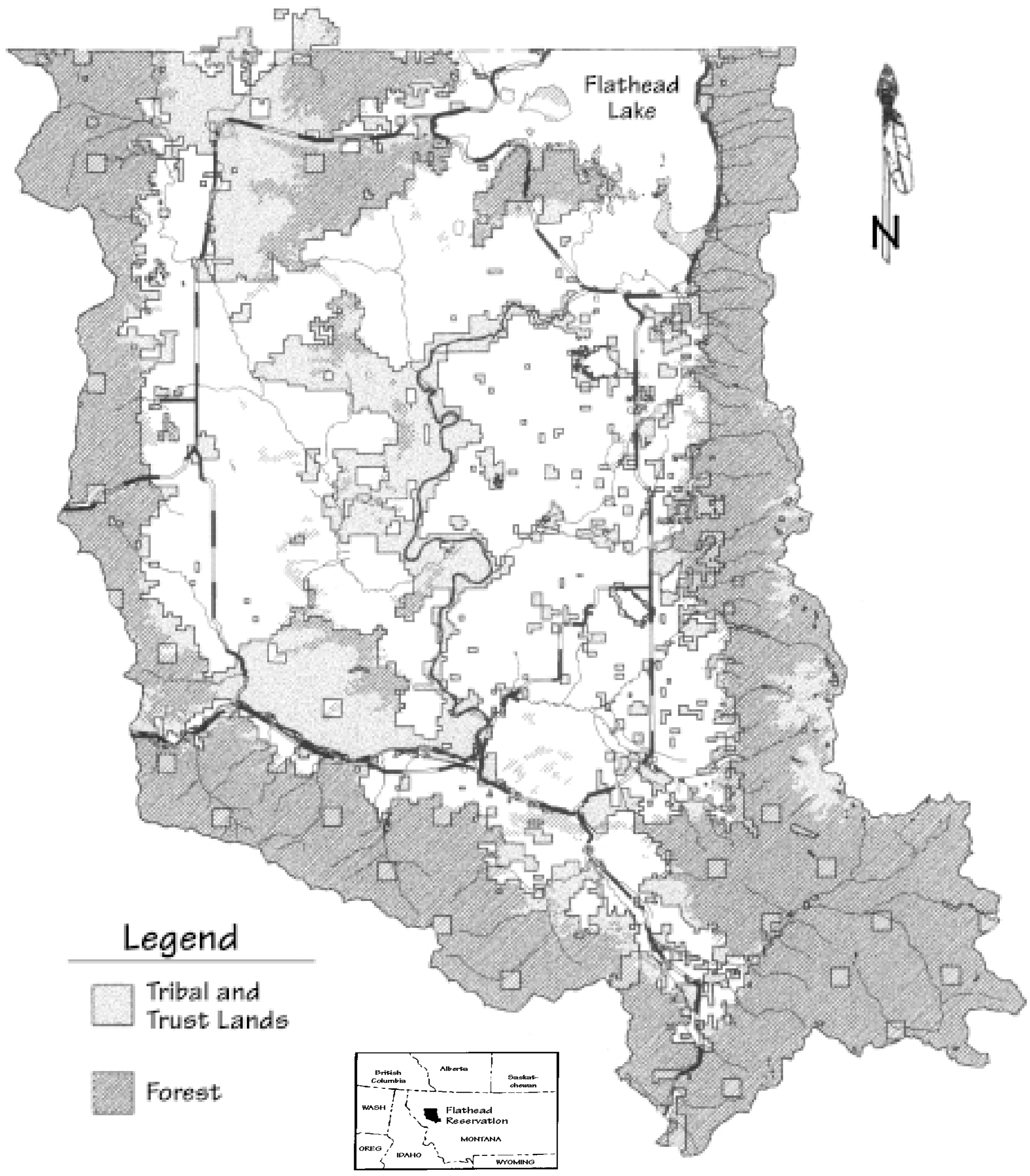
The 1996 Flathead Indian Reservation Draft Forest Management Plan proposed a set of goals, objectives, and standards that would guide the direction of all forest-related resource management programs and activities on Indian lands[†] within the Reservation. The implementation of the draft plan represents the proposed action in this Final Environmental Impact Statement (FEIS).

The Flathead Indian Reservation encompasses 1.3 million acres. Roughly, one third of it is forested. The alternatives in this FEIS deal with those forested acres owned by the Confederated Salish and Kootenai Tribes and allottees. The land status of the Reservation is shown in the map below (figure 1-1). The forest occurs primarily on Tribal and allottee trust land.

The purpose of this FEIS is to provide information to the public, landowners, and the Superintendent of the Flathead Agency on how the proposed action and the various alternatives will affect the environment. It is intended to foster informed decision making and informed public participation. An interdisciplinary (ID) team of resource specialists conducted the analysis by compiling existing condition and historical data and information on ecological processes. They analyzed various human uses of the forest—everything from logging to recreation to grazing—and constructed models to predict future trends. From all this, they developed specific objectives and desired condition goals for each of five alternatives. They then analyzed the environmental consequences of each alternative. This information was presented in the Draft Environmental Impact Statement (DEIS), which was released for public review in March of 1999. A total of 104 individuals or organizations commented on the DEIS. The ID team reviewed the comments and made a number of changes. Some involved corrections of factual information, others were substantive changes based on suggestions made by commenters. Still others expanded on information that was presented in the DEIS. Because the changes in response to comments did not involve significant modifications to any of the alternatives and did not require the addition of new alternatives, we circulated only the comments, responses, and changes to the DEIS. That document, entitled *Flathead Indian Reservation, Final Environmental Impact Statement: Comments, Responses, and Changes to the DEIS*, was mailed out to all those who commented on the DEIS.

[†]Indian lands are lands held in trust for indiviual Indians or for the Tribes.

Figure 1-1. The Flathead Indian Reservation is located in western Montana. Just under half a million of its roughly 1.3 million acres are forested.



In addition to this introduction, Chapter 1 includes a description of the proposed action, the purpose and need for the action, a brief summary of the alternatives, and a description of the public participation process. Chapter 2 describes the affected environment or existing condition of the resources that will be affected by the proposed action. Chapter 3 gives detailed descriptions of the alternatives. Chapter 4 describes the environmental consequences of each of the alternatives. Chapter 5 summarizes various National Environmental Policy Act considerations, and Chapter 6 lists agencies, organizations, and individuals contacted, as well as those commenting on the DEIS. Chapter 7 lists the specific comments recieved on the DEIS and the ID Team's responses to each of those comments.

The Proposed Action and Alternatives

The proposed action

The Confederated Salish and Kootenai Tribes propose to revise and implement the 1996 Flathead Indian Reservation Draft Forest Management Plan. The draft forest management plan takes an interdisciplinary, ecosystem approach to forest management and seeks to restore and maintain the long-term ecological integrity of the Reservation's forests in a manner consistent with Tribal values.

The goals of the plan are to:

1. **Strengthen Tribal sovereignty and self sufficiency through good forest management.**
2. **Manage forest ecosystems to include natural processes and to balance cultural, spiritual, economic, social and environmental values.**
3. **Adopt a process which accommodates changes in Tribal values and resources.**
4. **Facilitate Tribal member involvement in forest stewardship.**
5. **Provide sustained yield of forest products and maintain or enhance forest health.**
6. **Develop options for managing land use conflicts.**
7. **Provide perpetual economic benefits of labor, profit, and products to local communities.**
8. **Manage forested ecosystems to protect and enhance biological diversity.**
9. **Provide a variety of natural areas that Tribal members can use for solitude, cultural activities, and recreation pursuits.**
10. **Work cooperatively with adjacent landowners and Federal agencies to minimize cumulative impacts.**
11. **Protect human life, property and forest resources through fire suppression and fuels management.**
12. **Comply with Tribal and Federal laws.**

Purpose and Need

The purpose of the Flathead Indian Reservation Forest Management Plan is to provide long-term direction for the trust forest resources. The plan describes resource management practices and levels of resource production. It establishes management standards, allocates land, and prescribes management practices to achieve balanced forest ecosystems.

Chapter 1
Introduction: The Proposed Action and Alternatives

The Proposed Action is needed to:

1. **Satisfy Tribal goals and objectives.**
2. **Ensure that management activities are compatible with sustainable forest ecosystems.**
3. **Balance Tribal cultural, social, economic, and environmental values.**
4. **Establish a basis for an adaptive management and monitoring process that incorporates Tribal member values.**

A Summary of the Alternatives

Alternatives 1, 2, 3, and 5 are all *action alternatives*. The action alternatives, as defined by the National Environmental Policy Act, represent a departure from past management. They have been developed to meet the purpose and need of the proposed action and to respond to the issues identified in the scoping process. Alternative 4, the *No Action Alternative* would continue the management practices of the last forest management plan, which was prepared in 1982 and adopted in 1987. A No Action Alternative is included to provide a benchmark against which to evaluate the four action alternatives.

Among the action alternatives, Alternatives 1, 2, and 3 are similar in two respects. First, they have restoration as one of their primary goals. That is, they seek to restore, to varying degrees, more natural structures, processes, and functions to the forest in order to achieve more sustainable conditions over the long term. Second, all three take an ecosystem approach to management; they focus on the overall vegetative structure and composition of the forest rather than on individual stands or the needs of individual species. Of the three, Alternative 1 seeks the highest levels of restoration. It is the *Environmentally Preferred Alternative*. Alternative 2 ranks second with respect to restoration. Alternative 3 ranks third. Alternative 5 takes a passive approach to management. Timber harvesting would be limited to salvage operations after fires, windthrow, or insect and disease outbreaks. Nature would be the primary restorative force.

Alternative 2 is the *Proposed Action* (the 1996 Draft Forest Plan with updates and revisions made in response to modeling refinements and new information). It is also the *Preferred Alternative*. It was selected because it does the best job of balancing social, cultural, economic, and environmental concerns and best achieves the fulfillment of the purpose and need statement.

Figure 1-2. Throughout this document we refer to alternatives by number rather than name. To help you keep track of them, we have included a bookmark which contains brief definitions of each of the alternatives. Two bookmarks with definitions are located at the beginning of the DEIS; keep them handy as you read through the document to refer to as needed.

Major Characteristics of the Alternatives

Name	No.	Type	Theme
Full Restoration (**Environmentally Preferred Alternative**)	1	Action	Ecosystem-management based, emphasis on restoration
Modified Restoration (**Proposed Action and Preferred Alternative**)	2	Action	Ecosystem-management based, emphasis on balancing restoration with the needs of sensitive species and human uses
Restoration Emphasizing Commodities	3	Action	Ecosystem-management based, emphasis on commodity production
Continue Past Management (**No Action Alternative**)	4	No Action	Continue forest practices of the 1980s
Custodial	5	Action	Restoration through natural forces, minimal management (salvage only)

Table 1-1. The major characteristics of the five alternatives

Brief Descriptions of the Alternatives

Alternative 1—Full Restoration

The overall goal of this alternative is to use an ecosystem-management approach to aggressively restore pre-European forest conditions. Silvicultural treatments would be designed to reverse the effects of fire exclusion and undesirable forest practices of the past and would mimic natural disturbances in size and frequency. Fire Management would designate areas where a modified suppression response strategy would provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit would be covered by an agency fire plan. Managers would rely heavily on prescribed fire and would seek to restore grasslands, woodlands, and riparian zones; reduce livestock impacts; reduce road densities; visually rehabilitate areas heavily impacted by geometrically shaped clearcuts; protect some roadless areas from future roading; designate some new wilderness; and establish Limited Public Access Areas. At current stumpage rates, predicted volumes would generate about $3.65 million annually. The alternative would provide 1 to 2 million board feet of timber per year as small business set-asides for Tribal members. Alternative 1 is the *Environmentally Preferred Alternative*.

The Environmentally Preferred Alternative is the alternative judged to cause the least damage to the biological and physical environment. The Environmentally Preferred Alternative is not necessarily the same as the Preferred Alternative.

Alternative 2—Modified Restoration

The primary goal of Alternative 2 is to balance the restoration of pre-European forest conditions with the needs of sensitive species and human uses of the forest. Silvicultural treatments would be designed to reverse the effects of fire exclusion and undesirable forest practices of the past. Prescribed fire would be a major tool. Harvesting would mimic natural disturbances as much as possible; however, restoration would be balanced against present-day uses of the forest, the needs of sensitive wildlife species, and watershed concerns. Fire Management would designate areas where a modified suppression response strategy would provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit would be covered by an agency fire plan. This alternative would also restore grasslands, woodlands, and riparian zones; reduce livestock impacts; reduce road densities; protect some roadless areas from future roading; and designate some new wilderness, although these measures would be less extensive than under Alternative 1. Alternative 2 would also visually rehabilitate areas heavily impacted by geometrically shaped clearcuts and establish Limited Public Access Areas. At current stumpage rates, predicted volumes would generate about $4.3 million annually. The alternative would provide 2 to 3 million board feet of timber per year as small business set-asides for Tribal

What is Ecosystem Management?

Ecosystem management, the management philosophy underlying Alternatives 1, 2, and 3, views the entire forest as the context for management rather than the individual parts. It focuses on the diversity of forest structures and how they function across large areas. It also emphasizes the importance of key elements or processes like fire—the natural forces that shaped the forest and created the basic pattern or mosaic our plant and animal communities evolved with. Ecosystem management attempts to restore or mimic natural processes. The goal is to sustain forests as diverse, productive, and resilient ecosystems. Ecosystem management does not, however, ignore human uses of the forest. It views people—our life-styles, land uses, culture, and economy—as an integral part of the forest. It integrates economic and biological concerns so that each builds on and benefits the other. More important, ecosystem management takes the long view by merging what the current generation desires for itself and its children with what our scientific understanding tells us is sustainable over the long term.

members. Alternative 2 is the *Proposed Action* (the 1996 Draft Forest Plan with updates and revisions made in response to modeling refinements and new information). Alternative 2 is also the *Preferred Alternative*. It was selected because it does the best job of balancing social, cultural, economic, and environmental concerns and best achieves the fulfillment of the purpose and need statement.

Alternative 3—Restoration Emphasizing Commodities

Alternatives 1 through 3 are ecosystem management alternatives. Alternative 4 is the No Action alternative, and Alternative 5 is a salvage only alternative.

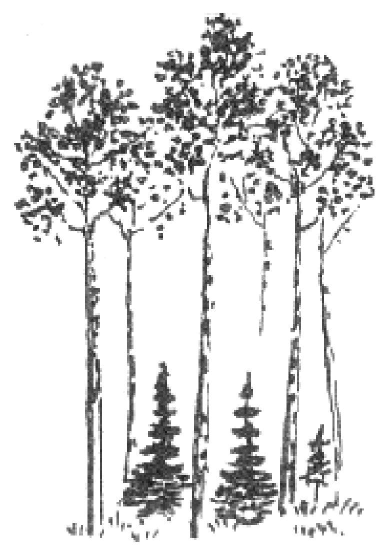
The primary goal of this alternative is to use intensive forest management practices to maximize forest-related income and employment. Managers would emphasize the production of wood products and other forest commodities. While this alternative would use an ecosystem management approach to restore pre-European forest structures, restoration efforts would be balanced against the need to maximize income and employment and reduce harmful forest insect infestations and diseases. Fire Management would designate areas where a modified suppression response strategy would provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit would be covered by an agency fire plan. Livestock impacts and road densities would be reduced, and riparian zones would be restored to a functional level. This alternative would also visually rehabilitate areas heavily impacted by geometrically shaped clearcuts and establish Limited Public Access Areas. At current stumpage rates, predicted volumes would generate about $3.74 million annually. The alternative would provide 3 to 4 million board feet of timber per year as small business set-asides for Tribal members.

Alternative 4—No Action

This is the No Action Alternative. It would continue the management practices established under the last-approved forest management plan, prepared in 1982 and adopted in 1987. Under this alternative, harvest activities would be moderately intensive and modified by best management practices and applicable Federal and Tribal policies, ordinances, laws, and directives. Managers would focus their efforts on individual stands rather than at the ecosystem level and would not attempt to restore historic forest structures. Livestock impacts would not change and road densities in currently roaded areas would remain about the same. Roadless areas would not be protected from future roading, and no new wilderness would be designated. At current stumpage rates, predicted volumes would generate about $5.63 million annually. The alternative would provide 1 to 2 million board feet of timber per year as small business set-asides for Tribal members.

Alternative 5—Custodial

The goal of alternative 5 is to allow natural processes other than fire to control the future direction of the forest. Current fire suppression policies would remain in place. Forest management would consist almost exclusively of salvaging dead and dying timber after fires, wind storms, or insect and disease outbreaks. Over time, road densities would drop to about half their current level as roads are overtaken by vegetation. Initially, grazing levels would see little change, but over time grazing opportunities would decline as access dropped off. Modest restoration work would occur in riparian zones. No new roads would be constructed anywhere for harvesting purposes, and no new wilderness would be designated. At current stumpage rates, predicted volumes would generate about $289 thousand annually. Most harvesting would be done by Indian loggers.



Alternatives Considered but Dropped from Detailed Analysis

A number of other alternatives were suggested during the scoping process. They were reviewed by the Interdisciplinary Team, Tribal Council, and Bureau of Indian Affairs and set aside for one or more of the following reasons: (1) they did not contribute to meeting the purpose and need, (2) they were not technologically feasible, (3) they were essentially duplicates of other alternatives, (4) they reflected decisions already made, (5) if implemented they would cause unreasonable environmental harm, or (6) they would violate laws or regulations. Brief descriptions of the alternatives considered and dropped from detailed analysis follow.

Alternatives Dropped from further Analysis

Ban Clearcutting

Alternative 5, which limits timber harvest to salvage after natural disturbances such as fire, windthrow, or insect and disease outbreaks, is essentially a no-clearcutting alternative. Although a small amount of clearcutting could occur under this alternative, volumes would be minimal and derived from trees that were already dead or dying. The revenue derived from salvage, though small, would meet the Tribes' need to provide perpetual economic benefits of labor, profit, and products to local communities and to balance cultural, spiritual, economic, social, and environmental values. (Initially, Alternative 5 included more harvesting, but the ID Team modified it during development of the DEIS in order to better address concerns expressed during the scoping process.)

Optimize Small Business Indian Logger Sales

All of the alternatives evaluate options to enhance small business Indian logger opportunities.

Ban Timber Harvest/Ban Sawlog Harvest

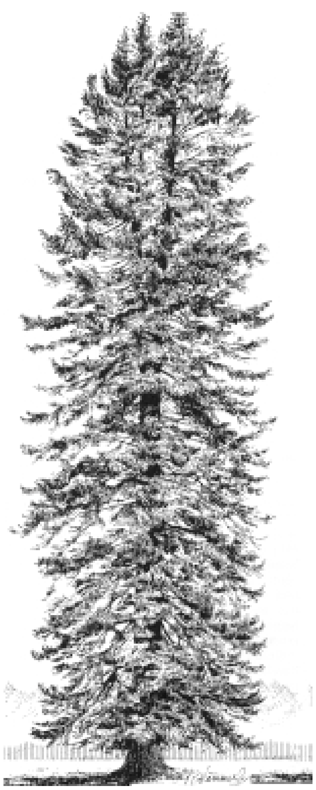
Alternative 5, which limits timber harvest to salvage after natural disturbances such as fire, windthrow, or insect and disease outbreaks, is essentially a no timber-harvest alternative. Although a very small amount of harvesting would occur under this alternative, volumes would be derived from trees that were already dead or dying. The revenue derived from salvage, though small, would meet the Tribes' need to provide perpetual economic benefits of labor, profit, and products to local communities and to balance cultural, spiritual, economic, social, and environmental values. A complete ban on timber or sawlog harvesting would be inconsistent with the economic provisions of the purpose and need statement.

Utilize a Full Land Allocation Approach

Land allocation (allocating specific areas for the practice of intensive forestry while managing the remaining land base for other resource values) is part of Alternatives 3 and 4.

Optimize Fish and Wildlife Habitat and Conditions for Threatened and Endangered Species

All the alternatives address the impacts on threatened and endangered species and comply with Tribal and Federal laws and regulations. Alternatives 1 and 2 attempt to optimize fish and wildlife habitat.



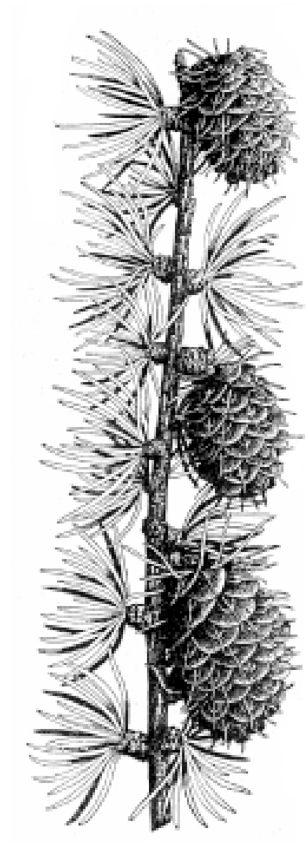
Grand Fir

Start with Transportation Planning as a Foundation

Road management is a tool used by all the alternatives to enhance resource values and to mitigate the impacts from logging and other human activities.

Manage the Forest for Traditional and Cultural Use Only

Alternative 5, which limits timber harvest to salvage after natural disturbances such as fire, windthrow, or insect and disease outbreaks, is close to a Cultural-Use-Only Alternative, especially over the long term. The small amount of revenue derived from salvage under Alternative 5 would meet the Tribes' need to provide perpetual economic benefits of labor, profit, and products to local communities and to balance cultural, spiritual, economic, social, and environmental values. Over time, access would decline dramatically under Alternative 5, and that would substantially limit most uses other than traditional ones.



Western Larch

Let Aesthetics Drive Forest Management

Improving the scenic quality of the forest is a major emphasis of Alternatives 1, 2, and 3.

Manage with Fire Only

Managing only with fire would cause unreasonable human risks and would not meet the economic elements of the Purpose and Need Statement.

Salvage Only

Alternative 5 is essentially a salvage-only alternative.

Public Participation

Notice of Intent

The scoping process required under the National Environmental Policy Act (NEPA) was followed to invite public participation and to determine issues to be addressed in the EIS. The Notice of Intent to prepare an EIS was published in the Federal Register on January 30, 1996. It announced meetings in five locations:

Location	Date	Time
Arlee, Montana	February 20, 1996	6:00 p.m.
St. Ignatius, Montana	February 21, 1996	6:00 p.m.
Elmo, Montana	February 22, 1996	6:00 p.m.
Hot Springs, Montana	February 23, 1996	6:00 p.m.
Pablo, Montana	February 25 and 28, 1996	6:00 p.m.

Table 1-2. Locations, dates, and times of scoping meetings.

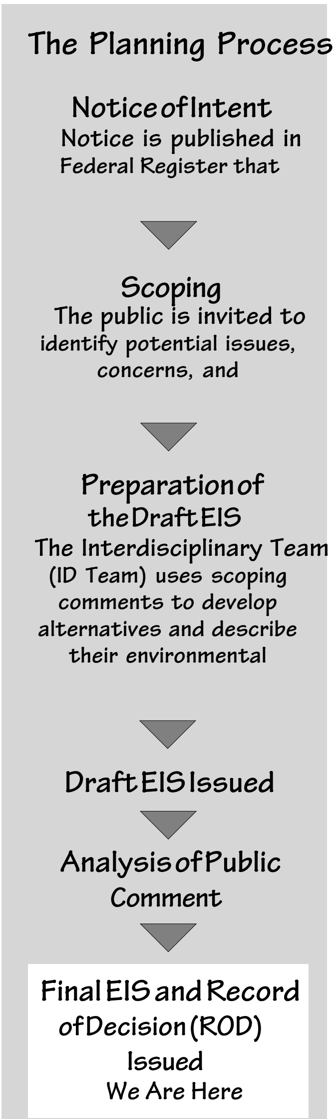


Figure 1-3. Planning Process for the development of the Environmental Impact Statement

Notifications of these meetings were also published in the Missoulian on February 7 and 9, 1996; in the Char-Koosta News on February 9 and 16; and in the Sanders County Ledger on February 15, 1996. The Draft Flathead Indian Reservation Forest Management Plan (FMP), which is the proposed action, was available for viewing at public libraries in Hot Springs, Ronan, Polson, and the Salish and Kootenai College, Montana.

Comment Period

The comment period began on January 30, 1996, and extended through March 29, 1996.

Meeting Format

Participants were asked to sign in and were given the following information: an agenda, a comment form, and an Executive Summary of the FMP. Several maps showing the forest, the status of forest vegetation, and other natural resource information were placed around the room for review and discussion. All verbal comments were recorded on flip charts.

Total attendance at the scoping meetings was 29. In addition, 14 written comments or requests for information were received.

Issues Coming out of the Scoping Process

Comments received during scoping meetings and in the mail were summarized into *issue statements* and grouped by resource, geography, action, or cause-and-effect relationships. These statements were then carried forward and considered in the preparation of this Draft EIS. (For a more detailed summary of the scoping process, see the document entitled, *Scoping Report for the Flathead Indian Reservation Draft Forest Management Plan Environmental Impact Statement*, issued in July, 1996 by the Confederated Salish and Kootenai Tribes.)

Issue Statements

Grazing

Current grazing practices have resulted in reduced wildlife cover, decreased riparian health, reduced tree regeneration, lowered the quality of recreational experiences, increased livestock forage competition, and reduced forage availability and condition.

Threatened and Endangered Species

Threatened and endangered species are important and need protection. The effects of timber management and livestock grazing practices on threatened and endangered species need to be addressed and restoration efforts need to be implemented where damage has occurred.

Wildlife

Wildlife habitat and viewing opportunities have been reduced by forest management activities. This damage includes impairing wildlife movement, reducing wildlife corridors, increasing road densities, and reducing big game habitat.

Comments received during scoping meetings and in the mail were summarized into issue statements. These statements were then carried forward and considered in the preparation of this Draft EIS.

Watersheds

Aquatic resources (including streams, wetlands, and riparian vegetation) have been degraded by grazing, logging, and roading activities in forested watersheds. These disturbances have resulted in long-term damage to the quality of the aquatic ecosystems and limited opportunities for other uses.

Traditional Uses

Opportunities for traditional use of forest lands have been lost or degraded by logging, grazing, roading, and recreational activities. The level, duration, and extent of these activities have resulted in undesirable long-term vegetation changes, loss of seclusion, and damage to unique settings that are used for traditional purposes.

Recreational Uses

Recreational uses by Tribal and non-Tribal members are in conflict with commodity uses and with each other. Conflicting uses and policies have resulted in limited recreational opportunities. Proposed exclusion areas also have the potential to limit recreational opportunities.

Clearcutting and Visuals

Clearcuts that do not blend well with natural features have reduced the scenic quality of the forest.

Socio-Economic

Some Tribal members are dissatisfied with the economic return from forested lands. There are not enough jobs, and revenues derived from the Reservation lands could be higher if the land base was put to its "highest and best use."

Forest Management

Throughout the Reservation, forest health has been damaged by fire suppression, insect and disease outbreaks, and poor management practices. Residents are concerned about the lack of reforestation, the availability of lodgepole pine for post and pole operations, the lack of old growth, and unregulated harvests. The public wants a healthy, sustainable forest that will provide both commodity and non-commodity benefits. Forest management should follow a holistic approach that considers all parts of the forest environment.

Communication and Education

The lack of communication between program agencies and the public has resulted in forest management priorities that do not reflect what the public wants. Education can be used to help promote understanding between programs, agencies, and the public and ultimately to increase public satisfaction with how the forest is managed.

Public Involvement with the DEIS

Based on the issues raised during the scoping meetings, the ID Team developed the five alternatives presented in the DEIS. The 60-day comment period on the Draft EIS began on Monday, March 1, 1999 and ended on May 2, 1999. Several comments were received subsequent to the May 2nd deadline but were accepted into the record. Both Tribal and non-Tribal members were invited to comment.

One public meeting was held on April 21 at the Mission Valley Power building in Pablo, Montana. About 100 people attended. The purpose of the meeting was to answer any questions members of the public might have and to accept written public comments on the DEIS. At the end of the comment period, 104 letters or comment forms had been received. Comments came from individuals, agencies, and organizations (see Chapter 6 for a complete list).

In addition to commenting on specific parts of the DEIS, a number of people said they favored a specific alternative. Two said they supported Alternative 1, ten supported Alternative 2 as it now stands, seven said they would favor Alternative 2 if the Limited Public Access Areas included in that alternative were dropped. None favored Alternative 3. Two said that if the Limited Public Access Areas are not dropped from Alternatives 1, 2, and 3, they support Alternative 4, otherwise they favor one of the other alternatives. Two people said they favored Alternative 5.

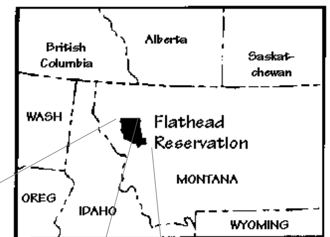
Chapter Two
Affected Environment

Contents

The Setting: The Flathead Indian Reservation

Home of the Flathead Nation

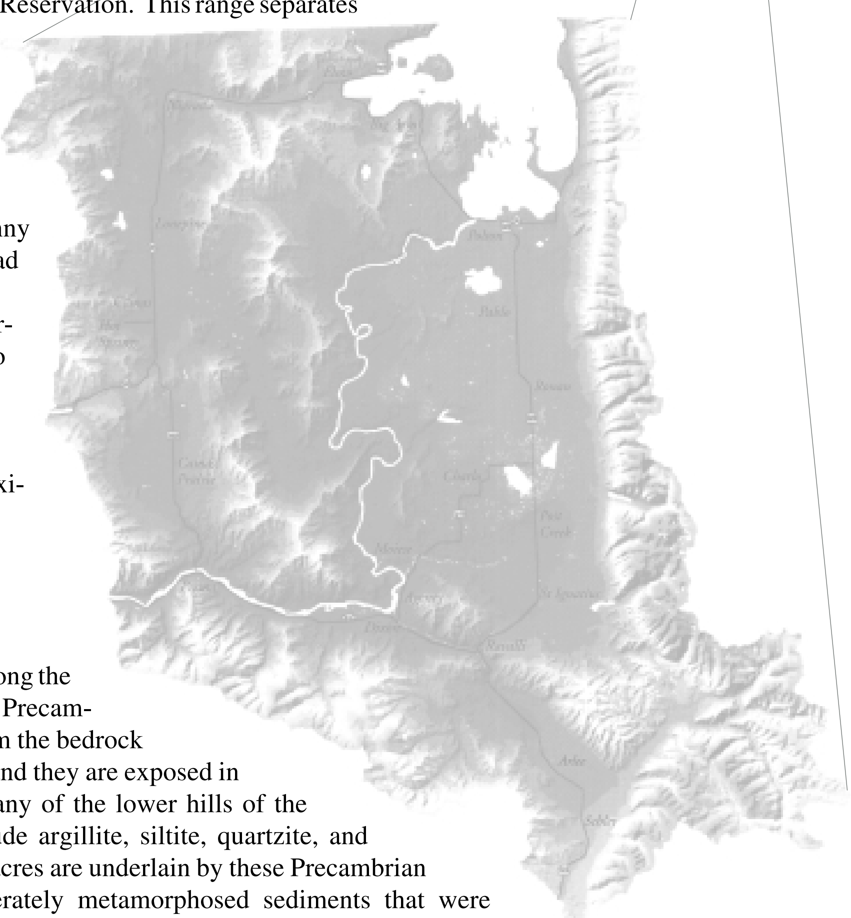
The Flathead Indian Reservation, which makes up the lower quarter of the Flathead River Basin, encompasses 1.3 million acres. About a third of that area, some 456,520 acres, is forested. Most of these timbered acres are on the hills and mountains along the perimeter and central portions of the Reservation and represent the bulk of the Tribal land base. Forest communities range from dry ponderosa pine and Douglas-fir types to subalpine fir and alpine larch.



The top of the Mission Range forms the eastern boundary of the Reservation. Its peaks vary in elevation from six thousand feet at their northern end to ten thousand feet at McDonald Peak in the middle of the range. The Rattlesnake Mountains, another high range, forms the southeast boundary. The Reservation Divide, which reaches eight thousand feet in elevation, defines the southwest boundary. The east edge of the Cabinet Mountains, where elevations reach seven thousand feet, forms the Reservation's western boundary. The northern boundary extends east from these mountains, across Flathead Lake, to the Mission Range. The Mountain ranges are, for the most part, forested.

The sparsely timbered, low lying Salish Mountains stretch south from the Reservation's north boundary to the central part of the Reservation. This range separates two north-south valleys, the Mission Valley to the east, the more arid Little Bitterroot River Valley to the west. Except for riparian zones, these areas are generally untimbered. Other principal valleys and basins include Camas Prairie, Big Draw, Irvine Flats, Sunny Slope, the Jocko Valley, and the Flathead River Valley downstream from Dixon.

These Reservation valleys are generally flat; some have low hills rising to thirty-five hundred feet. All have wetlands and wooded riparian areas. Where the Lower Flathead River leaves the Reservation, the elevation is approximately twenty-four hundred feet.



Geology

The Flathead Indian Reservation lies along the west slope of the Rocky Mountains. Precambrian rocks of the Belt Supergroup form the bedrock under virtually all of the Reservation, and they are exposed in the mountain ranges, as well as in many of the lower hills of the valleys. The major rock types include argillite, siltite, quartzite, and limestone. Almost all of the forested acres are underlain by these Precambrian rocks, which are fine grained, moderately metamorphosed sediments that were

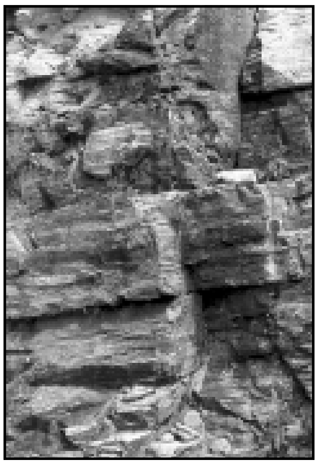


Figure 2-1. Top, an argillite outcropping. Argillite is one of the more common rock types underlying Reservation forests. Bottom, a soil profile showing volcanic ash overlying a gravelly loam.

deposited over one billion years ago. Belt sediments are highly stable; they account for the generally high stability of the Reservation's watersheds. Igneous rocks also occur but only in two areas: south of Hot Springs, and in the northwest corner of the Reservation. The rocks in the latter area are volcanic in origin.

Over the last 100,000 years, Reservation landscapes have been extensively modified by advances and recessions of glaciers. The most recent glacial advance, receded about 10,000 years ago and left unconsolidated surface sediments in many watersheds.

Unconsolidated glacial sediments found in forested watersheds:

1. Fine grained sediments deposited in Glacial Lake Missoula.

These materials are found to an elevation of approximately 4,150 feet across the Reservation.

2. Glacial tills

These are clays and silts with interspersed gravels and boulders. They are found along the east and west shore of Flathead Lake and in glaciated valleys.

3. Glacial stream deposits

These are sands and gravels deposited by glacial streams, and are widely distributed on the east half of the Reservation.

Since the glaciers receded, geologic conditions have been relatively stable. This is suggested by the widespread distribution of 6,700-year-old Mt. Mazama volcanic ash in forested drainages, well developed soil profiles on many glacial features, stable stream channels, and high slope stability in forested watersheds.

Soils

Reservation soils formed from residual and colluvial materials eroded from Belt rocks or in materials deposited by glaciers, lakes, streams, and wind. Wind deposits include volcanic ash from Washington and Oregon.

The volcanic ashes came from Cascade Range volcanoes. They produce soils with very high soil moisture holding capacity, high fertility, low strength, and high erodibility.

In many areas soils formed in glacial till and are generally loamy and with moderate to high quantities of boulders, cobbles, and gravels. Mountain and foothill soils are on steep slopes and mostly well drained, with large amounts of broken rock. Rock outcrops are common. In most of the valleys, the soils are deep and gently sloping. Most forest soils are somewhat resistant to erosion by water. Some areas have groundwater levels near the land surface.

Natural fire may produce large volumes of fine sediment that can enter streams. Additionally, fire in riparian areas can add large volumes of large woody debris to streams over short time spans.

Climate

The western half of the Reservation, which lies in the rain shadow of the Cabinet Mountains, receives less precipitation than the east half—Camas Prairie is one of the driest areas in Montana. Mean annual precipitation in the valleys ranges from twelve inches on the west side of the Reservation to twenty inches or more on the east side.

The mountains are wetter. Annual precipitation in the Mission Mountains, for example, reaches as much as one hundred inches, mostly in the form of snow. Typically the lower mountains receive twenty to thirty inches (fig. 2-2).

A moist, maritime influence from the Pacific Ocean dominates the Reservation, especially during winter months when low lying clouds blanket the region. Precipitation falls on a fairly regular basis throughout the year, although May and June are about twice as wet as other months. Forested watersheds receive over one half of their precipitation as winter or late spring snows. The hydrologic budgets in Reservation watersheds are considered snow-dominated hydrologic regimes. Rain events, which occur with greatest frequency in the early summer and fall, add to the input of water and modify the timing and magnitude of snowmelt runoff.

Depending upon the density and structure of the forest canopy, precipitation is either intercepted in the forest canopy or lands on the ground. A percentage of the snowfall intercepted by the canopy is lost back to the atmosphere. Precipitation that falls to the forest floor as snow accumulates as winter snowpack. As air temperature increases during early spring, snowpack converts to liquid water and saturates the forest soil profile. Overland flow is uncommon in forested watersheds due to the high levels of moisture retained in the soil (although overland flow can occur over frozen soils). Precipitation which infiltrates into the soil profile is either taken up and transpired by vegetation or ends up in stream channels.

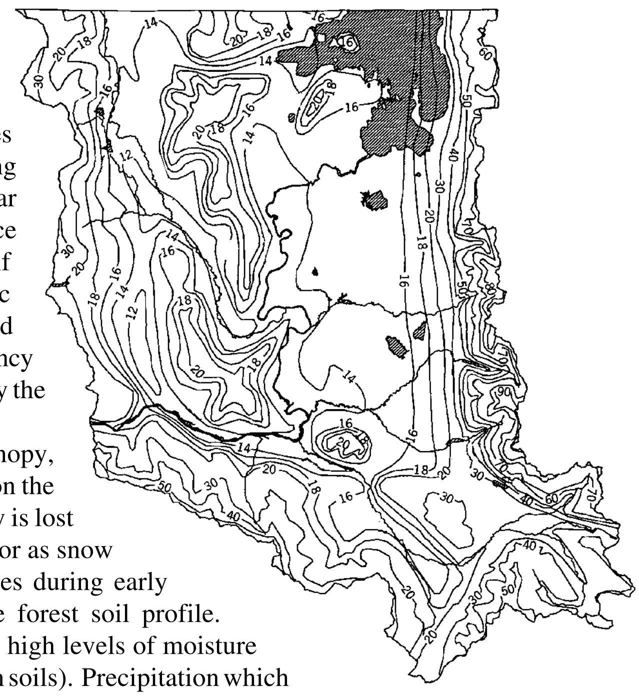


Figure 2-2 (above). Mean annual precipitation in inches. Sheltered portions of the Mission Divide can receive up to 100 inches of precipitation a year. Reservation-wide, about half of the moisture falls as snow.

The vegetative growing cycle, and the corresponding need for plants to utilize soil water, runs from May through September. During the early growing season, there is adequate moisture for plants. But as the summer season progresses, soil moisture becomes limiting. Most is consumed by vegetation. Streamflows decrease as levels drop. The permeability and depth of the soil influence how rapidly soil moisture levels decrease. Deeper profiles usually hold higher levels of soil moisture later into the summer season.

The mean annual temperature in the valleys is approximately 45° F. Winter temperatures are fairly moderate, averaging about 27° F thanks to the sheltering effect of the Mission Mountains and the Continental Divide. Warm, southern Chinook winds occasionally moderate these systems, and cold, arctic air masses can drop temperatures to below -20° F for short periods.

A drier, continental climate dominates the Reservation in July and August. Temperatures during these months fluctuate from the high 70s to 90s in the valleys. The growing season in the valleys lasts approximately one hundred days and runs from May to September.

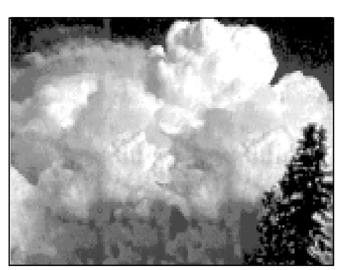


Figure 2-3 (left). Thunderstorms are not uncommon from mid-July to September. Lightning from these storms starts most of the wildfires on the Reservation.

Vegetation: an Overview

The forests of the Reservation are typical of the northern Rocky Mountain region. Ponderosa pine, Douglas-fir, western larch, lodgepole pine, grand fir, Engelmann spruce, subalpine fir, whitebark pine, and alpine larch are the most common trees (fig. 2-4). Common shrubs include snowberry, spiraea, and ninebark. Wheatgrasses, fescues, pine grass, and introduced bluegrasses compose most of the grasses. River floodplains support ponderosa pine, Rocky Mountain juniper, Douglas-fir, black cottonwood, paper birch, willow, alder, dogwood, rose, and snowberry. Willows, cattails, meadow grasses, and sedges dominate wetlands.

To date the Federal government has listed no threatened or endangered plant species on the Reservation. One plant, however, is being proposed for listing as Threatened or Endangered by the US Fish and Wildlife Service (Montana Natural Heritage Program). It is the Spalding's catchfly, also known as Spalding's campion (*Silene spaldingii*).

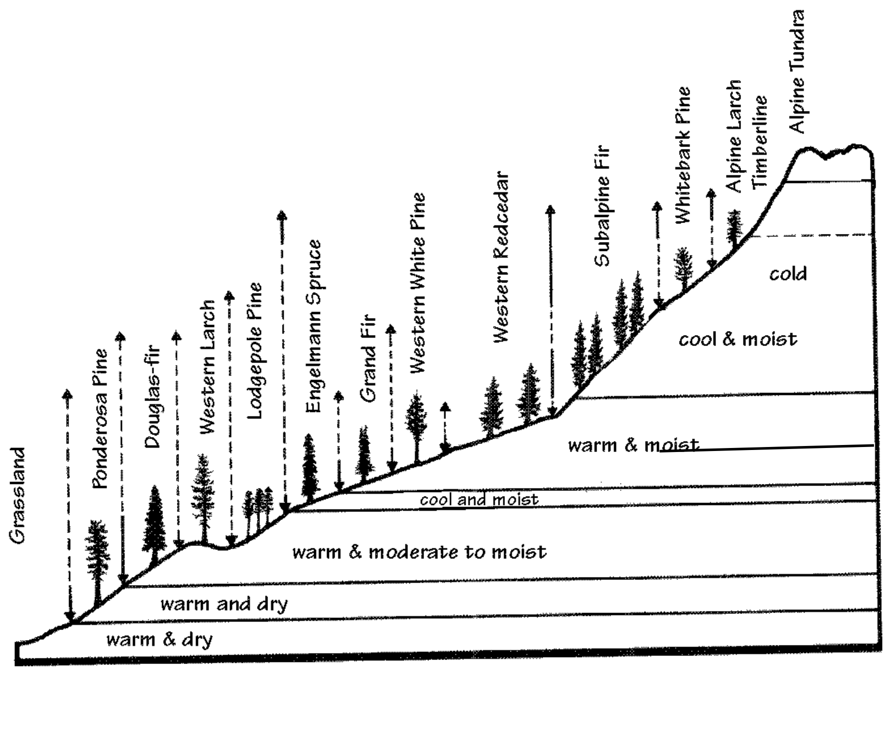


Figure 2-4. A generalized distribution of forest trees on the Reservation (after Pfister et al. 1977). The arrows show the relative elevational range of each species; the solid portion of each arrow indicates where a species is the potential climax and the dashed portion shows where it is seral.

The Tribes

Each of the tribes on the Reservation is culturally unique and has its own belief system. All three, however—the Salish, Kootenai, and Pend d'Oreille—are similar in at least two respects: they possess a thorough knowledge of the natural environment and each has a profound respect for all of creation. Both traits have enabled the Tribes to live sustainably within the forest for thousands of years.

Many of the ways in which the Salish, Pend d'Oreille, and Kootenai traditionally used the forest are not discussed in this document because the Tribes prefer not to describe them in a public document.

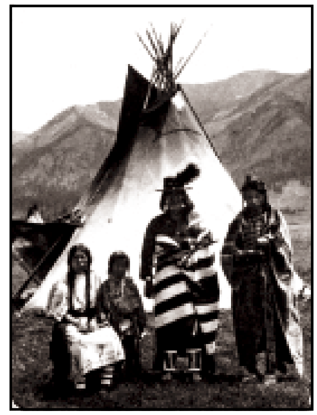


Figure 2-5. Salish bands lived in valleys throughout the Reservation and made extensive use of woodlands and forests.

Salish

On the Flathead Reservation, the designation "Salish" encompasses not only the Bitterroot Salish and the Pend d'Oreille, but also Kalispel and Spokane Indians who settled on the Reservation. Elders say that these and other tribes were once one Salish speaking tribe. Thousands of years ago this ancestral tribal group divided into a number of different bands that later became tribes and occupied much of the Northwest, from British Columbia to Montana and beyond. Some bands lived throughout Montana from the Bitterroot to the Yellowstone valleys. The Pend d'Oreille eventually settled in the Flathead Valley, and a band of Kalispel camped along the Flathead River near Perma, Camas Prairie, and Paradise.

The Salish believe that Creation consists not only of humankind, but of everything in the animal world, the mineral world, and the plant world. Even the elements and the forces of nature are part of Creation. Each has a spirit, that we must respect and love.

Before the time of the Reservation, the Salish tribes gained subsistence from a tribal system of hunting, fishing and harvesting that utilized all parts of the forest. The quest for food began in the early spring when the people started harvesting plants from the forest for shelter, tools,

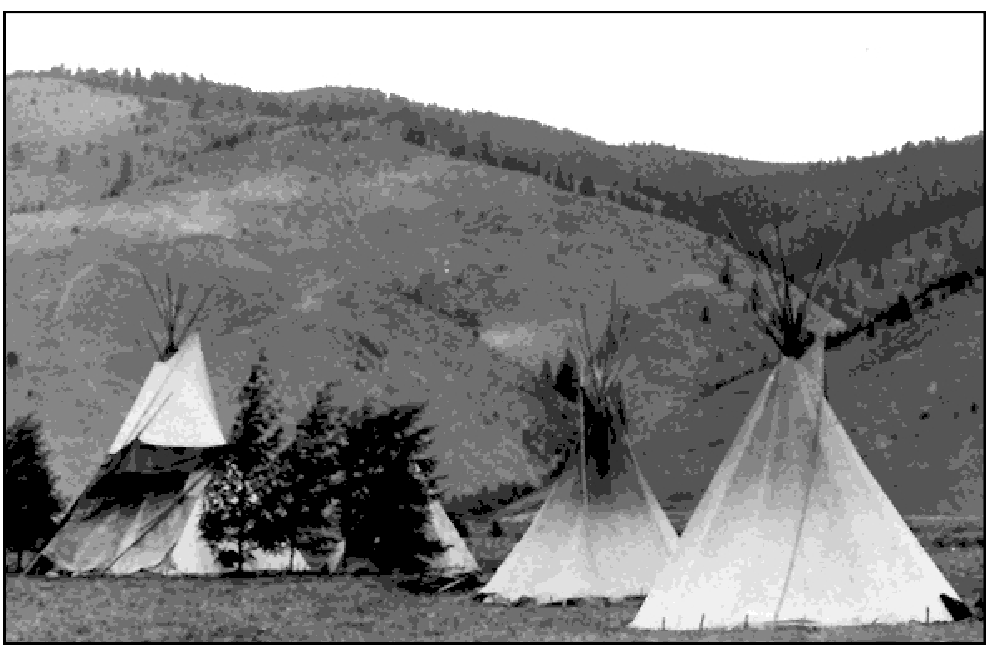


Figure 2-6. The Salish regularly lit fires to alter both the structure and composition of the forest to improve hunting and camping and other aspects of their lives.

food, medicine, and other purposes. They fished year-round in forest streams and lakes. In summer and fall, they hunted and picked berries: first strawberries and serviceberries, later huckleberries, raspberries, chokecherries and hawthorn berries. They also harvested mushrooms, barks, and roots. They made annual trips to the tops of the mountains to gather pine nuts from whitebark pine stands. In the fall, the men concentrated more on hunting. They hunted many different forest animals, but deer and elk were mainstays. Meanwhile, the women dried the meat and prepared hides for robes and buckskins. They spent the winter months trapping and fishing. Women repaired clothing and sewed new garments from deer and elk skins. They decorated their work with porcupine quills colored with natural dyes.

The forest provided not only food, but also material for lodges, tools, clothing, and games. The Salish made lodge frames from lodgepole pine and coverings from elk hides. They fashioned tools such as needles, mauls, and grinding stones from wood, bone, and rock.

Kootenai

Before contact with non-Indians, the Kootenai Nation numbered over ten thousand and inhabited what is now eastern British Columbia, the southern half of Alberta, northern Idaho, and eastern Washington and Montana. The Kootenai band that lived in the Dayton area called itself the “Fish Trap People,” a name that comes from their practice of setting traps in the creeks during large fish runs.

Figure 2-7. The Kootenai band that lived in the Dayton area managed forest vegetation with fire as did the Salish.

The Kootenai moved seasonally over a large territory. The seasonal round started in the early spring when they travelled to their fishing grounds to catch bull and cutthroat trout, salmon, sturgeon, and whitefish. They also set traps and weirs in streams.

In early May, as the fishing season came to a close, the root harvest began. From mid- to late summer the Kootenai harvested serviceberries, chokecherries, huckleberries, and other fruits. When fall approached they organized communal deer drives, caching surplus meat for winter. Deer were the most accessible and abundant of the game animals, and deer meat was one of the most essential foods, but the Kootenai also hunted elk, moose, caribou, buffalo, mountain sheep, bear, and birds such as grouse and geese and ducks.

The Kootenai lived in skin and mat-covered tepees (the latter woven from tulle and dogbane) and used canoes to transport family and gear, and to fish.

In the words of Naida Lefthand of the Kootenai Culture Committee: "It is important that we, as Tribes, preserve the lands of our Reservation and monitor the activities on all of our aboriginal territories.

"The land, Mother Earth, is what provides the food for Indian people. The pure water and air of these lands support the people and the fish and wildlife, as well as aid in the growth of plants whose roots and berries are needed by many of the Indian people. Religiously significant areas must be preserved for present-day religious practices."

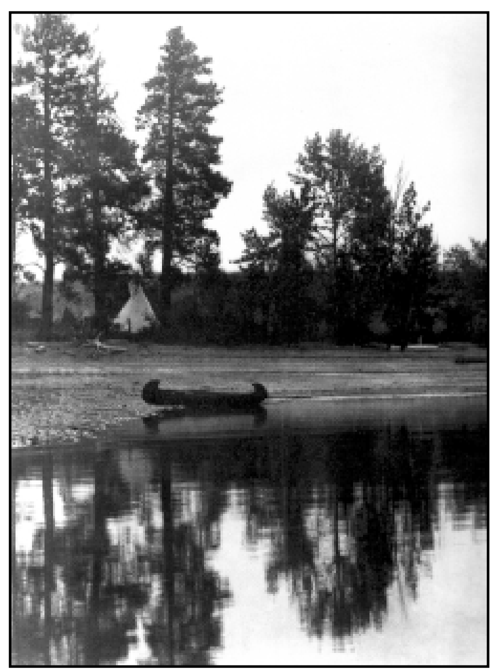


Figure 2-8 (right). Ponderosa pine woodlands and parklands near streams and lakes in the valley bottoms often served as important camping areas.

The Resources: Their Status, Use, and Management

Forest-wide Resource Descriptions

This section, describes the current condition, use, and management of resources on a forest-wide scale.

Topics included

1. **Disturbance and Vegetation**
2. **Wildlife and Diversity**
3. **Water and Fisheries**
4. **Culture**
5. **Scenery and Recreation**
6. **Transportation**
7. **Air Quality**
8. **Grazing**
9. **Minerals**

Each resource description includes a narrative of the pre-contact condition (when applicable), and a summary of the existing condition. Various maps are also included. Figure 2-10, below, shows the six landscapes that make up the Reservation.

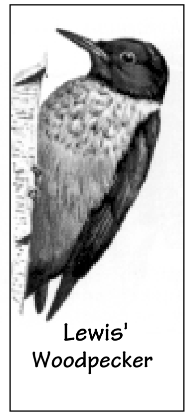


Figure 2-9. Red-faced and red-bellied, Lewis' woodpeckers favor open, parklike ponderosa pine forests for breeding. All summer long they feed on ants, flies, tent caterpillars, beetle larvae, mayflies, and other insects.

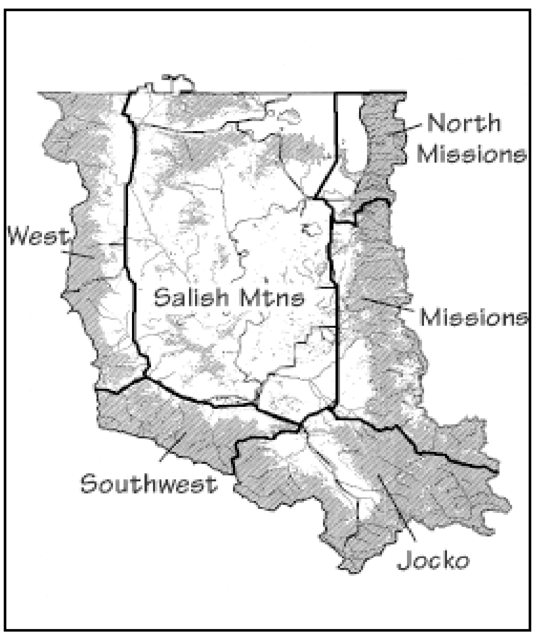


Figure 2-10. A landscape is defined as an area drained by one or more streams of similar character within which the climate, land-forming processes, and natural vegetation patterns are relatively uniform. It is an area that, for a number of reasons, people tend to view as a single unit. There are six landscapes on the Reservation.

Disturbances and Vegetation

Disturbance: Natural and Human

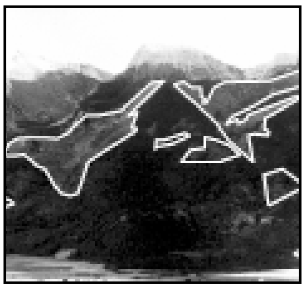
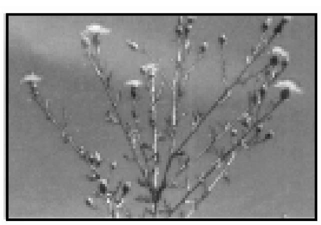


Figure 2-11. Natural disturbances have always played a major role in shaping the structure and composition of our forests. They were responsible for the mosaic—the overall pattern of vegetation. When this photo of the Missions was taken earlier in this century, the pattern created by natural fires was still evident; openings created by fire are marked.

Events that are described as *disturbances* generally cause significant change in a forest, usually altering the way it functions (a recent burn, for instance, has a different role than an old growth forest). Disturbances need not be a single large event however. Many small disturbances can add up to cause a significant change in a forest. Disturbances can also be natural or human caused. Natural disturbances include events like fire, insects and disease outbreaks, floods, drought, windthrow, and storm damage. Human-caused disturbances include timber harvesting, heavy grazing, the introduction of exotic species such as weeds, and so on. The consequences of human disturbances can be similar to those caused by natural forces or they can be of another magnitude, altering ecosystems in ways natural disturbances rarely do.

A good example is weeds. Noxious plants are thoroughly established in many forested areas of the Reservation. Their spread has reduced important wildlife habitat as well as land productivity. Spotted knapweed is the predominant noxious plant, and it occurs on about 85% of the weed-infested acres. Other noxious plants that occupy extensive acreages include sulfur cinquefoil, Dalmatian toadflax, leafy spurge, St. Johnswort, and whitetop. Smaller, but significant, infestations of thistle, hounds's tongue, yellow toadflax, and Russian and diffuse knapweeds are also present. Purple loosestrife has recently become established and is a serious invader of wetlands.

In the past, the Tribes have adopted a tiered method to address noxious weeds on Indian lands. They have utilized approaches that include species-specific objectives, control objectives based on the site or location of infestations, special management areas (such as the Tribal Wilderness and Wilderness Buffer Zone) which require modification of general treatment techniques and policies, and planning units based on watershed or political boundaries.



Spotted Knapweed

Leafy Spurge

Canada Thistle

Figure 2-12. While dozens of species of exotic plants or weeds have invaded Reservation wildlands, a handful pose serious threats to wildlands, among them spotted knapweed, leafy spurge, and Canada thistle.

Treatment methods include prevention, manual control, mechanical control, biological controls, and chemical controls.

Weeds are an enormous disturbance factor today. During pre-contact times, however, fire was the most frequent disturbance, second only to climate in the influence it exerted over the mosaic, structure, and composition of our forests. And while the affects of weeds are mostly negative from a biological perspective, fires, which were both natural and human-caused, were usually beneficial. While fire can no longer play the role it once did, silvicultural activities combined with prescribed fire can be designed to mimic natural fires. Timber sales differ from burns in many ways, but logging remains one of the most powerful tools we have to renew forests where large-scale fires are no longer an option. Of course, natural wildfire

Fire Management in Pre-contact Times

To learn about Indian burning practices, fire ecologist Steve Barrett interviewed 31 Tribal elders and 27 non-Indian "pioneer" settlers in the late 1970s. Testimony from these individuals and other research Barrett conducted indicated that the Salish, Kootenai, and Pend 'Oreilles used fire extensively, especially in low-elevation forests. Fire history studies, early accounts, and old photos show that these stands were generally open and parklike, presumably from the frequent occurrence of low-intensity fires that burned over large areas and reduced fuels and understory vegetation. Other research conducted in the area suggests this type of Indian burning has gone on for over 7,000 years.

Further evidence of frequent fires comes from the daily journal accounts of Jesuits living in the Mission Valley. The fathers who were here during the latter part of the last century, make frequent mention of fires and remark almost daily in August and September about the extremely smoky conditions in the valley. Theodore Shoemaker who worked for the US Forest Service in the early 1900s wrote that "Prior to 1897, and even later in many sections, fires burned continuously from spring until fall without the slightest attempt being made to extinguish them." While not all of these fires were Indian set, research by Barrett and others suggests that Indian people were responsible for as many as half of them in frequently used valley areas and low-elevation forests. In other words, they doubled the frequency of fires. Indians cited dozens of reasons for setting fires. The main reasons identified by Barrett and others follow.

"There is no question that enormous areas of the forests and grasslands we inherited were very much cultural landscapes, shaped profoundly by human action… The wildlife communities that characterized these cultural landscapes… were in large measure products of thousands of years of human intervention. And it will take continued human intervention to maintain them."
—Doug MacCleary, Landscape Architect, 1995

The reasons for setting fires

1. To maintain open stands to facilitate travel and clear routes through dense timber

2. To improve hunting by stimulating the growth of desirable grasses and shrubs, to facilitate stalking, and to drive or surround game

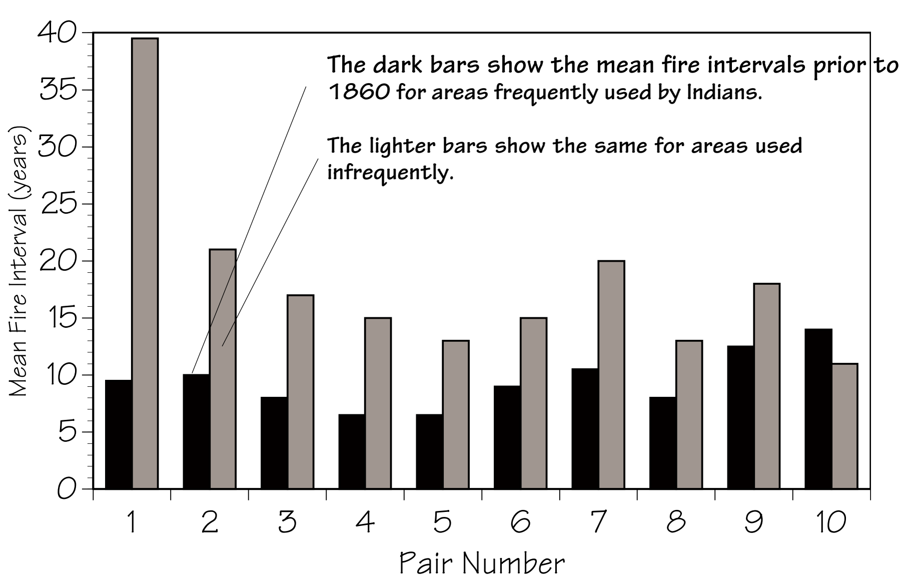


Figure 2-13. Barrett sampled ten pairs of old-growth stands. One member of each was on slopes above a large valley and was thought to be within a major travel and occupation zone. The other was on a similar site but in a remote area not used extensively by Indians for camping or travel. The results show that before 1860, frequently used stands had a mean fire interval (average interval between fires) of 9.1 years; remote sites had an interval of 18.2 years.

"This knowledge (about Indian burning) can help us understand why and how our forests have changed."
—Doug MacCleary, Landscape Architect, 1995

3. To enhance the production of certain foods and medicine plants

4. To improve horse grazing

5. To clear campsite areas thereby reducing fire hazard and camouflage for enemies, and cleaning up refuse

6. To communicate by setting large fires

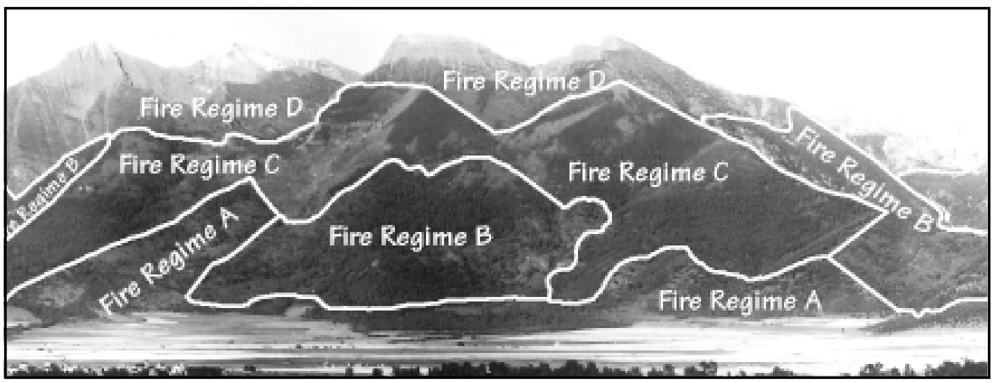
7. To reduce insect pests

Figure 2-14. Frequent, low-intensity fires lit by Indians kept the forest open. The practice explains why so many journal accounts of European settlers talk about people being able to ride horses or drive wagons through the forest—something that would be impossible today in most of those same areas.

as a disturbance will always be with us, regardless of how good suppression efforts are. A brief summary of pre-contact Tribal burning practices follows.

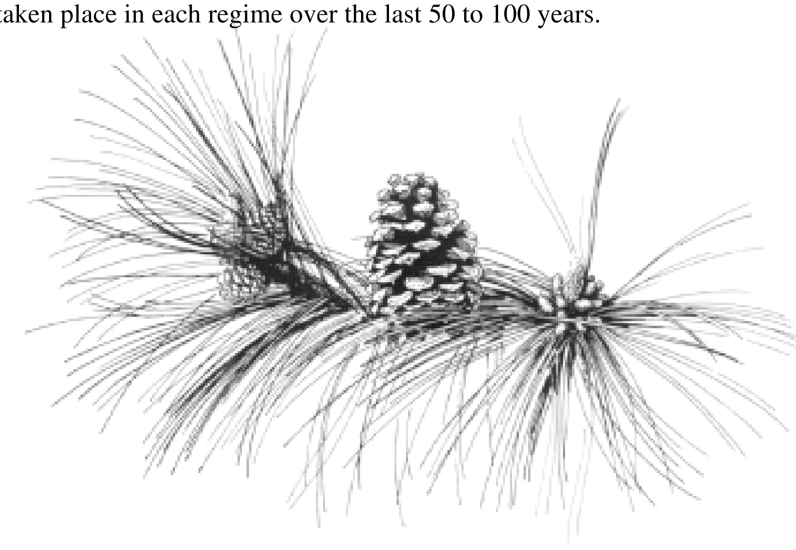
The Reservation's Fire Regimes

The term fire regime refers to the kind of fire that typically occurs in an area and the effects that that particular type of burning has on the vegetation. Fire regimes are described by fire frequency (how often fires occur), fire intensity (whether the fires that burn are mostly surface fires that burn ground vegetation or crown fires that burn ground vegetation as well as in the



canopy), and the pattern of vegetation that the fires create. We have identified four fire regimes on the Reservation. These are shown in the photo below as they occur on the face of the Mission Range. Fire Regime A is the Nonlethal Fire Regime, B the Mixed Fire Regime, C the Lethal Fire Regime, and D the Timberline Fire Regime.

On the pages that follow we describe the Reservation's four fire regimes and the vegetation patterns that existed in each during pre-contact times. We also describe the vegetative changes that have taken place in each regime over the last 50 to 100 years.



The Nonlethal Regime

"Travelers often rode horseback or pulled wagons for miles through these areas without having to cut trails."

— Steve Arno,
Forest Ecologist,
1994

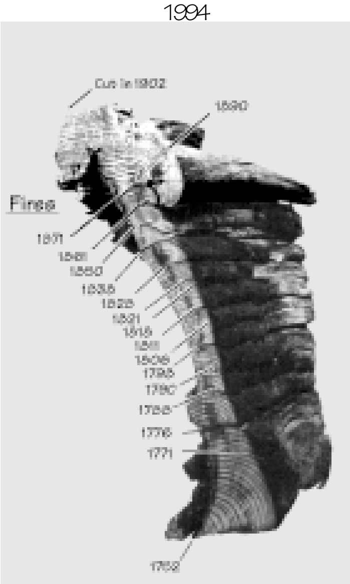


Figure 2-15 (above). A cross-section from a ponderosa pine stump reveals old fire scars that show an average fire frequency of one fire every 8.5 years.

Summary

Fires within this fire regime did not kill mature trees. They were brief, low intensity fires that burned mostly grass and litter on the forest floor. They occurred frequently, sweeping through stands every five to thirty years, and many were started by Indian people. They created a forest of large, old, mostly ponderosa pine trees—many individual trees were from 200 to 600 years old. These stands were open and parklike with few shrubs, understory trees, or downed logs. In most, the duff layer rarely exceeded three inches. The Nonlethal Fire Regime occurs at low to mid elevations on mild slopes and dry southeast to west aspects.

Stands tended to be uneven-aged although the pattern was dominated by small clumps of even-aged trees. Stands were also intermixed with fire-maintained grasslands and ponderosa pine woodlands. Occasionally bark beetles killed patches of trees and allowed a new age class to develop. Examples can be seen in Dry Fork, Jette, Stevens, and Seepay.

Changes since 1900

Fires have been all but completely excluded within this fire regime. Stands have become overgrown with dense Douglas-fir and ponderosa pine understories (commonly 200 to 2,000 small trees per acre beneath old-growth stands and between 2,000-10,000 trees per acre where pine overstories have been removed). Duff mounds of 6 - 24 inches are not uncommon. When duff piles like these burn, they girdle and kill even big trees. Because of the ladder fuels (fuels that reach from the forest floor into the canopy), fires in this zone now burn as partial stand-replacement or stand-replacement fires.

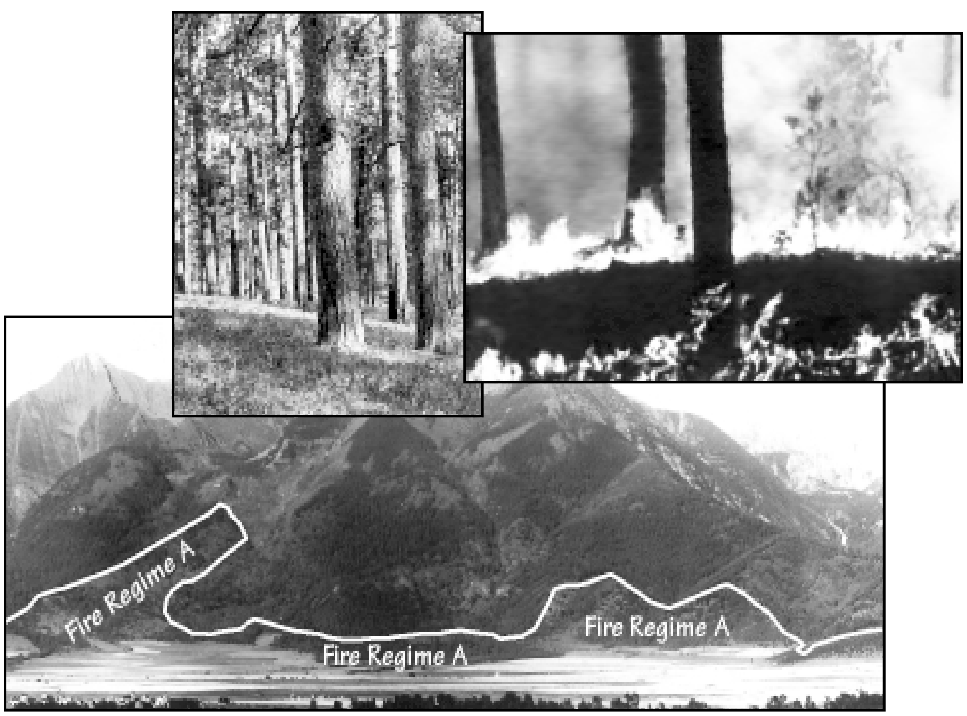


Figure 2-16 (right). The large photo shows where the Nonlethal Fire Regime (Fire Regime A) occurred within the Missions landscape. The top inset shows typical nonlethal fire behavior. The lower inset shows the kind of stand structure that frequent, low-intensity fires created.

A Closer Look at the Nonlethal Regime

The Vegetation

This regime is characterized by low-elevation seral and climax ponderosa pine and dry Douglas-fir types. These sites are typically on hot and dry, south to west-facing slopes or cool and dry upland ridges at low elevations.

Prior to 1900, low-intensity surface fires occurred frequently returning at intervals of from 1 to 30 years in most areas. The majority of overstory trees survived the fires, while many of the understory seedling and sapling-sized trees were killed. Consequently, these sites were generally maintained in a late seral, parklike condition where large trees dominated. Shrubs, understory trees, and downed logs were sparse, as testified to by dozens of historical photos and narrative accounts. Undergrowth was composed primarily of fire dependent grasses and forbs which resprouted quickly after each burn. The most fire-resistant species—ponderosa pine and western larch—were favored. Pine regeneration occurred whenever overstory trees died, thereby creating small openings. Trees were often distributed in small even-aged clumps. Old pines and scattered Douglas-fir often had scars from numerous fires dating back to the early 1600s.

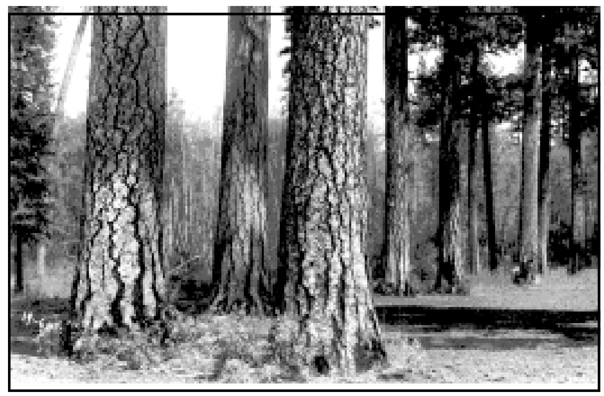


Figure 2-17. These sites were generally maintained in a parklike condition where large trees dominated.

The Fires

Recurrent lightning and native-set fires were usually nonlethal ground fires (underburns) with moderate to high spread rates. They burned throughout the summer and early fall over a long season of favorable burning weather. They may have been quite large, especially where dry forests and adjacent grasslands were extensive. However, in rugged mountainous topography, these fires were confined to small areas, mostly dry sites on south-facing slopes.

Stand replacement fires in this regime were rare, at intervals of several hundred years, but did occur under extreme fire weather conditions and when longer than normal fire-return intervals allowed litter and understory fuels to build.

Figure 2-18. In rugged mountainous topography, nonlethal fires were confined to small areas, mostly dry sites on south-facing slopes.

The Changes

Important changes have occurred in these forests since 1900 due to the interruption of frequent burning. Reduced fire occurrence began in the late 1800s as a result of the relocation of Indians, fuel removal by heavy grazing of livestock, the disruption of fuel continuity on the landscape due to cultivation and development, and the adoption of a full fire suppression policy. Successful suppression of surface fires in open, fire-maintained stands over the last several decades has increased the potential for catastrophic fire.

Many stands have an altered stand structure and composition, and a build up of understory fuels, so much so that it would be difficult—if not impossible—to restore forest health with prescribed fire alone.

The down-dead fuel loading in these cover types usually average 10-15 tons/acre, but tends to increase with stand age as a result of accumulated downfall from insect and disease damage, blowdown, and natural thinning. Overstory trees have been removed over more than a century of logging, (primarily partial cutting), and this has aided the development of thickets of small trees. On sites where ponderosa pine is seral, there has been a shift to shade-tolerant species, like Douglas-fir. These successional changes have resulted in a build up of understory or ladder fuels which now allow wildfires to burn as stand-replacing crown fires.

Today, prescribed fire is the obvious and most feasible substitute for filling the ecological role of historic fires. However, many stands have an altered stand structure and composition and a buildup of understory fuels that makes it difficult if not impossible to restore forest health with prescribed fire alone.

Figure 2-19. Today, prescribed fire is the obvious and most feasible substitute for filling the ecological role of historic fires.

The Mixed Regime

Summary

This fire regime was characterized by a combination of nonlethal and stand-replacing fires. Fire frequency varied from 30 to 100 years, and individual fires could be either large or small in size. Most burned over relatively long periods. Two patterns were typical. In the first, a stand might experience nonlethal fires every 30 to 40 years and a stand-replacing fire every 150 to 400 years. In the second, fires killed fire-susceptible species growing in the overstory (such as subalpine fir), but left fire-resistant trees (like big larch, Douglas-fir, and ponderosa pine).

The Mixed Fire Regime created many small stands dominated by various age structures and was therefore rich in its diversity. Stands with open overstories of mature Douglas-fir and larch were common, although there were also closed, young stands. The general pattern could be described as a patchy mosaic. The regime occurs on low to mid elevations on all slopes and all aspects. Examples can be found in Garceau, Hell Roaring, LaMoose, and Little Money areas.

Changes Since 1900.

Fire exclusion policies have allowed trees to become older and more dense in this regime. There has also been a significant buildup of down woody material and ladder fuels. Recent wildfires have burned as large, stand-replacement fires creating fewer and larger patches.

"Fires here create lots of patches, each with a different suscepti-bility to insects, diseases, and fire. It's a bit like the farmer who grows several different crops. If something goes wrong with one, he's still in business."

—Forest Plan ID Team member, 1995

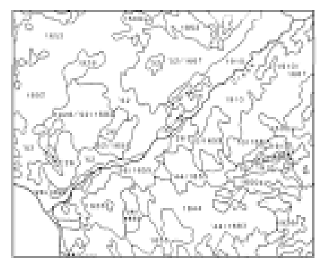


Figure 2-20 (above). The mosaic above is typical of that found in a Mixed Fire Regime. The numbers represent the year(s) an individual stand was established; the data is from the North Fork of the Flathead (Barrett et al. 1991).

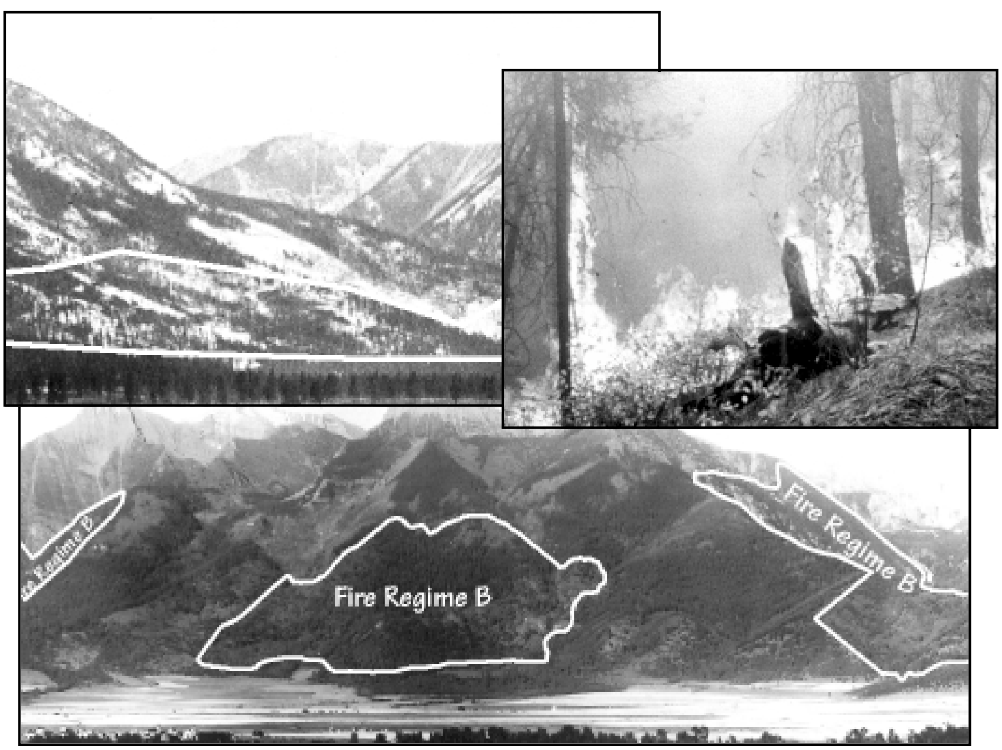


Figure 2-21 (left). The lower photo shows where the Mixed Regime (Fire Regime B) occurred within the Missions landscape. The delineated area within the top left inset shows a typical Mixed Fire Regime mosaic on the Reservation. The right inset shows one kind of fire behavior that occurs within the regime.

Figure 2-22. Stand- and partial stand-replacing fires typically swept through this zone about every 100 to 200 years.

A Closer Look: The Mixed Fire Regime

The Vegetation

This regime is characterized by moist Douglas-fir stands and occurs on most aspects in the 3,000 to 6,500 foot elevation range. Douglas-fir is both the indicated climax species and a vigorous member of seral communities. It is not uncommon for Douglas-fir to dominate all stages of succession on these sites.

Fires maintained a diverse pattern of forest vegetation of varying ages, compositions, and health that was shaped by fuels, topography, and climate. Stand- and partial stand-replacing fires typically swept through this zone about every 100 to 200 years, but lower intensity blazes that created small openings of burned ground vegetation and that killed only a few trees occurred as often as every 20 to 30 years.

The fires generally killed overstory trees in an irregular pattern as a result of lethal heating at the ground level or fire moving into the crowns of trees. The result was a mosaic pattern of various shaped patches of live, mixed-seral forest, and openings occupied by dead trees or even-aged regeneration. Lightning and native-set fires most likely spread over periods of weeks or months in these mixed conifer forests, so they often covered large areas. Patches were fine grained and had curved edges and a high degree of internal structural diversity (snags, islands of residual trees, etc.).

The uneven burning pattern in Mixed Fire Regimes was probably enhanced by the pattern from previous burns and complex mountain topography.

The Fires

Fire severity in this regime was variable; anywhere from 10% to 90% of the trees within a stand could have been killed, depending on the type of fire. Three types of fires were at work: nonlethal underburns like those that dominated the Nonlethal Regime; stand-replacing fires identical to those of the Lethal Fire Regime; and fires that were a hybrid of these two types. How a fire behaved depended on slope, aspect, fuel conditions, and both short and long-term climatic cycles. Steep, northerly slopes probably showed the greatest tendency toward stand-replacement behavior, while gentle, south-facing slopes tended to have more nonlethal fires. The remaining sites, steep south slopes and gentle north slopes, probably experienced a blend of the two behaviors.

Figure 2-23. As the name suggests, fire behavior in the Mixed Fire Regime is variable and includes both nonlethal and lethal fires.

The Changes

Stands within the forest zone have undergone significant changes in recent decades. As a result of fire exclusion, the trees have become older, and often have a build up of down woody or ladder fuels. Fuel loadings average 10 to 12 tons/acre but can range as high as 75 tons/acre (downed dead fuels tend to accumulate over time in these stands). The most hazardous conditions occur in well-stocked stands with dense Douglas-fir understories.

Fire's role as a stand-replacement agent becomes more pronounced with fire exclusion, unless corresponding fuel reduction activities occur. Recent wildfires have burned as large stand-replacement fires. Continued fire exclusion will move these communities even further toward a long-interval Lethal Fire Regime which will decrease vegetation diversity and reduce values for wildlife habitat, watershed protection, and esthetics.

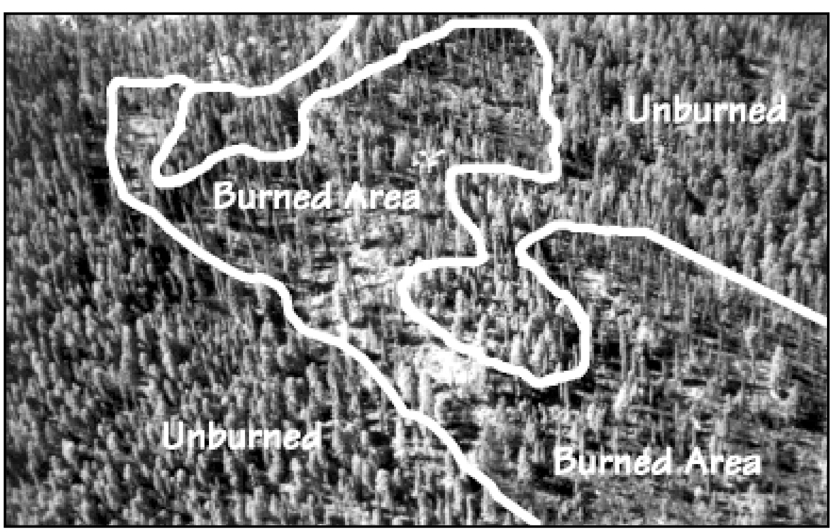


Figure 2-24. A typical pattern produced by a fire in the Mixed Fire Regime. Burned areas can be relatively small with patches of live trees. This mosaic—areas with lots of edge and many small patches is valuable habitat for many wildlife species, especially birds.

The Lethal Fire Regime

"Although some might argue that wildfires can be suppressed indefinitely with modern fire-fighting technology, a dispassionate view of the fire record in these forests shows that we are only postponing the inevitable… This situation is like holding water behind a leaky dam. We can either draw the water down gradually, or we can wait for the dam to break."

—Monnig and Byler, Forest Ecologists, 1992

Summary

Stand-replacing fires killed most if not all the trees where they occurred, although the size and intensity of the fire varied with topography, fuels, and burning conditions. Some fires consumed thousands of acres in a uniform way, others created a complicated mosaic that consisted of stand replacing burning mixed with patches of unburned or lightly burned timber. Stand replacement intervals are generally long—from 70 to 500 years—and probably varied with climatic cycles.

The stands created within this regime occur on steep, mid to high elevation slopes and were composed of grand fir, Douglas-fir, lodgepole pine, western redcedar, subalpine fir, and spruce. They were dense and typically contained substantial amounts of downed woody material and ladder fuels. The size of fires varied. Large fires occurred on more gentle slopes and plateaus while smaller fires burned in rugged mountain terrain where slopes and aspects created a variety of vegetative conditions. Where fires occurred relatively frequently, they created numerous open areas dominated by seral shrub species which provided forage for wildlife. Examples of the Lethal Fire Regime can be seen at Dog Lake, Boulder, the South Fork of the Jocko, and mid way up Revais Creek.

Changes since 1900.

Because of the low frequencies of fire within this regime, this zone has been altered less by fire exclusion policies than other fire regimes. However, our policy of keeping fires at bay has allowed stands to become denser and more susceptible to insect and disease epidemics and unusually large stand-replacement fires.

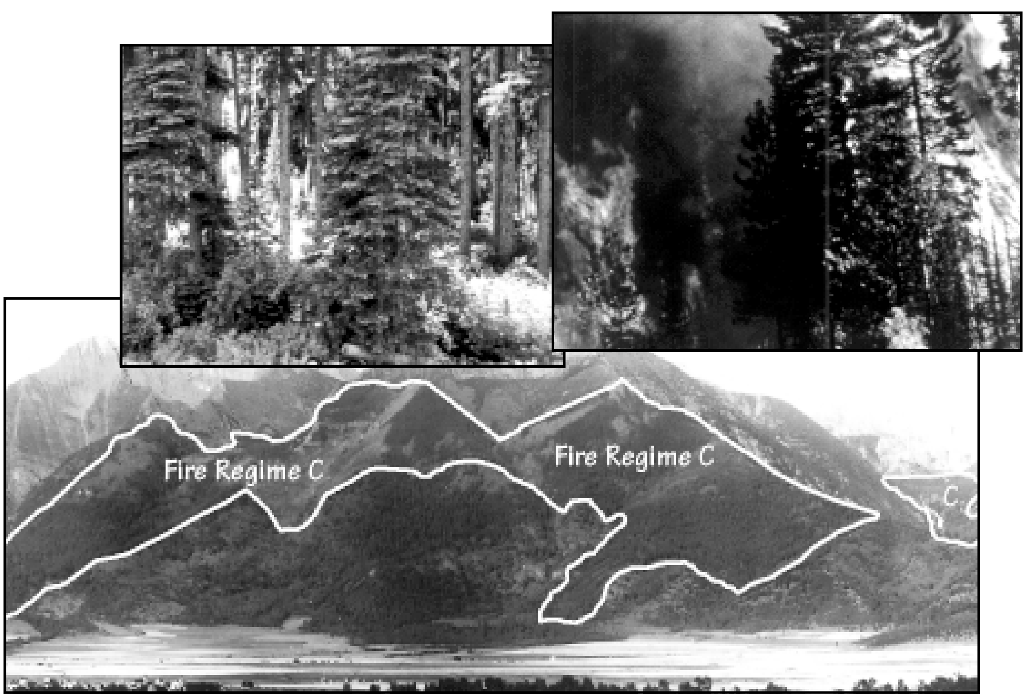


Figure 2-25. The large photo shows where the Lethal Fire Regime (Fire Regime C) occurred within the Missions landscape. The inset (top left) shows the ladder fuels that give rise to the all-consuming fires that characterize this zone. The right inset shows a stand-replacing blaze.

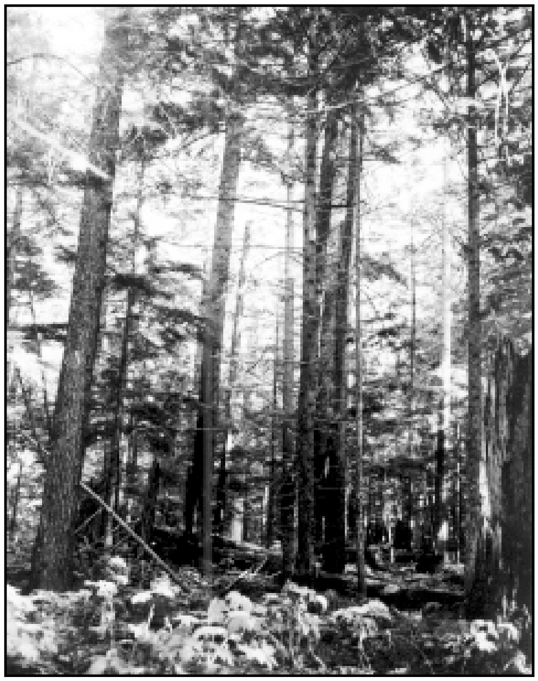


Figure 2-26. Fire return intervals ranged from about 70 years in lower-elevation lodgepole pine forests to 300-500 years in upper elevation subalpine types.

A Closer Look at the Lethal Regime

The Vegetation

At lower to mid elevations this regime was characterized by grand fir/western redcedar and Douglas-fir/larch types. At upper elevations subalpine fir, spruce, and whitebark pine types dominated.

The warm, moist grand fir and western redcedar habitat types occurred in valley bottoms, riparian areas, benches, and protected exposures (many tree species can occupy these sites, but grand fir and western redcedar are commonly the climax species). Elsewhere at these elevations, western larch, Engelmann spruce, lodgepole pine, and Douglas-fir were a major component of seral stands. Subalpine fir, lodgepole pine, and timberline habitat types occurred at mid- to upper elevations. Undergrowth is characterized by a rich variety of moisture-loving herbs and shrubs.

Though fires killed trees over large areas (from 25 to 500 acres in fir types and from 100 to 10,000 acres in lodgepole stands), relatively small, partially burned or unburned areas were produced by rugged mountainous topography that contained contrasting site types, microclimates, and vegetation. Patches of surviving trees were generally limited to moist, protected areas, or to places where fuels were lighter and more discontinuous.

The Fires

Fire return intervals ranged from about 70 years in lower-elevation lodgepole pine forests to 400 years in upper elevation subalpine types. The range is broad because the fires themselves depended on a combination of chance factors such as drought, lightning, and wind. Generally over 90% of the trees in a stand were killed.

Figure 2-27. Fire return intervals ranged from about 70 years in lower-elevation lodgepole pine forests to 400 years in upper elevation subalpine types.

Fuels, stand structure, species composition, and forest health play a critical role in the behavior of fire in this regime. Predominant climax tree species, extensive ladder fuels, dense canopies, and high levels of downed/dead fuels (from stand age, insect epidemics, root rots, blow-down, or previous fires) is required to allow a fire to sustain itself and spread with torching or to change into a running crown fire.

Forest fuels are typically greater than 25 tons/acre and result from accumulated deadfall and natural thinning. Soils and fuels are moist or wet much of the year. The typically high humidity of these moist sites usually mitigates the fire hazard under normal weather conditions.

A combination of deep duff and large amounts of dead, rotten fuel can result in severe surface fires during unusually dry moisture conditions. Where dense understories exist, fires easily spread to the tree crowns and destroy the stand.

The Changes

Because of the low frequency of fire, this regime probably shows less influence by fire exclusion policies. Nevertheless, fire history studies suggest that fire suppression has allowed large areas to develop into denser stands with higher susceptibility to insect and disease epidemics and even larger stand-replacement fires. At the same time, seral plants are being replaced by thickets of shade-tolerant species.

Figure 2-28. Fuel loadings in this fire regime can be dramatic. Fires that burn through these materials during dry seasons can damage soils. Regeneration suffers as a result.

The Timberline Regime

Summary

This fire regime is similar in nature to the Mixed Fire Regime found at mid- to low elevations except that it is found at the highest elevations on the Reservation, in whitebark pine habitat types (the regime also occurs slightly lower in some lodgepole types). Before European settlement, it experienced both nonlethal underburns and large stand-replacement fires. It generally occurs where terrain is rocky and rugged and where dry south and west-facing slopes are bordered by cool and moist north slopes, so fires generally had a patchy pattern. Fire frequencies varied from 30 to 500 years.

Mountain pine beetle epidemics periodically killed older whitebark pine trees, and those dead trees and ladder fuels from young subalpine fir and Engelmann spruce trees increased the number and size of fires in the regime. Examples can be found on Moss Peak and up Agency Creek.

The loss of whitebark pine is particularly unfortunate here on the Reservation because at one time whitebark pine nuts were used extensively by the Tribes. The nuts were also important to wildlife. They were a primary food for over forty species, including grizzly bears.

How the Timberline Regime has changed since 1900.

Fire exclusion policies have been especially effective in this regime due to the terrain. These policies and white pine blister rust, an introduced disease that kills cone-bearing limbs and young trees, have caused whitebark pine to decline. Engelmann spruce and subalpine fir—both less fire resistant—have replaced it. The loss of whitebark pine is particularly unfortunate because whitebark pine nuts were used extensively by Tribal people and wildlife.

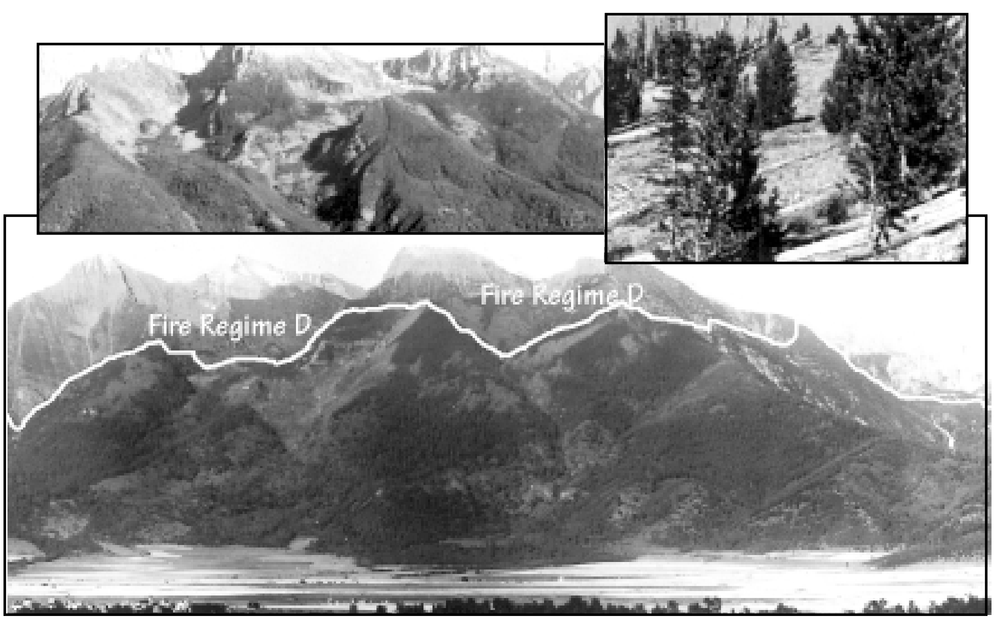


Figure 2-29. The large photo shows where the Timberline Fire Regime (Fire Regime D) occurred within the Missions Landscape. The two insets show, from left to right, the upper elevations of the Mission Range, which is typical whitebark pine habitat, and a whitebark pine tree.

Figure 2-30. A typical whitebark pine stand. Both stand-replacing and nonlethal fires shaped this regime. Fires have largely been removed from this ecosystem.

A Closer Look at the Timberline Regime

The Vegetation

This fire regime consists of high-elevation forests near and at treeline. Subalpine fir or mountain hemlock are the indicated climax in all of the upper subalpine habitat types. Whitebark pine and Engelmann spruce are long-lived seral species. Fire is secondary to climate and soil as an influence on forest development on these sites. Fire, however, has been important in perpetuating an abundance of whitebark pine.

Rugged terrain, including extensive rock outcrops and cool-moist north slopes hampered the spread of fires and usually resulted in a variable burn pattern. Fuels created by beetle kills and successional ladder fuels contributed to patchy torching or stand-replacement burning. Underburning in whitebark pine types had a thinning effect that removed much of the competing fir, while more intense fires created open areas favorable to the establishment of whitebark pine.

Figure 3-31. Clark's nutcrackers are one of many species that have suffered as a consequence of fire suppression in this regime. They, like grizzly bears and some 40 other species, fed heavily on whitebark pine nuts when they were available.

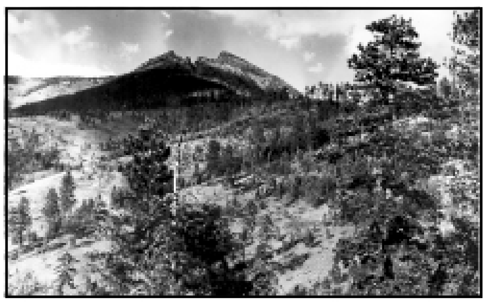
The Fires

Fires in this type rarely occur from individual ignitions in the regime itself, but rather get their start from fires at lower elevations that burn up the slope. Fire return intervals ranged from 30 to 500 years. Fire behavior ranged from nonlethal underburning to large, patchy, stand-replacing blazes.

These sites are characterized by relatively sparse fine fuels and moderate to heavy loadings of widely scattered, large-diameter fuels. Average downed woody loadings of about 18 to 20 tons per acre are common. The downed and dead woody fuel loadings often take the form of scattered, large-diameter downfall resulting from wind and snow breakage, windthrow, and mortality caused by insects or disease.

The Changes

For a variety of reasons, fire exclusion policies have had a major affect on this regime. On many upper subalpine sites, whitebark pine is being replaced by more shade-tolerant species, which ecologists attribute to fire suppression coupled with mortality caused by mountain pine beetle and white pine blister rust. Evidence suggests that unless active management is carried out on a landscape scale, whitebark pine, a species of tremendous ecological significance, will continue to decline and will disappear from some areas.



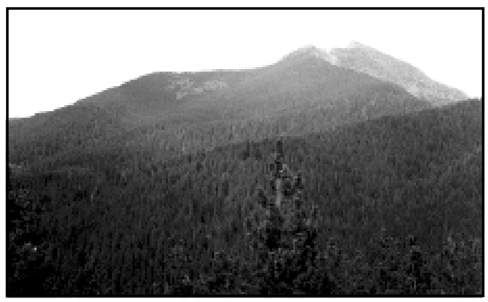


Figure 2-32. These two photos show the same high ridge, the first photo taken in the early part of the century, the second in 1994. Fire exclusion has brought about great changes to this regime.

Fire Suppression Policies in this Century

Around 1910, a national wildfire policy was instituted that required all forest fires to be extinguished as soon as possible. This policy continues with some modification. Under certain conditions, some natural fires are allowed to burn in isolated parts of the forest, such as in the Mission Mountains Tribal Wilderness Area.

But elsewhere, where fires have been promptly extinguished, fuels from dead and dying trees in undisturbed stands have accumulated and are now at the upper end or in excess of what they would be under natural fire conditions.

Limbs and tops from selectively harvested trees, or slash, were historically sawn into small pieces and left to decay on the ground, a process called lopping and scattering. Wildfires which started in these logged areas were aggressively extinguished because of the explosive risks which resulted from unnaturally high fuel loadings.

The role of fire as a management tool has been limited to slash disposal by broadcast burning of clearcuts and seed tree units and understory burns designed to improve wildlife habitat.

Existing Policy

Most Flathead Indian Reservation forested land is protected under a full fire-suppression policy, except for prescribed natural fires managed under the *Mission Mountain Tribal Wilderness Fire Plan*. Fire management, fire suppression, and prescribed fire activities are conducted under the direction of *Flathead Agency Fire, Fuels and Prevention Plans*; *Mission Mountains Tribal Wilderness Fire Plan; Department Manual, 910 DM1; 53 BIAM*, *Supplement 8; and Prescribed Fire Systems Handbook*.

Federal policy requires an aggressive fire suppression program using the least expenditure of funds, based on state-of-the-art management decisions, and employing suppression methods least damaging to resources and the environment. Suppression activities are also required to employ a high level of cooperation between Federal, Tribal, State, and local fire suppression organizations.

Figure 2-33. The High Elevation-Roadless Fire Management Zone is characterized by climax or late seral timber stands. The potential exists for destructive fires due to the combination of topography, fuels, and high resistance to control.

Tribal fire management staff is responsible for fire planning, training, aviation, fire prevention, fuels management, rehabilitation, wilderness fire management, and initial attack and large fire suppression and logistics.

Fire Occurrence and Cause

Flathead Agency has fire protection responsibility for Tribal and allotted forested lands.

The agency averages 40 fires per year that burn an average 310 acres. We control most fires at less than 10 acres in size, although fires greater than 200 acres are common, and large fires—5,000 to 10,000 acres—have occurred in the recent past.

Lightning is the primary cause of wildfires. Between 1980 and 1992 lightning started an average of 82% of all fires.

Figure 2-34. Lightning is the primary cause of wildfires. Between 1980 and 1992 lightning started 82% of all fires. Most of lightning strikes occur in July and August.

Fire Management Zones

The Flathead Agency forested area is presently divided into two fire management zones based on vegetative, resource use, topographic, and fire behavior criteria.

High Elevation-Roadless Fire Management Zone

The high elevation-roadless zone is an area of recreational and cultural uses. These areas have been set aside primarily for those uses. The zone contains wilderness, Tribal primitive, and inaccessible areas that are mostly unroaded. Prescribed natural fires are allowed within the Mission Mountains Tribal Wilderness. All other areas outside of the wilderness are managed under a full suppression policy.

The zone is characterized by steep, high elevation timber types interspersed with brush-fields, avalanche chutes, and rock. Most timbered stands are in climax or late seral stages. Common forest types are subalpine fir, lodgepole pine, Englemann spruce, and upper timberline whitebark pine types under Lethal to Mixed Fire Regimes. The potential exists for destructive fires due to the combination of topography, fuels, and high resistance to control. The area presents very difficult access problems for fire suppression crews.

The fire management objective for this zone is to contain 90% of wildfires at 10 acres or less, except for prescribed natural fires in the Tribal wilderness.

Commercial timberland Fire Management Zone

The lower elevation timberland zone is an area of commercial forest that is mostly roaded, except for portions of the Mission Mountains Buffer Zone, Ninemile Divide, Big Draw, Jocko River, and Flathead River Corridor areas. Forested wildland-residential intermix lands are also found in this zone. The policy is one of full suppression.

Common forest types are ponderosa pine, Douglas-fir, and grand fir and most of the zone falls within the Nonlethal, Mixed, and Lethal Fire Regimes.

The fire management objective for this zone is to contain 90% of wildfires at 5 acres or less within 1/2 mile of homesites and 90% of wildfires at 62 acres or less during periods of critical fire weather. Prescribed fire activities are utilized to meet fuels and wildlife management goals and objectives.

Figure 2-35. Fuels management in Ferry Basin.

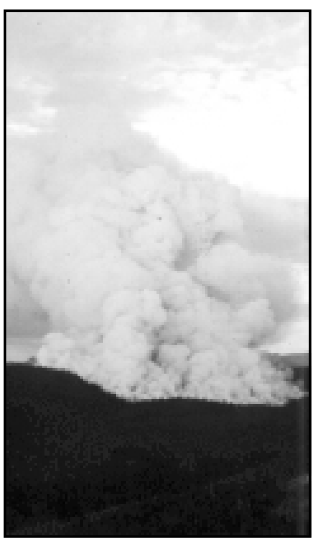


Figure 2-36. Broadcast burning a clearcut. The Tribes conduct broadcast and understory burning, vegetative management, and pile burning to reduce hazards, improve wildlife habitat, prepare sites for replanting, and to control insects and diseases.

Fuels Management

The Flathead Tribal Fire Management organization supports an active fuels management and prescribed fire program. Prescribed fire and fuels management activities include: prescription writing; fuels and fire effects monitoring; implementation of broadcast, understory, ecosystem maintenance, wildlife habitat enhancement, homesite hazard reduction, and dozer pile burning; management of the prescribed natural fire program in the Mission Mountains Tribal Wilderness; fuel inventory and wildland-residential intermix data collection and analysis; and, fuels evaluations and IDT participation in all timber sale activities.

The primary goal of the Fuels Management program is to ensure that land management objectives of forest protection and sound silviculture are accomplished. The activities involved in meeting these land management objectives must ensure minimal environmental impacts on all uses.

Prescribed Fire

Prescribed fire is used extensively in a wide variety of vegetation types and in all fire regimes. Broadcast, understory, vegetative management, and pile burning are conducted to meet hazard reduction, wildlife habitat improvement, site preparation, ecosystem maintenance, insect/disease control, and various other treatment objectives. The purpose of prescribed fire is to apply fire treatments that achieve predetermined effects to meet objectives, especially in ecosystems that are partially or totally fire dependent.

Prescribed fire treatment acres have steadily increased since the early 1980s. Approximately 900 total acres were burned under all prescribed treatments in 1981. By 1989 the acreage burned had increased to 2,500 acres. Treatments from 1990 to the present have averaged from 2,000 to 2,100 acres per year. This upward trend in prescribed fire treatments is expected to continue.

All prescribed fire projects are conducted under approved burn prescriptions to ensure that the burn is executed safely, is within prescription parameters to meet specified objectives, and is environmentally sound. All projects are routinely monitored to document and evaluate fire behavior and fire effects in order to validate or refine management objectives and to guide decisions on possible alternative treatments.

Prescribed Natural Fire

The Mission Mountains Tribal Wilderness is presently managed under a prescribed natural fire (PNF) program. The overall goal of the *Mission Mountains Tribal Wilderness Fire Plan* is to restore fire to its historic role. The reintroduction of fire is accomplished through prescribed natural and management ignited fires.

The wilderness is characterized by Mixed and Lethal Fire Regimes. Terrain features are sharp and well defined. About 95 % of fires are lightning caused. Fuels inventory data and historical photos indicate that large stand-replacement wildfires occurred in the wilderness on a regular basis prior to the start of successful fire suppression activities in the 1930s. Additional fire history data are needed for proper management of this area.

Several large wildfires in 1910 and the late 1920s are estimated to have been 3,000 to 15,000 acres in size. Steep topography, heavy downed fuels, and poor forest health conditions indicate that many areas within the wilderness are at high risk of large, catastrophic wildfires.

Three prescribed natural fires have been managed within the wilderness since 1986. The largest was the 1990 St. Marys Peak fire that consumed 12 acres. Fire occurrence within the wilderness only averaged about 3 fires per year between 1981 and 1992, and the average size was less than 3 acres. Under existing conditions, the goal of restoring fire processes to the Tribal wilderness is not being met.

Steep topography, heavy downed fuels, and poor forest health conditions indicate that many areas within the wilderness are at high risk of large, catastrophic wildfire.

Wildland-Residential Intermix

Intermix lands are Indian lands that have residential homesites or developments within or adjacent to forested areas (for maps and detailed descriptions, see the *Flathead Agency Urban Interface Hazard Analysis*, 1992). These forested areas are generally at lower elevations in the Nonlethal and Mixed Fire Regimes.

Figure 2-37. Many homes adjacent to or within forested areas are becoming more susceptible to fire as the risk of wildfires in the Nonlethal Fire Regime increases.

"People who live in the woods or adjacent to a forest can minimize the risk from wildfire by manipulating fuels (both live and dead). The challenge for managers comes in education and in motivating people to take some action to reduce the hazards."
—Tony Harwood, Fire Specialist, 1995

Annual fire occurrence within the zone averages seven fires per year. Fire size is usually less than ten acres due to rapid suppression responses from agency and volunteer fire departments. Several outbuildings and developments have been lost to wildfire in the recent past and numerous residences have been threatened in the past few years.

Most intermix areas (approximately 75%) are at moderate to high risk of catastrophic wildfire due to fire exclusion practices and overall problems that include a lack of defensible space, inadequate transportation systems, a lack of proper homeowner fuels management, and the location of homesites on moderate to steep slopes.

Existing homesites are located in dry, low-elevation forests where fire exclusion over the past several decades has changed the overall vegetation composition and structure. The development of a dense understory has resulted in an increase in vertical ladder fuels which allow ground fires to move to the crowns of larger overstory trees, and increase the risk of severe, stand-replacing wildfires.

Residential development in high fire-risk areas continues to occur in remote, previously uninhabited forested areas and is expected to increase in the future. The risk to life, property, firefighter safety, and economic welfare from wildfires in these areas is clearly much higher today than ever before. In response to increasing wildland-residential intermix problems, the fire management department utilizes public education, homeowner awareness, hazard analysis, and fuel hazard reduction projects to mitigate risks.

A Summary of the Changes in the Forest

To summarize, many important changes have occurred to forest lands on the reservation since the late 1800s.

Major Changes

1. **Fire exclusion has resulted in increases of down woody and ladder fuels. Stands are more dense and have shifted to late seral species.**

2. **Fire regimes have changed so that more severe and less frequent events will be creating fewer and larger patches on the landscape.**

3. **Extensive timber harvest and inflexible fire exclusion policies have altered forest structures and patterns at both the stand and landscape level. Most of the changes are inconsistent with the "pre-contact" era.**

Changes resulting from fire exclusion are more pronounced in the Nonlethal and Mixed Fire Regimes than the Lethal Fire Regime.

What Researchers are Finding

*Forest Ecologists' Views on the Role of Fire Management in Fire-Adapted Ecosystems**

…[The] scenario has been reported in the literature since the 1940s: open ponderosa pine, larch, and Douglas-fir forests at lower elevations burned naturally at rather frequent intervals, on the order of 10 to 25 years, maintaining rather open, fuel-free stands with few fir trees. The larch and pine overstory was harvested extensively, fire was controlled, and the composition of the stands shifted towards an unnaturally dense understory of Douglas-fir and grand fir in the absence of fire. The spruce budworm for the last ten years has been enjoying a steady diet of Douglas-fir and grand fir, which has led to tree mortality, fuel build up, and high-intensity wildfires.

The solution to this problem seems straightforward, but it has some huge barriers. The solution should start with harvesting what fir is possible without causing environmental impacts and retaining larch and ponderosa pine in the overstory for future regeneration purposes. Prescribed fire on a fairly large scale should be coupled with silvicultural methods whenever possible to enhance natural or planted regeneration of larch and pine. Where large quantities of standing dead trees are present, salvage logging should be encouraged to remove unnatural accumulations of fuels and obtain wood products. In areas where large quantities of downed dead woody material cannot be removed mechanically, two or three prescribed fires at high fuel-moisture levels might be needed to restore desired conditions without adverse impacts. This strategy would reduce the amount of fir in the stands over time and substantially reduce the threat of future insect infestations and large-scale wildfires. Over the long term, many of these forests could have silvicultural partial-cutting treatments to favor retention of an open overstory of pine and larch along with periodic underburning.

Managing for healthy forests… will depend on how well we can overcome internal and external barriers to burning on a scale large enough to make a real difference. The question of scale is a critical one… Potential problems are numerous when we contemplate an annual change in prescribed burning: air quality, sedimentation [streams], wildlife cover, visual quality, funding, and risk of fire escapes to name a few.

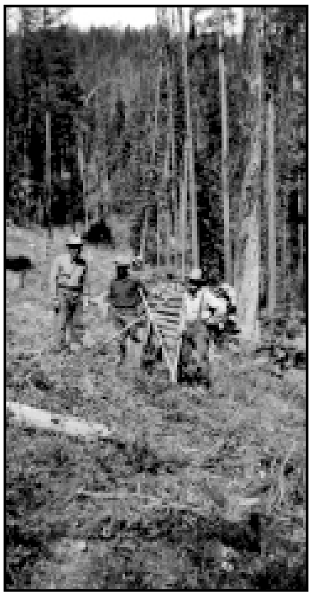
But if we embark on a major paradigm shift toward ecosystem management, then are we not going to have to make a shift in the way that we value such individual outputs as smoke particulates, sediment load, percentage of wildlife cover, and visual quality objectives? Placing the priority on valuing the health of entire ecosystems will require increased understanding and tolerance on the part of natural resource specialists and managers, as well as on the part of the general public, politicians, and regulatory agencies.

If we are not prepared to make the necessary changes to manage successfully for healthy and sustainable ecosystems, then the consequences of maintaining the status quo will be the aggravated increase of severe forest mortality resulting from insect and disease epidemics and high-intensity wildfires. We have taken drastic steps in attempting to exclude fire from fire-dependent ecosystems in the past. Now bold steps must be taken to effectively manage ecosystems with all processes in place, including prescribed fire and other treatments to the landscape in large enough and correct enough doses to make a difference.

* excerpted from *Forest Health in the Blue Mountains: A Management Strategy for Fire-adapted Ecosystems* by R. W. Mutch, S. F. Arno, J. K. Brown, C. E. Carlson, R. D. Ottmar and J. L. Peterson (1993).

Vegetation Management this Century

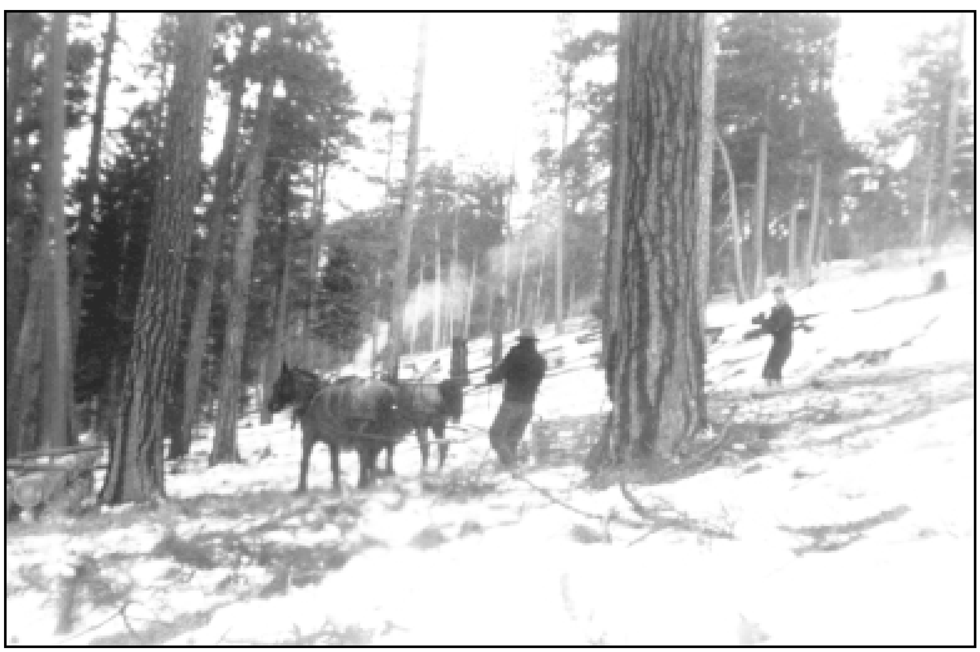
By about 1860, much of Indian burning had stopped and by 1880 logging had started on the Reservation. In the first two decades of cutting, most of the timber went for the construction of the St. Ignatius Mission complex, the Jocko Agency, the Northern Pacific Railway, and Indian farms. In the early 1900s, non-Indian settlement, the timber demands of World War I, and changes in national Indian policy contributed to the onset of large-scale commercial logging operations.[1]



The Basic Philosophy

An underlying philosophy of forest management for much of this century was to apply the basics of forest succession to produce high volumes of timber. This was accomplished by managing against stagnated young trees and by harvesting trees over 120 years old. The theory was, the longer an area stayed in the grass and brush stage after being logged the longer it took for that particular stand to reach prime timber production age. So foresters attempted to speed the process along. Where they logged selectively, they retained overstory trees and they left behind most of the young trees. When they clearcut, the goal was to achieve full stocking within 5 years. Two Tribal greenhouses produced the seedlings for replanting all clearcuts.

Similarly, forest managers have historically tried to harvest stands of timber before full-grown trees died from insects, disease, fires, or old-age, or before their growth rate slowed significantly.

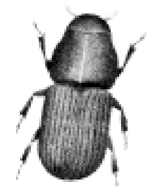


Figures 2-38 a, b, and c. For much of this century, logging and other forest-related commerce has been a major factor in the Tribal economy. It has supplied both jobs and revenue. Most of the membership has benefited either directly or indirectly.

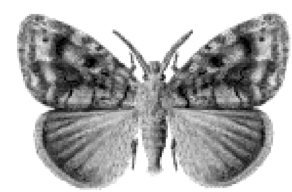
1. For more details on the history of forestry on the Reservation, see Timber, Tribes, and Trust: A History of BIA Forest Management on the Flathead Indian Reservation (1855-1975). Historical Research Associates, Missoula, MT.

Past Harvest Practices

A number of silvicultural regeneration cutting prescriptions were used before 1932 including group selection, individual tree selection, patch, clearcuts, and shelterwood cuts. Early cuttings were heavy; in fact, according to Historical Research Associates, "previous to 1932 every tree that would make a single sawlog was cut for its merchantable content…" Beginning in 1932, all live timber removed under contract was selectively marked for harvest by forest officers based on the crown classes and vigor of individual trees. It was the practice and intention then, to selectively harvest and deplete all “virgin timber” over three entry periods over about sixty years. Harvest specifically targeted old ponderosa pines and other big seral trees.



Mountain Pine Beetle



Tussock Moth

Figures 2-39 a and b. Two insects that affect tree species on the Reservation are the mountain pine beetle and the tussock moth.

Clearcutting to Fight Insects and Diseases

Selective logging of older trees was the rule until the early 1960s. It was about that time that logging roads were first constructed into high elevation spruce and fir stands in order to control a major outbreak of the spruce-bark beetle. Because the high probability of excessive blowdown of the timber, which was growing on shallow, moist soils, the selection method of harvest was not practical, and large areas in the South Fork of the Jocko and along the tops of the northern Missions near Yellow Bay, Boulder, and Hellroaring Creeks were clearcut. The goal was to reduce timber losses from beetle kill.

Nevertheless, selection prescriptions continued to be the silvicultural method of choice over most of the Reservation's forests through the 1960s and 1970s. It had become evident, however, that selective cutting was not controlling the spread of dwarf mistletoe or root rots. Seeds from the dwarf mistletoe plants growing on trees left behind fell on young trees, and the new stands became more heavily infected than the old. Thus, it was common practice in the late 1970s to use clearcutting or seed tree methods in mistletoe-infested stands. The idea was to return to a selection prescription once the new stands, free of mistletoe, had regenerated.

Another problem foresters faced was an increasing level of tree mortality due to the *Armillaria* root-rot fungus. This disease increased in portions of the forest after selective harvest. *Armillaria* feeds primarily on dead, woody material, but attacks and kills live trees where infection levels are high. The selection harvest methods increased the amount of dead matter in the soil by providing abundant stumps and roots from harvested trees so that infection levels, in many cases, were great enough to permit the fungi to begin to seek out and choke the roots of the live trees in the stand. Silvicultural policy in these areas has been to remove all trees—except ponderosa pine and western larch, species that are resistant. Foresters then tried to regenerate the site with these resistant species. Recently, *Fomes annosum*, another species of root rot, has been killing live ponderosa pine trees on dry sites at lower elevations.

Forest Pests

Parasites

Dwarf mistletoe is the Reservation's most serious timber-management problem. It affects most Douglas-fir stands but also infects western larch and lodgepole pine. Dwarf mistletoe can kill trees, but the greatest damage is from growth loss. Root-rots and needlecast fungi are also problem parasites.

Insects

The mountain pine beetle kills trees in lodgepole and ponderosa pine stands. Spruce-bark beetle can also cause extensive damage. Engraver, western pine and Douglas-fir beetles cause limited mortality. The western spruce budworm, Douglas-fir tussock moth, and pine butterfly defoliate trees and cause productivity losses.

Harvest Volumes

Industrial timber harvest began in earnest on Reservation forests around the turn of the century and has continued to the present. Average annual harvest of sawlogs has been 29.1 million board feet (MMBF) since 1911.

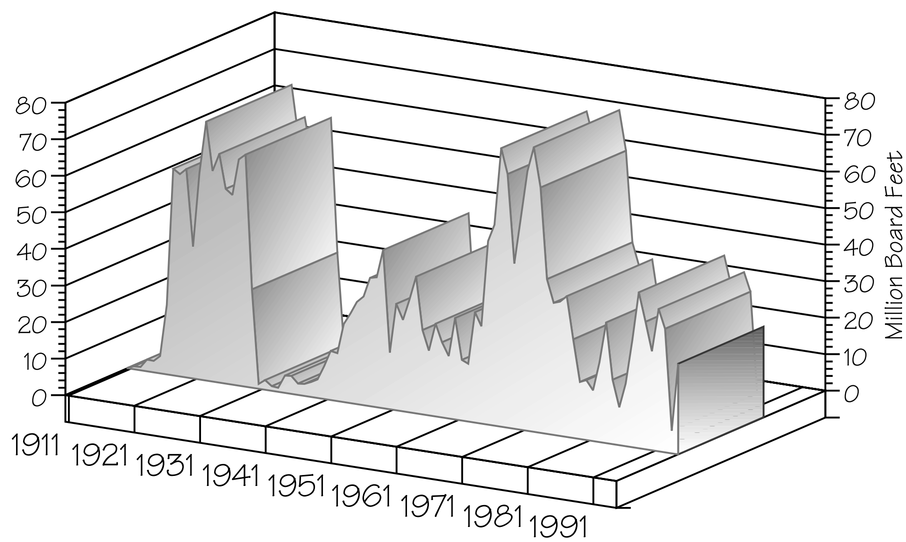


Figure 2-40. The volume of timber harvested over the past several decades has varied considerably. Variations are due primarily to market fluctuations.

The first Forest Management Plan prepared for the Reservation forest in 1945 estimated an annual harvest of "at least 40 million feet" could be sustained. The annual allowable cut (AAC) of sawlog products has been recalculated four times since then, based on growth and stocking information measured from as many as 489 of the 754 permanent forest installations (CFI). The calculations are illustrated in table 2-1. Despite a long history of logging on the Reservation, inventories of timber continue to increase as growth outpaces harvest.

Table 2-1. In this table, the 1945 actual harvest (AH) is an average annual harvest of all wood products for the years from 1911 to 1945. The 1968 AH is the average from 1945 to 1968; the 1972 AH is the average from 1968 to 1972; 1981 the average from 1972 to 1981; and 1989 the average from 1922 to 1989.

Era	Commercial Acres	Total Forest Stocking MMBF	Per Acre Stocking	Calculated AAC MMBF	Actual Harvest MMBF/Yr	Estim. Growth BF/AC/Yr
1945	379,800	1,658	4,367	40	**24.5**	105.3
1968	411,844	3,546	8,612	76	**32.8**	184.5
1972	338,215	1,887	5,580	56.4	**62.1**	167.1
1981	322,065	2,214	6,876	59.1	**43.1**	183.5
1989	296,425	2,157	7,279	68.6	**33.3**	230.8

Table 2-1 illustrates an upward trend in annual allowable cuts, except for a disputed calculation in 1968. Foresters attribute this increase to the regular increase in per-acre stocking, or the amount and size of trees on the average acre. Average stocking has increased by 67%, from 4,367 board feet per acre (BF/AC) in 1945 to 7,279 BF/AC in 1989.

Since wildfires have been effectively excluded, stocking has increased. The levels of disturbance caused by timber harvests have not equaled pre-contact levels of natural forest disturbances like fire. In other words, actual harvests have been less than what the forest is growing, thus forest stocking has increased.

The Timber Harvest Policy Since 1982

The 1982-1992 Forest Management Plan precedes the proposed action. It was based on the 1980 Continuous Forest Inventory Analysis, which estimated a net allowable cut of 54.1 million board feet of timber per year and required the use of uneven-aged management (selection harvest) wherever possible.

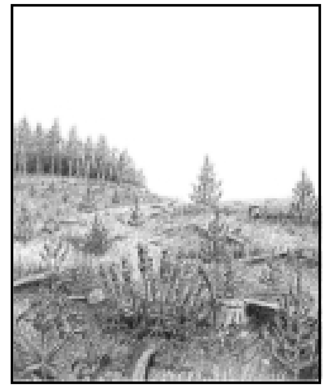
When the Tribal Council approved the plan, they elected to harvest 38.4 million board feet of sawlogs per year. This decision removed temporary even-aged treatment options or clearcuts, except on a case-by-case basis, because of their high visual impact. However, serious forest health issues continued to demand even-aged practices for feasible solutions. Over time the use of temporary even-aged treatments became routine.

The Tribal Council chose to optimize post and pole harvest opportunities for Tribal members by allowing the harvest of four hundred and fifty-two thousand posts annually. It set aside approximately fifteen thousand acres of lodgepole for continuous post and pole production.

Forest Trends

A detailed description of the current status of the forest and forest trends in terms of timber are described in detail in the *Flathead Reservation Draft Inventory Analysis Report* and the *1992 State of the Forest Report*.

Forest succession should be like a conveyor belt moving sites clockwise through seral clusters (as shown below). Effective fire suppression coupled with past harvest levels has



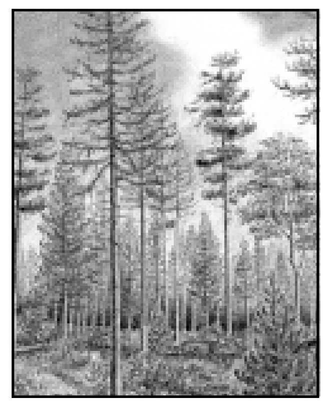
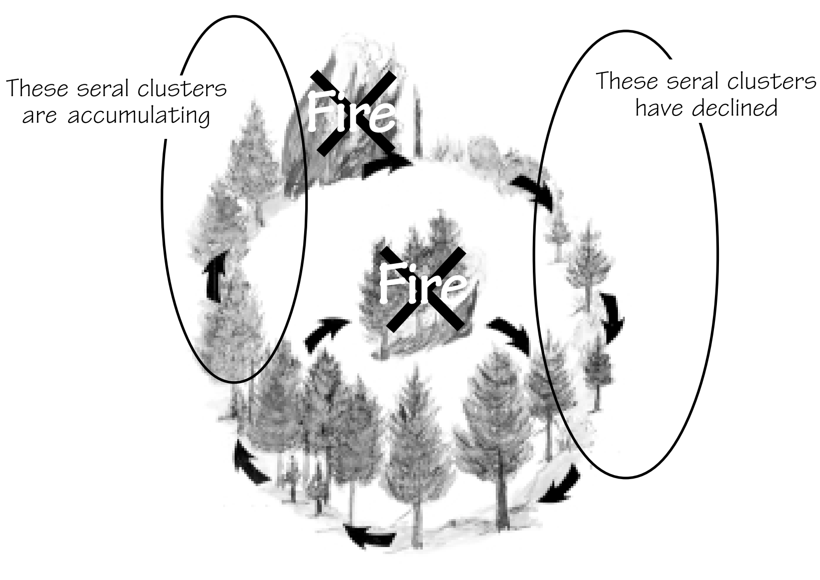


Figure 2-41 a, b, and C. Two types of silvicultural systems are shown above. At top is a clearcut, which involves the removal of all trees over an area of two acres or more. Below is a selection system in which a continuous uneven-aged forest is maintained or achieved by selecting a limited number of trees of various ages and sizes for harvest. Left, succession when fire is excluded yields an abundance of late seral clusters.



allowed the forest to build more acres of late succession seral clusters than would have occurred under natural fire conditions or a more aggressive harvest schedule.

The practice of harvesting older seral trees earlier in the century along with the protection of fire-susceptible climax species that would have otherwise gone up in smoke has resulted in a greater proportion of climax species, particularly Douglas-fir, than would have occurred in pre-contact times. In fact all data for the Nonlethal Fire Regime show a strong trend away from an open-ponderosa-pine-dominated forest towards a closed-Douglas-fir/true-fir-climax forest. Climax species are generally more susceptible to damage and mortality due to fire, dwarf mistletoe, and root rots. Today, forest pests affect more than half of the timber stands in the commercial forest.

"We talk about resource management as a way of sustaining the productivity of the land, but what if instead we talked about sustaining the generosity of the land? What if, instead of talking about managing an ecosystem, we spoke of cooperating with the ecosystem?"
—Herb Schroeder, USFS Scientist, 1994

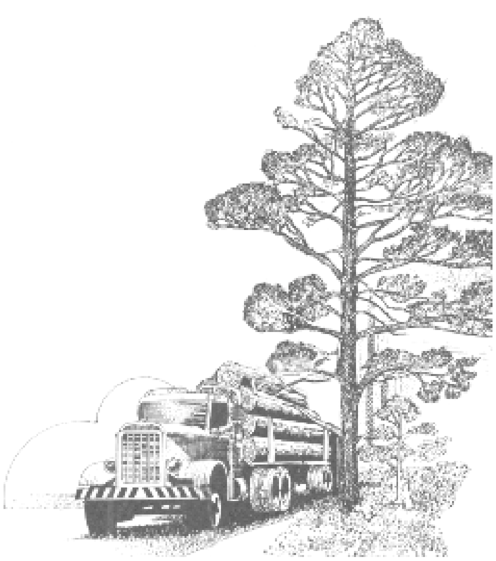
The Economic Value of Forestry

Timber harvest is now the second largest revenue generating activity on Indian lands, and the forest products industry is a major component of the Reservation economy. It supports about 192 person-years of Tribal member employment each year (table 2-2). Reservation forest products are crucial to the stability of local sawmills, as well as Tribal members who make a living in the industry. The volume cut from the Reservation is about three percent of the statewide harvest.

Table 2-2. Annual forestry and employment revenue.

Category	Employees (full and part-time)	Total Earnings
Tribal Forestry	55	$1,094,941
BIA Firefighters	43	$225,703
Other Firefighters	364	$619,123
Logging	81	$793,500
Milling	132	$810,395
Fuelwood	51	$72,000
Christmas Trees	331	$143,522
Cultural Foods		
Cone/Seed Collection	21	$14,945
Planting Contractors	20	$10,234
Thinning Contractors	25	$59,524
Total Personal Values	**1745**	**$3,843,887**
Mean Annual Stumpage Revenue		**$5,533,355**

Source: Beyer, Jim 1996



In recent years the Federal government has reduced timber harvest on surrounding national forest lands. They have done this in response to the cumulative effects of large-scale harvests on private lands and public pressure to preserve non-timber resources and values. As a result, off-Reservation logging companies have shown a greater interest in Tribal timber. The Tribes are responding to this increased demand while providing for multiple use of forest resources. Still, forest management on the Reservation has changed from the extensive logging of large tracts that dominated the past. It is now a complex, interdisciplinary process that incorporates a variety of harvest and protection strategies, and includes the establishment and protection of wildland areas, interdisciplinary team reviews, and sustained-yield management.

Other Forest Products

In addition to timber, Tribal members have also harvested firewood and other products from Reservation forests. They have been cutting Christmas trees—mostly Douglas-fir—for over 60 years. From 1977 to 1984, Tribal members sold approximately 45,300 bales per year, and from 1985 to 1989 they sold approximately 22,800 bales per year. (Figures stopped being kept in 1990.) Dwarf mistletoe has limited Christmas tree production in many areas.

Tribal members also cut firewood from the forests for personal and commercial use. From 1977 to 1989, members cut approximately 2,500 cords of wood a year.

Tribal members selectively harvest several thousand acres of lodgepole pine stands for posts, rails, grape stakes and other products. Regulated harvest occurs in assigned lodgepole blocks. This allows for timely follow-up of reforestation activities and insures that multiple-use values are addressed.

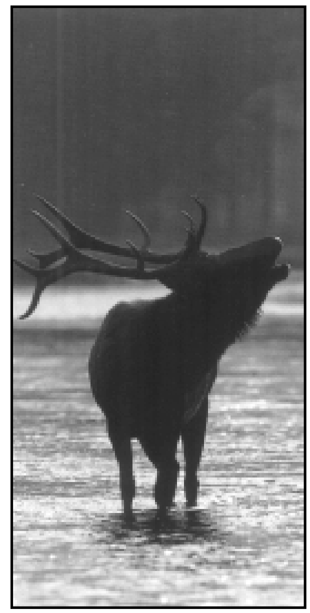


Figure 2-42. The Tribes derive many non-timber benefits from the forest—clean water, medicine plants, wildlife, and peace of mind to name a few.

Other Forest Uses and Values

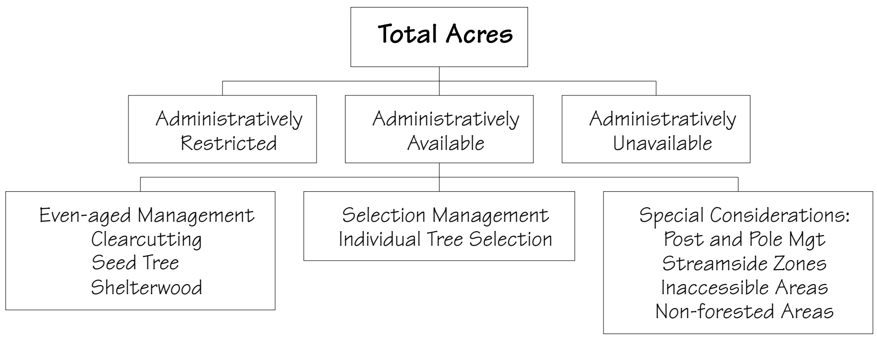
While about 50% of the total forest base is managed for timber, the Tribes also manage Reservation forests for fish, wildlife, recreation, range, cultural, and scenic resources, and watershed protection. And although timber revenues are important to the Tribal economy, so are other values derived from forest vegetation. The protection of cultural sites, air and watershed values, and fish and wildlife is one of the Tribes' highest priorities.

Commodity Management Systems

The forested acres of the Reservation are classified according to the following simple scheme:

The categories of ***restricted***, ***available***, and ***unavailable*** refer to the availability of a particular parcel of land for general land management activities.

The purpose of management, and the use of specific management systems, is to accomplish the long term goals and shorter-term objectives of the Tribes.



Forest classification according to availability

1. Available Acres

May receive the full range of harvest treatments that are appropriate for the sites involved.

2. Restricted Acres

Include areas where the Tribes have set specific management objectives, and the types of culturing and harvest are limited to accomplish these objectives.

3. Unavailable Areas

Include the river corridor, primitive areas, cultural reserves, wilderness or other areas where certain forest management activities are not permitted.

Figure 2-43. All the alternatives in this EIS would employ many of the same management and silvicultural systems that have been used in the past. The classification of the forest has been somewhat simplified, however.

Management Systems

Management relates to the business and organizational aspects forestry. The purpose of management, and the use of specific management systems is to accomplish the long term goals and shorter-term objectives of the Tribes. Thus management systems such as uneven-aged, even-aged, and temporary even-aged are fundamental building blocks of a forest-wide management strategy.

Silvicultural systems (such as clearcutting, seed tree, and shelterwood) are applied specifically to a parcel of ground such as a stand or "patch" of timber. Silviculture, as the science and art of managing forest vegetation to meet landowner objectives, provides an array of tools or treatments necessary to develop the desired structure of the future forest. In this document we discuss three management systems and four silvicultural systems.

Management and silvicultural systems

1. Uneven-aged

Selection (including group and individual tree)

2. Permanent Even-aged

Clearcutting, seed tree, and shelterwood

3. Temporary Even-aged

Clearcutting, seed tree, and shelterwood; reverting to selection 50 to 70 years hence

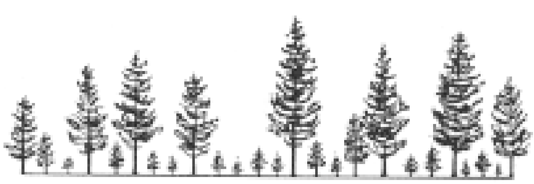
Treatments applied on the ground under permanent even-aged and temporary even-aged management systems will look identical for the duration of all the alternatives and beyond, because they use the same tools. Temporary even-aged treatments are applied to areas where uneven-aged practices would normally be desired, but are infeasible because of insects, diseases, and other problems. Thus, the goal of temporary even-aged management is to remedy immediate and urgent forest health problems through even-aged practices. Successive harvests, would be designed to move the stand toward structures that can be perpetuated with selection management systems. Because these two management systems each have a unique sequence of future treatments, they must be distinguished for forest planning purposes.

The goal of temporary even-aged management is to remedy immediate and urgent forest health problems through even-aged practices. Successive harvests, would be designed to move the stand toward structures that can be perpetuated with selection management systems.

The Tools

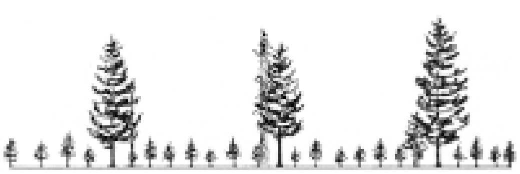
Selection

A continuous uneven-aged forest maintained or achieved by selecting a limited number of trees, of various ages and sizes for harvest. Trees are harvested over intervals of 15 to 40 years in small groups (group selection) or individually (individual tree selection).



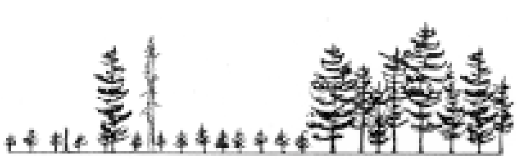
Shelterwood

Trees are removed in a series of harvests designed to establish a new, even-aged stand under the shelter of older trees. The shelter trees may provide seed for regeneration, and, once a new generation is growing, may be either harvested or left depending on the objective.



Seed tree

Selected trees are left standing to provide a natural source of seed for a new even-aged stand. Seed trees may be cut several years later or may be left to provide structural diversity on the site.



Clearcutting

The removal of all or almost all trees over an area of two acres or more, in a single harvest. A new, even-aged stand is planted or regenerates naturally. Clearcuts were traditionally shaped in square blocks, but under ecosystem management, cuts would mimic natural fire patterns and would leave some snags and some trees for green-tree retention.

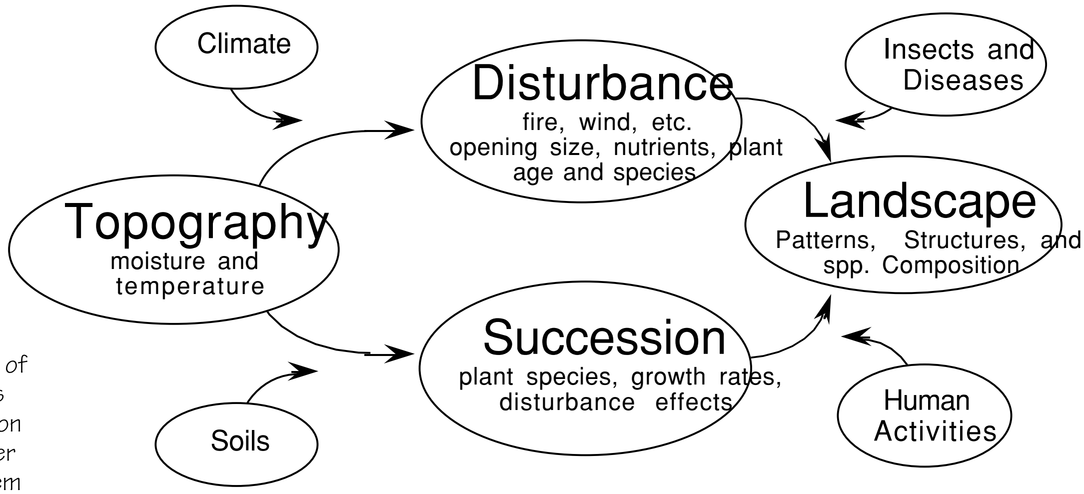


Figure 2-44. The pattern of forest vegetation and its structure and composition is determined by a number of factors. The ecosystem management alternatives in this EIS focus on the structures characterizing fire regimes, which are in large measure a product of both succession and fire behavior.

Traditional Systems and Ecosystem Management

Ecosystem management begins by viewing broad landscapes and defining a range of forest structures and processes that will perpetuate a healthy, resilient forest over the long run. Forest management is the catalyst and link that allows broad ecosystem issues to be resolved on the ground through the use of specific silvicultural systems.

Treatments such as thinnings, clearcutting, planting, individual tree selection, and prescribed fire manipulate individual stands of trees to create, maintain or adjust the form and structure of the forest for the benefit of long term stability, health, and productivity.

Using Management Tools to Imitate the Processes of Nature

As we have stated, even without the intervention of humans, forests change dramatically over time. Floods, winds, outbreaks of bark beetles, and other events radically changed the density, average size, and species composition of trees and other plants living on the landscape. Prior to fire control programs, the most consistently influential factor was wildfire.

The purpose of silvicultural treatments is twofold: to create and maintain varied conditions for the long-term health of the forest landscape and to achieve desired outputs such as improved wildlife habitat or forage or lumber production.

Today, for a variety of economic and social reasons, managers attempt to replace uncontrolled and sometimes catastrophic natural events with planned changes in vegetation through harvesting techniques and prescribed fire.

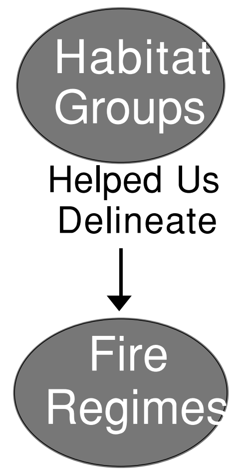
The exclusion of fire for the past 100 years, timber harvesting, and very high populations of many forest pests (much higher than would have occurred under natural fire conditions) has created what many consider to be an unnatural forest.

The Role of Ecological Classification

If a forest is left undisturbed by fire or logging, it will grow through a series of stages until, eventually, it arrives at a somewhat predictable mix of trees, shrubs, forbs, and grasses known as climax. These associations of plants can be classified and identified readily in the field using a system known as ***habitat typing***. A given habitat type represents the combined effects of soils, slope, aspect, temperature, moisture regimes, and elevation and suggests a number of useful things for the land manger, including growth rates and the species that are likely to be present. As such, the habitat type represents a kind of biotic potential, that is, the type of community that a particular piece of ground will support as it approaches a climax stage.

The mountain west, with its sharply defined topographic features, readily lends itself to the use of habitat typing. Since slope, aspect and elevation also affect fire behavior, it is easy to see that habitat types or groups of similar types correspond to fire regimes. In fact, fire regimes can be approximated from habitat type data. Figure 2-44 shows the relationship of topography, fire, and habitat type.

Thus, even though this document emphasizes the use of fire regimes and seral clusters, habitat typing and related successional pathway data continue to be used as fundamental tools in forest management on the Reservation. Table 2-3 shows the relationship between fire regimes, habitat groups, management systems, and silvicultural treatments.



Fire Regime	Habitat Groups	Mgt System	Treatments (prefered order)
Non-lethal	Ponderosa pine (A) Very dry Douglas-fir (A)	Unevn-aged	ITS
	Dry Douglas-fir (B)	Uneven-aged Temporary even-aged Permenant Even-aged	ITS SW, ST, CC SW, ST, CC
Mixed	Wet Douglas-fir (C) [1]	Uneven-aged Temporary even-aged	ITS, GS SW, ST, CC
		Permenant Even-aged	ST, CC, SW
Lethal	Wet grand fir (D)	Uneven-aged [2] Permenant Even-aged	GS, ITS SW, ST, CC
	Warm subalpine fir (E)	Permenant Even-aged	SW, ST, CC
	Cool subalpine fir (F)	Permanent even-aged	SW, ST, CC
Timberline	Cold subalpine fir (G)	Permenant Even-aged Uneven-aged	Salvage GS

1. Some low elevation, southerly sloped sites are classified as Nonlethal.
2. Some dry sites may be more appropriately treated within the Mixed Fire Regime.

Table 2-3. Management systems and preferred silvicultural treatments by fire regime. The abbreviations in this table are as follows: ITS—Individual Tree Selection, GS—Group Selection, SW—Shelterwood, ST—Seed Tree, and CC—Clearcut.

Wildlife: Pre-settlement Conditions

Wildlife has always been an immensely important part of the lives and traditions of the Salish and Kootenai Tribes. Historically the Tribes relied heavily on game and fur-bearing animals. The introduction of the horse facilitated the hunting of buffalo on the plains east of the Rocky Mountains. As the bison disappeared in the late 1800s, local wildlife populations became the most important sources of meat and raw materials. Pete Beaverhead once described how deer were hunted in the old days:

"They killed around a hundred deer. They didn't kill them all, and they turned the rest loose. The children who were old enough and also the women went along to drag the deer back to camp… It was really something to see…"
—Pete Beaverhead
1975

> When the Indians are going to hunt, they have a head leader called a situs. There will be many, many young men. And when the Indians move from their regular homes and get all their camps set up, they would have their horses all herded back. Everyone at camp was afoot. Then it will be agreed that a certain place was where they will hunt in the morning.
>
> The next morning the men go to this place. It might be a wide place in a draw. They would say, "This one particular draw or canyon is where we will hunt."… They killed around a hundred deer. They didn't kill them all, and they turned the rest loose. The children who were old enough and also the women went along to drag the deer back to camp… It was really something to see… Over towards the Deer Lodge country was where the deer is plentiful.
>
> The Indians did this type of hunting until there was enough meat supply to last them a long time. Then the Indians went back after their horses, which they herded back to their regular homes.
>
> My father was with this group of Indians when they went hunting. He was the one who told me this story.
>
> —Pete Beaverhead
> Pend d'Oreille Elder, 1975

Figure 2-45. The Thompson party reported elk were very rare and only killed one during the expedition.

There are both Native American oral and non-Indian written accounts of wildlife conditions in the western United States prior to European settlement. Oral accounts are documented in culture committee archives. Most of the written records are from early explorers, fur traders, and missionaries. The non-Indian people who travelled through the northwest region give varying accounts of the status of wildlife populations. Differences in the authors' understanding of game and their habitats make it exceedingly difficult to ascertain from these documents the preexisting conditions of wildlife populations and wildlife habitat before European-Americans arrived. The native oral accounts, however, make it clear that Indian people were acutely aware of the rise and fall of game populations. The Tribes used fire for a variety of reasons, chief among them increasing forage for their horses and big game. The role of natural fire and fires set by Indian people had a major affect on wildlife habitat.

The three Tribes made frequent trips eastward to hunt bison and other game on the Great Plains, especially after the introduction of the horse. Bison furnished the Tribes with large amounts of meat, hides for tepees and clothing, and bones to make weapons and tools. West of the divide, the Tribes hunted elk, deer, moose, bear, sheep, goats, and caribou. The latter species is nearly extirpated in Montana due to logging of old-growth forests and non-Indian settlements. The spread of white-tailed deer into the area may have also spread disease to caribou.

Written Historical Accounts

The earliest written records of game abundance come from the journals of the Lewis and Clark expedition (1804-1806). The explorers were astounded by the abundance of game on the prairies east of the Continental Divide. As the expedition reached the Bitterroot Valley, game was still in sufficient quantities to keep the party fed, however animals became scarce after they crossed over the Bitterroot Mountains around Lolo Pass, and the group was forced to subsist on stored supplies. They nearly starved to death. On their return trip through this area in June of the following year, game was still scarce, although they managed to kill a few deer.

It is not clear why there appeared to be very few game animals in the area. Koch states that game herds in Idaho and western Montana were relatively poor compared to the abundant herds on the Plains. Ross Cox, a member of the Peter Skene Ogden Expedition, made a trip in 1812 up the Clark Fork River to around present-day Thompson Falls. The expedition nearly starved also and did not see any game until farther upriver where they found bighorn sheep in huntable numbers. He also noted that the Flathead Indians were depending entirely on dried buffalo meat which they obtained from their annual hunt on the plains. David Thompson, also of the Northwest Company, explored the Clark Fork and Kootenai River drainages between 1808 and 1811. Thompson was able to procure only a few "antelope" and had to rely mostly on dried fish and moss bread, a survival food made by the local Indians from tree lichen. (Thompson's "antelope" were probably deer or bighorn sheep.) The Thompson party reported elk as being rare and only killed one during the expedition.

In contrast to this paucity of game comes the report of Alexander Ross, another fur trapper, on an expedition up the same Clark Fork River 12 years after David Thompson in 1823. The Ross expedition was very large and consisted of 55 men, 25 women, and 64 children. In the dead of winter, this party carried no supplies but instead subsisted entirely on the abundant game they found in the region, primarily elk, deer, and bighorn sheep.

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Other wildlife species have seen drastic range and population reductions since settlement. The most visible species were the larger carnivores such as the grizzly bear, which is now relegated to the Mission Mountains and possibly the Rattlesnake Wilderness Area, South Fork Primitive Area, and the Ninemile Divide. The grizzly once roamed the valley bottoms from the Jocko to Flathead Lake. Wolves were also more common and likely lived throughout the Reservation. It is believed that wolves may have also kept coyote populations lower than present conditions and may have at times controlled big game populations.

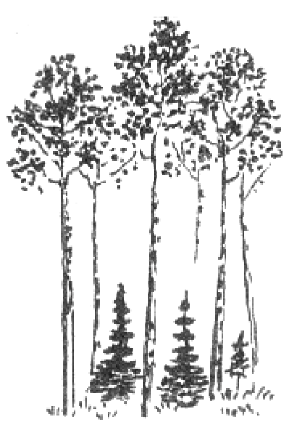
Figure 2-46. A ruffed grouse on her nest. Three species of mountain grouse inhabit the Reservation: blue, spruce and ruffed. Blue grouse use higher elevation open areas within coniferous forests. Spruce grouse prefer spruce forests and pine habitats, and ruffed grouse live in mixed or deciduous stands like the one shown below.

Conflicting Early Reports

The conflicting reports of early explorers makes it difficult to firmly state how much game was present when non-Indians first arrived. It may well be that Lewis and Clark suffered from a visibility bias when they compared the abundance of game of the more open Great Plains to that of the more densely forested mountain ecosystem. Many people of the period believed that the northwest part of Montana had the potential to support larger big game herds. Some authorities believe that relative to the abundance of the Great Plains, this area supported modest game populations. In other words, game was not necessarily scarce. Wildlife populations are naturally dynamic, always responding to changing conditions. These changing conditions result in periods of population stability as well as population peaks and depressions. Different observations by early explorers may reflect these conditions.

Wildlife Populations and Habitats Today

The Federal government opened large areas of the Reservation to non-Indian ownership in the early 1900s. This brought major changes in the quantity and quality of wildlife habitat. Non-Indian settlers converted forests to range and croplands, and fire suppression allowed grassland areas to become forested. Non-Indians introduced exotic species, primarily upland gamebirds, and some of these flourished. The changes resulted in the local eradication of some species and the decline of others.



Today, human activities continue to diminish wildlife habitats. Perhaps the most noticeable changes that have occurred are reductions in the ranges of larger carnivores such as the northern gray wolf and grizzly bear. Another significant change is loss of big game winter range due to high road densities, housing developments, unrestricted hunting, and competition with livestock. In addition, the habitats of other species have been altered by fire suppression, logging, grazing, various forms of development, and the introduction of exotic plant and animal species. Fire suppression alone has had major consequences. For example, at low elevations, open stands of old ponderosa pine, which provided important habitat for many wildlife species, have been converted to dense thickets of Douglas-fir. At higher elevations, fire exclusion policies have meant fewer natural openings, which also provide important habitat. Although there is still great ecological diversity on the Reservation, humans have altered many of the natural ecological processes that influence wildlife habitats. Arresting the degradation and managing wildlife for the long-term benefit of Tribal members is one of the Tribes' highest priorities.

Threatened and Endangered Species

The Federal Endangered Species Act of 1973 established two categories of protected species. An endangered species is defined as a species in danger of extinction throughout most or all of its range. A threatened species is one that is likely to become endangered in the near future. The Federal government lists the grizzly bear as threatened in Montana. On the Reservation, grizzlies occur primarily in the Mission Mountains and adjacent areas, although there have been occasional observations in the southern parts of the Reservation.

The Federal government lists the bald eagle as a threatened species in Montana. Fourteen breeding territories occur within the Reservation; most of these are along the Lower Flathead River. Migrant and overwintering bald eagles may number as high as 70 birds during peak periods.

The northern gray wolf is listed as endangered in Montana. It once occupied the Reservation, but was eliminated during the early days of settlement. Wolves occasionally pass through the Reservation, and they have denned near the south boundary. They may eventually repopulate some areas of the Reservation.

The peregrine falcon is listed as endangered in Montana. Although no verified breeding records exist for it on the Reservation, the species probably inhabited portions of the Mission Mountains and possibly the Flathead River. Peregrines are observed as occasional migrants during fall and spring, and have been seen during the summer as recently as 1990. In 1992 the Tribes began reintroduction efforts on the Reservation. Please see Appendix E for more specific information on threatened, endangered, and rare wildlife species.

"Arresting this degradation and managing wildlife for the long-term benefit of Tribal members is one of the Tribes' highest priorities."

—CSKT Comprehensive Resources Plan, 1995

Sensitive Species

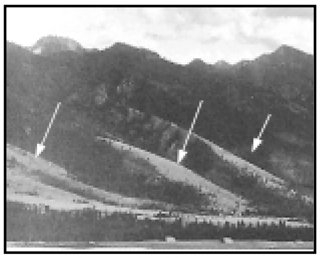
Sensitive species are those for which current viability is a concern, as evidenced by significant downward trends in their population status or habitat. All the species listed under the Federal Endangered Species Act are considered sensitive, as are river otters, wolverine, lynx, fishers, bobcat, a variety of bird species, tailed frogs and Van Dyke's salamanders. The following wildlife species are considered sensitive by the Montana Natural Heritage Program.

Figure 2-47. Lynx are proposed for listing by the U.S. Fish and Wildlife Service.

Coeur d'alene salamander	Yellow-billed cuckoo
Tailed frog	Flammulated owl
Common loon	Burrowing owl
American white pelican	Great gray owl
Black-crowned night-heron	Boreal owl
White-faced ibis	Black swift
Trumpeter swan	Black-backed woodpecker
Harlequin duck	Loggerhead shrike
Bald eagle	Baird's sparrow
Northern goshawk	Le conte's sparrow
Ferruginous hawk	Townsend's big-eared bat
Peregrine falcon	Northern bog lemming
Columbian sharp-tailed grouse	Gray wolf
Black-necked stilt	Grizzly bear
Franklin's gull	Fisher
Caspian tern	Wolverine
Common tern	Lynx
Forster's tern	Woodland caribou
Black tern	

Forest Habitats

There are approximately 358 wildlife species found on the reservation. Many have unique habitat requirements. The structural characteristics of timber vegetation play a major role in determining the kinds of habitats available. For example, ***landscape diversity***, a key measure of the ability of an area to support a diversity of wildlife species, is based upon forest habitat types and seral condition or structure and composition of the timber vegetation.



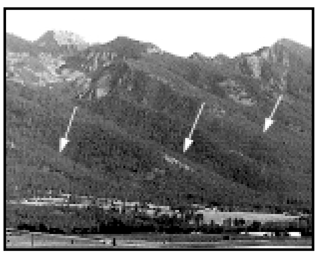


Figure 2-48 a and b. Another trend affecting wildlife is that trees are encroaching into openings that had been maintained by fires. Forest meadows and grasslands such as these in the Missions add a great deal to the diversity of our plant and animal communities—certain insects and birds and some large mammals are dependent on them. Without frequent fires, many of these areas are fast disappearing.

Measures of landscape diversity

1 Richness

Richness is defined by the number of habitat types and seral classes.

2 Evenness

Evenness indicates how evenly distributed the different habitat types and seral classes are. In other words, if all appear in equal proportions the even index is high. If one or two dominate, the index is low.

3 Diversity index

The diversity index is derived by combining the above two measures into a single number.

4 Potential or Theoretical maximum diversity

This is the *potential* the landscape has for overall habitat diversity.

The values of each of these factors for each landscape are presented in Appendix F.

The Jocko landscape has the highest diversity, potential diversity, habitat richness, and evenness of the six Reservation landscapes. This is due to its relatively large size, its highly variable topography, and past logging practices, which have created a broad range of seral classes. The latter is especially true in the Nonlethal Fire Regime. Although data was not available, diversity in the Missions landscape is probably similar to that of the Jocko.

The North Missions landscape is the least diverse. High annual precipitation reduces the number of dry habitat types and has yielded a more uniform, dense forest with a lower richness index. These various differences in habitat diversity directly or indirectly influence the type of wildlife present and population levels. A more diverse landscape or ecosystem theoretically supports more niches for wildlife to exploit.

Landscape Fragmentation and Diversity

Fragmentation on forested landscapes is caused by a combination of human and natural factors. Human factors that increase fragmentation include forest harvesting, housing

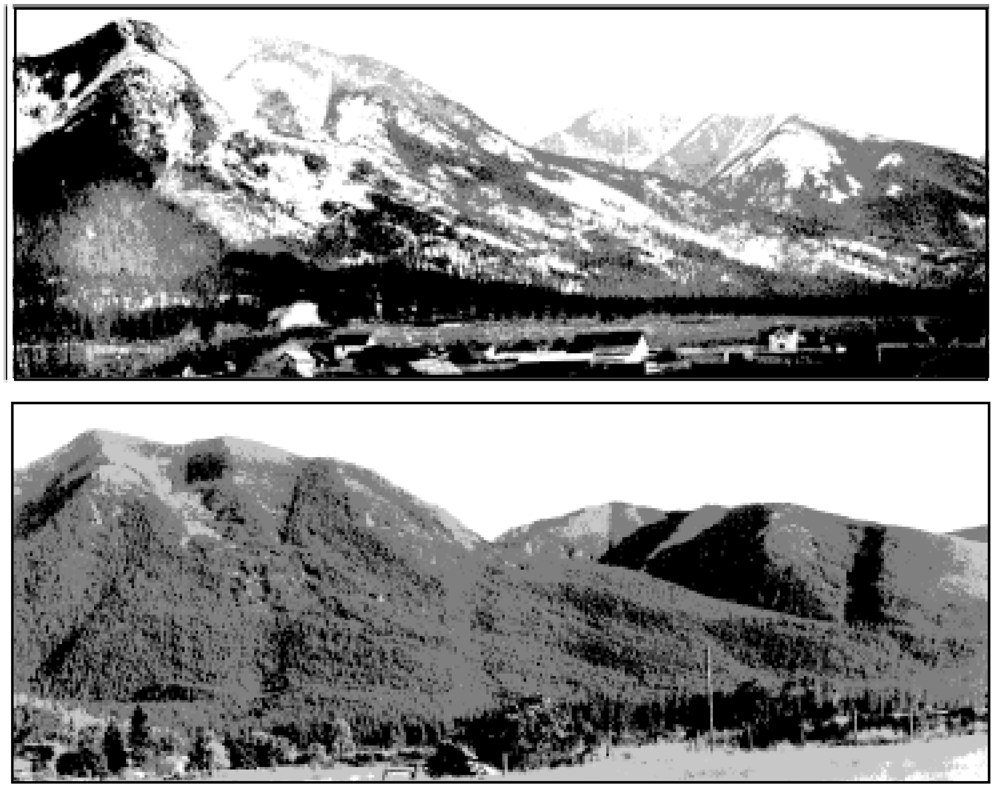


Figure 2-49 a and b. Fire exclusion policies have created major changes in habitat richness and fragmentation as these two photos of the old Jocko Agency area show. The top photo was taken in the early part of this century, the bottom in 1995. The changes have affected wildlife diversity.

development, power transmission lines, hydroelectric development, and road construction. Natural elements that increase fragmentation include meadows, talus slopes, avalanche chutes, ponds, lakes, streams, and rivers.

Generally, wildlife managers are most concerned with human-caused fragmentation, the impacts of which vary depending upon the needs of individual species. For example, species such as white-tailed deer, ruffed grouse, and red-tailed hawk benefit from early seral habitats (the kinds of openings created by clearcuts or burns), while other species like fisher, red-backed vole, boreal owl, and olive-sided flycatcher require interior forest habitats (large, contiguous patches of old growth or near old growth).

Wildlife diversity generally increases as large contiguous forests in late seral or old-growth condition are fragmented into smaller stands of varying sized age classes. However, there is a threshold past which increasing fragmentation causes diversity to decrease because the habitats become uniform and simplified in structure.

At first glance high species diversity seems desirable, and often this is the case. However, fragmentation (and the corresponding increase in diversity) can have negative effects on species like lynx, fisher, and pileated woodpecker because they require large, contiguous forest patches. Species like elk, mule deer, sharp-tailed grouse that need large open patches can also suffer from fragmentation. Thus managers need to consider diversity not only at the stand and watershed levels, but also at the landscape level. Working at the landscape scale managers can develop a balance of forest conditions that contain fragmented areas as well as areas with larger patch sizes and more uniform size and age classes of timber.

Fragmentation on the six landscapes is highly variable (Appendix F). The Missions Landscape is the least fragmented due to fire exclusion and the large acreage now unavailable for timber harvesting because of the Tribal Wilderness and Buffer Zone. The Southwest and Salish landscapes are also relatively unfragmented, although both are broken by large areas of scree slopes, meadows, and steep ground. The North Missions landscape has the largest average clearcut size of the six landscapes, and a relatively high patch-dispersion index. (A high patch-dispersion index indicates uniformity in clearcut patterns across the landscape which means very few areas of interior forest remain.) The North Missions also has the highest percentage of its total acreage in clearcuts (17%). The West Landscape is the most fragmented, however, due to a very high patch dispersion index and other factors.

Figure 2-50. Pileated woodpeckers, like many species that use old-growth forests, are affected by fragmentation.

Thermal Cover

The amount of thermal cover varies, depending upon fire regime, landscape, and past management practices. Low elevation forests, particularly ponderosa pine and dry Douglas-fir forests in the Nonlethal Fire Regime, have experienced substantial increases in density due to encroachment by Douglas-fir and young ponderosa pine. In addition, selective logging has removed the old-growth pine trees that once dominated this forest and replaced them with younger trees. Higher stand density has resulted in an increase in thermal cover at the expense of old-growth pine forest. This has probably benefited species such as white-tailed deer, mountain lions, and some songbirds, but hurt species like mule deer and cavity-nesting birds, bats, and other small mammals.

Table 2-4. The existing condition of thermal cover (as a percentage of total acres in the fire regime) by fire regime and landscape.

Landscape	Nonlethal Regime	Mixed Regime	Lethal Regime
North Missions	55.1	58.6	51.9
Missions	60.6	66.1	42.7
Jocko	25.9	33.0	36.1
Southwest	5.9	18.5	26.9
West	4.3	3.4	15.0
Salish	13.0	19.4	19.7

Mid and upper elevation stands have undergone a shift in age and size classes due to past logging. The West and Salish Landscapes have low levels of thermal cover while the Missions and North Missions Landscapes have abundant thermal cover. Most of the old-growth stands have been logged except in the Missions Landscape. Existing thermal cover consists of small stands that may be isolated from forage and riparian areas, making them unavailable for use by species like elk, moose, flammulated owls, and ruffed grouse. This situation is found on much of the West Landscape and parts of the Jocko Landscape.

Hiding Cover

Hiding cover makes up from 8 to 20% of the Nonlethal Fire Regime, 12 to 23% of the Mixed Regime, and 25 to 33% of the Lethal Regime depending on landscape. These levels are sufficient for big game. In some areas, the level of hiding cover in the Nonlethal Fire Regime is unnaturally high due to densification by Douglas-fir and fire suppression. In some areas high road densities have reduced the effectiveness of hiding cover.

Landscape	Nonlethal Regime	Mixed Regime	Lethal Regime
North Missions	8.9	17.9	25.2
Missions	14.8	16.8	25.7
Jocko	23.0	19.9	31.0
Southwest	12.3	23.0	30.8
West	11.0	11.7	29.2
Salish	20.1	23.6	33.0

Table 2-5. The existing condition of hiding cover (as a percentage of total acres in the fire regime) by fire regime and landscape.

Snag Habitat

Snag levels are low across most of the commercial forest base due to past logging. Large snags still exist as individual trees throughout many areas of the forest. Some areas, such as the North Missions and Mission Landscapes, have residual patches with high snag densities. In areas where logging has not occurred due to low stocking or steep and rocky terrain, large snags are still present. Examples include the Seepay Creek watershed and the Perma/Little Money Creek area.

Landscape	Nonlethal Regime	Mixed Regime	Lethal Regime
North Missions	3.3	15.7	11.8
Missions	2.7	7.6	9.5
Jocko	2.4	1.1	1.8
Southwest	0.9	0.5	0.4
West	0.3	0.5	0.0
Salish	1.7	1.0	0.0

Table 2-6. The existing condition of large snag habitat (as a percentage of total acres in the fire regime) by fire regime and landscape.

Down Woody Debris

Conditions are similar to those described for large snag density. Older forests containing high amounts of down woody debris are few because old growth forests have been largely lost. Some areas in the North Missions and Missions Landscapes retain higher levels because they are inaccessible. These areas include mainly mixed conifer and spruce-fir cover types and are important areas for lynx, red-backed voles, pileated woodpeckers, and many other wildlife species.

Table 2-7. The existing condition of down woody debris habitat (as a percentage of total acres in the fire regime) by fire regime and landscape.

Landscape	Nonlethal Regime	Mixed Regime	Lethal Regime
North Missions	3.3	15.7	11.8
Missions	2.7	7.6	9.5
Jocko	2.4	1.1	1.8
Southwest	0.9	0.5	0.4
West	0.3	0.5	0.0
Salish	1.7	1.0	0.0

Early-Seral/Forage Habitat

A large part of the forest base is currently in an early- to mid-seral condition from intensive timber harvesting and grazing. Within this early-seral base, many acres are either in new clearcuts with little regeneration or in older clearcuts with fairly extensive regeneration. Other areas are natural meadow openings with few or no trees. Early-seral/forage habitat levels are currently not a limiting factor for early seral wildlife species. In some areas (West and Jocko landscapes) these early seral habitats are probably in a more fragmented pattern than what occurred naturally.

Some early-seral/forage habitat is in poor condition due to noxious weed invasions and livestock grazing. This is particularly evident on mountain foothills and in riparian areas in the Nonlethal and Mixed Fire Regimes, in areas like Valley Creek, Pistol Creek, Jette, Selow Creek, and Lonepine. Many of these areas do not support the big game and other wildlife populations that they are capable of supporting. This is mainly due to intensive, season-long grazing, which has left little grass for forage and nesting, particularly in riparian zones. Livestock have largely eliminated grassland and shrub vegetative structure from these areas. This has impacted small mammals, big game, and breeding birds and allowed weeds to invade, which has further exacerbated the problem. Cattle grazing has also reduced fine fuels and thus altered fire regime processes (Belsky and Blumenthal 1997).

Early seral habitats at higher elevations (in the Lethal and Timberline Fire Regimes) receive less intensive use because of their steep slopes and the lack of water. Consequently, they are in better condition. Some of these areas are critical big game summer ranges. One concern in these higher elevation areas is fire suppression. Historically, fires maintained early-seral/forage habitat and provided summer range and winter range for big game, grizzly bears, and songbirds. Fire suppression has caused a dramatic reduction in these habitats as forests have grown dense and encroached upon open meadows. This is most evident in the Missions Landscape where there has been no logging or natural fire to provide the disturbances needed to maintain early-seral conditions. Whitebark pine habitat, critical for grizzly bears and some bird species, has been lost due to fire suppression and the introduction of white pine blister rust.

Landscape	Nonlethal Regime	Mixed Regime	Lethal Regime
North Missions	24.8	20.2	25.9
Missions	25.2	12.9	22.2
Jocko	35.4	24.2	26.6
Southwest	57.5	33.7	26.9
West	56.8	53.5	35.8
Salish	44.6	36.0	38.5

Table 2-8. The existing condition of early-seral/ forage habitat (as a percentage of total acres in the fire regime) by fire regime and landscape.

Clearcutting

The extent of clearcutting is discussed in the paragraphs on early-seral/forage habitat.

Fragmentation caused by clearcuts has the potential to impact some wildlife species. All six landscapes have some degree of natural and human-caused fragmentation. The North Missions and West Landscapes have the highest levels of fragmentation from intensive forest practices. They are much more fragmented than they were during the pre-contact period, which has probably impacted species that require large patches of contiguous mature forest like the fisher and pileated woodpecker. Big game movement corridors have also been impacted in some areas by extensive clearcutting and high road densities.

The Missions landscape is the least fragmented. It, too, is not representative of the pre-contact condition. During the pre-contact era, natural and Indian-set fires kept the landscape in a more open condition. A more detailed description of fragmentation for each landscape, including statistics, is included in Appendix F.

Threatened, Endangered, and Sensitive Species

Grizzly Bear

Grizzly bears are found mainly in the Mission, North Missions, and Jocko Landscapes. This area is part of the Northern Continental Divide Grizzly Bear Recovery Zone. Three separate habitat zones are recognized on the Reservation: Situation 1, Situation 2, and Situation 3

Grizzly bear management is primarily focused on reducing human-bear conflicts, minimizing bear mortality, and providing secure high quality habitat for bears.

(Appendix G). Each of these has a unique set of restrictions on the types of resource management activities allowed, the timing of activities, and mitigation requirements. Grizzly bear management is primarily focused on reducing human-bear conflicts, minimizing bear mortality, and providing secure high quality habitat for bears. Human-bear conflicts are currently the leading cause of bear mortality.

Logging activities can be used to improve habitat for bears. For example, silvicultural prescriptions—logging and prescribed fire—can be used to covert the forest to early-seral stages in order to improve forage conditions. However, intensive forestry, logging that convert the forest to mostly early-seral conditions and that increases road densities is detrimental for bears.

Rocky Mountain Wolf

Wolves have been documented on the Flathead Indian Reservation. The sightings have been of wolves from existing packs that are resident near the Reservation boundary. Because wolves are habitat generalists and are dependent on healthy prey populations, habitat manipulation through logging may not seriously impact wolves unless it lowers prey populations, particularly the populations of big game species. Important big game habitat includes calving and fawning areas, winter range, and summer range. Maintaining healthy prey populations by protecting these important habitats will insure a potential for the wolf's return to the Reservation. If packs become established within the Reservation, more direct management, such as the protection of denning and rendezvous sites, may be needed. Otherwise, most management for wolves would be through the management of big game populations.

Bald Eagle

The Montana Bald Eagle Management Plan (1994) lists specific objectives for eagle habitat. On the Reservation, the major bald eagle habitat is Flathead Lake and the Flathead River. Other important habitat is located around major reservoirs and mountain lakes. Eagle habitat consists of three major components: nesting, roosting, and foraging habitat. Important nesting habitat consists of large open-canopied trees adjacent to large water bodies. The nesting period is critical for eagle productivity. Resource extraction activities need to be well planned to avoid interference with nesting and disruptions that could endanger future nesting. Foraging habitat consists of maintaining an adequate fisheries food base and large and tall trees and snags for perching. Roosting habitat consists of mature forest with moderate to closed canopies. Human activities like logging, highway construction, and mining can disrupt the use of these habitats and force eagles to abandon areas. Resource management or construction activities need to consider impacts to bald eagles to maintain or increase existing eagle populations and eagle habitat.

Currently, bald eagles are present along Flathead Lake and the Flathead River. Although many areas are occupied by nesting bald eagles, the recruitment of nestlings and juveniles into the breeding population is low. The reasons for this are not known, but it may be due to pollutants in Flathead Lake or disturbances during the breeding season.

Peregrine Falcon

This species was once more common on the Flathead Indian Reservation but habitat destruction and the widespread use of DDT and other pesticides have substantially reduced number. Since DDT has been banned in the U.S. and a captive breeding program started, peregrine falcons have increased steadily in many parts of their former range. Two reintroduction sites were established on the Reservation in the early 1990s. Reintroduction has been successful at one of these. Potential habitat exists, primarily in the Mission Mountains and along the Flathead River.

Managing for peregrine falcons involves protecting nesting falcons from disturbances and maintaining a prey base. Typical peregrine nesting habitat includes large cliffs, but the species is also known to nest on bridges, the ground, and city skyscrapers. Prey species include waterfowl, doves, grouse, and other upland game birds. Potential disturbances include logging, explosives, and general construction activities. Competition for nest sites occurs between peregrine and prairie falcons and great horned owls. Predation from great horned owls can also be a problem.

Canadian Lynx

The Canadian lynx has been proposed for listing as a threatened or endangered species. The status of the lynx on the Flathead Indian Reservation is unknown at this time. Track surveys and remote sensing cameras have detected the presence of lynx. Studies of their status are currently underway.

Lynx prefer subalpine fir habitats, that occur at higher elevations than the drier ponderosa pine and Douglas fir habitat types. The subalpine fir habitats provide both foraging and denning habitat for lynx. These habitats also provide habitat for the primary prey of lynx, the snowshoe hare.

During pre-settlement times, there were relatively long intervals between fires in the subalpine, but the fires that did occur were generally large, stand-replacement fires. These burns regenerated into dense stands of lodgepole pine, subalpine fir, and spruce that provided large expanses of lynx habitat. Decades of fire suppression and timber harvesting have resulted in a forest mosaic that provides less high-quality habitat for lynx.

Sensitive Species

The Montana Natural Heritage Program lists 37 sensitive vertebrate wildlife species that occur or may occur within the Flathead Indian Reservation (Appendix E). These species are considered sensitive due to low populations, threats to their habitats, or highly restricted distributions. These species do not have legal protection but are considered sensitive to human activities and attention to their habitat and population needs may be warranted during the planning of resource management activities. The status of many of these species is not known because there have been few population or habitat studies.

Old Growth

Very few stands of old growth exist within the commercial base of the forest. Most old growth was logged many years ago, particularly old growth ponderosa pine, western red cedar, and larch. Some remains in the North Missions Landscape; it is inaccessible to logging. Many parts of the noncommercial forest such as the Missions Wilderness and South Fork Primitive Area still retain some old-growth communities.

Water and Fisheries

Water: Yesterday and Today

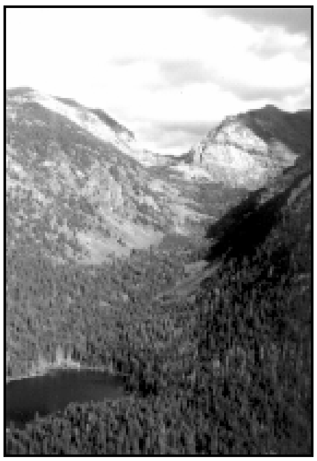


Figure 2-51. Many of the forested watersheds on the Reservation start out in high basins like the headwaters of Hellroaring Creek.

The water resources found within the Flathead Indian Reservation include all, or part of three river systems, the south half of Flathead Lake, hundreds of streams, extensive and diverse wetland systems and large groundwater aquifers. Waters entering the Reservation, and streams arising in the high country of the Reservation are generally of good to excellent quality. Native fish species such as cutthroat, bull trout and mountain whitefish depend on clean water, adequate instream flows, and high quality stream and lake habitats. Most of the amphibians, reptiles, birds and mammals indigenous to the Reservation also require clean water and the food and cover that borders streams, ponds and lakes. Large mammals like grizzly bears use riparian areas as feeding and travel corridors.

Reservation watersheds contain extensive pristine aquatic habitat—much of it in headwater forested areas. However, each increment of activity has a potential detrimental impact on aquatic resources, and as traditional and new development pressures increase, the high quality and interconnectedness of aquatic resources decreases. The Reservation's surface and ground waters remained relatively undisturbed until the Flathead Allotment Act of 1904. This act eventually led to the construction of an extensive irrigation network which now includes approximately 1,200 miles of canal and seventeen irrigation reservoirs, nine of which are in forested areas. Development within the forested landscape over the last century has prompted the construction of an extensive road network with large sections of road within riparian areas and innumerable stream crossing structures. Vegetative manipulation has influenced the timing and magnitude of streamflows within individual watersheds. Grazing management practices have generally allowed livestock uninhibited access to stream corridors. The influence of this practice is minimal where conifer vegetation is dense, as in the Lethal

Figure 2-52. The Jocko River conveys large volumes of high quality water and is well known for its fishing.

Fire Regime. In the Nonlethal Fire Regime, and to a lesser extent the Mixed Fire Regime, unrestricted livestock access has had a significant influence on streamside corridors. Increasingly, commercial and homesite development within floodplain environments, is influencing the character and quality of streamside environments.

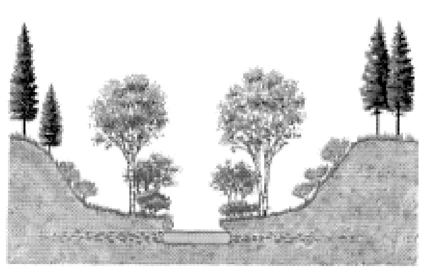
Watershed-Scale Conditions

Cumulative levels of impact in a watershed can be examined by identifying the inherent stability of a catchment and overlaying the amount of activity which has occurred in a catchment. The Forest Management Plan Interdisciplinary Team developed a qualitative Watershed Model as a means to evaluate human disturbances in watersheds and to predict stream conditions. Disturbances include roads, stream crossings, livestock grazing and clearcuts. A watershed's intrinsic stability is determined by measures of slope, soil erodibility and stream type. Watersheds are given a score between 1 and 100. A threshold score of 40 is initially set as the point below which the combination of factors of disturbance and sensitivity result in unacceptable degradation to aquatic environments. Results are summarized in figure 2-53. For the 61 watersheds which were evaluated 36 (59%) indicated low likelihood of degradation, 23 (38%) indicated moderate degradation and 2 (< 1%) indicated high degradation.

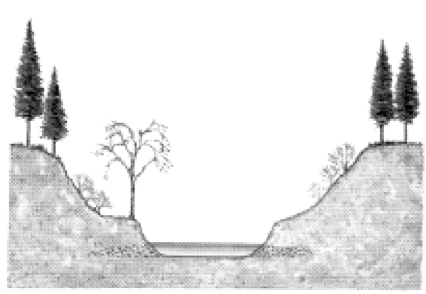
Stream Channel Complexity

Stream channel complexity is a term which is utilized to characterize the diversity and range of aquatic habitats and the interconnectedness between habitats. Channel complexity is defined within the context of the stream environment being evaluated. For example, a high

When Healthy Streams are Degraded



In a healthy stream (left), the stream banks and channel are in good condition. Healthy riparian vegetation helps to stabilize the banks.



The stream channel widens and gets shallower in response to deteriorating upland and/or riparian vegetation conditions. Eventually, the stream becomes even wider and shallower and swings back and forth in the channel.

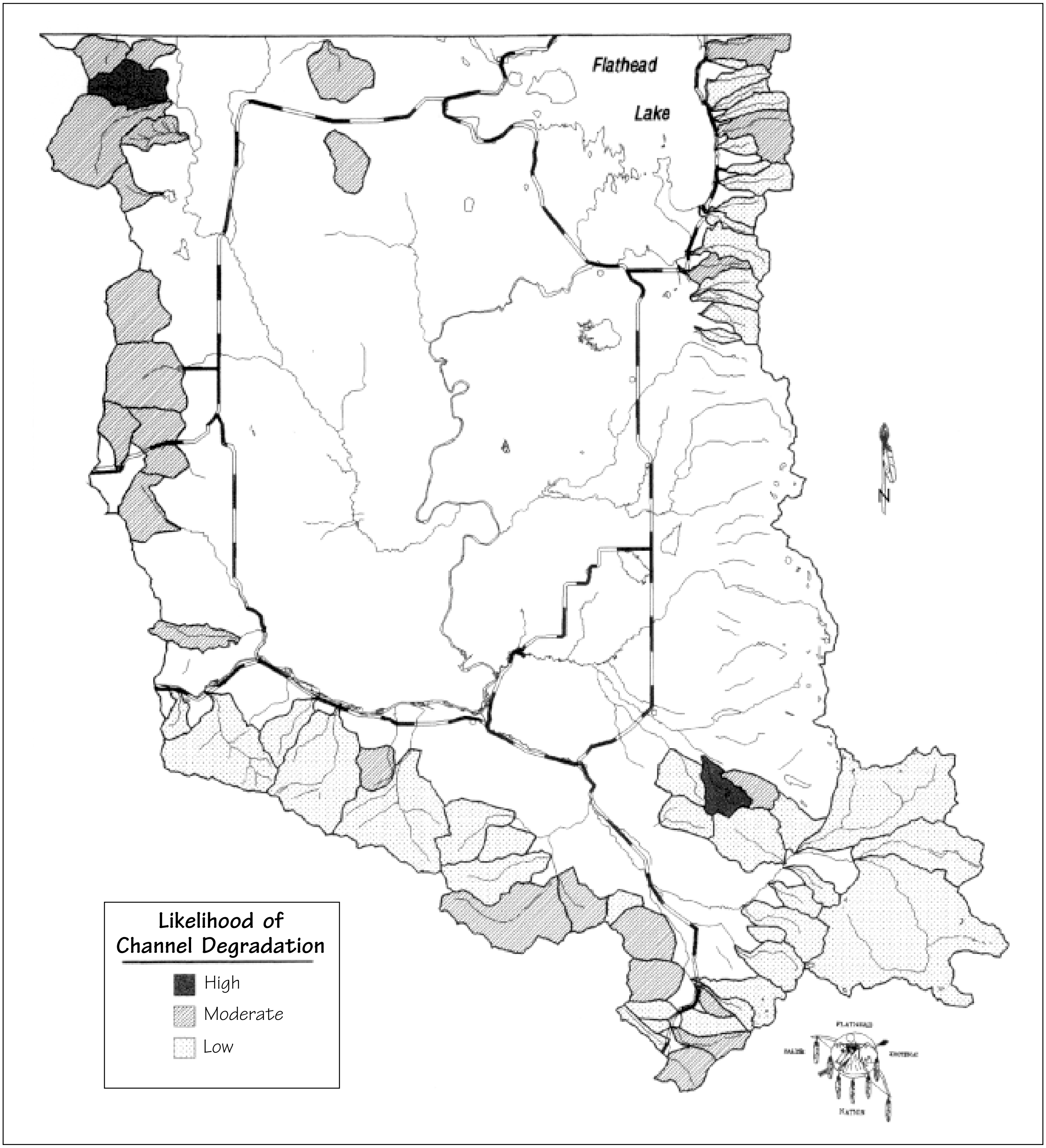


Figure 2-53. Watershed model predictions of the likelihood of channel degradation in selected forested watersheds (for more detail on the model, please see Appendix J).

gradient alpine stream with a narrow floodplain may have less natural complexity than a low gradient, stream with a wide floodplain. At the project-level, channel complexity is defined with the following set of measurable aquatic attributes.

- Width of accessible floodplain environment and geomorphic features found in the floodplain environment. Geomorphic features may include cutoff channels, wetlands, or surface water – ground water interaction zones.
- Variability in streambed elevation in a downstream direction can be a surrogate measure of the longitudinal diversity of the bed and indirectly characterizes hydraulic diversity, depth and inchannel habitat diversity.
- The amount, quality and diversity of inchannel habitat units including pools, riffles, tailouts, side channels and other habitat features provides a measure of channel complexity.
- Substrate patchiness, or the variability in particle size distribution on the bed surface partly accounts for substrate habitat diversity and also the amount of fine sediment covering or infiltrating into the streambed.
- Large woody debris features in the channel, and the potential for continued large woody debris recruitment, are a significant component of channel complexity in forested streams.
- Bank margin diversity, including overhanging banks, roughness elements on banks and bank cover characteristics are incorporated into channel complexity.

The primary influence from past forestry practices has been extensive roading of watersheds resulting in cases of delivery of sediment and encroachment on channels.

Reservation-wide surveys have not been completed to measure the components of channel complexity. Comprehensive surveys for recent project-level activities indicate that there is a moderate to high level of impact, which translates into decreased channel complexity, in the lower portions of most watersheds. Loss of channel complexity at higher elevations generally is associated with stream crossing sites or previously-employed harvest methods.

Stream Connectivity

The connectivity between tributary streams and downstream, larger water bodies may be disrupted by irrigation structures, impassible stream crossings or other inchannel barriers. Due primarily to construction of the irrigation project, connectivity between up and downstream water bodies has been significantly disrupted. Many of the barriers occur in high elevation canals, located in the forested landscape. Table 2-9 estimates the percentage of streams with barriers that impact connectivity in each landscape.

Table 2-9. Percentage of streams with barriers that interrupt the connectivity between upstream and downstream water bodies

Landscape	Percentage of Streams
West	> 95%
Southwest	< 25%
Salish	< 25%
Jocko	> 80%
Mission	> 95%
North Missions	< 50%

Fluvial Geomorphology

Forested watersheds on the Reservation exhibit a recognizable downstream trend in stream channel and floodplain characteristics. This trend, illustrated in Figure 2-53b (adapted from Montgomery and Buffington 1997), is largely controlled by decreasing valley slope and increasing floodplain width in a downstream direction.

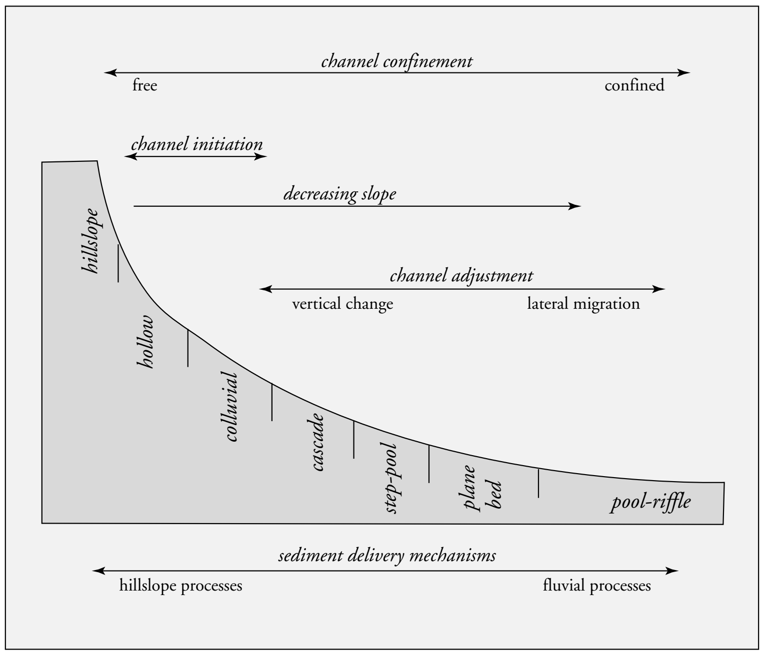


Figure 2-53b. Longitudinal profile through a stream channel network (adapted from Montgomery and Buffington 1997)

The summary below is taken from Makepeace (1998). That report contains a compilation of geomorphic data at over 20 reference reaches in forested watersheds and should be referenced for more in-depth information.

In headwater, first-order drainage basins soil moisture accumulates and moves downslope via shallow, subsurface pathways. Across some transitional zone, which is often influenced by a change in geology or valley slope, the magnitude and duration of soil moisture moving downslope produces an incised stream channel. Headwater, incised channels form the ephemeral channel network in Reservation forested drainages.

Cascade stream channels develop in uppermost perennial stream reaches. Cascade channels are formed of irregularly spaced, large bed elements, including boulders and inchannel wood accumulations. Cascade channels are generally incised and have limited floodplain development. Downstream and often separated by cascade reaches, step-pool channel morphologies develop.

Step-pools channels are comprised of generally discrete, spaced accumulations of large-bed elements which form channel steps. Steps are separated by lower gradient pool areas where gravel size fractions accumulate (Grant et al. 1990). Cascade and step-pool channel morphologies are observed in most forested watersheds and forested stream reaches on the Reservation.

Plane bed channels are characterized as straight reaches with uniform substrate sizes and a channel which lacks the rhythmic alteration in bedforms found in most other channel types (Montgomery and Buffington 1997). Plane bed channels are observed in several forested watersheds, but are not as widespread as cascade and step-pool morphologies (Makepeace 1998).

Pool and riffle channels are not well developed in forested watersheds because the alluvial valley width is generally restricted and the meandering pattern which initiates pool-riffle sequences does not develop. Makepeace (1998) does report reference reaches with forced pool-riffle morphologies. These are channel types where pools form behind obstructions as backwater features. Riffle sections are generally not well developed, but occur as patches of gravel in depositional areas.

Concurrent with the downstream change in channel morphologies in forested watersheds, there is generally a decrease in sediment delivery from hillslope sources and an increase in sediment delivery from fluvial, or near-channel sources (Figure 2-53b). This transition often coincides with an increase in floodplain width in a downstream direction.

Hillslope sediment delivery mechanisms include dry gravel from hillslopes, shallow seated earthflows, and debris flows. Often these are episodic sediment inputs which occur during or after extreme weather events. Fluvial sediment sources include channels scoured in the floodplain or sediment scoured from the floodplain during overbank flows. Often streambank sediment sources are limited in forested reaches due to dense vegetation along channel margins (Makepeace 1998).

Water Quality

Reservation-wide water quality information is detailed in two recent reports (CSKT 1997 and Makepeace 1999). The following review of water quality is abstracted from these reports, and they should be examined for more detailed information on water quality in forested watersheds.

At the outset it is important to recognize that there are two predominant land types on the Reservation - forested areas and lower elevation palouse prairie grasslands. The grassland land type has almost entirely been converted to agricultural or development uses. Overall, water quality data utilized in CSKT (1997) and Makepeace (1999) demonstrate that instream water quality declines as agricultural impacts reach stream corridors, but that water quality generally remains high in forested watersheds.

It is also important to recognize that water quality sampling has historically targeted valley-floor stream segments because of the elevated impacts which occur on the valley floor. Consequently, the number of water quality stations which isolate forest activities is more limited.

Water quality in forested watersheds is characterized as a calcium bicarbonate water type with total dissolved solids concentrations which do not exceed 200 mg/l. Dissolved oxygen concentrations range between 8 mg/l and 12 mg/l with occasional determinations which are outside of this range. Increases in water temperature are generally not observed in forested watersheds, partly because of the short distance between headwaters and mouth in most channels, but also because of the restrictions on riparian harvest (see *CSKT BMPs* 1995).

Episodic, wet weather events have been observed which lead to increased suspended solids loads in streams and decreased water clarity, but generally in forested drainages existing data sets indicate water clarity generally is high. Suspended solids and turbidity data do demonstrate a notable decrease in water clarity as agricultural impacts reach stream corridors.

Nutrient data (nitrogen and phosphorus) indicate significant increases in nutrients where irrigation return flows reach streams. However, in forested watersheds it is difficult to detect downstream increases in nutrients, and the magnitude of nutrient concentrations are similar for managed and unmanaged drainages.

Wetlands

At the present there is not a comprehensive inventory of forested wetlands. The CSKT cooperated with, and supported the development of the USFWS National Wetlands Inventory (NWI) for Reservation wetlands. The inventory is based in part on aerial photographic delineation of wetlands, and where forest canopy exists, the inventory procedure could not be utilized to delineate forested wetlands.

Forested wetlands which occur in association with stream corridors are generally considered riparian land types. The Tribes have contracted with the University of Montana, School of Forestry, Forest and Conservation Experiment Station to complete riparian inventories in specific forested watersheds for project-level work. These data are very generally summarized in Makepeace (1999) and are available in CSKT staff project files.

Forest wetlands and riparian areas exhibit a wide range of diversity and classification efforts defined in Hanson and others (1995) and Sirucek and others (1995) can be used as tools to characterize the forested wetlands and riparian areas found on the Reservation.

Monitoring

Tribal staff recognize the important role that monitoring plays in resource assessment and management, both from the perspective of identifying the existing characteristics of an environmental feature, and from the perspective of defining the range of variability and rate of change of an environmental feature.

The Tribes maintain hydrologic monitoring programs in forested watersheds. These can generally be categorized into four areas - water supply or streamflow discharge monitoring, instream water quality monitoring, fluvial geomorphic monitoring, and project-level monitoring.

Streamflow Discharge Monitoring

Streamflow discharge is measured at a number of locations in forested watersheds. Often streamflow is measured at canal-stream intersections, but there is a core network of nine streamflow gages maintained by the USGS and supported by the Tribes at natural flow stations in forested watersheds. The period of record for these gages is 1983 to the present, and as the period of record increases at these stations, the value of this data increases substantially. Data from these stations are reported in USGS Water Supply Reports for Montana.

USGS maintained streamflow stations are located in all the major hydrologic response units on the Reservation, and data from these stations are used in project-level, cumulative effects modeling to evaluate peak flow increases.

Instream Water Quality Monitoring

Instream water quality has historically been monitored in a number of forested watersheds. This effort is supported by the EPA and completed by staff from the CSKT Natural Resources Department.

Instream water quality is monitored to characterize the range in water quality found in Reservation watersheds, and as the period of record increases at key monitoring stations, temporal trends in water quality can be evaluated. Current instream water quality monitoring efforts are detailed in Natural Resources Department Project Files (CSKT Water Quality Monitoring Plan, Version 2.0, 5/98 and CSKT Quality Assurance Project Plan, Sampling and Analysis Plan and Standard Operating Procedures, Revision 2, 1/99). Summaries of previous data collection efforts are available in CSKT (1997) and Makepeace (1999).

Fluvial Geomorphic Monitoring

Beginning in 1995, Tribal staff have been measuring geomorphic features at a set of reference (or representative) stream reaches in forested watersheds. Data are collected generally following procedures in Harrelson and others (1995) and information for approximately 20 reaches are reported in Makepeace (1998).

At each reach survey information includes cross sections, particle size distributions, Rosgen classification information (Rosgen, 1994), riparian habitat typing (Hanson and others, 1995), pool and large woody debris characterization, and general reach descriptions.

At a subset of reaches, repeated data are collected to evaluate the response of channel parameters over time.

Project-level Monitoring

Project-level monitoring is completed as part of individual timber sale planning efforts. Although the form of project-level monitoring varies based on the scale of the project and the features found within a watershed, there is a basic set of information collected for most projects. This includes a roads and road crossing inventory and sediment source survey, a qualitative to quantitative stream channel survey, an evaluation of past harvesting activities, and a qualitative evaluation of grazing impacts.

Project-level monitoring is also completed during active timber sales to document compliance or noncompliance with best management practices for forestry activities (CSKT, 1995).

Project-level monitoring results are maintained in Natural Resources Department staff files and are often reported in Environmental Assessments for specific projects.

Planned Hydrologic Monitoring

Tribal staff will maintain and adapt their hydrologic monitoring activities in forested watersheds throughout implementation of the Forest Management Plan. Tribal staff intent to maintain their current streamflow monitoring network and core instream water quality network.

Tribal staff intent to expand their geomorphic monitoring effort, both to include more reference reaches, and also to collect more detailed information at existing reference reaches. Tribal staff also intent to expand their effort in project-level monitoring both for sale planning and for active sales.

Fisheries Today

The fisheries resources of the Flathead Reservation have been affected by a wide variety of human activities. The initial and probably greatest influence has been the construction and operation of the Flathead Indian Irrigation Project. Historic impacts from irrigation include stream dewatering, migration blockage by diversion structures, and the loss of large numbers of fish as water is diverted into the canal system. Another major influence on the Reservation fisheries has been the introduction of exotic species. These introductions have produced some thriving fisheries, but have reduced native populations through competition and hybridization. Agriculture and grazing have influenced fisheries by degrading water quality and modifying stream bank vegetation. The primary influence from past forestry practices has been extensive roading in watersheds resulting in increases in sediment and encroachment on channels.

Fisheries management on the Flathead Reservation has been conducted by both state and Federal agencies from the 1930s until 1985 when the Tribal Fisheries Program assumed the management responsibilities.

Populations of cutthroat and bull trout on the Flathead Reservation are greatly reduced from pre-contact levels, and because many of today's populations are not secure, the decline is probably continuing. Reasons for the decline include impacts from irrigation practices, the introduction of exotic species, and habitat degradation. Artificial migration barriers have isolated many populations which has been both detrimental and beneficial. The barriers have hastened the demise of some populations while ensuring the perpetuation of others due to protection from the invasion of exotics. Habitat degradation will likely continue if overall seral condition advances toward younger stands and road building continues.

The Status of Key Parameters

Stream Substrate Condition

Between 1994 and 1997 we collected samples from 15 streambeds using the McNeil coring method (McNeil and Ahnell 1964). These samples included both commercial and noncommercial forested lands. The samples for each stream contained an average content of particles less than 4.75 mm in diameter ranging from 9.0 – 40.0 %.

Riparian Condition

Between 1993 and 1997 the University of Montana Riparian and Wetland Research Program evaluated 102 reaches of streams on the Reservation. The average score for all reaches was 74, which is described as a functional riparian condition, but considered at risk if remedial management actions are not taken. Of the 102 inventoried reaches, 15 rated as nonfunctional, 46 were functional but at risk, and 41 were in proper functioning condition.

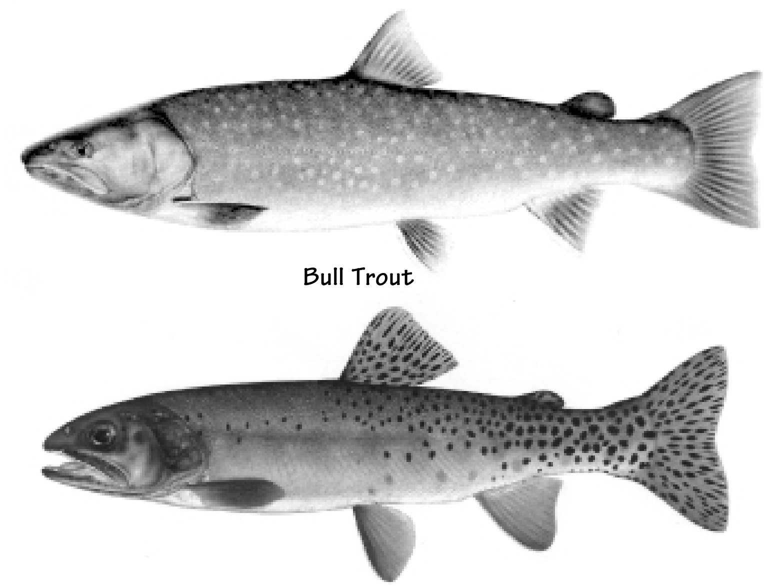


Figure 2-54. Bull trout (top) become sexually mature at about four to five years when they are 11 to 15 inches long. By eight or nine years, they can grow to be 35 to 37 inches long. The species is in serious trouble over much of its range. The size of westslope cutthroat trout (bottom) varies depending on where they live. In small headwater reaches of streams they may not grow larger than 10 inches, while in lakes and larger streams they may reach 16 to 18 inches and weigh several pounds or more. This species is also facing problems over much of its range.

Threatened Species

There are five populations of bull trout within the Flathead Indian Reservation. Prior to the construction of dams, adults from these populations may all have shared habitats within the Flathead River and Flathead Lake. Today three populations are isolated behind dams at the base of the Mission Mountains. They spawn in streams within noncommercial forest lands and are most vulnerable to changes in dam operations and to hybridization with nonnative brook trout. There is no timber harvest or roading planned within the ranges of these three populations. The population of bull trout in Flathead Lake spawns off the Reservation and is only minimally influenced by forestry activities on the Reservation. The remaining population that resides in the Jocko and Flathead rivers is the one most subject to influence by forestry activities. Much of its range is in the forks of the Jocko River, in areas that are noncommercial forest lands.

Tribal Cultural Resources

Many cultural resources are nonrenewable resources. Their destruction is a gross violation of everything we value.
—Salish Culture Committee, 1995

Cultural resources —Tribal elders, languages, cultural traditions, and cultural sites—are intimately tied to the forests of the Reservation. Tribal traditions depend on native fish and wildlife, food and medicinal plants, landmarks, traditional use sites, and other areas where Tribal members practice cultural traditions. Hunting, fishing, plant harvesting, hide-tanning, food and medicine preparation, singing, dancing, praying, feasting, story telling, and practicing ceremonies are examples of age-old traditions that rely on the land and the community of life it supports.

Although each of the Tribes on the Reservation possess distinctive beliefs and practices, the people share one important similarity: the Tribes value the Earth—its air, water, and land—as the foundation of Indian culture. In the words of the Salish Culture Committee, "The Earth is our historian, it is made of our ancestors' bones. It provides us with nourishment, medicine and comfort. It is the source of our independence; it is our Mother. We do not dominate Her, but harmonize with Her."

The Tribes believe everything in nature is embodied with a spirit. The spirits are woven tightly together to form a sacred whole (the Earth). Changes, even subtle changes, that affect one part of this web affect other parts.

Protecting cultural resources in the forest is essential, and this is one of the most important goals of Tribal natural resource management. It is also a goal that the Tribes have for Tribal aboriginal territories managed by other entities.

Existing Conditions

Cultural traditions rely on abundant populations of native fish and wildlife, healthy plant communities, clean air and water. Undisturbed spiritual sites, traditional campsites, dwellings, burial sites, and other cultural sites are important, too, because they, in the words of the Salish Culture Committee, "reaffirm the presence of our ancestors…we are alive today…because of them. These places are part of the basis of our spiritual life." They provide young people with a connection to ancestors and native traditions.

Many food and medicinal plants grow on Reservation and aboriginal lands. Some grow in mountain areas, others along river and stream corridors, still others in arid places. Many have multiple uses. The Tribes have used most of them for thousands of years.

Tribal elders report that some human activities, such as logging and grazing, have damaged some of the areas where these plants grow. Work is ongoing to protect these sites.

Salish and Kootenai cultural resource specialists use the term "site" for areas of historical, cultural or spiritual importance. These areas sometimes, but not always contain artifacts. They may be the site of past activities or they may still be used. The Tribes do not study these areas in any scientific sense, but consider them to be a living part of Tribal culture and use them as such. Many

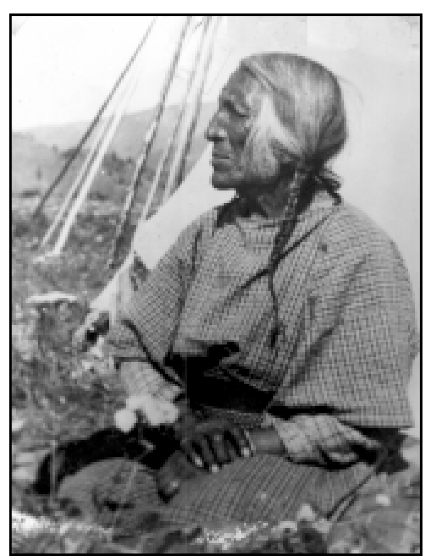


Figure 2-55. Tribal cultural traditions rely on healthy forests that support populations of native fish, wildlife, and plants, as well as clean air and water. Ecosystem management practices proposed by Alternatives 1, 2, and 3 attempt to restore and maintain healthy forests. The photo, right, is of Mary Arlee.

archaeologists and historians, however, view a site as a location of past human activity. Archaeological sites often contain physical remains or artifacts. Scientists use them for research.

Important cultural sites have been destroyed over time. Often, when the Tribes or others have disclosed their locations, visitors have stolen from or vandalized them. Many people do not understand the value of these resources to the Tribes.

Tribal, Federal, and state laws prohibit the destruction of land-based cultural resources. The Salish and Kootenai Culture Committees and the Tribal Preservation Office provide training to natural resource managers about the importance of cultural resources. They teach managers how to recognize them and how to protect them. To protect sites, the committees have developed cultural awareness programs for people interested in Tribal cultures and resources. They work with Federal, state, and local agencies, as well as Tribal departments for cultural resource protection both on and off the Reservation.

"The Earth is our historian, it is made of our ancestors' bones. It provides us with nourishment, medicine, and comfort. It is the source of our independence; it is our Mother. We do not dominate Her, but harmonize with Her."

—Salish Culture Committee, 1995

Programs and Policies

In 1975, the Tribal Council passed Resolution 4762. It formally established the Flathead and the Kootenai Culture Committees to develop Salish and Kootenai cultural awareness programs for schools so that they might "enhance the understanding and appreciation of the past and present Indian peoples." Since then, the responsibilities of the culture committees have grown. They now work "to preserve, protect, perpetuate and enhance" all cultural resources essential for the survival of the Salish and Kootenai cultures.

Figure 2-56. Whitebark pine nuts were gathered during most years. The nuts, are high in fat and protein and are an important cultural food. The tree, however, has not fared well in recent times. An introduced disease, the white pine blister rust, and fire exclusion policies have all but eliminate cone crops.

Role of the two culture committees

1. **Document the locations and descriptions of cultural sites, for in-house use.**

   (Also, because new sites are being recorded, the committees review and monitor areas before developers log or disturb them. If disturbance or development is in a sensitive area, the culture committees remain on site during the activity.)

2. **Conduct historical research to create a repository of historical, cultural and general Tribal information for reference and study.**

   Activities include gathering language, song and history books and tapes; photographs and genealogies; and samples of food and medicinal plants.

3. **Act as representatives of the Elders to learning groups and Tribal organizations.**
4. **Conduct and participate in traditional activities.**
5. **Sponsor culture and language camps.**
6. **Meet with Tribal departments, schools, other tribes and agencies about cultural resource protection.**

Figure 2-57. Western redcedar

The Tribes have, for thousands of years, maintained unwritten policies regarding cultural resources. In recent times Federal and state governments have developed their own policies to protect these resources. Their actions include Federal and state antiquities acts, the National Historic Preservation Act of 1966, the American Indian Religious Freedom Act of 1978, the Archaeological Resource Protection Act of 1979, and the Native American Graves Protection and Repatriation Act.

In 1995, the Confederated Salish and Kootenai Tribes established approved the Cultural Resource Protection Ordinance, which provided the framework and guidelines for the Tribal Historic Preservation Office. In 1996, the Tribal Historic Preservation Office (TPO) was established to identify, evaluate, and protect Tribal cultural, historical, and archaeological resources. The TPO reviews proposals for site disturbing activities—development, road-building, logging, and the like—and through consultation with elders, Culture Committees, and other sources, determines whether the activity is a potential threat to any cultural or historic sites, and then takes appropriate action using a number of Tribal and Federal laws and regulations.

After tremendous Tribal pressure, the Federal government has begun to recognize the significance of Tribal cultural resources and the Tribes' role in protecting these resources, both on and off Reservation lands. New amendments to the National Historic Preservation Act (NHPA) expressly provide for the protection of sacred sites and traditional and cultural properties, and affirm Tribal authority over these resources. The 1992 amendments to the NHPA provided Tribes the opportunity to assume all State Historic Preservation Office (SNPO) authority and responsibilities within the exterior boundaries of their reservations.

Under Section 101(d)(2) of this act the Confederated Salish and Kootenai Tribes assumed SNPO authority for the Flathead Reservation. In 1990, the Federal government passed the Native American Languages Act and the Native American Graves Protection and Repatriation Act. In addition, the National Indian Forest Resource Management Act and the Archaeological Resource Protection Act also affirm Tribal authority over cultural resources. The State of Montana passed the Montana Human Skeletal Remains and Burial Site Protection Act in 1991 which protects unmarked burials on state and private land.

In September of 1995, the Tribes passed Ordinance 95 which establishes a Tribal Cultural Preservation Office to maintain and implement the following Federal laws: the Archeological Resources Protection Act, the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, the National Indian Forest Resource Management Act, and the American Indian Religious Freedom Act through the establishment of a preservation program to identify and protect cultural historical and archaeological resources.

For standards relating to cultural issues, please see Tribal Ordinance 95, the Cultural Resource Protection Ordinance.

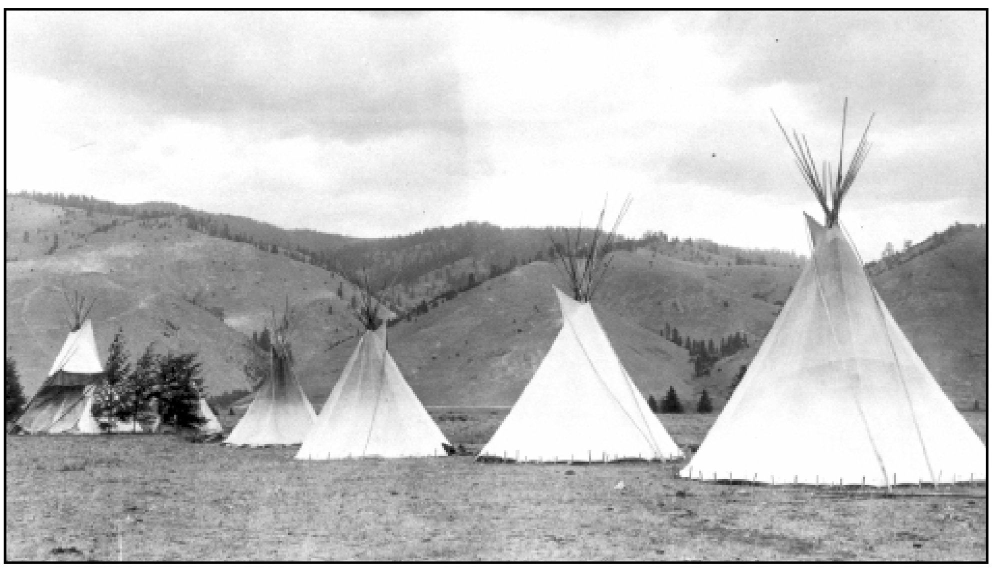


Figure 2-58. Old camp site near modern day Arlee.

Scenery and Recreation

The forests of today, that we consider so beautiful and natural-looking because they haven't experienced any kind of disturbance for half a century, might have been considered quite unnatural several hundred years ago. Indeed, the hunters and berry pickers of that time probably would have missed the mosaic and considered the forest ripe for a few human-lit fires.

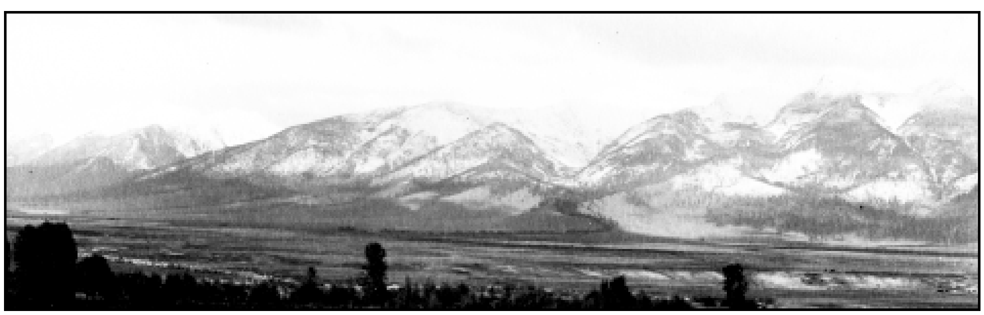
Scenery: Pre-contact Conditions

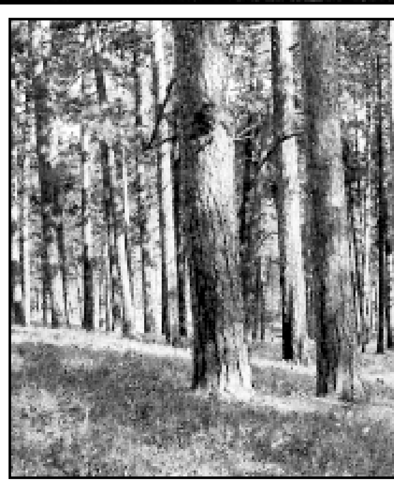
The scenery of the Reservation is influenced to a large degree by the condition of the vegetation. Vegetation provides color and texture on mountain slopes and in meadows, and when the vegetation varies in a natural way, as was the case during pre-contact times, the effect is usually pleasing to humans. Judging from historical accounts and old photos, there was tremendous vegetative diversity during the pre-contact period—the mountains looked very different than they do today, largely because of frequent fires, some of which were set by Native Americans.

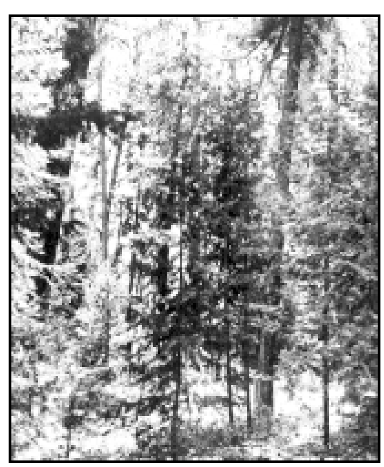
The patterns that resulted varied with slope, aspect, the type of fuel, and the timing of the fire. Small fires often occurred in many different areas producing a mosaic of burned and unburned patches over time. While these burned areas varied in size, shape, and location, ridges, which are vulnerable to lightning strikes, often burned completely, while narrow valleys burned with a more spotty pattern or not at all. Old photos reveal that frequent fires in the 1800s and early 1900s created a tremendously diverse mosaic pattern of vegetation of different ages, heights, textures, and colors.

Foreground Viewing

From the floor of the Mission Valley (below), viewers looked out upon broad grassy rangelands and rolling hills. Periodic fire maintained the grass types in the valley. In fact, Native Americans set fires to stimulate growth of grasses to increase forage for their horses and increase the quantity of edible plants for their own use.







Figures 2-59 a, b, and c. Top, the Missions east of St. Ignatius in the early part of this century. Bottom left, an old growth ponderosa pine stand typical of those found in the Nonlethal Fire Regime all across the Reservation 100 years ago. Bottom right, heavy growth of Douglas-fir in the Nonlethal Fire Regime. In today's forests, much of this formerly parklike regime has converted to this kind of structure.

Pockets of ancient ponderosa pine were scattered throughout the Valley. Frequent fires killed off shrubs and other conifers growing beneath them. But the big trees, which are resistant to fire, survived. The result was a visually appealing, parklike forest.

Mid-Ground and Background Viewing

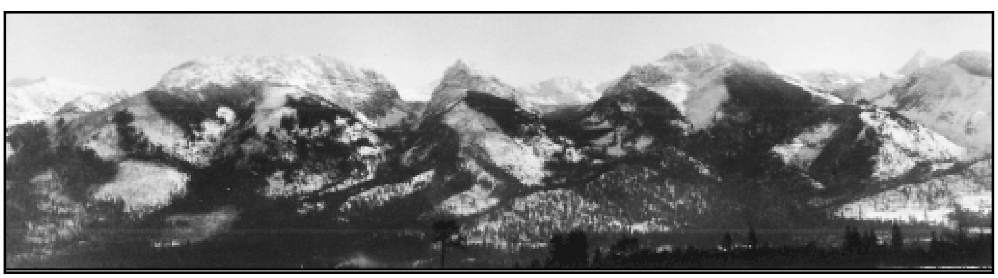
Native Americans in the Mission Valley had a spectacular view of the Mission Mountains to the east. There they saw a mosaic of vegetation created by fire; irregularly shaped mountain meadows were interspersed with stands of young and mature timber. Mountain fires were ignited primarily by lightning although Indian-lit fires also burned substantial acreages.

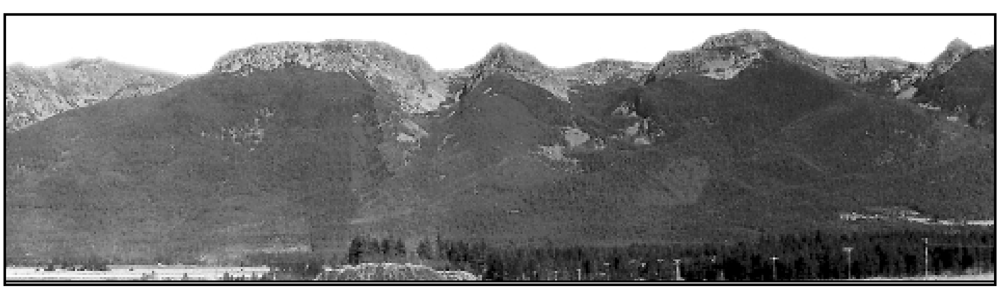
What many view as natural today, for example the forests of the west slope of the Missions, are not natural at all, but the product of many decades of fire exclusion. What is natural appearing may actually be a very unnatural landscape.

Scenery Today

Figure 2-61 shows how the scenery of the Reservation is perceived today in terms of naturalness. It is important to point out that fire suppression efforts in the last 50 to 100 years has interrupted the natural cycle of periodic fire on the Flathead Reservation, and the absence of fire has allowed thick vegetation to grow under once-open stands of large ponderosa pine. The visual appeal of these former parklike stands has been reduced, although they still appear natural. Mountain slopes are now mostly covered by mature timber. The pattern is much more uniform in its color and texture as seen from the Mission Valley than it was in pre-contact times, although this pattern, too, is perceived by many as natural.

The Flathead Indian Reservation remains one of the most scenic areas in the U.S. and the preservation of a high quality visual environment concerns both Indian and non-Indian residents. Currently, Tribal government provides only limited management direction on





Figures 2-60 a, and b. Top, the Missions east of Pablo in the 1920s. Bottom, the same area in 1995. The mosaic is gone.

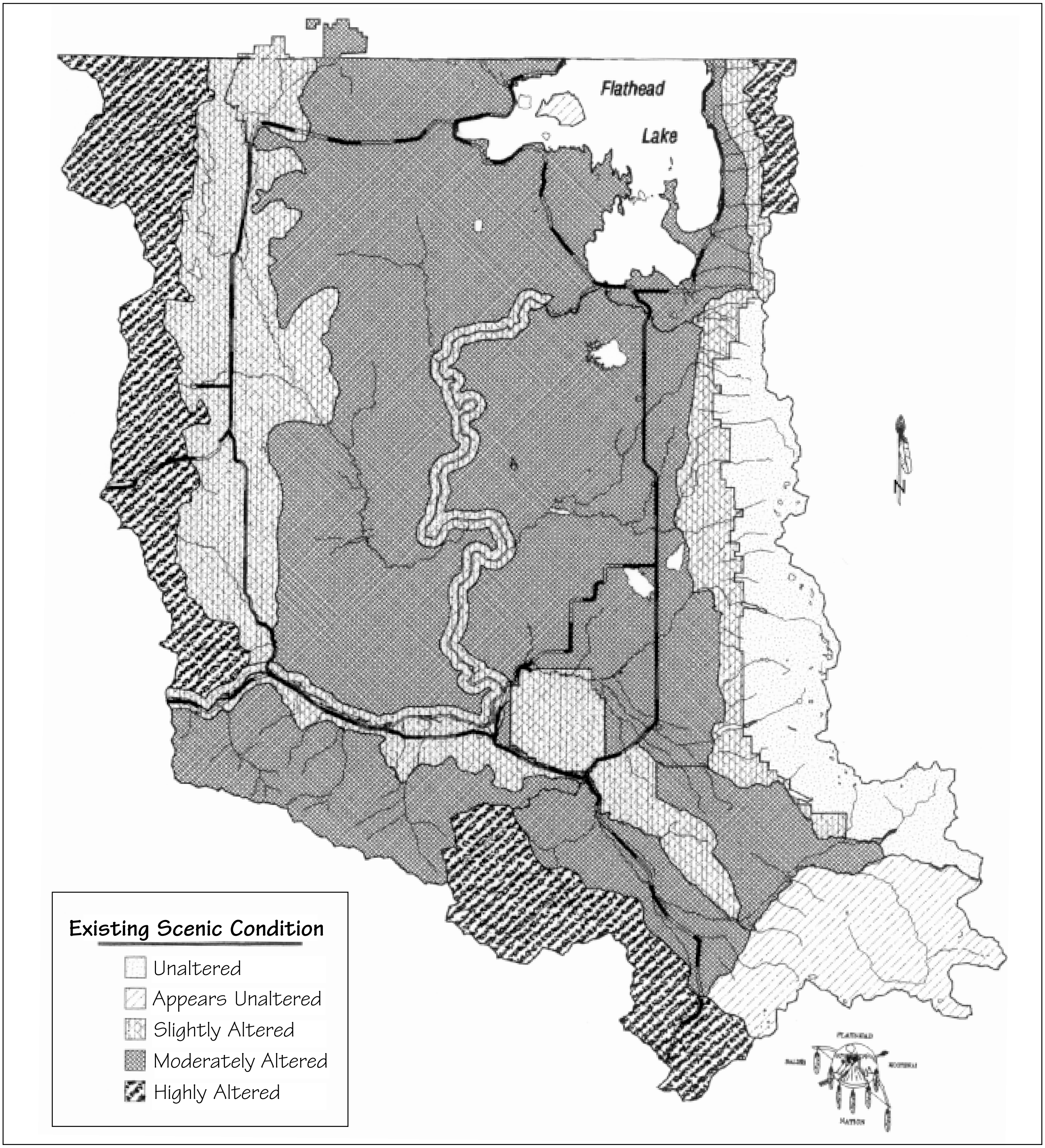


Figure 2-61. Scenic integrity levels reflect unique visual features and visual sensitivity to disturbances such as clearcuts and roading. Definitions for terms used can be found in Appendix M.

visual resources. Regarding timber harvesting activities, the 1982 Forest Management Plan states that: "Scenic areas on the Flathead Indian Reservation that receive special visual quality consideration include areas viewed from major highways, homesites, communities, recreation facilities, Flathead Lake, and forest roads and trails. Some areas are more visually sensitive than others to forest management activities. Special visual-quality protection must be given to the Mission Range, the Flathead River, and the Upper Jocko watershed. The visual quality objective in these special areas should retain the visual resource so man's activities are not evident to the casual observer."

Currently, the 1993 Wilderness Buffer Zone Management Plan is the only other Tribal management plan that addresses any type of guidelines or limits for activities which would alter the forest's scenery. The Buffer Zone Plan states that "retention will be used as the visual quality objective for all resource management activities within the Buffer Zone." (Retention means that management activities are not evident to the casual observer.)

The Tribes prohibit commercial forest harvest activities within the boundaries of Tribal recreation sites, the Tribal Wilderness Area, the Buffer Zone, the South Fork Primitive Area, the Chief Cliff Management Area, and the Lower Flathead River Corridor. In addition, the National Bison Range and Wildhorse Island State Park both have restrictive development policies in place to preserve scenic integrity.

Many areas identified for special attention in the alternatives have not been managed for the preservation of visual quality in the past. However, impacts from past logging may be recovered in time by achieving the Reservation-wide scenery objectives set forth under Alternatives 1, 2, and 3. The two photos below (the bottom is a computer simulation) demonstrate how areas can be rehabilitated so they are more aesthetically appealing. In the lower photo (the computer simulation), the square boundaries of clearcuts so evident today have been feathered and made to follow natural contours. The bottom simulation also assumes about fifteen years of regrowth.

Figure 2-62. When you are face to face with a clearcut (top), the visual affect can be different than when you see one from a distance. From close-up the harsh visual effects soften considerably with time, especially after young trees begin to take over the site (bottom).

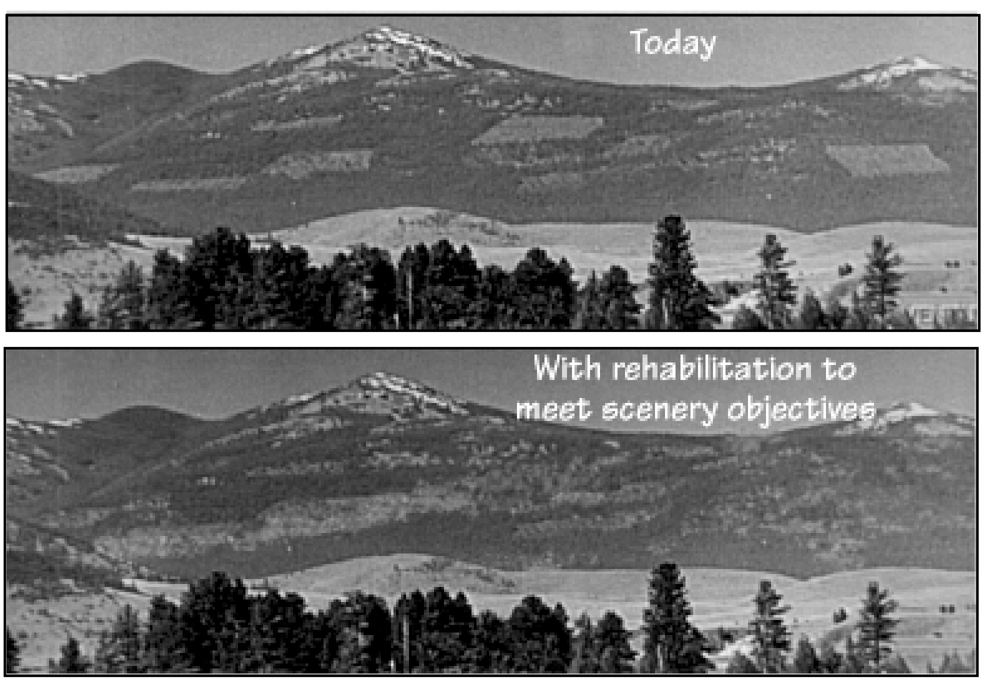


Figure 2-63. The Revais Creek area as it exists today, and how it might look after scenic rehabilitation efforts are completed and fifteen years of regrowth. By feathering the edges of clearcuts and by leaving islands and ribbons of trees, clearcuts can be made to look more natural, more like old burns. The result is more aesthetically pleasing.

Recreation: Existing Conditions

Generations of Tribal members have enjoyed the beauty of the natural environment and the recreational amenities it has to offer. The recreational resources of the Reservation continue to enrich the lives of Tribal members. In addition, they provide economic development opportunities.

During 1990, approximately 767,580 out-of-state vacationers drove through the Reservation on Highways 93, 200, and 28. Natural features that attract visitors to Reservation forests include the Mission Mountains, Flathead Lake, the Flathead River, and the Jocko River. These and many other areas provide the setting for a variety of recreational activities, particularly during the summer. Although recreation use is most frequent during the summer months, winter activities such as cross country skiing, snowmobiling, and ice fishing are also popular. Figure 2-65 shows Tribal Recreation Permit income for the last twenty years.

Rivers, lakes, streams, and roadless areas, such as the Mission Mountains Tribal Wilderness, receive the majority of recreation use, and most use occurs on Tribal land. Over 40 Tribal campgrounds and recreation sites and 60 miles of backcountry trails are maintained each year.

The lower Flathead River is an important recreation area. Many Tribal members boat, swim, and fish its waters and hunt, camp, and practice traditional activities in the forested areas along its banks. The river provides other opportunities as well. Because it is substantially undeveloped, has large rapids, runs, and backwaters, and supports a variety of fish and wildlife species, it attracts people engaged in many types of primitive and water-related recreational activities.

A large percentage of the Reservation's recreational use occurs in forested areas in, and bordering, the Mission Valley. The primary activities include fishing at reservoirs, streams and lakes; waterfowl and upland gamebird hunting; and use of the Mission Mountains Tribal Wilderness. The wilderness, which extends along the eastern border of the Mission Valley, provides hiking, fishing, camping, solitude, and horseback opportunities, and it serves as an

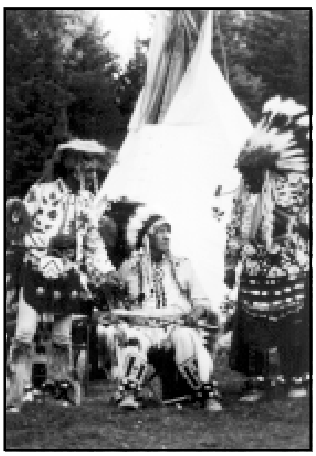
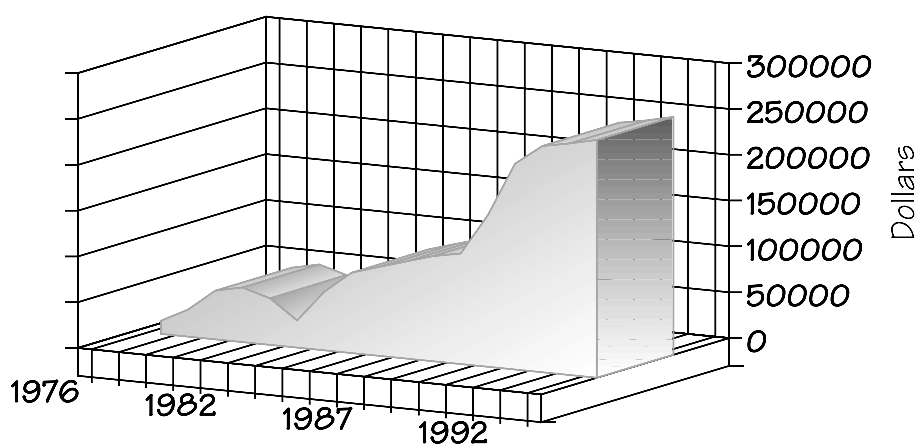


Figure 2-64. Forested areas on the Reservation are used by Tribal members for a variety of purposes.

Figure 2-65. Nonmembers, too, use these lands as demonstrated by recreation permit sales, shown in the graph at right.



outdoor classroom for schools and groups. Trout fishing occurs on most of the streams in the valley, however, large tracts of privately owned land limit access. McDonald Lake, Mission Reservoir, St. Mary's Reservoir, and Twin Lakes provide facilities for fishing, as well as camping, picnicking and hiking.

The Jocko Valley also offers a variety of quality recreational opportunities. The Jocko River and its tributaries are excellent trout fisheries. The South Fork of the Jocko Primitive Area is a recreational and cultural use area reserved for Tribal members and their families. The Jocko Range, which includes a portion of the Jocko Primitive Area and borders the Federally designated Rattlesnake Wilderness, contains one of the largest roadless tracts on the Reservation. These mountains are crossed by a series of backcountry trails that lead to high mountain lakes. The Pistol Creek Range, which forms the northern border of the valley, is an important big game hunting area.

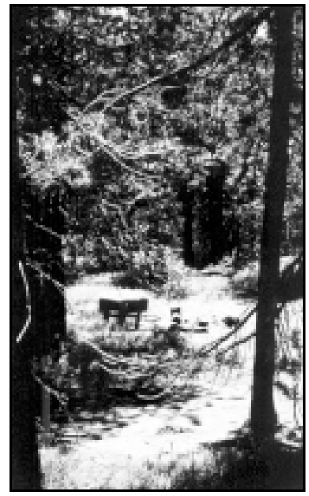


Figure 2-66. A typical backcountry campsite on the Reservation.

The Perma-Dixon area receives a large amount of recreational use from visitors to the National Bison Range, Tribal member big game hunters, fishermen, backcountry hikers and horseback riders. Wildlife viewing at the Little Money and Ferry Basin areas has also become a popular activity. The Reservation Divide along the south end of the Perma-Dixon area offers a range of backcountry recreational experiences. Many people visit and camp at the Agnes Vanderburg Cultural Camp, located in the Valley Creek drainage. The Three Lakes Peak, Black Tail Basin, and Reservation Divide Trails receive moderate use from hikers and horseback riders.

The primary recreation activities in the Camas-Hot Springs area are Tribal member big game hunting in the mountains and northern pike fishing in Dog (Rainbow) Lake, the Little Bitterroot River, Lonepine Reservoir, and the Upper Dry Fork Reservoir. Other activities include hiking, horseback riding, and bird hunting.

The Lozeau Primitive Area, the Salish Mountains, and dozens of streams and lakes also attract recreationists. The Lozeau Primitive Area, established for the exclusive use of Tribal members and their families, offers stream fishing, camping, and hunting opportunities. In addition, Tribal members enjoy big game hunting in the Salish Mountains. Local residents fish streams in the Polson-Elmo area, but use is light. Hiking, camping, and horseback riding are popular activities, particularly in the Jette-Sunny Slope area northwest of Polson. Surrounding landowners fish Jette Lake.

The primary uses of the north end of the Mission Range include snowmobiling, crossing-country skiing, fishing, and Tribal member hunting. Boulder Road receives a large amount of snowmobile use, and the area from Hellroaring Pass to Moss Peak snow cabin receives cross-country skiing use during the winter. The Hellroaring Pass Trail also receives summer use from hikers accessing the Federally designated Mission Mountains Wilderness Area to the east.

Existing Recreation Policies

The Tribal Hunting and Fishing Conservation Ordinance (44-D) is the principal Tribal policy pertaining to fish, wildlife and recreation uses. This ordinance prescribes the regulation of Tribal member and nonmember hunting and fishing on the Reservation, and recreation uses on Tribal and other trust lands and waters. Land use plans for the wilderness, Flathead River,

Pete Beaverhead once said that he would go up into the mountains for weeks at a time and then would not want to come back down because "it was so clear up there. The air made your breathing easy. I didn't want to come back down because I knew the air down below would be bad. It was the stink from the roads and the other things the white man has made."

and Wilderness Buffer Zone also provide recreational management policies as do various site-specific Tribal Council resolutions.

The Tribal Council has established the Division of Fish, Wildlife, Recreation and Conservation, which includes the Tribal Wildland Recreation Program. The Wildland Recreation Program oversees management of all recreational resources except fish and wildlife. It coordinates administrative and private activities affecting either the quality of recreational experiences or the amount, timing, and distribution of recreational use. It also maintains the 44-D permit system. Priority areas for the program include the Mission Mountains Tribal Wilderness, the two primitive areas, the Lower Flathead River Corridor, and Tribal parks and recreation areas.

The Tribes use an interdisciplinary approach in the management of its recreational resources. The process involves many Tribal programs and departments as well as other affected parties. An example is the Wilderness Buffer Zone Administrative Use Committee established in 1986 to manage land use activities along the western base of the Mission Mountains Tribal Wilderness. The committee consists of Tribal Council and culture committee members and specialists from the Natural Resources Department.

Figure 2-67. The Mission Mountains Tribal Wilderness is one of the most popular backcountry recreation areas on the Reservation. The scenery, fishing, and camping it offers draws both Tribal and non-tribal use from a relatively large area.

Current Tribal management strategies recognize the importance of the Reservation's diverse outdoor recreation opportunities. Managers determine development and maintenance activities using integrated resource management strategies that consider the protection of cultural uses, landowner concerns, and timber and grazing values, as well as the protection of water quality and sensitive plant and wildlife habitats.

Transportation: The Existing Condition

Currently, there are approximately 2,930 miles of forest roads within the Reservation. As shown in the table below, 701 miles of these are classified as main haul roads, 836 as major spurs, and 1,397 as minor spurs.

Forest roads are essential for logging and other forest management activities. Most forest roads on the Flathead Reservation are constructed or reconstructed for removing timber and other forest products. However, they also provide access for hunting, fishing, recreation, forest administration, fire control, and other uses. Some forest roads provide the only access for scattered private fee lands and State inholdings. In addition, there are a number of county roads that connect to forest roads.

Figure 2-68. Although most forest roads on the Flathead Reservation have been constructed for removing timber and other forest products, they also provide access for hunting, fishing, recreation, forest administration, fire control, and many other uses.

A portion of the present Flathead Reservation road system evolved from road and trail construction during the 1930s and early 1940s under the Civilian Conservation Corps-Indian Department (CCC-ID). Created during the Great Depression by President Franklin D. Roosevelt, the CCC-ID built or rebuilt and improved many miles of primary access roads up the major drainages and over major ridges. The main justification for these projects was fire protection, but the roads were also expected to be useful for future logging, and this probably determined locations and lengths. Some have become important main haul roads. Many of the existing main haul roads are now on the Bureau of Indian Affairs (BIA) Road System. Past timber sales generally incorporated these access routes and any other old or existing roads and trails into the road system in order to reduce costs.

The Tribal Forestry Department is in the process of developing a Forestry Transportation Plan. The primary reason for formulating and completing the plan is to do a needs analysis for access while balancing other resource concerns. Several projects mentioned in the last Reservation forest management plan have been completed including the orthophoto mapping of forest areas, mapping and identification of forest roads by number, and signing of all forest roads.

Road Classification

Forest Road Units and Numbering System

The Reservation has been divided into 15 Forest Road Units. Road unit boundaries are defined by the Reservation boundary, major highways or primary access roads, major topographical features, and section lines. Within each road unit, all forest roads have been systematically identified by a common letter or letters followed by a four-digit number (i.e. D-1000 for Dixon Forest Road Unit Road 1000, HS-4000 for Hot Springs Forest Road Unit 4000 Road and etc.). This identifies road type and its relative location. In addition, road types are designated by a different number sequence. For example, main haul roads have an even thousand number, 1000, 2000, 3000, etc. Major spurs add 100s or 50s to the 1000s, and minor spurs add 10s or 1s (table 2-10). Nearly all forest roads have forest road number signs posted at the beginnings and intersections.

Table 2-10. Number of miles of each road type.

	Main Haul (1000's)	Major Spur (100's)	Major Spur (50's)	Minor Spur (10's)	Minor Spur (1's)
Miles	701	583	253	683	714

BIA Road System

There are 39 designated BIA forest roads totaling approximately 345 miles. This mileage is included in the 2,930 total miles of forest roads. BIA roads have a BIA road number and, in addition, a forest road number (see Appendix L for the list of BIA roads that serve as main hauls and their corresponding Forest Road numbers). The BIA number is not posted, but the Forest Road number is. There are 12 bridges on the BIA system.

Inventory and Condition

At present, an estimated one-third or 1,000 miles of the forest road network is considered usable. Approximately 900 miles of the total 2,930 miles of forest roads have been field inventoried. The inspections and reports are done as field personnel have time or during individual timber sale preparation.

The BIA Road System portion of forest roads has been inspected every three years on average and the results are reported in the *BIA Road Condition Report*. Most of these roads have generally fair to poor surface conditions. BIA bridges are constructed out of timber and are in good to poor condition. A formal engineering bridge inspection is conducted every two years by a consultant for the BIA Portland Area Office. Tribal staff also conduct inspections.

Road Densities

Road densities as of 1990 are shown in figure 2-70. Although this map is six years old, it represents the most recent compilation of data.

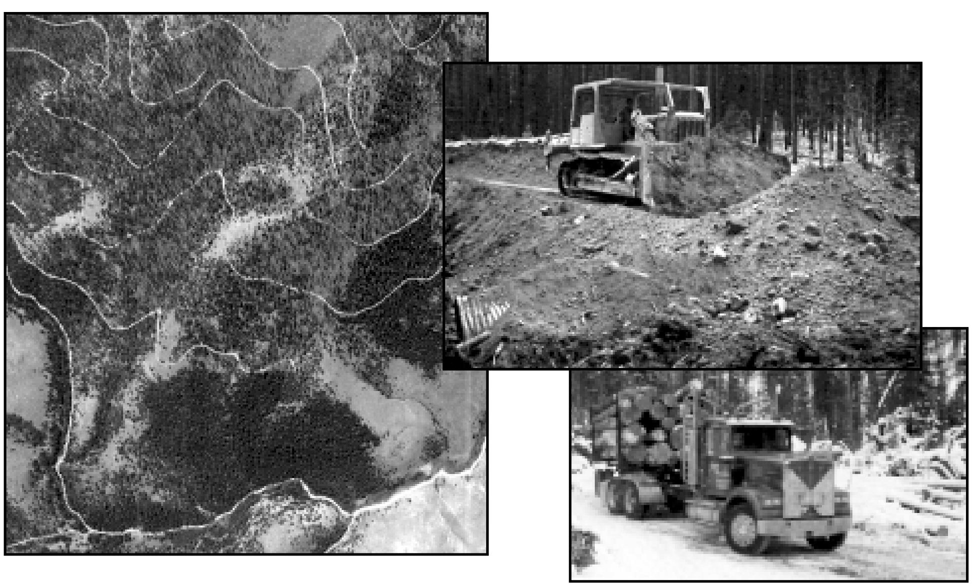


Figure 2-69. One of the main reasons for considering road densities is the impact roads have on fish and wildlife. Open roads affect habitat security and both open and closed roads may affect fish because of the sediment roads can generate. Having sustainable populations of fish or wildlife may require lowering road densities substantially, as well as meeting BMPs.

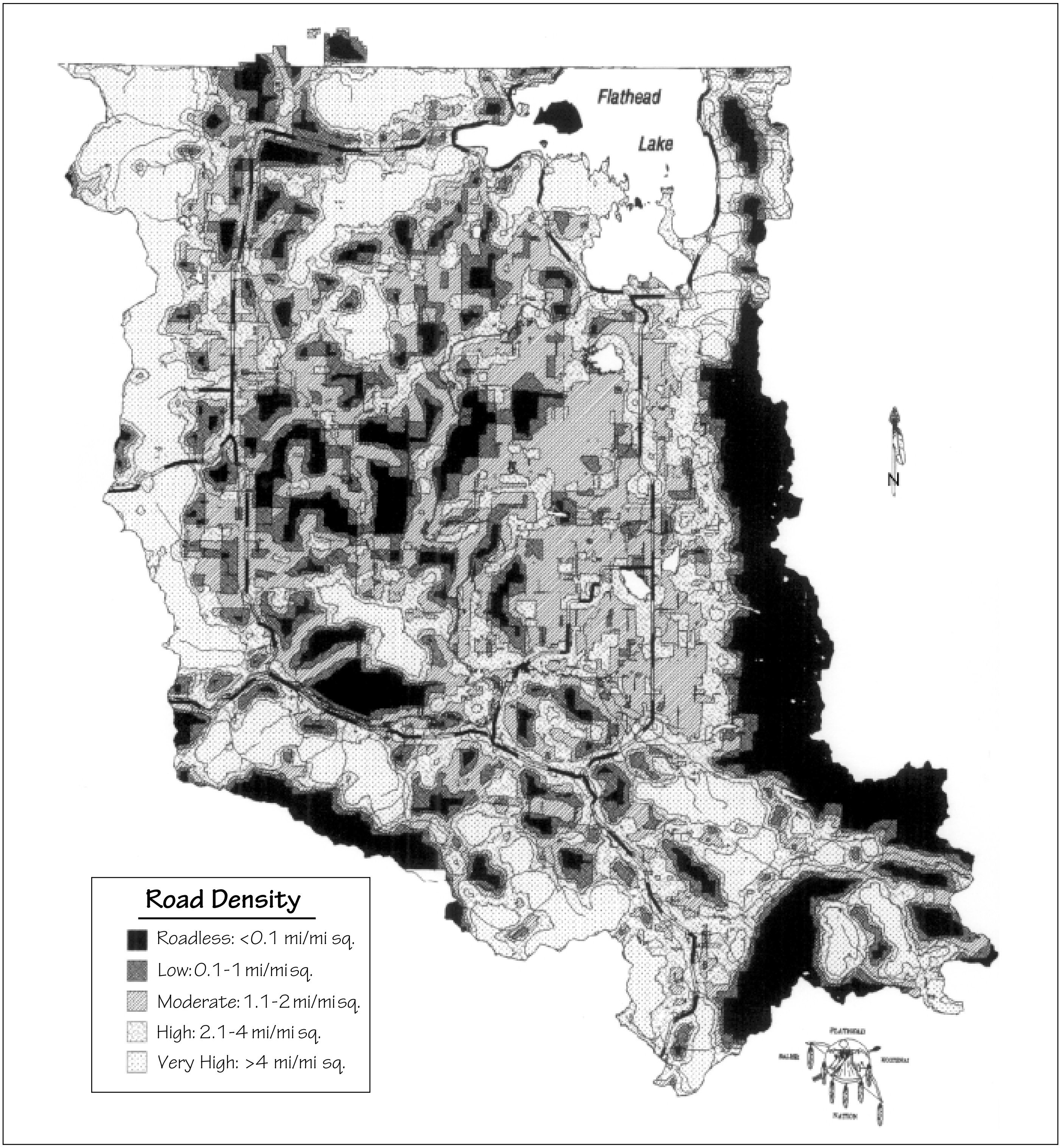


Figure 2-70. Reservation-wide road densities (1990) in forested and non-forested areas. Road densities are on average three times higher in the forest than in the valley bottoms.

Existing Road Policies and Guidelines

Best Management Practices

The general guidelines laid out in the *CSKT Forestry Best Management Practices* (BMPs) passed by Council on January 6, 1995 are to protect soil and water resources. The following BMPs relate to forest roads (see *CSKT Forestry Best Management Practices* for more detailed information on BMPs):

Figure 2-71. A portable railroad flatcar provides access across streams less than 10 feet wide with minimal disturbance to the stream banks or bed. This type of practice is consistent with Best Management Practices.

A summary of Best Management Practices

1. **Minimize number of roads, use existing roads where practical.**
2. **Fit roads to topography and avoid grades over 8%, drainage bottoms, and large cut slopes.**
3. **Locate roads on stable materials and outside of streamside management zones.**
4. **Minimize number of stream crossings; locate crossings perpendicular to channel; reconstruct abandoned stream crossings to stable configurations; design for 50-year peak discharge and passage of fish.**
5. **Avoid intercepting shallow groundwater.**
6. **Provide adequate road surface drainage; keep drainage from streams; avoid berming material on road perimeter; construct rolling dips; install water bars; and crown road/outslope road.**
7. **Construct stable cut and fill slopes; stabilize erodible soils.**
8. **Minimize activity during wet periods.**
9. **Reseed road prism.**

Density and Spacing

While roads are only one factor that affects a viewshed, they can have long-term affects. Cumulatively, roads can degrade a viewshed, which is one reason why their location, spacing, density, and standards are important.

Current forest transportation system planning reflects the Tribal Council's desire for an average road spacing of 1000 feet slope distance or 5.5 miles per section because of Tribal concerns over wildlife and water quality. (The previous average for road density was 5.5 to 6.25 miles of forest roads per section with spacing averaging 900 feet of slope distance.)

The density and spacing requirements vary depending on the degree of slope. For example, on slopes greater than 45% and suitable for cable skidding, road spacing averages 750 feet slope distance. On slopes less than 45%, average road spacing ranges from 900 to 1300 feet. If the average slope in the forest is approximately 35%, the average miles per section would be close to 5.5 miles of road per square mile. In the future on slopes greater than 35%, road spacing averages should be at least 800 to 1200 feet. On slopes less than 35% road spacing averages should be at least 1200 to 1800 feet.

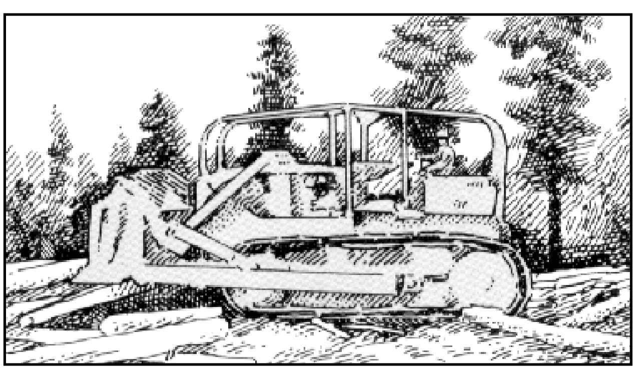
Most timber sale entries now eliminate some old roads to meet the 1000-foot spacing criteria. If new roads are planned, then more old roads are eliminated and permanently put to bed. These abandoned roads are reseeded to return them to productive growing sites and to limit sediment production.

The Effect of Roads on Scenery

Careful consideration is given to the visual impact that roads have. Each timber sale that affects scenic resources includes a Geographic Information System (GIS) graphic depicting the visual impacts of each alternative in an environmental assessment or impact statement. The aesthetic importance and visual degradation of areas as viewed from close up are also important; swaths cut through the forest for roads, cut and fill, erosion and other soil disturbance from roads and road construction affect our aesthetic sensibilities. Although some modification of the forest and visual environment must be expected from roads, the key is the degree and magnitude of the change.

Maintenance

All roads, including newly constructed or reconstructed roads, are seeded with grass immediately after construction and after logging activity has ceased. Issues like dust abatement, weed control, and weight limits are considered for each timber sale.



BIA Road Maintenance

In past years, the limited amount of BIA road maintenance funding has been able to keep approximately 7% of the BIA system maintained. Considerable expense goes to snow removal and pavement maintenance for streets in Tribal homesites. The remaining funds are used for brushing, signing, grading, bridge repair, and some culvert installation. In 1995, through the Self-Governance compact, the Tribes were able to increase the budget by 73%, which may allow a doubling of maintenance activities on BIA forest roads.

Timber Sale Maintenance

Roads and bridges are improved prior to the start of a logging operation to bring them up to standards for logging trucks. The timber sale contractor is required to maintain logging roads in a condition suitable for logging trucks and to do it in an environmentally sound manner.

Wildland Recreation and Safety of Dams

Occasionally these two Tribal Programs carry out limited road or bridge maintenance on roads that are important for recreation and irrigation.

Road Management

Road management in this context refers to the determination of which roads will be closed or opened. As of January 1993, the Tribal Council directed no more than a maximum of four miles of open road per section.

Effective road closure is critical to minimize disturbance of wildlife and to protect habitat. Road management for each timber sale is planned by the interdisciplinary team. The plan is then proposed to the Tribal Council for a final decision regarding closures. BIA roads may be restricted in use or closed to public access in certain situations. “When required for public safety, fire prevention or suppression, or fish or game protection, or to prevent damage to unstable roadbed, the [Secretary] may restrict the use of them or may close them to public use." Additional reasons to close forest roads are to protect cultural resources, reduce road maintenance costs, and to discourage trespassing on Indian lands.

The following guidelines for closed or abandoned roads are in the BMPs.

Guidelines for closed or abandoned roads

1. **Stabilize cut and fill slopes, borrow areas, and any other road-related feature.**

2. **Remove cross drainage and ditch relief culverts and provide for permanent runoff control on abandoned roads.**

3. **Reseed all road surfaces, cut and fill slopes, log decking areas, and borrow areas.**

4. When culverts and bridges are retained, provide for long term maintenance.

5. When culverts and bridges are removed, reconstruct stream crossings to a stable configuration.

Access to closed roads for necessary forestry or other activities is regulated by a Tribal permit system enforced through Tribal Fish and Game.

Seasonal Closures

When a road is closed for a portion of the year for reasons such as wildlife management or fire suppression or danger, but the intent is to reopen the road again when possible, a seasonal closure is used. Seasonally restricted access is often accomplished by locked gates or by breaching the road. The duration of closure may be short-term or long-term, depending on the situation.

Temporary Closures

Temporary closures may be long-term, for example, until the next timber sale entry period. The closure alternatives are determined by the interdisciplinary team as part of a road management plan. Temporary closures are usually accomplished by ripping up the first 100 feet of road surface.

Abandonment

A road is abandoned for use and returned it to its natural condition if it is no longer needed or there are other benefits that outweigh its remaining open. Abandonment is accomplished by ripping the entire length, removing culverts, installing waterbars, grass seeding, and blocking access.

Air Quality: The Pre-contact Condition

Although there is no known historical air quality data for the pre-contact period on the Reservation, it is known that fires and smoky conditions were common. Journals from early day explorers and priests as well as newspaper articles from the late 1800s often mention the almost continuous smoke pollution caused by fires burning in western Montana and northern Idaho. Fires ignited by lightning or by Native Americans would have generated smoke visible for periods of as short as a few hours to as long as 90 to 120 days.

Figure 2-72. Journals from early day priests as well as newspaper articles from the late 1800s often mention the almost continuous smoke pollution caused by fires burning in western Montana and northern Idaho.

Air Quality: The Existing Condition

The Flathead Indian Reservation is a designated Class I Airshed. This designation was initiated through Tribal Resolution in July, 1979. A Class I classification provides the highest level of air quality protection to Indian lands by limiting the amount of additional human-caused air pollution that can be added to the airshed. Under this classification, existing air quality can not be significantly degraded from what it was in 1979.

The Tribal Forestry Department will cooperate with the Tribal Air Quality Department and the State of Montana Air Quality Bureau to assure that Tribal, State, and Federal air quality standards are met or exceeded, and that the airshed meets constraints established by the *Montana State Airshed Group's Memorandum of Understanding*, 1985.

The combustion products from prescribed burning include; water vapor, particulate matter, hydrocarbons, trace minerals, and noxious gases (carbon dioxide, carbon monoxide, and nitrogen oxides). Particulate matter generally has the most potential for reducing air quality below health standards. Specifically, particulate matter less than or equal to 10 micrometers in aerodynamic diameter (PM 10) is the size that can penetrate the inner recesses of the lungs and cause health problems.

The communities of Ronan and Polson are classified as non-attainment areas for national ambient air quality standard of PM 10 by the Environmental Protection Agency. These communities are the only local areas where potential health problems exist from poor seasonal air quality impacts from automobile, road dust, wood stoves, industrial, agricultural, and prescribed fire emission sources. At times, the Flathead Indian Reservation is impacted by off-site emissions from wildfire, prescribed fire, and agricultural burning activities in western Montana, Idaho, and eastern Washington.

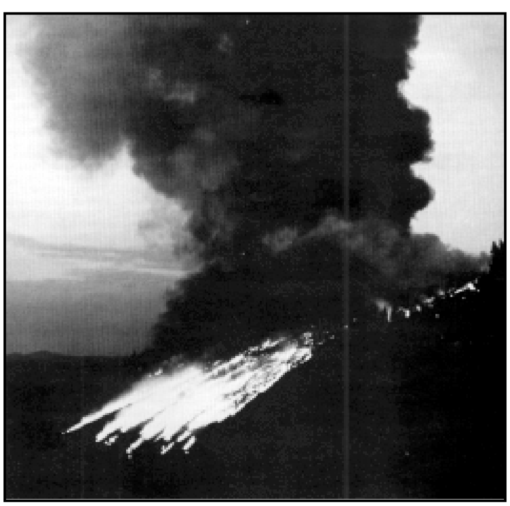


Figure 2-73 (left). Combustion products from prescribed burning include; water vapor, particulate matter, hydrocarbons, trace minerals, and noxious gases (carbon dioxide, carbon monoxide, and nitrogen oxides).

Flathead Indian Reservation air quality is impacted by various activities associated with timber harvesting, prescribed burning, and wildfires. Wildfires and prescribed fire smoke emissions cause temporary particulate and visibility impacts on local air quality.

These effects are dependent on the type of burn, the amount or type of fuel consumed, and seasonal airshed characteristics that affect smoke dispersal. The annual amount of smoke generated from forest and range fires has generally decreased since the early 1900s, even with today's use of prescribed fire thanks to the advent of a total fire suppression policy.

Reservation prescribed-fire-smoke emissions are estimated to average 342 tons of particulate and 270 tons of PM10 particulate per year. Total smoke emissions range from an estimated 214 tons total particulate and 169 tons PM10 particulate in 1986 to 544 tons total particulate and 430 tons PM10 particulate in 1991. Annual emissions from wildfires and prescribed natural fires have not been calculated.

All prescribed fire activities are conducted under excellent to good smoke dispersal conditions and have not significantly impacted Reservation sensitive or non-attainment areas. Most of the burning projects are conducted during spring and early summer months, which are generally the best months for smoke dispersal. Limited broadcast burning and dozer pile burning are conducted during the fall burn season under the Montana Airshed Group burn permit system. Prescribed burning is not conducted during the winter months.

Grazing: The Existing Condition

Domestic Livestock

The Tribes first grazed livestock (horses) in the late 1600s or early 1700s. Within a few years of cattle coming to the reservation in the late 1800s, some Tribal people had established large herds. By the 1930s, non-Indians had large numbers of livestock, particularly sheep. The continuous, season-long grazing and overstocking during that period damaged Tribal grazing lands and degraded other resources. Native forage species declined while introduced species, including undesirable grasses and noxious weeds, increased. The Indian Reorganization Act of 1934 enabled the Tribes to gain control over unsettled lands and consolidate them into timber and range tracts. This land consolidation created the basis for the present Tribal range units.

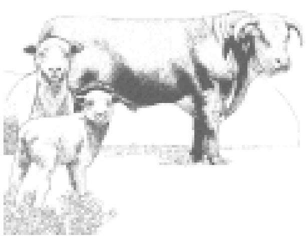
The Reservation now has 51 designated range units encompassing more than 320,000 acres of the Tribal land base. Most of these range units are permitted to six Indian stock associations and to individual Tribal member stockmen. They include open and forested units with forested and woodland areas accounting for approximately 80% of the total.

Domestic livestock grazing occurs in all of the forest landscapes. In the North Missions, however, it is minimal. There are no range units in this landscape and only a few Tribal tracts in the Turtle Lake area are leased for livestock use. Seven range units are designated in the Missions Landscape but they are all inactive. Past Tribal Council action has idled them to favor wildlife. Pasture leases occur in the foothills, from Ronan south to St. Ignatius. Those in the Wilderness Buffer Zone are specifically targeted for inventory and stocking rates with seasons of use established prior to leasing, as required by the Buffer Zone Plan. Grazing of leases are planned with interdisciplinary input, particularly those leases in grizzly bear habitat. All seven range units in the Jocko Landscape are active. Those in the Thorn Creek area are used in combination with adjoining pasture leases to incorporate seasons of use and pasture rotations. Three range units and a few pasture leases occupy most of the Southwest Landscape. The West Landscape is entirely incorporated into range units and pasture leases. Seventeen range units and numerous pasture leases occur within the Salish Mountains Landscape. Grazing in Ferry and McDonald Basins is authorized by a grazing permit (not a designated range units) and one lease. These areas are managed primarily for elk conservation. Livestock grazing is allowed, but the full potential of the area for livestock is not utilized. Wildlife has precedence. The two designated range units in Piano Creek area of Ferry Basin have been idled for wildlife.

Figure 2-74. The Reservation now has 51 designated range units encompassing more than 320,000 acres of the Tribal land base. Most of these are permitted to six Indian stock associations and to individual Tribal members. Forested and woodland areas account for approximately 80% of the total acreage.

The most recent vegetation inventory was conducted during 1979 and 1980, and it showed that most timbered range units were in fair to good condition. Some areas were in good to excellent condition, meaning they contain a predominance of desirable native species.

Economic Benefits of Grazing



In the late 1940s, the Federal government established a program to provide seed stock to start Tribal members in the livestock business. The livestock industry has become an important source of income for many Tribal members and is a major component of the regional economy.

Current stocking rates for all the range units allow for about 7,000 head of cattle. Some permits allow for horses or sheep. Forested range units are permitted for grazing during the growing season. Stocking rates in the timbered range units vary from three to over 25 acres per animal unit month (AUM).

Approximately eighty-five Tribal members and their families are supported, at least partially, by forest agriculture (range unit permittees and/or grazing lessees). The most recent census data for 1990 indicates wide variabilities in reported farm income. The census data is not specific to enrolled members of the Confederated Salish and Kootenai Tribes, and does not identify whether or not the reporting household used forest agricultural resources. The data was collected with persons "self-identifying" their principle tribe, whether enrolled or not. Table 2-11 reports the mean annual household income during 1989 by source. Farm self-employed income is net money income (gross income minus operating expenses) by the owner, renter or share cropper. Wage and salary income is the total gross money earnings, before deductions.

Table 2-11. The mean annual household income of families making a major part of their living from range units or grazing leases.

Claimed Tribal Affiliation	Wage and Salary Income (# reporting)	Farm Self-Employed Income (# reporting)
Kootenai	$20,121 (115)	$890 (4)
Salish	$18,769 (760)	$5,897 (51)
Salish and Kootenai	$17,921 (505)	$9,497 (53)

Figure 2-75. The most recent range inventory, which is now 18 years old, found most of timbered range units were in fair to good condition and some areas (such as the one shown below right) were in good to excellent.

Annual Tribal revenue from forest grazing is approximately $45,000 which is deposited in the Tribal general fund. Of the 116 personnel in the Tribal Natural Resources Department (NRD), 10 are employed within the Agriculture Program of the Division of Lands. There is one range conservationist and one range technician to manage all the Tribal range units. The Agriculture Program uses an interdisciplinary team approach to manage lands and requests expert input from other NRD Divisions and Tribal programs to assist in the formulation of management alternatives.

Figure 2-76. Off-stream livestock watering points such as this one can protect streams and riparian areas from livestock impacts.

Minerals: The Existing Condition

The Flathead Reservation lies in the Rocky Mountain trench, which extends from the southern part of the Reservation into Canada. Rocks are mainly of the Precambrian Belt supergroup and more than 30,000 feet thick. Tertiary rocks cover the Precambrian rocks in the northwestern part of the Reservation. Valley bottoms contain thick deposits of glacial till and lake sediments of Pleistocene age.

Mines in the southern part of the Reservation have produced small quantities of metals in the past, but there are no mines producing now. About 9,000 tons of copper ore was mined at the Revais Creek mining district from 1910 to 1949. Patented mining claims in the Camas Prairie mining district yielded almost 1,500 tons of copper ore, mostly during the 1940s.

Historically, Tribal people used small amounts of stone and clay for building, hunting, fishing, warfare, and domestic and religious purposes. Commercial development of mineral resources on the Reservation by non-Indians started in the early 1900s. Miners staked many claims and established a few mining operations between 1910 and 1949. These small-scale mines produced modest quantities of gold, silver, and copper. Since 1917, sand and gravel have also been mined. In the mid 1980s, several oil companies leased land and explored for gas and oil. Activity has since subsided, and there is little interest in further exploration. Small, low grade, noncommercial coal deposits also occur.

Metallic minerals on the Reservation include copper, lead, zinc, silver, gold, platinum, and palladium. The Prichard Formation underlies a large part of the Reservation and is the same formation that lead, zinc, and silver are mined from in British Columbia. Mines in the southern part of the Reservation have produced small quantities of metals in the past, but there are no mines producing now. About 9,000 tons of copper ore was mined at the Revais Creek mining district from 1910 to 1949. Patented mining claims in the Camas Prairie mining district yielded almost 1,500 tons of copper ore, mostly during the 1940s. Total recorded mineral production has been small. Only narrow, high-grade veins have been mined, and only mineral occurrences with surface exposures have been prospected. The Flathead Mine near the north boundary of the Reservation has produced over seven million tons of lead-silver ore. It is currently not active due to low silver prices. Prospecting pits occur in Hog Heaven, Camas Prairie, Ferry Basin, and the Southwest portion of the Reservation. There is one active, noncommercial mine near the Ferry Basin lookout.

Sand and gravel deposits found throughout the Reservation are the most valuable nonmetallic mineral resource. There has been recent interest in mining stone, clay, and other deposits for building projects.

Figure 2-77. Total recorded mineral production on the Reservation has been small, and no mines are producing now.

Socio-economic: The Existing Condition

Analysis Area

The analysis area can be divided into two overlapping parts. The first is the study area. This is the area within the exterior boundaries of the Reservation. The second is the socioeconomic impact area. Forest management related activities—for example, harvesting, thinning, planting, road building—affect areas outside the Reservation and therefore have social and economic effects in surrounding counties and communities.

Portions of four counties occur within the Reservation. Lake and Sanders Counties comprise the largest portion, making up 54.7 % and 35.1 % of the land area, respectively. Missoula County makes up 7.9 % and Flathead County 2.3 %. The Reservation encompasses a total of about 1.3 million acres, 71,800 acres of which are lakes and rivers. Tribally owned lands (trust) comprise about 656,000 acres or about 50% of the land. Of these trust lands, 451,000 acres are forested, and about 298,000 are managed as commercial forestland.

The Reservation is primarily rural but includes four main towns—Polson, Ronan, St. Ignatius and Arlee. The Reservation also includes a handful of smaller towns—Hot Springs, Dixon, Ravalli, Big Arm, Elmo, and Lone Pine. The remainder of the population is thinly dispersed on farms, ranches, and rural homes.

Social Setting

Settlement Patterns

To understand many of the diversity and population trends we see today, it helps to know the history of the Reservation. The Hellgate Treaty of 1855 established the Reservation boundaries, but it took more than 35 years before the federal government forced most of the Tribal members onto the Reservation. As a prelude to allotting the lands and opening the Reservation to homesteading by nonmembers, the federal government "enrolled" reservation Indians as Tribal members between 1902 and 1909 . In 1910, the Reservation was opened to homesteaders. Some 1.1 million acres became available to the new settlers. The vast majority of the homesteaded land was in the agriculturally rich valleys. The Indians were left with most of the forested land and scattered allotments. Over the years, much of the allotted land was sold to nonmembers. In recent years, however, the Tribes have started an aggressive land acquisition effort in an attempt to reverse this trend.

As a result of this settlement pattern most of the forested land remained in Tribal hands, while most of the land suitable for agriculture was transferred to nonmembers. Nonmember populations grew larger than Tribal populations in a short time, and today three-quarters of the population is non-tribal.

Considerable social conflict has resulted from this history of settlement. Jurisdictional disputes are common, and a degree of racial antagonism and segregation exists, with both sides asserting a certain amount of authority over resources and amenities.

Lifestyles

The study area is predominantly rural. Residents, both Tribal and non-Tribal, tend to be conservative fiscally if not politically. There is generally resistance to rapid change. Attitudes toward forest management and harvest are also conservative.

The Tribes own the vast majority of the forested land within the Reservation and are dependent upon it sociologically, culturally, and economically. Forested lands form a large part of the economic base of the Tribes; comprising nearly 70% of the total Tribal land base.

The presence and use of the forest resource influences the lifestyles of all Reservation residents. The forest provides not just raw materials for the wood products industry, but it also offers opportunities for recreational, cultural, spiritual, and aesthetic activities. While the dollar values of these activities are not easily quantified, they are considered important to both the Tribal and non-Tribal public, and are incorporated into forest management decisions.

Population

The Reservation is home to both Tribal members and nonmembers. The following table summarizes the distribution of population by counties and the Reservation as a whole.

Table 2-12. Flathead Reservation Population (U.S. Census 1980 and 1990)*

	Lake Co. Portion	Sanders Co. Portion	Missoula Co. Portion	Flathead Co. Portion	Reservation Total
1990					
Indian	4469	371	283	7	5130
Non-Indian	14426	1267	421	15	16129
Total	18895	1638	704	22	21259
1980					
Indian	3140	344	283	4	3771
Non-Indian	13918	1543	370	26	15857
Total	17058	1887	653	30	19628
Change: 1980 - 1990					
Indian	42%	8%	0%	15%	36%
Non-Indian	4%	-18%	14%	-42%	2%
Total	11%	-13%	8%	-27%	8%

* From CSKT, Comprehensive Resources Plan 4-3 (Draft) Identification as Indian does not necessarily mean respondents were Tribal members.

Both Tribal and County officials believe the 1990 census data are lower than actual numbers (Shelby, Sanderson 1992).

The most striking statistic from the table is the increase in Indian population. During the decade of the 1980s, Indian population increased from 19% to 24% of the total Reservation population. It is not possible to determine whether this shows an actual increase, a willingness to declare Indian status, or some other factor. In any case, the Indian to Non-Indian ratio has changed from 1 to 4 in 1980 to 1 to 3 in 1990. This is a large change and may have significant social and political effects.

Social Conditions

The rural character of the Reservation has gradually changed over the past thirty years and the rate of change has accelerated over the last five years. What was once an agriculture- based economy is becoming a more urbanized one. Small businesses are opening, many of those catering to the tourist trade. Land values are escalating rapidly as disgruntled city dwellers retreat to the security of small towns with their perceived low crime rates and high amenity values. These immigrants bring with them many values from the cities. Polson in particular is changing from an agriculturally supported community to one supported largely by recreation and tourism.

At the same time, public attitudes about logging have shifted. Considerations for recreation, wildlife, water quality, aesthetics, and culture have reduced harvest volumes from 70,000,000 board feet per year in the early 1970s to less than 40,000,000 board feet per year in the early 1990s. In 1994 the volume cut under contract was less than 6,000,000 board feet. As harvest volumes have declined, so have some of the high paying jobs in mills and logging operations. Some of those jobs have been replaced with lower paying jobs in the service sector of the economy. Because the forest base represents such a large part of the Tribal economy, economic effects are felt strongly by the Tribal public.

The table that follows summarizes some of the socio-economic differences between Indians and non-Indians on the Reservation.

Table 2-13. Socio-economic characteristics of Indians and Non-Indians on the Flathead Indian Reservation. (U.S. Census 1990)*

Trait	Indian	Non-Indian
Median Age	23.7 years	35.8 years
Per Capita Income	$6,428	$10,098
Graduated High School	73%	77%
Hold Bachelors Degree	5.5%	15.3%
Unemployment Rate	17%	9%
% at or below Poverty Level	38.5%	20.5%

Area Economy

Natural resources provide the economic base for the reservation. The productive agricultural lands of the valley represent the largest segment of the economy of the study area, however most of the income from these lands goes to nonmembers. The surrounding Tribally owned forest lands provide income from wood products and recreation-related activities. Flathead Lake draws recreational income into the area economy; most of that income goes to the Polson area. The majestic natural setting of the Mission Mountains and Flathead Lake has attracted many retirees.

Forest Related Employment and Personal Earnings

The economic effects of major forest product harvest (contract timber sales) was analyzed by the Bureau of Business and Economic Research at the University of Montana and M. Nicholucci of the Forest Service, using 1993 volume data. The following chart shows the jobs and income generated by the harvest of each million boardfeet of timber. “Direct” refers to the actual forest harvest and mill jobs and income attributable to harvest. Indirect refers to services purchased by those engaged in harvest, and induced refers to income and jobs generated when the direct workers spend their money in the local economy.

Table 2-14. Jobs and Income Produced by Timber Harvest (per MMBF) (Bureau of Business and Economic Research).

Type	Jobs	Income
Direct	11.03	$350,170
Indirect and Induced	22.17	437,713
Total	32.20	$787,883

These figures apply to the entire socioeconomic area, not just the study area. Some percentage of benefits goes to surrounding communities where raw materials are milled and services are purchased.

There is little information on how many of these jobs are held by Tribal members. Contractors who win major timber sales are required to employ at least 25% Tribal members for the harvest operation, and records show that they are meeting the requirement. Although data is unavailable, it is unlikely that mills employ Tribal members in proportion to the percentage of the population they represent on the Reservation.

Major Forest Products Based Industries

Agriculture, retail trade and services, forestry, and recreation are the major segments of the Reservation economy. The only forest-based major industry left on the Reservation is the Plum Creek Lumber Mill in Pablo, which employs about 200 full-time people. This mill is heavily reliant on raw material from the Reservation. A lumber mill in Polson closed in 1990 because of timber shortages and high prices caused by reductions in harvest levels on National Forests. A Tribal post and pole yard also closed in 1990.

Minor Forest Products Based Industries

Small post and pole yards open and close periodically on the Reservation, as do yards that receive cord wood. One small mill, Hunt's Timbers near Post Creek, continues to buy timber from small wood lots and individuals.

Forest Receipts

The following table shows the Forest Receipts and Volumes cut since 1980.

Table 2-15. Forest Receipts and Volumes.

Year	Contracts Volume	Contracts Value	Avg. Stumpage
1980	14,489,000	$1,907,810.00	$131.67
1981	14,225,000	$1,392,412.00	$97.88
1982	12,888,000	$1,070,060.00	$83.03
1983	19,633,000	$1,673,670.00	$85.25
1984	31,943,000	$3,230,518.00	$101.13
1985	15,389,000	$1,448,314.00	$94.11
1986	7,415,000	$800,469.00	$107.95
1987	14,113,000	$1,373,078.00	$97.29
1988	25,160,000	$2,874,416.00	$114.25
1989	30,900,000	$3,141,485.00	$101.67
1990	28,988,000	$3,748,043.00	$129.30
1991	20,613,000	$3,629,092.00	$176.06
1992	37,199,000	$8,581,296.00	$230.69
1993	33,552,000	$10,204,985.00	$304.15
1994	5,454,000	$1,841,645.00	$337.69
1995	24,805,000	$6,789,476.00	$273.71
1996	18,324,000	$5,056,181.00	$275.93
1997	18,474,000	$5,058,629.00	$273.82
Total	373,564,000	$63,821,579.00	
Average/Year	20,753,500	$3,545,643..00	$167.53

Volumes cut since 1980 have ranged from 5,454,000 to 37,199,000 boardfeet, and values received have ranged from $800,469 to $10,204,985. These ranges reflect the volatile nature of the timber industry. Over the eighteen-year period, volume harvested has averaged

20,800,000 boardfeet and income has averaged $3,545,000 annually. The Tribal Council had set an annual harvest goal of 38.4 million boardfeet, but that was not reached during the period.

Besides the timber harvested under contract, additional timber is sold under permits to Indian loggers. The volume of these sales ranged from 335,000 to 11,700,000 boardfeet with values ranging from $41,000 to $484,000. Free use permits are also issued to Tribal members. Over the period these volumes ranged from 2.8 million boardfeet to 5.4 million boardfeet. Values ranged from $85,000 to $300,000. This income went directly to the Tribal members rather than the Tribal government.

Volumes from all these activities combined ranged from 15.7 to 64 million boardfeet during the period; values ranged from $1 to $10.5 million.

Harvest is not the only forest management activity that generates income. About $470,000 comes to the Reservation annually for forest development activities (planting, thinning, site preparation) and mistletoe control. Additional income comes from Christmas tree cutting. From 1,200 to 1,500 bales per year were harvest by about 250 Tribal members. Each bale brought $7.25 per bale.

Forestry Management Employment

There are 58 full time, 10 seasonal forestry employees and 28 seasonal fire fighters. Planting, thinning, cone collection and site preparation work employs about 60 to 70 Tribal members seasonally, and it is estimated that 135 Tribal members cut post and poles, cordwood, and firewood. Sale preparation involves the combined efforts of specialists from the Forestry and Natural Resources Departments and uses perhaps 20 people part time.

Recreation

Recreation activities also occur on forested lands. These activities have significant social and economic effects. Data about numbers of recreational-use days for Tribal members is lacking, but the numbers are significant and certainly exceed use by nonmembers. The number of recreation permits sold to nonmembers between 1992 to 1994 is shown in the following table.

Table 2-16. Recreational Use by Nonmembers

Year	Annual Permits	3-Day Permits	Value*
91 - 92	17,343	combined with annual	$224,690
92 - 93	14,588	3,940	$247,085
93 - 94	14,696	4,642	$252,600

* Source for income from permit fees is Tom McDonald, CSKT Wildland Recreation Program.

Flathead Lake is probably the biggest recreational draw on the Reservation. It receives about 150,000 user days per year, and over a million sightseers. The Flathead River attracts in excess of 20,000 users annually. The Mission Mountains Tribal Wilderness averages about 5,000 user days per year. The South Fork Primitive area, which is used only by Tribal members, has about 1,500 user days per year. The Bison Range attracts 185,000 visitors per year.

Forest management activities like timber harvesting and road building affect recreation use because they impact the aesthetics of the forest. There is no quantitative data, however, on the affect of these activities on visitor use days or recreational income.

Chapter Three
The Alternatives

Contents

Introduction

The ID Team developed the alternatives included in this document after reviewing the purpose and need for the proposed action and considering the issue statements that came out of the scoping meetings (the purpose and need statement and issue statements can be found in Chapter 1).

The ID Team drafted five alternatives. Alternatives 1, 2, and 3 take an ecosystem management approach and focus on the restoration of historic forest structures. Alternative 4, the No Action alternative, represents a continuation of the management direction of the last forest management plan. Alternative 5 limits commercial timber harvest to salvage operations only. In this chapter, we describe each of these alternatives in detail. For each we give a general description written in lay terms. The descriptions are followed by objectives. The objectives set forth the short and long-term actions that would be taken to implement each of the alternatives. The chapter ends with a matrix that compares the alternatives.

To save space in this chapter and those that follow, alternatives are referred to by numbers rather than names. To help you remember which is which, we have included a bookmark (located at the beginning of this document) that briefly describes the alternatives. Alternative names are also given at the bottom of each page.

Before reading about the alternatives, we strongly recommend you take a few minutes to read the next section, which explains some of the terms and concepts that we have used in our descriptions.

Figure 3-1. At the beginning of this document are several bookmarks such as the one shown above. They contain definitions and descriptions to assist the reader. Keep them handy to refer to as you read on.

Key Terms and Concepts Readers will Need to Know

Landscapes

Ecosystem management requires managers to focus on relatively large areas. In this plan, we have divided the Reservation into six landscapes based on physical features such as topography, soils, geology, climate, watersheds, vegetation types, and administrative designations. The six landscapes are shown below (fig. 3-2). Each landscape in turn is divided into four fire regimes.

Figure 3-2. The Reservation landscapes. A landscape is defined as an area drained by one or a group of similar stream within which the climate, rock, and vegetation patterns are fairly uniform.

Historical Range of Variability (HRV)

Fundamental to ecosystem management is the concept of sustainability. Managers hope to manage for conditions that will allow plant and animal communities to perpetuate themselves. The best model of sustainability comes from the pre-contact or pre-European period when forest ecosystems remained relatively stable over thousands of years. Pre-contact conditions are the conditions under which our plant and animal communities evolved. These are the conditions to which they are best adapted.

The Historical Range of Variability (HRV) is the natural variation exhibited by an element of the forest during pre-contact times.

Westslope cutthroat trout, for instance, are adapted to summer water temperatures of between 43 to 62° F (fig. 3-3). For thousands of years that was the natural range of variation in water temperature. If, however, through land management activities such as removing shade trees, we raise the summer temperatures to, say, 75° F, the trout would suffer, their growth would slow, and some fish would likely die. If the high temperatures persist, the population itself would be in jeopardy. In other words, it would not be possible to sustain a cutthroat population under this new condition.

In ecosystem management, managers attempt to identify and manage within the natural range of variation for key elements of the forest because these conditions represent the best opportunity for sustainability. This natural range of variation is referred to as the ***historical range of variability*** (or **HRV**).

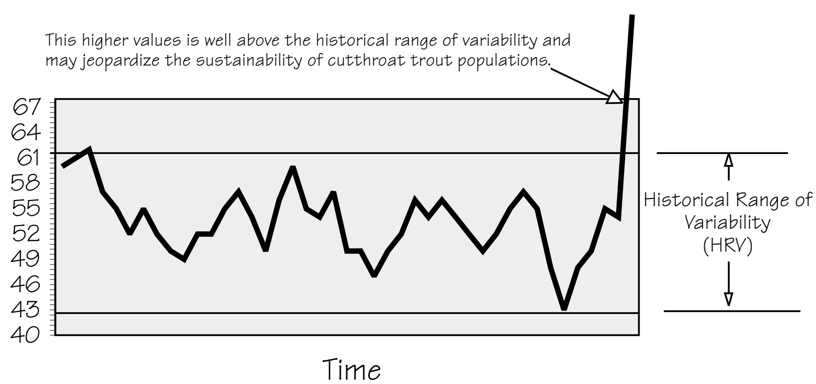


Figure 3-3. This graph shows how the water temperature of a hypothetical stream may have fluctuated prior to European settlement. A sudden jump to 73°F in modern times would clearly be beyond the historical range of variability and would probably threaten the sustainability of aquatic organisms in the stream.

The concept of an HRV is important to this Draft EIS. Morgan, et al., (1994) discuss the value of the HRV as a tool to evaluate ecosystem change. The key points that are pertinent to this document are:

- The concept of HRV provides a window for understanding the set of conditions and processes that sustained ecosystems before their recent alterations by humans.
- HRV provides a reference against which to evaluate present ecosystem change. It is useful as a monitoring baseline if goals of management are defined relative to the HRV.
- The HRV in conditions, processes, populations, or structures of variability can be used as a reference in establishing the range of desired conditions.
- The HRV can be used to identify the range of future conditions that are sustainable.

Ecosystems evolved over an extended time present the best chance for sustainability. Management designed to reproduce the key components, structures, and processes present during pre-contact times is the approach most likely to sustain ecosystem integrity.

- Use of the HRV approach does not necessarily imply that systems must be maintained within that range, but the risks associated with departure from historical conditions must be acknowledged in the decision-making process.

Recommended Management Variability (RMV)

In general, managers hope to manage for conditions that fall within HRVs. However, they probably do not want to operate at the extremes of the HRVs. For example, with cutthroat trout, the HRV for summer water temperatures is 43 to 62° F. A fisheries manager probably would not want to manage for conditions that would have water temperatures near 62° F. Rather, he or she would probably target a more narrow range within the reference variability, say, an upper temperature of 55°F. Managing at the margins leaves little room for error, and if the system experiences a major disturbance like a fire, we run a greater risk of being pushed beyond the HRVs. It is therefore prudent to manage within a more narrow range. We call this more narrow range the recommended management variability (RMV). The concept is illustrated in figure 3-4.

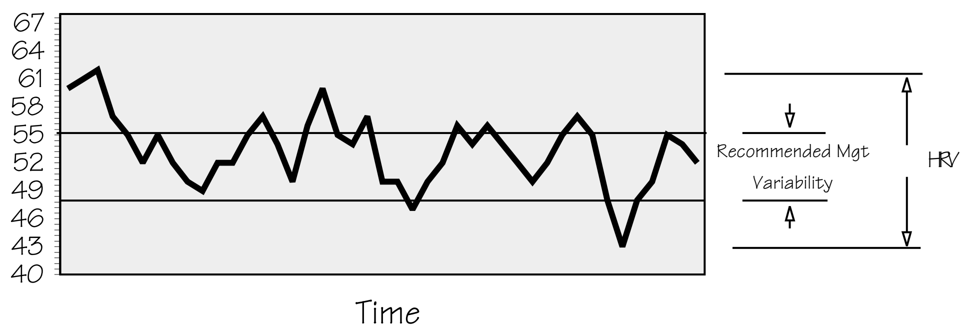


Figure 3-4. Managers will generally choose to operate within a slightly more narrow range than the historical range of variability to provide them with a buffer in the event of major disturbances like fires. This more narrow zone is referred to as the **recommended management variability**.

Again, the basic premise is: ecosystems that have evolved over extended time periods present the best chance for sustainability; management designed to maintain or restore key components, structures, and processes is generally the most likely to sustain ecosystem integrity and productivity. There is one important caveat, however.

In an ideal world, we would attempt to restore and maintain key elements of the forest within their HRVs. However, there are often times when, for social, cultural, economic, or even ecological reasons, this approach will not be possible. The world has changed substantially since pre-contact times. We now have thousands of miles of forest roads. We have hundreds of homes within the forest or at its margin. We have threatened and endangered species for which there are specific Federal guidelines limiting management options. The public has strong attitudes about prescribed and natural fires, clearcutting, and other forest practices. Also, the Tribes depend on revenue from timber.

The world has changed so much that fully restoring many components of an ecosystem over relatively short time-frames, could very well threaten some sensitive species or jeopardize other resources. This is especially true when it comes to the HRVs for vegetative structures. For example, before European-Americans began suppressing and excluding fires, there were, at any given time, significant areas of mid-elevation and subalpine forest that had experienced stand-replacing fires—we estimate that within these two zones, between 14 and 28 percent of the forest was in this young and open condition at any given time. If we attempted to restore this particular vegetative structure to the upper end of its HRV, we might threaten cutthroat and bull trout, species that have already been pushed to the margin by the cumulative impacts from roads and other human activities. Hence, in some instances the RMVs may not fall within the HRV. But being outside the HRV does not necessarily mean that the ecosystem is not sustainable.

We should also point out that after we developed our HRVs, the ID Team recognized a weakness in our methodology. The vegetation model that we used failed to account for variations caused by disturbances other than fire, such as insects, disease, climate, and weather. We compensated for this weakness when we developed our RMVs by supplementing our model estimates with professional knowledge, local data, and data published in Volume 1 of the *Upper Columbia River Basin Draft Environmental Assessment* (1997) and Part 1 of the *Historic and Current Forest and Range Landscapes in the Interior Columbia River Basin and Portions of the Klamath and Great Basins*. Our adaptive management approach will allow us to adjust our HRVs (and RMVs) in the future as we gain more knowledge about pre-contact era forests.

The Desired Condition

The bar chart below (fig. 3-5) shows the hypothetical relationship between the HRV, the RMV, the existing condition, and the desired condition for a hypothetical vegetative structure. The chart shows that during pre-contact times, this structure occupied between 25 and 90% of lower-elevation forests Reservation wide (the actual percentage fluctuated with natural disturbances). This 25-to-90% range is our HRV. Based on it, the ID Team is recommending we try to manage for between 35 and 80%. This is the RMV. The existing condition is at 43%. The chart also shows the desired condition for three of the alternatives. For Alternative 1, the desired condition is 35 to 50%. For Alternative 2, it is 45 to 65%, and for Alternative 3, it is 60 to 80%.

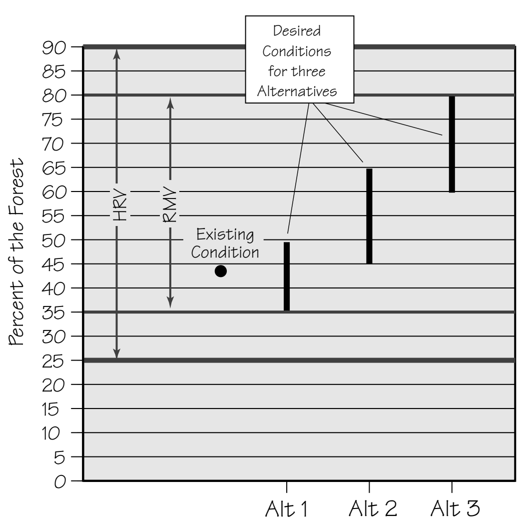


Figure 3-5. This chart shows that during pre-contact times, this hypothetical vegetative structure covered between 25 and 90% of the forest (that's the HRV). Managers recommend that today it should occupy between 35 and 80% of the forest (this is the RMV). Currently, the forest, has about 43% of this kind of structure. The three black bars show how each three alternatives would manage this particular structure (the desired condition).

The term fire regime refers to the kind of fire behavior that occurs in an area. During pre-contact times, fire behavior determined the pattern, structure, and composition of the vegetation.

Fire Regimes

The term fire regime refers to the kind of fire behavior that occurred within a portion of the forest during pre-contact times. Although fire exclusion policies have changed the fire behavior and vegetation within these zones, pre-contact fire regimes reveal basic information about how our ecosystems functioned before the days of fire suppression. We have identified four fire regimes on the Reservation: Nonlethal, Mixed, Lethal, and Timberline. These are summarized below (table 3-1) and described in detail in the Affected Environment section of this document.

Table 3-1. The Reservation's fire regimes.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime	Timberline Fire Regime
Habitat	Dry P. Pine, Dry D.Fir	Moist D. Fir, W. Larch, Cool/Dry D.Fir	L. P. Pine, G. Fir, Spruce and S. A. Fir	W. B. Pine and L. P. Pine
Fuels	Grass and Litter	Grass, Shrubs and Regen.	Regen. and Downfall	Grass, Shrubs and Downfall
Location	Low to Mid-Elevations, Mild Slopes, SE-W Aspects	Low to Mid-Elevations, All Slopes, All Aspects	Mid- to High Elevations, Steep Slopes, SE-W Aspects	High Elevations, All Slopes, All Aspects
Structure	Large Trees, Old Growth, Closed Canopy, Uneven-aged, Seral Stands	Mature Trees, Open/Closed Canopy, Mosaic, Mixed Seral Stands	Mature Trees & Old Growth Closed Canopy Even-aged, Climax Stands	Mature Trees, Open/Closed Canopy, Mosaic, Climax Stands
Fire Frequency	Short Interval 5 - 30 years	Variable Interval 30 - 100 years	Long Interval 70 - 500 years	Long Interval 30 - 500 years
Fire Behavior	Low Intensity, Large Size, Short Duration	Variable Intensity, Variable Size, Long Duration	High Intensity, Large Size, Long Duration	Variable Intensity, Variable Size, Short Duration
Typical Areas	Dry Fork, Jette, Stevens, Seepay	Garceau, Hell Roaring, La Moose, Little Money	Dog Lake, Boulder, S. Fork Jocko, Revais Creek	Moss Pk, Ninemile Divide, Top of Mission Range

Seral Clusters

In this plan, we focus chiefly on the structure and composition of the forest—on the size and age of the trees, on how close they are to each other, on whether a stand is multi- or single layered, and on whether species are shade tolerant (climax) or shade intolerant (seral). Keeping track of all these factors on a Reservation scale is complex, so we have simplified things somewhat by developing what we refer to as seral clusters. Seral clusters are types of timber vegetation distinguished by their structure and composition. An example might be stands of old trees that are moderately dense and multi-storied with mostly shade tolerant (or climax) species in both the overstory and understory. A stand within this particular seral cluster might look like the one below (fig. 3-6), which is a computerized depiction of an actual timbered stand on the Reservation. It should be noted that considerable variation can occur within each seral cluster. Depictions, such as the one below, represent an average condition.

Seral clusters are a simplified way of classifying timber vegetation based on its structure and composition.

The vegetative structures included within a seral cluster generally function in a similar fashion with respect to factors such as fire risk, fire severity, hiding and thermal cover for big game, habitat for birds, insect and disease risks, and so on. The vegetation descriptions of individual landscapes in this plan use these seral clusters. A brief description and image of each follows on the next two pages (table 3-2). One of the bookmarks found at the beginning of this document also includes descriptions and depictions of the seral clusters; we recommend you keep it handy to refer to it as you read through the different sections of this document.

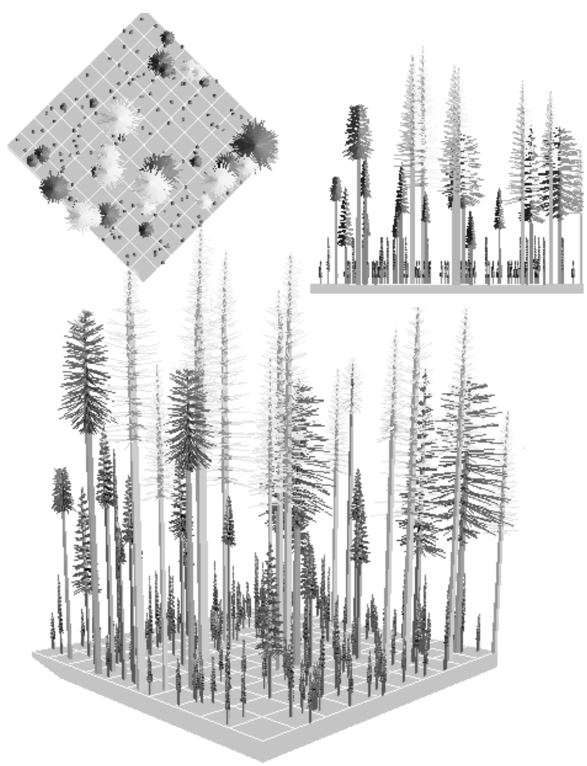


Figure 3-6. The depiction of this stand of trees was made by taking actual forest inventory data (CFI) for a specific plot on the Reservation and feeding that data into a computer program. The computer then drew this image of the stand. Each individual tree measured in the field is represented.

Seral Cluster Key

Table 3-2. Seral Cluster Key.

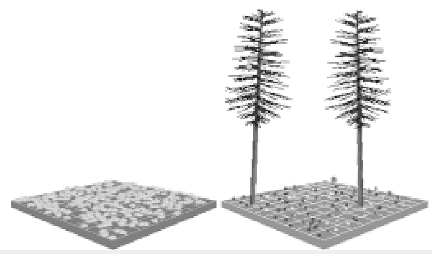
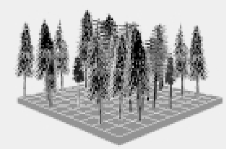
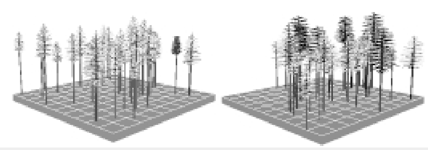
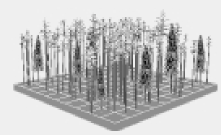
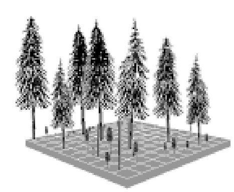
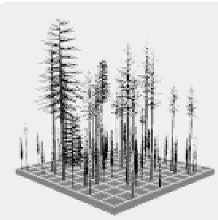
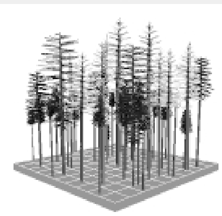
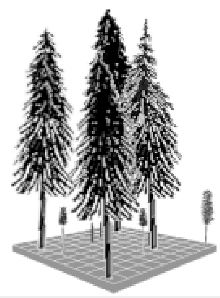
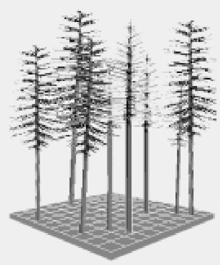
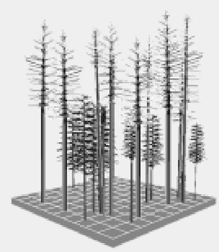
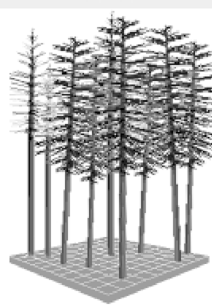
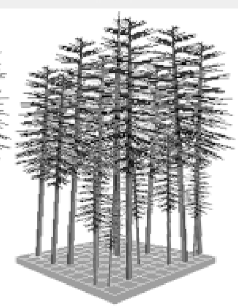
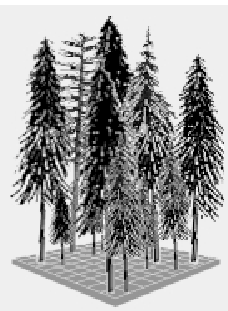
Cluster	General Description	Examples
Cluster A	Cluster A1: Young and recenlty disturbed, open canopy, mostly pine and larch. Cluster A2: mature and old, frequently disturbed, open canopy, mostly pine and larch.	
Cluster B	Young, undisturbed since regeneration, moderate canopy, mostly fir.	
Cluster C	Young, frequently disturbed to undisturbed, moderate canopy, mostly pine and larch.	
Cluster D	Young, frequently disturbed to undisturbed, closed canopy, mostly pine and larch.	
Cluster E	Mature, undisturbed, moderate canopy, moslty fir and spruce.	
Cluster F	Mature, undisturbed, moderate canopy, mostly pine and larch. Potential for lodgepole old growth.	
Cluster G	Mature, less frequently disturbed, closed canopy, mostly pine and larch. Potential for lodgepole pine old growth.	

Table 3-2. Seral Cluster Key (continued).

Cluster	General Description	Examples
Cluster H	Mature, undisturbed, closed canopy, mostly fir and spruce	
Cluster I	Old, undisturbed, moderate canopy, mostly fir and spruce. Potential for old growth	
Cluster J	Old, undisturbed, moderate canopy, mostly pine and larch. Potential for old growth.	 
Cluster K	Old, undisturbed, closed canopy, mostly pine and larch. Potential for old growth.	 
Cluster L	Old, undisturbed, closed canopy, mostly fir and spruce. Potential for old growth.	

Open, Moderate, and Closed Canopies

Throughout this document, forest vegetation is described as having open, moderate, or closed canopies (figs. 3-7 through 3-9). These terms refer to the amount of ground surface shaded by tree canopies when viewed from above. The amount of canopy shading determines all sorts of characteristics of a forest, for example: the productivity of the site for timber, the fire risk associated with it, its scenic character, the wildlife species that will use it, how humans will use it, the amount of forage available to livestock, and so on.

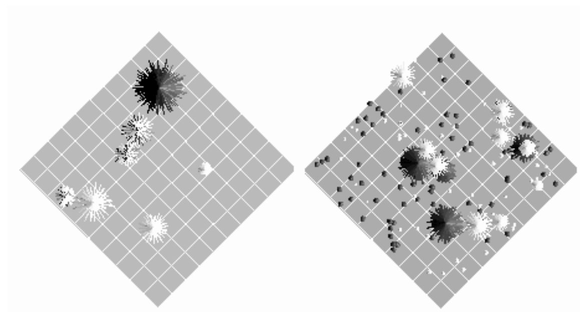


Figure 3-7. Open-canopied stands shade from 0 to 29% of the ground. The two images at right are examples of open-canopied stands.

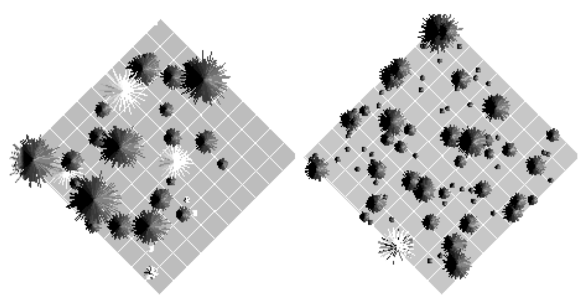


Figure 3-8. Moderate-canopied stands shade from 30 to 59% of the ground. The two images at right are examples of moderate-canopied stands.

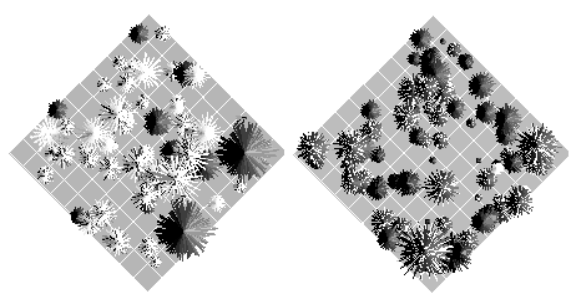


Figure 3-9. Closed-canopied stands shade from 60 to 100% of the ground. The two images at right are examples of closed-canopied stands.

Disturbances

The term disturbance comes up frequently in this EIS. We use it to refer to events that alter the structure, composition, or function of forest vegetation. Natural disturbances include fires, winds, forest insects and diseases, drought, and floods. The primary kinds of human-caused disturbances we refer to in this document are timber harvest and prescribed fires, although livestock grazing, roads, and the introduction of exotic species also fit the definition.

Fire was the main disturbance during pre-contact times. There are several kinds of fire disturbance.

Underburns are surface fires that can consume mostly ground vegetation—grass, shrubs, and young trees. These kinds of disturbances are also referred to as nonlethal fires. In a nonlethal fire, more than 90 percent of the canopy cover typically survives.

Lethal or stand-replacing fires are at the other end of the spectrum. In a lethal fire, most of the canopy is consumed. Less than 20 percent typically remains.

Mixed fires are a combination of the two. Some of the area is disturbed by a nonlethal fire, other parts by a lethal or stand-replacing fire.

Road Densities

We refer here to two types of road densities: open road density and total road density.

Open road density is defined as the number of open roads per square mile. This measure is important to wildlife mangers because open roads have an impact on wildlife populations, while the impact closed roads have is generally negligible. Open road density is also important to recreationists and cultural users because the number of open roads in an area affects access.

Total road density is defined as the number of open *and* closed roads per square mile. The total road density is important to fisheries managers because roads, regardless of whether they are open or closed, can increase water yield, increase sediment, block fish passage, and decrease native fish populations. Total road density is also important to livestock producers because all roads provide access for cattle.

Adaptive Management

In our planning process, we readily admit that our scientific knowledge and technical abilities are limited. We do, however, recognize the need to move forward—even if we don't have all the answers. Our approach under Alternatives 1, 2, and 3 is to use our best stewardship skills and to always remain open to new information; in other words to use what planners call an **adaptive management** strategy. Adaptive management simply means that we will plan and implement our activities to the best of our abilities, monitor the results to see if we are meeting our goals, and if our approach proves inadequate, make the necessary changes to better meet our goals. The diagram at right (fig. 3-10) illustrates how adaptive management works.

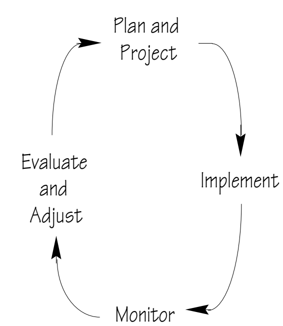


Figure 3-10. The Adaptive Management Cycle

Narrative Descriptions of the Alternatives

Narrative Descriptions of the Alternatives

Alternative 1: Full Restoration

Goal and General Description

The overall goal of this alternative is to use an ecosystem-management approach to aggressively restore, to the extent possible, pre-European forest conditions. Silvicultural treatments would be designed to reverse the effects of fire exclusion and undesirable forest practices of the past and would mimic natural disturbances in size and frequency. Managers would rely heavily on prescribed fire and would seek to restore grasslands, woodlands, and riparian zones; rejuvenate big game winter range; reduce livestock impacts; reduce road densities; visually rehabilitate areas heavily impacted by geometrically shaped clearcuts; protect some roadless areas from future roading; designate some new wilderness; and establish Limited Public Access Areas. Alternative 1 is the *Environmentally Preferred Alternative*.

Vegetation

This alternative would place the greatest emphasis on restoration of the forest structures and processes that existed prior to European settlement. Harvest activities would be designed to mimic the size, timing, and location of natural disturbances.

It would have the highest levels of prescribed burning and the greatest number of restoration acres. A total of 62,308 acres of grassland, woodland, and parklike stands in the Nonlethal and Mixed Fire Regimes would receive restoration and maintenance treatments over the long term.

The Nonlethal Fire Regime would be managed to restore and maintain old, moderate- and closed-canopied stands of ponderosa pine. Restored parkland areas would contribute less to commercial timber harvest over the long term. Parkland restoration would also be a major emphasis of the wildland/urban-intermix hazard-reduction strategy. The amount of old growth would increase. Bark beetle impacts would likely be reduced as would root rot, mistletoe, and budworm. Silvicultural treatments would be prioritized as follows: (1) underburning (2) uneven-aged treatments (3) temporary even-aged treatments (4) no treatment. Entry periods would be 5 to 30 years.

In the Mixed Fire Regime, the emphasis would be on very open stands and mature stands with moderate to closed canopies of mostly pine and/or larch. Early-seral stands would occupy about 15 to 20% of the regime. The levels of root rot, mistletoe, and budworm would most likely be reduced. Old growth would increase. Silvicultural treatments would be prioritized as follows: (1) underburn and permanent even-aged treatments (2) uneven-aged treatments and no treatment (3) temporary even-aged treatments. Entry periods would be 20 to 40 years.

In the Lethal Fire Regime, early-seral stands would occupy between 15 to 50% of the forest. Lodgepole pine and spruce and fir old growth would increase. Silvicultural treatments would be prioritized as follows: (1) permanent even-aged treatments (2) no treatment (3) uneven-aged treatments. Entry periods would be 25 to 50 years. At higher elevations, periodic fires would be reintroduced to most whitebark pine habitats.

Under this alternative, 20% or less of the forest products damaged by fire, insects and disease, or windthrow would be salvaged. Post and pole management would occur on 5,000 acres on an 80-year rotation and on 2,000 acres after 2019 (due to access limitations).

For Alternative 1, the vegetation model predicts an annual harvest of 700 thousand board feet of ponderosa pine and 14.2 million board feet of other species for the first thirty-year period. This level of harvest would result in an estimated Tribal income of $3.65 million. Of the total volume, 1 to 2 million board feet would be set aside for Indian loggers in small sales and paid permits.

Fire
This alternative would have the highest level of smoke emissions from prescribed burning. An estimated 5,000 acres a year would receive prescribed burn treatments. Over the long term, restoration activities would result in the lowest levels of wildfire risk. There would be a strong emphasis on wildland-urban intermix education and hazard reduction. Fire Management would designate areas where a modified suppression response strategy would provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit would be covered by an agency fire plan.

Grazing
Management would focus on improving and maintaining the biodiversity of existing grassland types with an emphasis on enhancing native species. Grazing would be managed to restore grasslands to a good condition and nonfunctional and at-risk riparian areas to the highest functional condition. Noxious weeds would be aggressively managed on 90% of infested areas.

Wildlife
Big game summer and winter ranges would be maintained and restored by reducing road densities, reintroducing fire, and improving management of livestock grazing. Old-growth habitat restoration would occur throughout the forest, and restoration goals would receive priority of over forest health concerns. Big game habitat effectiveness would be increased by reducing road densities to 2 miles of open road per square mile in the Lethal Fire Regime, and to 3 miles of open road per square mile in the Nonlethal and Mixed Fire Regimes.

Water and Fish
Total road densities would be the second lowest of all the alternatives. One hundred percent of the road sections that are severely degrading aquatics would be abandoned using full road rip, some recontouring, and the removal of all culverts and bridges. A full range of channel complexity would occur over 80% of channel length of streams. Water pollution sources would be removed wherever they are found. Alternative 1 also includes objectives to restore cutthroat trout to three drainages and bull trout to one.

Recreation, Scenery, and Transportation
The scenery of areas heavily impacted by geometrically shaped clearcuts would be restored, and the scenic integrity of all landscapes would be protected through the use of buffers, natural-shaped openings, green tree retention, seed tree cuts, shelterwood cuts, and the blending of clearcuts with surrounding vegetation. Eleven roadless areas totalling 68,245 acres would remain unroaded. Five areas totaling 38,191 acres would be protected as new wilderness or added to existing wilderness areas. Trail and campsite maintenance would be enhanced.

Culture
Limited Public Access Areas would be established throughout the Reservation to provide a variety of natural areas and recreational settings that Tribal members can use for solitude, cultural activities, and recreational pursuits.

Alternative 2: Modified Restoration

Goal and General Description

The primary goal of this alternative is to balance the restoration of pre-European forest conditions with the needs of sensitive species and human uses of the forest. Silvicultural treatments would be designed to reverse the effects of fire exclusion and undesirable forest practices of the past. Prescribed fire would be a major tool. Harvesting would mimic natural disturbances as much as possible; however, restoration would be balanced against present-day uses of the forest, the needs of sensitive wildlife species, and watershed concerns. This alternative would restore some grasslands, woodlands, and riparian zones; reduce livestock impacts; reduce road densities; protect some roadless areas from future roading; and designate some new wilderness, although these measures would be less extensive than under Alternative 1. Alternative 2 would also visually rehabilitate areas heavily impacted by geometrically shaped clearcuts and establish Limited Public Access Areas. Alternative 2 is the *Preferred Alternative*.

Vegetation

This alternative would balance efforts to restore forest structures and processes with social, economic, and environmental concerns. Harvest activities would, for the most part, be designed to mimic the size, timing, and location of natural disturbances.

Alternative 2 would have the second highest level of prescribed burning and the second greatest number of restoration acres. A total of 49,466 acres of grassland, woodland, and parklike stands in the Nonlethal and Mixed Fire Regimes would receive restoration and maintenance treatments over the long term.

The Nonlethal Fire Regime would be managed to restore and maintain old, moderate- and closed-canopied stands of ponderosa pine. Restored parkland areas would contribute less to commercial timber harvest over the long term. Parkland restoration would receive moderate emphasis in the wildland-urban-intermix hazard-reduction zone. The amount of old growth would increase. Bark beetle impacts would be reduced as would root rot, mistletoe, and budworm. Silvicultural treatments would be prioritized as follows: (1) uneven-aged treatments (2) underburns (3) temporary even-aged treatments (4) no treatment. Entry periods would be 10 to 20 years.

In the Mixed Fire Regime managers would emphasize very open stands and mature stands with moderate to closed canopies of mostly pine and/or larch. Early-seral stands would occupy from 0 to 25% of the fire regime. The levels of root rot, mistletoe, and budworm would be reduced. The amount of old growth would increase. Silvicultural treatments would be prioritized as follows: (1) uneven-aged and permanent even-aged treatments (2) temporary even-aged treatments and underburns (3) no treatment. Entry periods would be 15 to 30 years.

In the Lethal Fire Regime, early-seral stands would occupy between 15 to 40% of the forest. Lodgepole pine and spruce and fir old growth would increase. Silvicultural treatments would be prioritized as follows: (1) permanent even-aged treatment (2) uneven-aged treatments and no treatment. Entry periods would be 20 to 40 years. At higher elevations, periodic fires would be reintroduced to about half of the whitebark pine habitats.

Fifty percent or less of the forest products damaged by fire, insects and disease, or windthrow would be salvaged. Post and pole management would occur on 5,000 acres on a 40-year rotation.

For Alternative 2, the vegetation model predicts an annual harvest of 700 thousand board feet of ponderosa pine and 17.4 million board feet of other species for the first thirty-year period. This would result in an estimated Tribal harvest income of $4.3 million. Of the total volume, 2 to 3 million board feet would be set aside for Indian loggers in small sales and paid permits.

Fire

This alternative would have the second highest level of smoke emission from prescribed burning. An estimated 3,000 to 4,000 acres a year would receive prescribed burn treatments. Restoration activities would decrease the overall wildfire risk. A moderate emphasis would be placed on wildland-urban intermix education and hazard reduction. Fire Management would designate areas where a modified suppression response strategy would provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit would be covered by an agency fire plan.

Grazing

Management would focus on improving and maintaining the biodiversity of existing grassland types. Grazing would be managed to restore grasslands to a fair or better condition and nonfunctional and at-risk riparian areas to a fully functional condition. Noxious weeds would be aggressively managed on 80% of infested areas.

Wildlife

Although less so than under Alternative 1, big game summer and winter ranges would be restored through the use of fire and by reducing road densities and livestock impacts. Reducing the level of fragmentation in all fire regimes would receive a high priority. Big game habitat effectiveness would be increased by reducing road densities to 3 miles of open road per square mile in the Lethal Fire Regime and to 4 miles of open road per square mile in the Nonlethal and Mixed Fire Regimes.

Water and Fish

Total road densities would be the third lowest of all the alternatives. One hundred percent of road sections that are severely degrading aquatics would be abandoned using full road rip, some recontouring, and the removal of all culverts and bridges. A full range of channel complexity would occur over 70% of channel length, and 80% of water pollution sources would be removed. Alternative 2 also includes objectives to restore cutthroat trout to two drainages and bull trout to one.

Recreation, Scenery, and Transportation

The scenery of areas heavily impacted by geometrically shaped clearcuts would be restored, and the scenic integrity of all landscapes would be protected through the use of buffers, natural shaped openings, green tree retention, seed tree cuts, shelterwood cuts, and the blending of clearcuts with surrounding vegetation. Seven roadless areas totalling 33,210 acres would remain unroaded. Four areas totaling 26,969 acres would be protected as wilderness. Trail and campsite maintenance would be enhanced.

Culture

Limited Public Access Areas would be established throughout the Reservation to provide a variety of natural areas and recreational settings that Tribal members can use for solitude, cultural activities, and recreational pursuits.

Alternative 3: Restoration Emphasizing Commodities

Goal and General Description

A primary goal of this alternative is to use intensive forest management practices to maximize forest-related income and employment. Managers would emphasize the production of wood products and other forest commodities. While this alternative would use an ecosystem management approach to restore pre-European forest structures, restoration efforts would be balanced against the need to maximize income and employment and reduce harmful forest insect infestations and diseases. Livestock impacts and road densities would be reduced and riparian zones would be restored to a functional level. This alternative would also visually rehabilitate areas heavily impacted by geometrically shaped clearcuts and establish Limited Public Access Areas.

Vegetation

This alternative would have the third highest level of prescribed burning but would not restore woodlands or grasslands. Approximately 2,400 existing acres of existing grasslands would be maintained. Prescribed underburns would be used to maintain existing woodlands and restore parklands. In the Mixed and Lethal Fire Regimes, even-age acres would be treated with broadcast or pile burning.

In the Nonlethal Fire Regime, management would emphasize very open stands and old stands with moderate to closed canopies composed mostly of pine. Bark beetle, root rot, mistletoe, and budworm impacts would be reduced. Parklike stands would increase, as would old growth. Silvicultural treatments would be prioritized as follows: (1) uneven-aged treatments and temporary even-aged treatments (2) underburn (3) no treatment. Entry periods would be 15 to 20 years.

In the Mixed Fire Regime, managers would emphasize very open stands and mature stands with moderate to closed canopies of mostly pine and/or larch. Early-seral stands would occupy 20 to 30% of the regime. Root rot, mistletoe, and budworm would be reduced. Old growth would be increased. Silvicultural treatments would be prioritized as follows: (1) uneven-aged treatments and temporary even-aged treatments and permanent even-aged treatments (2) underburn (3) no treatment. Entry periods would be 15 to 25 years.

In the Lethal Fire Regime, early-seral stands would occupy 15 to 50% of the regime. Lodgepole and spruce and fir old growth would be increased. Silvicultural treatments would be prioritized as follows: (1) permanent even-aged treatments (2) uneven-aged treatments (3) no treatment. Entry periods would be 15 to 30 years.

Eighty percent or more of the forest products damaged by fire, insects and disease, or windthrow would be salvaged. Post and pole management would occur on 5,000 acres on a 40-year rotation.

For Alternative 3, the vegetation model predicts an annual harvest of 700 thousand board feet of ponderosa pine and 15.9 million board feet of other species for the first thirty-year period. This would result in an estimated Tribal harvest income of $3.74 million. Of the total volume, 3 to 4 million board feet would be set aside for Indian loggers in small sales and paid permits.

Fire

Smoke emissions would increase under this alternative due to higher levels of prescribed burning and wildfire activity. Alternative 3 would have the third highest level of emissions from prescribed burning. Estimated prescribed burning would average 2,000 to 3,000 acres a year. Managers would place a strong emphasis on wildland-urban intermix education and hazard reduction. Fire Management would designate areas where a modified suppression response strategy would provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit would be covered by an agency fire plan.

Grazing

Management would focus on enhancing the production of forage species rather than the maintenance of native grasslands. Grazing would be managed to restore grasslands to a fair or better condition and nonfunctional and at-risk riparian areas to a fully functional condition. Noxious weeds would be aggressively managed on 80% of infested areas.

Wildlife

Key wildlife parameters for most big game, forest carnivores, and nongame wildlife species would be managed at lower levels than under Alternatives 1 and 2; however, species like white-tailed deer, ruffed grouse, and black bear, that favor young and open forests and forest edges, would do well. Elk and bighorn sheep habitat would not be a primary focus of management in most areas. In the Lethal Fire Regime, there would be 4 miles of open road per square mile in all fire regimes.

Water and Fish

Total road densities would be the second highest of all the alternatives. Sixty percent of the road sections that are severely degrading aquatics would be abandoned using 100-foot or effective-distance road rip and the removal of all culverts and bridges. A full range of channel complexity would occur over 60% of channel length under this alternative, and 70% of water pollution sources would be removed. Alternative 3 also includes objectives to restore cutthroat trout to two drainages.

Recreation, Scenery, and Transportation

The scenery of areas heavily impacted by geometrically shaped clearcuts would be restored, and the scenic integrity of all landscapes would be protected through the use of buffers, natural shaped openings, green tree retention, seed tree cuts, shelterwood cuts, and the blending of clearcuts with surrounding vegetation. No roadless areas would be protected from future roading, and no new wilderness would be added. In some areas, new roads would impact scenery.

Culture

Limited Public Access Areas would be established throughout the Reservation to provide a variety of natural areas and recreational settings that Tribal members can use for solitude, cultural activities, and recreational pursuits.

Alternative 4: No Action

Goal and General Description

This is the No Action Alternative. It would continue the management practices established under the last-approved forest management plan, which was prepared in 1982 and adopted in 1987. Under this alternative, harvest activities would be moderately intensive and modified by best management practices and applicable Federal and Tribal policies, ordinances, laws, and directives. Managers would focus their efforts on individual stands rather than at the landscape level and would not attempt to restore historic forest structures. Livestock impacts would not change and road densities in currently roaded areas would remain about the same. Roadless areas would not be protected from future roading, and no new wilderness would be designated.

Vegetation

Managers would treat 80% or more of stands that are moderately to severely impacted by root rot, mistletoe, and budworm. Silviculture treatments emphasized in the Nonlethal Fire Regime would be (1) uneven-aged and temporary even-aged treatments, (2) underburn, and (3) no treatment. Entry periods would be 15 to 20 years. In the Mixed Fire Regime treatments emphasized would be (1) uneven-aged, temporary even-aged and permanent even-aged treatments; (2) underburn; and (3) no treatment. Entry periods would be 15 to 20 years. In the Lethal Fire Regime, treatments emphasized would be (1) permanent even-aged treatments, (2) uneven-aged treatments, and (3) no treatments. Entry periods would be 15 to 20 years.

Ninety-five percent of the forest products damaged by fire, insects and disease, or windthrow would be salvaged. Post and pole management would continue unregulated on unspecified acreage. The vegetation model predicts an annual harvest of 1.0 million board feet of ponderosa pine and 21.5 million board feet of other species for the first thirty-year period. This would result in an estimated Tribal harvest income of $5.6 million. Of the total volume, 1 to 2 million board feet would be set aside for Indian loggers in small sales and paid permits.

Fire

This alternative would continue most of the recent prescribed fire practices; however, restoration activities would be incidental.

In all fire regimes, increased biomass and the densification of canopies would increase the risk of wildfires. There would also be an increased risk of smoke emissions from large wildfires. Prescribed burning would average about 1,500-2,000 acres per year. Underburning in the Nonlethal Fire Regime could increase due to new hazardous fuel reduction funding. Moderate emphasis would be placed on wildland-urban intermix education and hazard reduction.

Grazing

Management would focus on maintaining native grassland communities and desirable introduced forage species. Grassland and riparian conditions would remain unchanged. Some local improvements would occur as funding and other resources permit. Noxious weeds would be managed on 80% of infested areas.

Wildlife

This alternative would emphasize forest health and full regulation of the commercial forest timber base. Wetlands and riparian areas would be excluded from timber harvesting under most instances. Big game habitat would receive management priority only in Ferry Basin and Camas Wildlife Management Units. Old-growth habitats would decline in the commercial forest base. Fragmentation would increase, impacting travel corridors, breaking up large patches of interior mature forest, and reducing the quality of security cover. Wildlife species favoring early to mid-seral stands would increase. Open road densities would be 4 miles per square mile in all fire regimes.

Water and Fish

Total road densities would be the highest of all the alternatives. Fifty percent of road sections that are severely degrading aquatics would be abandoned using 100-foot or effective-distance road rip. A full range of channel complexity would occur over 40% of channel length, and 70% of water pollution sources would be removed. Alternative 4 also includes objectives to restore cutthroat trout to two drainages.

Recreation, Scenery, and Transportation

No roadless areas would be protected from future roading, and no new wilderness would be added. Visual mitigation would include seed tree cuts, green tree retention and other silvicultural techniques in even-aged units to minimize the visual impact of timber harvesting. In some areas, new roads would impact scenery.

Alternative 5: Custodial

Goal and General Description

The goal of this alternative is to allow natural processes other than fire to control the future direction of the forest. Current fire suppression policies would remain in place. Forest management would consist almost exclusively of salvaging dead and dying timber after fires, wind storms, or insect and disease outbreaks. Over time, road densities would drop to about half their current level as roads are overtaken by vegetation. Initially, grazing levels would see little change, but over time grazing opportunities would decline as access dropped off. Modest restoration work would occur in riparian zones. No new roads would be constructed anywhere for harvesting purposes, and no new wilderness would be designated.

Vegetation

Stands would not receive treatments to prevent insect and disease outbreaks or epidemics. Salvage harvests, wildfire, blowdown, and insect and disease outbreaks are the only kinds of disturbances that would occur, and their frequency would be dictated by nature.

The Nonlethal Fire Regime would shift from young and open structures to mature and closed stands. The trend would increase fire risk and the probability of large wildfires. Pine old growth would decline over the long term.

The structure of the Mixed and Lethal Fire Regimes would depend on wildfire occurrence and weather-related disturbances. It is likely the regimes would become less diverse structurally.

Eighty percent or more of the forest products damaged by fire, insects and disease, or windthrow would be salvaged. Post and pole management would occur on 5,000 acres on a 40-year rotation. That would drop to 2,000 acres as access declines.

For Alternative 5, the vegetation model predicts an annual harvest of 400 thousand board feet of ponderosa pine and 2.6 million board feet of other species for the first thirty-year period. That would result in an estimated Tribal harvest income of $289 thousand. Harvesting would be accomplished mostly by Indian loggers.

Fire

Minor prescribed fire and restoration activities would be undertaken but only to reduce the fire hazard. Increased biomass and the densification of the canopy would increase wildfire risk and smoke emissions. Estimated prescribed burning would average 500 to 1,000 acres per year and would primarily occur within the wildland-urban intermix zones and woodlands. Managers would place a strong emphasis on wildland/urban intermix education and hazard reduction.

Grazing

Management would focus on maintaining native grassland communities and desirable introduced forage species. The condition of grasslands would remain unchanged for the most part, although grazing would be managed to reduce livestock impacts in sensitive riparian areas. Noxious weeds would be managed only along main roads and as needed to protect non-timber resources.

Wildlife

The emphasis for wildlife management would be on species favoring mature and old-growth stands, although old growth would take decades to develop. The management of big game and riparian habitats would receive a low priority.

Open road density would be at 2 miles per square mile in the Lethal Fire Regime and at 3 miles per square mile in the Nonlethal and Mixed Fire Regimes.

Water and Fish

Total road densities would be the lowest of all the alternatives and under half of what they are today. All non-arterial roads would be abandoned by removing all culverts and bridges, installing cross drains, and ripping portions of the road bed. A full range of channel complexity would occur over 70% of channel lengths, and 70% of water pollution sources would be removed. Alternative 5 also includes objectives to restore cutthroat trout to two drainages.

Recreation, Scenery, and Transportation

Roadless areas would remain unroaded. No new wilderness would be added. Salvage operations would follow natural disturbance patterns to minimize the impacts on scenery.

Major Features of the Alternatives

Table 3-3. Major features of the alternatives

Major Feature	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Modeled Acres[1]					
Available	218,378	240,654	267,253	267,253	267,253
Restricted	31,637	38,347	41,468	41,468	41,468
Unavailable	186,919	161,053	126,312	126,312	126,312
Restoration & Maintenance				N/A	N/A
Grassland	16,742	13,644	2,400		
Woodland	14,953	7,992	3,422		
(Total of above acres modeled outside of the Vegetation Model)	(24,500)	(16,236)	(2,400)		
Parklike	30,613	27,830	12,999		
Protected Roadless Acres			N/A	N/A	N/A
With Roadless Harvest	56,922	21,886			
Without Roadless Harvest	11,323	11,323			
New Wilderness Acres	38,191	26,969	N/A	N/A	N/A
Cluster Groups Emphasized[2]				This is not an Ecosystem Management Alternative[3]	This is not an Ecosystem Management Alternative
Nonlethal Fire Regime	A2, F/G, J/K	A1, A2, F/G, J/K	A1, A2, F/G, J/K		
Mixed Fire Regime	A, C/D, F/G, J/K	C/D, F/G	A, C/D, F/G		
Lethal Fire Regime	A, C/D, F/G, J/K, E/I/H/L	A, C/D, F/G, J/K, E/I/H/L	A, C/D, F/G, E/I/H/L		
Whitebark Pine Habitat	Reintroduce fire on 75% of whitebark pine habitats	Reintroduce fire on 50% of whitebark pine habitats	Reintroduce fire on 25% of whitebark pine habitats	No reintroduction of fire	No reintroduction of fire

[1] Modeled acres do not equal total forest acres due to slivering and other reductions that occurred in the development of GIS data themes.
[2] Includes cluster groups that are desired as common (occupying 15 to 19% of a fire regime) or major (occupying 30% or more of a fire regime) components in the fire regime.
[3] Non-ecosystem management alternatives do not emphasize seral cluster groups. Seral cluster groups do result from management actions under these alternatives, but usually not at the levels desired in the ecosystem management alternatives.

Major Features of the Alternatives

Table 3-4. Major features of the alternatives (part 2)

Major Feature	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Silvicultural Systems Emphasized[4] Nonlethal Regime Mixed Regime Lethal Regime	UB>U>T UB=P>U>T P>U	U>UB>T U=P>T=UB P>U	U=T>UB U=T=P>UB P>U	U>T>UB U=T=P>UB P>U	N/A Salvage and wildfire are the only treatments available
Silvicultural Tools (1) Systems used (2) Intermediate entries	(1) Even- and uneven-aged, prescribed fire and wildfire management (2) Underburns & mechanical site prep.	(1) Even- and uneven-aged, prescribed fire & wildfire management (2) Underburns, mechanical site prep., & restricted use of herbicides, fertilizers & pruning	(1) Even- and uneven-aged, prescribed fire and wildfire management (2) Underburns, mechanical site prep., herbicides, fertilizers & pruning	(1) Even- and uneven-aged (2) Minimal underburns, mechanical and chemical site prep., fertilizers & pruning	(1) Salvage cuts (2) Minimal mechanical site prep.
Salvage (Percent Recovery)	20% or less	50% or less	80% or more	95% or more	95% or more. Access may limit salvage in later years
Entry Periods Non-lethal Fire Regime Mixed Fire Regime Lethal Fire Regime	5 to 30 20 to 40 25 to 50	10 to 20 15 to 30 20 to 40	15 tp 20 15 to 25 15 to 30	15 to 20 15 to 20 15 to 20	as determined by natural disturbances
Harvest (mmbf/yr)[5] Period 1 Period 2 Period 3 Period 5 Period 8 Period 11	13.5 15.4 15.6 15.9 16.5 18.3	18.1 19.0 17.0 19.4 18.1 19.4	15.6 16.8 17.4 18.1 20.5 22.9	22.0 23.4 22.3 22.8 24.0 24.0	3.0 3.0 3.0 3.0 3.0 3.0

[4] Treatment codes are: U = uneven-aged management, T = temporary even-aged management, P = Permanent even-aged management, UB = underburning and thinning, and NT = no treatment.

[5] The economic impact analysis in this document is based on short term and long term averages rather than the ten-year periods shown here. The short term is the average harvest over the first thirty years; the long term is the average harvest over the last 90 years of the planning time frame.

Objectives Common to All Alternatives

Forest Management and Fire

Fire Hazard Reduction

Within the wildland-residential intermix, convert 5,250 acres of forest stands with a high-to-extreme fire risk rating to a low-to-moderate rating by the year 2020, and a total of 10,500 acres by the year 2040. This objective will be accomplished through a combination of timber harvest, prescribed fire, and fuel hazard reduction treatments.

Snags

The 2+2 rule (leave 2 snags and 2 recruits) will be retained as an average within timber sale boundaries.

Herbicide Use

Herbicides and other toxicants and chemicals will be used in a safe manner that allows for the protection and maintenance of water quality standards, assures protection of the ecological integrity of the environment, and avoids public health and safety problems.

Grazing

Grazing Land Inventories

A comprehensive grazing-land inventory that uses standard range inventory techniques will be conducted on all grazing units as funding allows and other resources are available. Information gathered will be used to establish stocking rates and seasons of use, as well as monitoring trends in range condition and alerting managers to potential resource conflicts.

Monitoring Sites and Photo Points

Permanent range and riparian monitoring sites with photo points will be established and monitored at least biennially. The sites will be used to evaluate grazing management on an ongoing basis and to build a long-term database. Interdisciplinary teams will incorporate this information to develop livestock grazing plans that are compatible with the seral-stage goals for a landscape and the comprehensive range inventory.

Best Management Practices

Best management practices for domestic livestock grazing within the forest will be developed. Considerations will include, but will not be limited to, the protection of critical areas such as grizzly bear habitat, riparian areas, and wetlands.

Improvements

Off-stream livestock watering points and cross fences will be installed when needed to protect streams and riparian areas from livestock impacts. This will be an ongoing project that is dependent on available funding. (This objective is in addition to specific improvements included in other objectives.)

Range Unit Plans

Range unit grazing plans will be developed cooperatively between a Tribal interdisciplinary team and land users. Plans will be developed as funding allows and other resources are available and will be updated as forest conditions change. The dependency of the Tribal ranching community on forest grazing will be considered during the planning process and any needed revision. More responsibility will be placed on land users for compliance monitoring and range management.

Lower Flathead River

A separate planning process will be initiated to manage livestock use on the Lower Flathead River.

Water and Fish

Water quality

Restore and maintain the chemical, physical, and biological integrity of Reservation streams to ensure compliance with applicable water quality standards and maintenance of beneficial uses of Tribal waters.

Scenery and Recreation

Scenic Corridors

Evaluate the designation of Highway 200 as a scenic highway, and develop a Scenic Corridor Plan for Highway 200 (along the Jocko and Flathead River corridors) from Ravalli west to the reservation boundary near the Clark Fork River confluence by the year 2008. The purpose of the plan will be to preserve the outstanding natural beauty of the lower Flathead and Jocko Rivers.

Develop a Scenic Corridor Plan for Highway 35 by the year 2008.

Culture

Cultural Resources Training

Develop training sessions to be supervised by both Culture Committees that will involve the Tribal Preservation Office and the Natural Resources and Forestry Departments. These sessions will focus on Tribal values associated with cultural sites and plants and will include information on the culture and history of the Tribes, the significance of cultural sites and artifacts to the Tribes, the care and handling of cultural sites and artifacts that may be inadvertently discovered, and the importance of traditional and medicinal plants to the cultures of the Tribes. Sessions will be offered at least every two years (more frequently if requested) beginning in the year 2002.

Language

The Natural Resource and Forestry Departments will incorporate Salish and Kootenai languages into resource documents, signs, and everyday use by the year 2002. With the assistance of the Culture Committees, the two departments will also develop a list of plant and animal species names in both languages by the year 2002. The list will include species commonly encountered on the Reservation.

Place Names

The Natural Resources and Forestry Departments will, under the supervision of the Culture Committees, develop a reservation map of place names with labels in both the Salish and Kootenai languages by the end of the year 2002.

Communication and Education

General

Improve communications and awareness of forest issues with Tribal youth, educational institutions, neighbors and public by making annual presentations; participating in intertribal youth practicums, science fairs, and career days; holding summer field trips for the Tribal Council and the public; attending annual coordination meetings with Federal, state, county, and rural cooperators; writing feature articles for local newspapers; and promoting "Project Learning Tree" at local schools.

Contribute to our profession and its knowledge of Indian natural resource management by providing staff as trainers and presenters for local, regional and national training programs.

Improve and maintain coordination and communication between the Tribal Natural Resource and Forestry Departments by developing common goals annually, holding annual field trips to present and discuss key projects, and developing and maintaining a home page to display public information feature articles by the year 2002.

Fire Education

Promote a fire-role and fire-use message for decision makers and the public by developing and implementing an action plan for a comprehensive education program by December 2009.

Objectives by Alternative

Alternative 1: Full Restoration

Forest Management and Fire

Nonlethal Fire Regime

Grasslands

Use fire-management response strategy and prescribed burn treatments on 7,200 acres of existing grasslands within the forest to restore and maintain historical levels of herbaceous and seral shrub vegetation. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals (seven to ten years) for the Nonlethal Fire Regime.

Use a combination of silvicultural, mechanical, and prescribed fire treatments to restore 9,500 acres of encroached grasslands by the year 2029. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals (seven to ten years) for the Nonlethal Fire Regime.

Woodlands

Use fire-management response strategy, silvicultural, mechanical, and prescribed burn treatments on 7,600 acres of existing ponderosa pine woodlands within the forest to maintain pine and bunchgrass communities. Burn activities will be consistent with historical fire return intervals for ponderosa pine woodlands within the Nonlethal Fire Regime.

Use a combination of silvicultural, mechanical, and prescribed fire treatments to restore 4,400 acres of encroached woodlands by the year 2029. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals for ponderosa pine woodlands within the Nonlethal Fire Regime.

Parklike Stands and Old Growth

Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 25 to 80% by the year 2089. These two clusters are composed of old stands of ponderosa pine with moderate to closed canopies. This objective will be accomplished through the use of a fire-management response strategy, mechanical treatments in unavailable and restricted strata, planned ignitions, and silvicultural treatments. These clusters will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Maintain these parklike structures by restoring natural fire return intervals by the year 2029. The natural fire return interval for these stands is estimated to be from fifteen to twenty-five years.

Climax Stands

Reduce Clusters E, H, I & L to less than 20% of their combined RMV ranges by the year 2089 through the use of planned ignitions and timber harvest treatments. This group of clusters is composed of mature and old stands of mostly Douglas-fir with moderate to closed canopies.

Alternative 1 (cont.)

Forest Health

Decrease favorable habitat conditions for bark beetle complexes by increasing Cluster J to an RMV range of 20 to 60% by the year 2089. Cluster J is composed of stands of large ponderosa pine trees with moderate canopy closure. This objective will be accomplished through the use of planned ignitions and timber harvest treatments.

Reduce the impacts of common root rot complexes, Douglas-fir dwarf mistletoe, and Western spruce budworm by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20% by the year 2089. This group of clusters is composed of mature and old stands of Douglas-fir with moderate to closed canopies.

Mixed Fire Regime

Early-Seral Vegetation

Maintain Cluster A at an RMV range of 15 to 20% through a fire-management response strategy and silvicultural, mechanical, and prescribed fire treatments. This cluster is composed of young open stands of ponderosa pine and western larch.

Parklike Stands and Old Growth

Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 10 to 20% by the year 2089. These two clusters are composed of old stands of ponderosa pine and larch with moderate to closed canopies. This objective will be accomplished through the use of a fire-management response strategy, mechanical treatments in unavailable and restricted strata, planned ignitions, and silvicultural treatments. These clusters will meet the size and density characteristics of old growth; a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition.

Forest Health

Reduce the impacts of common root rot complexes, Douglas-fir dwarf mistletoe, and Western spruce budworm by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20% by the year 2089. This group of clusters is composed of mature and old stands of Douglas-fir and occasionally grand fir with moderate to closed canopies.

Lethal Fire Regime

Early-Seral Vegetation

Maintain Clusters A, B, and C at a combined RMV range of 15 to 50% using a fire-management response strategy, and silvicultural, mechanical, and prescribed fire treatments. This group of clusters is composed of young stands of lodgepole pine, spruce, grand fir, alpine fir, and larch with open, moderate, and closed canopies.

Old Growth

Restore old-growth lodgepole pine by increasing Clusters F and G to a combined RMV range of 24 to 60% by the year 2089. These clusters are composed of mature stands of larch, lodgepole pine, and spruce with moderate and closed canopies. They will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Restore old-growth spruce and fir by increasing Clusters K and L to a combined RMV range of 30 to 100% by the year 2089. These clusters are composed of mature and old stands of larch, spruce, and fir with moderate to closed canopies. They

Alternative 1 (cont.)

will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Timberline Fire Regime

Whitebark Pine

Map the extent of whitebark pine by the year 2009.

Reintroduce periodic fire to 75% of whitebark pine habitats by the year 2029 using a combination of a fire-management response strategy, timber harvest activities, mechanical treatments, and planned ignitions.

Cooperate with other agencies on the development of a whitebark pine blister rust program by the year 2019.

Work with other agencies to develop a first-generation, disease-resistant whitebark seed source for out-planting by 2029.

General

Stocking

Where timber harvest occurs, meet tree stocking standards within 15 years. Where openings occur as a result of planned or unplanned ignitions or other natural disturbances, allow natural processes to restock the site with tree seedlings.

Salvage

Within the available forest base, salvage harvest no more than 20% of commercial forest products damaged by windthrow, planned or unplanned ignitions, or insects and disease. Salvage operations will occur within 6 months of detection of the damage. Within the restricted forest base, the same guideline applies, except that salvage operations will be permitted only where they will not compromise other resource values.

Utilize mechanical and planned ignition treatments to mitigate extreme fuel-loading hazards within one to three years after blowdown or bug-kill events that cover 25 acres or more.

Tribal Member Employment Opportunities

Provide 1 to 2 million board feet of timber per year as small-business set-asides for Tribal members, subject to market conditions and available Tribal labor.

Post and Pole

Manage 5,000 acres for lodgepole pine post-and-pole products on an 80 year rotation. By the year 2019 and beyond, lower road densities will force this acreage to drop to about 2,000 acres.

Fire Hazard Reduction

Use mechanical and/or prescribed fire treatments on 6,000 acres of closed canopy wildland-residential intermix per decade to produce suppression-zone fuel breaks to decrease the likelihood of loss to catastrophic fire. Maintain fuel breaks with periodic prescribed fire treatments where feasible.

Alternative 1 (cont.)

Grazing

Grassland Types Favored

Improve or maintain the biodiversity of existing grassland types with an emphasis on enhancing native species.

Range Condition

Manage grasslands to restore them to a healthy ecological (good or better) condition.

Riparian Areas

Manage grazing in riparian areas to restore nonfunctional and functioning-at-risk riparian areas to the highest functional level under the Montana Riparian Association classification system.

Tools

Use stocking rate and season-of-use-adjustments; rest/rotation grazing systems; cross, riparian, and boundary fencing; and stockwater developments to meet range condition and riparian area objectives.

Weeds

Aggressively manage noxious weeds on 90% of infested areas.

Wildlife

Habitat Effectiveness

Increase big game habitat effectiveness to an average of 50% (2 miles of open road per square mile) in the Lethal Fire Regime and to an average of 40% (3 miles of open road per square mile) in the Nonlethal and Mixed Fire Regimes by the year 2009. Road closure methods will include permanent abandonment in the Lethal Fire Regime, and gates in the Nonlethal and Mixed Fire Regimes.

Mature Forest

Restore and maintain Clusters G, H, K, and L at the following RMV ranges by the year 2009 to provide forest areas within each landscape that offer closed canopies for wildlife. The spatial arrangement of these clusters will mimic natural fragmentation patterns. This objective will be accomplished by deferring harvest and thinning or where appropriate, through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	10 to 45%
Mixed Fire Regime	22 to 55%
Lethal Fire Regime	55 to 90%

Alternative 1 (cont.)

Hiding Cover

Restore and maintain Clusters B, C, and D at the following RMV ranges by the year 2009 to provide areas within each landscape that offer hiding cover for big game. This objective will be accomplished through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	0 to 25%
Mixed Fire Regime	20 to 40%
Lethal Fire Regime	20 to 45%

Snags and Woody Debris Habitat

Restore and maintain Clusters I, J, K, and L at the following RMV ranges by the year 2089 to provide areas within each landscape that offer snag habitat for cavity-nesting wildlife species and down and dead woody debris for wildlife. This objective will be accomplished by deferring harvest and thinning or where appropriate, through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	0 to 25%
Mixed Fire Regime	20 to 40%
Lethal Fire Regime	20 to 45%

Early-Seral Habitat

Restore and maintain Clusters A, B, and C at the following RMV ranges by the year 2009 to provide areas within each landscape that offer forage and breeding habitat for early-seral wildlife species. This objective will be accomplished through the use of silvicultural treatments and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	25 to 90%
Mixed Fire Regime	10 to 30%
Lethal Fire Regime	30 to 60%

Alternative 1 (cont.)

Riparian Areas

Maintain and restore the species composition of 80% of forested riparian areas so that the type and number of species is the same as that of undisturbed reference riparian areas. Methods used will include the removal of noxious weeds or other invasive, nonnative species and the implementation of management prescriptions that reverse conifer densification in the Nonlethal and Mixed Fire Regimes.

Water and Fish

Roads

Increase the minimum total road spacing to 1000 feet on slopes greater than 35% and to 1500 feet on slopes less than 35%.

Achieve a total road density of less than 6 miles of road per square mile by removing 20% of road spurs in currently roaded areas.

Improve the condition of 100% of the road segments that are severely degrading stream channels.

Use full road rip, some recontouring, and the removal of all culverts and bridges when removing roads.

Prepare a Reservation-wide transportation plan by the year 2005. The plan will provide for management of all system and non-system Reservation roads in a manner consistent with road spacing, density, and improvement objectives.

Early-Seral Vegetation

Maintain Clusters A1 and A2 within the following RMV ranges:

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	25 to 90%
Mixed Fire Regime	10 to 30%
Lethal Fire Regime	30 to 60%

The combined percentages of the Mixed and Lethal Fire Regimes will equal less than 30%.

Channel Complexity

Ensure that a full range of channel complexity occurs over 80% of channel length by 2019.

Alternative 1 (cont.)

Riparian Areas

Inventory 80% of all forested riparian areas by the year 2004 using the methods set forth by the Montana Riparian Association (MRA).

Water Quality

Remove or treat 100% of identified point- and non-point pollution sources by 2019. Sources will be identified by the Tribes' Natural Resources and Forestry Departments.

Fish

Maintain or enhance cutthroat and bull trout populations in all drainages where they currently exist.

Restore cutthroat trout to three drainages and bull trout to one drainage within the Reservation.

Scenery and Recreation

Scenic Integrity Level

Meet established Scenic Integrity Level (SIL) objectives for all areas. Conduct the following visual rehabilitation projects to meet desired SIL standards (table 3-5). See Appendix M for more details.

Table 3-5. Visual Rehabilitation Projects

Area	Completion Date
Big Draw (Dendroctonus)	2001
Revais	2003
Hot Springs	2003
Garden Creek	2005
Hellroaring and Station Creeks	2008
St. Marys, Evaro, Stevens, and Charity	2008
Valley	2008

Alternative 1 (cont.)

Roadless Areas

Formally designate the areas listed in tables 3-6 and 3-7 as Roadless Areas within one year of Forest Plan approval. Develop management plans for these areas within three years of Forest Plan approval (the location of these areas is shown in fig. 3-11).

Table 3-6. Roadless areas with logging restricted to roadless harvest

Roadless Area	Acerage
Oliver Point (Sal)	8,175
Big Draw Complex	11,573
Garceau	8,675
Burgess	3,328
Little Money (Bighorn Sheep) Complex	1,564
Perma Point	3,815
Pistol Face	8,156
Blue Bay (N. Missions)	6,452
Finley Lake	5,184
Total	**56,922**

Table 3-7. Roadless areas with logging prohibited

Roadless Area	Acerage
Ravalli/Valley (Ravalli/Hewolf) Complex	11,166
Swartz Lake	157
Total	11,323

Wilderness Areas

Formally designate the areas listed in table 3-8 as Wilderness Areas or Wilderness Additions within two years of Forest Plan approval. Develop management plans for these areas within four years of Forest Plan approval (the location of these areas is shown in fig. 3-11).

Alternative 1 (cont.)

Table 3-8. Wilderness areas and wilderness additions

Area	Acerage
Thompson Peak Wilderness Area	4,838
Sleeping Woman (Ninemile Divide) Wilderness Area	24,976
South Missions Addition	2,152
North Missions Addition	6,076
Courville Creek Addition	149
Total	**38,191**

Diversified Recreation Opportunity Levels

Meet Diversified Recreation Opportunity Level (DROL) objectives for all areas (table 3-9). Prepare a Reservation-wide recreational use plan by the year 2005. The plan will be based upon existing DROLs and will provide for planning and management of recreation resources (Appendix O contains definitions of DROL classifications).

Table 3-9. DROL classifications and management restrictions

Area	DROL Classification	Special Restrictions
Chief Cliff	Semi-Primitive Motorized	No commercial logging activities
Irvine West Face	Semi-Primitive Motorized	Maintain natural appearance, require full rehabilitation of any new roadway construction after use.
Revais Creek Riparian Area	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Seepay Riparian Area	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of viewshed along full length of corridor.
Dog Lk, Inlet Marsh & Camas to Cutoff Rd	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Hot Springs Creek	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Little Bitterroot Canyon	Semi-Primitive Motorized	Prohibit logging, protect and maintain river corridor' s outstanding natural envirnoment for cultural and recreational uses, use manager ignited fires to achieve seral cluster aoals.

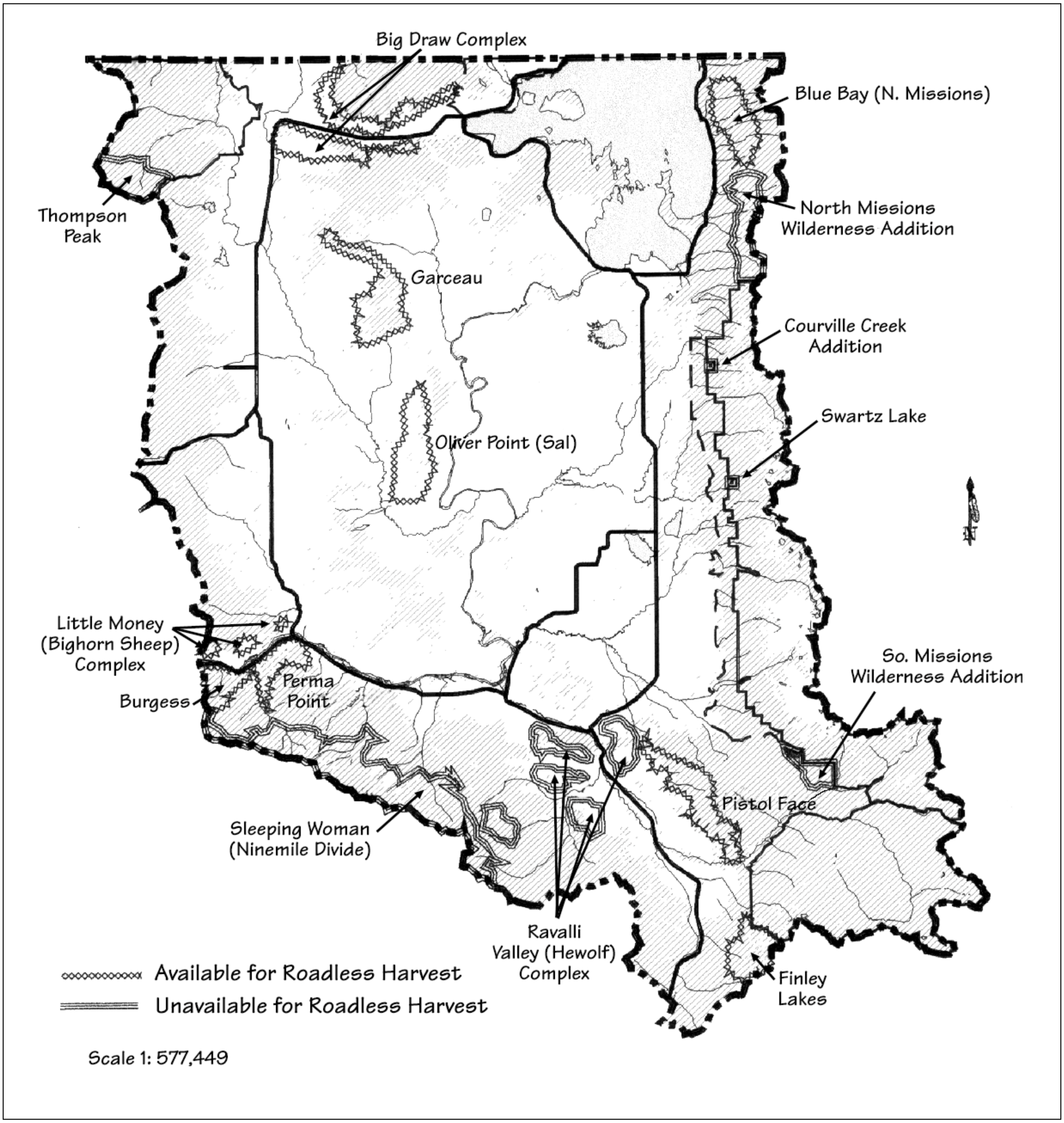


Figure 3-11. Alternative 1 roadless areas and wilderness additions

Alternative 1 (cont.)

Table 3-9. DROL classifications and management restrictions (continued)

Area	DROL Classification	Special Restrictions
Little Bitterrroot-Basso-Mill Creek	Roaded Natural	Maintain as scenic drive corridor, maintain and protect main transportation routes with the stream and river corridor for cultural and recreational uses, buffer road from logging and maintain natural appearance of foreground viewshed along roadway.
Upper Dry Fork Reservoir	Roaded Natural	Maintain lower reaches of Dry Fork Creek and Reservoir and the surrounding riparian vegetation for cultural and recreational purposes, buffer all foreground viewshed areas from logging, and prohibit all logging within immediate use areas.
Boulder Road Scenic Route	Roaded Natural	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.
Hellroaring Road	Roaded Natural	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.
Wilderness Buffer Zone	Roaded Natural	No commercial logging activities, expand the wilderness fire plan to include the Buffer Zone land tracts and cluster goals.
Jocko River Corridor	Semi-Primitive Motorized	Maintain as a scenic drive corridor, buffer road from logging activites, maintain natural appearance of foreground viewshed along roadway.
Kelly' s Ridge	Semi-Primitive Motorized	Maintain current roadless acreage.
South Fork P.A.	Primitive	No commercial logging activities.
South Fork Rd Sys (Fingers & Corridors)	Semi-Primitive Motorized	Maintain outstnding scenic roadway qualities, utilize native materials on stream crossings and other roadway facilities whenever practicable.

Trails and Campsites

Redirect winter recreation activities that currently occur throughout the Reservation to the North Missions Landscape by creating up to 11 miles of cross-country trails and up to 20 miles of groomed snow mobile trail systems between Blue Bay and Boulder by the year 2003. The snowmobile trail grooming will be done in cooperation with the US Forest Service and the Montana Department of Fish, Wildlife and Parks.

By the year 2002 enhance trail maintenance for Three Lakes Peak, Black Tail, and Burgess Lake; increase the level of trail monitoring for the Reservation Divide and Seepay Trails; and increase the level of monitoring of impromptu campsites in the Revais, Magpie, and Seepay Creek drainages.

Develop a trail-use fee system for the use of the groomed snowmobile tails and new cross country ski trails proposed for the North Missions Landscape. The fees would be used to fund the maintenance of these trails.

Alternative 1 (cont.)

Increase maintenance at Vanderburg Cultural Camp, Jocko River, Job Corps Campsites 1 and 2, Twin Lakes, South Fork Gate Cabin, Middle Fork Campground, and eight sites in the South Fork of the Jocko Primitive Area by the year 2005.

Develop interpretive trails at Swartz Lake (by the year 2002) and Blue Bay (by the year 2003) for educational and group use.

Culture

Tribal Member Subsistence Activities

Meet RMV objectives for forest vegetation in order to increase variety, texture, diversity, and vegetation mosaics and to enhance Tribal member subsistence hunting, plant collecting, and other traditional uses.

Limited Public Access Areas

Designate the following Limited Access Areas (table 3-10) by the year 2002 in order to provide a variety of natural areas and recreational settings that Tribal members can use for solitude, cultural activities, and recreational pursuits. Limited Public Access Areas are areas in which some or all uses are closed to the non-Tribal public.

Table 3-10. Limited Public Access Areas

Landscape	Limited Public Access Area
Southwest Landscape:	One of the following: Entire Southwest Landscape; Magpie drainage; Seepay and Burgess drainages.
West Landscape:	All forested Tribal lands except the Dog Lake Area, the Upper and Lower Dry Fork Reservoir areas, and the Hot Springs drainage area.
Salish Mountains Landscape:	The eastern portion of the Lower Flathead River corridor from Buffalo Bridge to Sloans Bridge.
North Missions Landscape:	The Hellroaring drainage area.
Missions Landscape:	One of the following: the McDonald Lake to Mollman drainage, the Swartz Lake and Terrace Lake drainage; the McDonald Peak Grizzly Bear Conservation Zone.
Jocko Landscape:	Continue to maintain the South Fork Primitive Area.

Cultural Area, Trail and Campsite Protection

Develop a plan to identify, inventory, and maintain culturally important areas, trails, and campsites within the Reservation by the year 2004.

Cultural Plants

Beginning in the year 2002, utilize Tribal ethnobotanists to identify sites within proposed sale management areas that may contain plants important to the cultures of the Tribes.

Alternative 1 (cont.)

Socio-Economic

Income

Provide income to the Tribal government from an estimated annual harvest of 700 thousand board feet of ponderosa pine and 14.2 million board feet of other species for the first thirty-year period. At current stumpage rates these volumes will generate approximately $3,645,000. This includes one to two million board feet set-aside for Indian loggers in small sales and paid permits. (The stumpage values used for Indian loggers is 36% of the contract stumpage. This is the average value of Indian stumpage versus non-Indian stumpage for the period 1988 through 1997.)

Employment

Provide employment to between 85 and 105 Tribal government employees.

Provide employment to about 165 other wood products workers based on an annual harvest of approximately 14.9 million board feet, generating about $5.1 million in wages annually.

Tribal Member Business Assistance

Provide information on site specific resources to Tribal members' developing business plans for forest-related concessions or outfitting enterprises.

Communication and Education

Nature Interpretation and Points Of Interest

Develop interpretive trails at Boulder (the Blue Bay Interpretive Trail) by 2003 and Swartz Lake (the Swartz Lake Interpretive Trail) by 2002.

Develop "points of interest" stops along V-1000 & V-1200 roads in Valley Creek and Saddle Mountain by 2005.

Personnel

Develop and fill a public information officer position by December 2005.

Alternative 2: Modified Restoration

Forest Management and Fire

Nonlethal Fire Regime

Grasslands

Use fire-management response strategy and prescribed burn treatments on 5,400 acres of existing grasslands within the forest to restore and maintain historical levels of herbaceous and seral shrub vegetation. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals (seven to ten years) for the Nonlethal Fire Regime.

Use a combination of silvicultural, mechanical, and prescribed fire treatments to restore 5,600 acres of encroached grasslands by the year 2029. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals (seven to ten years) for the Nonlethal Fire Regime.

Woodlands and Old Growth

Use fire-management response strategy, silvicultural, mechanical, and prescribed burn treatments on 7,600 acres of existing ponderosa pine woodlands within the forest to maintain pine and bunchgrass communities. Burn activities will be consistent with historical fire return intervals for ponderosa pine woodlands within the Nonlethal Fire Regime.

Use a combination of silvicultural, mechanical, and prescribed fire treatments to restore 400 acres of encroached woodlands by the year 2029. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals for ponderosa pine woodlands within the Nonlethal Fire Regime.

Parklike Stands and Old Growth

Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 15 to 55% by the year 2089. These two clusters are composed of old stands of ponderosa pine with moderate to closed canopies. This objective will be accomplished through the use of a fire-management response strategy, mechanical treatments in unavailable and restricted strata, planned ignitions, and silvicultural treatments. These clusters will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Climax Stands

Reduce Clusters E, H, I & L to less than 20% of their combined RMV ranges by the year 2089 through the use of planned ignitions and timber harvest treatments. This group of clusters is composed of mature and old stands of mostly Douglas-fir with moderate to closed canopies.

Forest Health

Decrease favorable habitat conditions for bark beetle complexes by increasing Cluster J to an RMV range of 10 to 40% by the year 2089. Cluster J is composed of stands of large, ponderosa pine trees with moderate canopy closure. This objective will be accomplished through the use of planned ignitions and timber harvest treatments.

Manage Cluster G at the lower end of its density range and for species that are non-host for the prevalent pathogen through the use of harvest treatments and prescribed fire. Cluster G is composed of mature pine stands with moderate to closed canopies.

Alternative 2 (cont.)

Reduce the impacts of common root rot complexes, Douglas-fir dwarf mistletoe, and Western spruce budworm by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20% by the year 2089. This group of clusters is composed of mature and old stands of Douglas-fir with moderate to closed canopies.

Mixed Fire Regime

Early-Seral Vegetation

Maintain Cluster A at an RMV range of 0 to 25% through a fire-management response strategy and silvicultural, mechanical, and prescribed fire treatments. This cluster is composed of young, open stands of ponderosa pine and western larch.

Parklike Stands and Old Growth

Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 5 to 20% by the year 2089. These two clusters are composed of old stands of ponderosa pine and larch with moderate to closed canopies. This objective will be accomplished through the use of a fire-management response strategy, mechanical treatments in unavailable and restricted strata, planned ignitions, and silvicultural treatments. These clusters will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Forest Health

Reduce the impacts of common root rot complexes, Douglas-fir dwarf mistletoe, and Western spruce budworm by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20% by the year 2089. This group of clusters is composed of mature and old stands of Douglas-fir and occasionally grand fir with moderate to closed canopies.

Lethal Fire Regime

Early-Seral Vegetation

Maintain Clusters A, B, and C at a combined RMV range of 15 to 40% using a fire-management response strategy, and silvicultural, mechanical, and prescribed fire treatments. This group of clusters is composed of young stands of lodgepole pine, spruce, grand fir, alpine fir, and larch with open, moderate, and closed canopies.

Old Growth

Restore old-growth lodgepole pine by increasing Clusters F and G to a combined RMV range of 35 to 55% by the year 2089. These clusters are composed of mature stands of larch, lodgepole, and spruce with moderate and closed canopies. They will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Restore old-growth spruce and fir by increasing Clusters K and L to a combined RMV range of 15 to 30% by the year 2089. These clusters are composed of mature and old stands of larch, spruce, and fir with moderate to closed canopies. They will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Alternative 2 (cont.)

Timberline Fire Regime

Whitebark Pine

Map the extent of whitebark pine by 2009.

Reintroduce periodic fire to 50% of whitebark pine habitats by the year 2029 using a combination of a fire-management response strategy, timber harvest activities, mechanical treatments, and planned ignitions.

General

Stocking

In the available and restricted acreage bases, meet tree stocking standards within 10 years whereever timber harvest occurs or whereever openings occur as a result of planned and unplanned ignitions or natural disturbances . In the unavailable acreage base, allow natural processes to restock the site with tree seedlings whereever openings occur as a result of planned or unplanned ignitions or other natural disturbances.

Salvage

Within the available forest base, salvage harvest no more than 50% of commercial forest products damaged by windthrow, planned or unplanned ignitions, or insects and disease. Salvage operations will occur within 6 months of detection of the damage. Within the restricted forest base, the same guideline applies except that salvage operations will be permitted only where they will not compromise other resource values.

Utilize mechanical and planned ignition treatments to mitigate extreme fuel-loading hazards within one to three years after blowdown or bug kill events that cover 25 acres or more.

Tribal Member Employment Opportunities

Provide 2 to 3 million board feet of timber per year as small-business set-asides for Tribal members, subject to market conditions and available Tribal labor.

Post and Pole

Manage approximately 5,000 acres for lodgepole pine post, pole, and other small products on an 40 year rotation.

Fire Hazard Reduction

Use mechanical and/or prescribed fire treatments on 4,000 acres of closed canopy wildland-residential intermix per decade to produce suppression-zone fuel breaks to decrease the likelihood of loss to catastrophic fire. Maintain fuel breaks with periodic prescribed fire treatments where feasible.

Alternative 2 (cont.)

Grazing

Grassland Types Favored

Improve or maintain the biodiversity of existing grassland types.

Range Condition

Manage grasslands to restore them to a healthy ecological (fair or better) condition.

Riparian Areas

Manage grazing in riparian areas to restore nonfunctional and functioning-at-risk riparian areas to a fully functional level under the Montana Riparian Association classification system.

Tools

Use stocking rate and season-of-use-adjustments; rest/rotation grazing systems; cross, riparian, and boundary fencing; and stockwater developments to meet range condition and riparian area objectives.

Weeds

Aggressively manage noxious weeds on 80% of infested areas.

Wildlife

Habitat Effectiveness

Increase big game habitat effectiveness to an average of 40% (3 miles of open road per square mile) in the Lethal Fire Regime, and to an average of 30% (4 miles of open road per square mile) in the Nonlethal and Mixed Fire Regimes by the year 2009. Road closure methods will include permanent abandonment in the Lethal Fire Regime, and gates and recontouring in the Nonlethal and Mixed Fire Regimes.

Mature Forest

Restore and maintain Clusters G, H, K, and L at the following RMV ranges by the year 2009 to provide forest areas within each landscape that offer closed canopies for wildlife. This objective will be accomplished by deferring harvest and thinning or where appropriate, through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	10 to 45%
Mixed Fire Regime	22 to 55%
Lethal Fire Regime	55 to 90%

Alternative 2 (cont.)

Hiding Cover

Restore and maintain Clusters B, C, and D at the following RMV ranges by the year 2009 to provide areas within each landscape that offer hiding cover for big game. This objective will be accomplished through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	0 to 25%
Mixed Fire Regime	20 to 40%
Lethal Fire Regime	20 to 45%

Snags and Woody Debris

Restore and maintain Clusters I, J, K, and L at the following RMV ranges by the year 2089 to provide areas within each landscape that offer snag habitat for cavity-nesting wildlife species and down and dead woody debris for wildlife. This objective will be accomplished by deferring harvest and thinning or where appropriate, through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	15 to 65%
Mixed Fire Regime	5 to 30%
Lethal Fire Regime	15 to 40%

Early-Seral Habitat

Restore and maintain Clusters A, B, and C at the following RMV ranges by the year 2009 to provide areas within each landscape that offer forage and breeding habitat for early-seral wildlife species. This objective will be accomplished through the use of silvicultural treatments and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	20 to 80%
Mixed Fire Regime	15 to 60%
Lethal Fire Regime	15 to 40%

Alternative 2 (cont.)

Riparian Areas

Maintain and restore the species composition of 70% of forested riparian areas so that the type and number of species is the same as that of undisturbed reference riparian areas. Methods used will include the removal of noxious weeds or other invasive, nonnative species and the implementation of management prescriptions that reverse conifer densification in the Nonlethal and Mixed Fire Regimes.

Water and Fish

Roads

Increase minimum total road spacing to 800 feet on slopes greater than 35% and to 1200 feet on slopes less than 35%.

Achieve a total road density of less than 6.5 miles of road per square mile by removing 15% of road spurs in currently roaded areas.

Improve the condition of 100% of the road segments that are severely degrading stream channels.

Use full road rip, some recontouring and/or the installation of cross drains, and the removal of all culverts and bridges when removing roads.

Prepare a Reservation-wide transportation plan by the year 2005. The plan will provide for management of all system and non-system Reservation roads in a manner consistent with road spacing, density, and improvement objectives.

Early-Seral Vegetation

Maintain Clusters A1 and A2 within the following RMV ranges:

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	20 to 80%
Mixed Fire Regime	15 to 60%
Lethal Fire Regime	15 to 40%

The combined percentages of the Mixed and Lethal Fire Regimes will equal less than 30%.

Alternative 2 (cont.)

Channel Complexity

Ensure that a full range of channel complexity occurs over 70% of channel length by 2019.

Riparian Areas

Inventory 80% of all forested riparian areas by the year 2004 using the methods set forth by the Montana Riparian Association (MRA).

Water Quality

Remove or treat 80% of identified point- and non-point pollution sources by 2019. Sources will be identified by the Natural Resources and Forestry Departments.

Fish

Maintain or enhance cutthroat and bull trout populations in all drainages where they currently exist.

Restore cutthroat trout to two drainages and bull trout to one drainage within the Reservation.

Scenery and Recreation

Scenic Integrity Level

Meet established Scenic Integrity Level (SIL) objectives for all areas. Conduct the following visual rehabilitation projects to meet desired SIL standards (table 3-12). See Appendix M for more details.

Table 3-12. Visual Rehabilitation Projects

Area	Completion Date
Big Draw (Dendroctonus)	2001
Revais	2003
Hot Springs	2003
Garden Creek	2005
Hellroaring and Station Creeks	2008
St. Marys, Evaro, Stevens, and Charity	2008
Valley	2008

Roadless Areas

Designate roadless areas throughout the Reservation as listed in tables 3-13 and 3-14 within one year of Forest Plan approval. Develop management plans for these areas within three years of Forest Plan approval (the location of these areas is shown in fig. 3-12).

Alternative 2 (cont.)

Table 3-13. Roadless areas with logging restricted to roadless harvest

Roadless Area	Acerage
Oliver Point (Sal)	8,175
Burgess	2,219
Little Money (Bighorn Sheep) Complex	1,561
Blue Bay (N. Missions)	4,756
Finley Lake	5,176
Total	**21,886**

Table 3-14. Roadless areas with logging prohibited

Roadless Area	Acerage
Ravalli/Valley (Ravalli/Hewolf) Complex	11,166
Swartz Lake	157
Total	11,323

Wilderness Areas

Designate wilderness areas and make wilderness additions throughout the Reservation as listed in table 3-15 within two years of Forest Plan approval. Develop management plans for these areas within four years of Forest Plan approval (fig. 3-12).

Table 3-15. Wilderness areas and wilderness additions

Area	Acerage
Thompson Peak Wilderness Area	4,838
Sleeping Woman (Ninemile Divide) Wilderness Area	17,578
North Missions Addition	4,404
Courville Creek Addition	149
Total	**26,969**

Alternative 2 (cont.)

Diversified Recreation Opportunity Levels

Meet Diversified Recreation Opportunity Level (DROL) objectives for all areas (table 3-16). Prepare a Reservation-wide recreational use plan by the year 2005. The plan will be based upon existing DROLs and will provide for planning and management of recreation resources (Appendix O contains definitions of DROL classifications).

Table 3-16. DROL classifications and management restrictions

Area	DROL Classification	Special Restrictions
Chief Cliff	Semi-Primitive Motorized	No commercial logging activities
Irvine West Face	Semi-Primitive Motorized	Maintain natural appearance, require full rehabilitation of any new roadway construction after use.
Revais Creek Riparian Area	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Seepay Riparian Area	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of viewshed along full length of corridor.
Dog Lk, Inlet Marsh & Camas to Cutoff Rd	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Hot Springs Creek	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Little Bitterroot Canyon	Semi-Primitive Motorized	Prohibit logging, protect and maintain river corridor' s outstanding natural envirnoment for cultural and recreational uses, use manager ignited fires to achieve seral cluster goals.
Little Bitterrroot-Basso-Mill Creek	Roaded Natural	Maintain as scenic drive corridor, maintain and protect main transportation routes with the stream and river corridor for cultural and recreational uses, buffer road from logging and maintain natural appearance of foreground viewshed along roadway.
Upper Dry Fork Reservoir	Roaded Natural	Maintain lower reaches of Dry Fork Creek and Reservoir and the surrounding riparian vegetation for cultural and recreational purposes, buffer all foreground viewshed areas from logging, and prohibit all logging within immediate use areas.
Boulder Road Scenic Route	Roaded Natural	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.

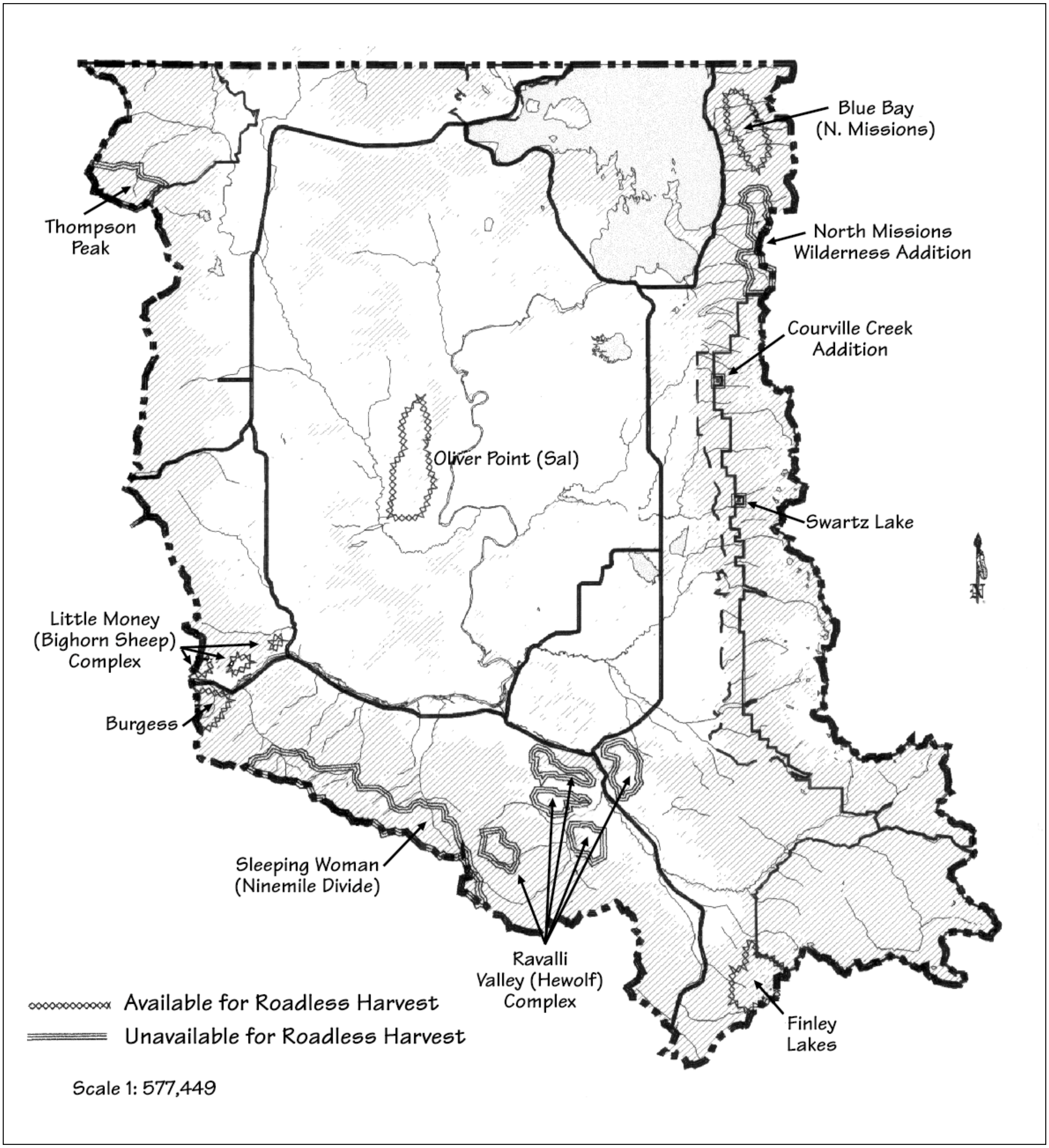


Figure 3-12. Alternative 2 roadless areas and wilderness additions

Alternative 2 (cont.)

Table 3-16. DROL classifications and management restrictions (continued)

Area	DROL Classification	Special Restrictions
Hellroaring Road	Roaded Natural	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.
Wilderness Buffer Zone	Roaded Natural	No commercial logging activities, expand the wilderness fire plan to include the Buffer Zone land tracts and cluster goals.
Jocko River Corridor	Semi-Primitive Motorized	Maintain as a scenic drive corridor, buffer road from logging activites, maintain natural appearance of foreground viewshed along roadway.
Kelly' s Ridge	Semi-Primitive Motorized	Maintain current roadless acreage.
South Fork P.A.	Primitive	No commercial logging activities.
South Fork Rd Sys (Fingers & Corridors)	Semi-Primitive Motorized	Maintain outstnding scenic roadway qualities, utilize native materials on stream crossings and other roadway facilities whenever practicable.

Trails and Campsites

Redirect winter recreation activities that currently occur throughout the Reservation to the North Missions Landscape by creating up to 11 miles of cross-country trails and up to 20 miles of groomed snow mobile trail systems between Blue Bay and Boulder by the year 2003. The snowmobile trail grooming will be done in cooperation with the US Forest Service and the Montana Department of Fish, Wildlife and Parks.

By the year 2002 enhance trail maintenance for Three Lakes Peak, Black Tail, and Burgess Lake; increase the level of trail monitoring for the Reservation Divide and Seepay Trails; and increase the level of monitoring of impromptu campsites in the Revais, Magpie, and Seepay Creek drainages.

Develop a trail-use fee system for the use of the groomed snowmobile tails and new cross country ski trails proposed for the North Missions Landscape. The fees would be used to fund the maintenance of these trails.

Increase maintenance at Vanderburg Cultural Camp, Jocko River, Job Corps Campsites 1 and 2, Twin Lakes, South Fork Gate Cabin, Middle Fork Campground, and eight sites in the South Fork of the Jocko Primitive Area by the year 2005.

Develop interpretive trails at Swartz Lake (by the year 2002) and Blue Bay (by the year 2003) for educational and group use.

Alternative 2 (cont.)

Culture

Tribal Member Subsistence Activities

Meet RMV objectives for forest vegetation in order to increase variety, texture, diversity, and vegetation mosaics and to enhance Tribal member subsistence hunting, plant collecting, and other traditional uses.

Limited Public Access Areas

Designate the following Limited Access Areas (table 3-17) by the year 2002 in order to provide a variety of natural areas and recreational settings that Tribal members can use for solitude, cultural activities, and recreational pursuits. Limited Public Access Areas are areas in which some or all uses are closed to the non-Tribal public.

Table 3-17. Limited Public Access Areas

Landscape	Limited Public Access Area
Southwest Landscape:	One of the following: Entire Southwest Landscape; Magpie drainage; Seepay and Burgess drainages.
West Landscape:	All forested Tribal lands except the Dog Lake Area, the Upper and Lower Dry Fork Reservoir areas, and the Hot Springs drainage area.
Salish Mountains Landscape:	The eastern portion of the Lower Flathead River corridor from Buffalo Bridge to Sloans Bridge.
North Missions Landscape:	The Hellroaring drainage area.
Missions Landscape:	One of the following: the McDonald Lake to Mollman drainage, the Swartz Lake and Terrace Lake drainage; the McDonald Peak Grizzly Bear Conservation Zone.
Jocko Landscape:	Continue to maintain the South Fork Primitive Area.

Cultural Area, Trail and Campsite Protection

Develop a plan to identify, inventory, and maintain culturally important areas, trails, and campsites within the Reservation by the year 2004.

Cultural Plants

Beginning in the year 2002, utilize Tribal ethnobotanists to identify sites within proposed sale management areas that may contain plants important to the cultures of the Tribes.

Alternative 2 (cont.)

Socio-Economic

Income

Provide income to the Tribal government from an estimated annual harvest of 700 thousand board feet of ponderosa pine and 17.4 million board feet of other species for the first thirty-year period. At current stumpage rates these volumes will generate approximately $4,300,000. This includes two to three million board feet set-aside for Indian loggers in small sales and paid permits. (The stumpage values used for Indian loggers is 36% of the contract stumpage. This is the average value of Indian stumpage versus non-Indian stumpage for the period 1988 through 1997.)

Employment

Provide employment to between 85 and 105 Tribal government employees.

Provide employment to about 200 other wood products workers based on an annual harvest of approximately 18.1 million board feet generating about $6.3 million in wages annually.

Tribal Member Business Assistance

Provide information on site specific resources to Tribal members' developing business plans for forest-related concessions or outfitting enterprises.

Communication and Education

Nature Interpretation and Points Of Interest

Develop interpretive trails at Boulder (the Blue Bay Interpretive Trail) by 2003 and Swartz Lake (the Swartz Lake Interpretive Trail) by 2002.

Develop "points of interest" stops along V-1000 & V-1200 roads in Valley Creek and Saddle Mountain by 2005.

Personnel

Develop and fill a public information officer position by December 2005.

Alternative 3: Restoration Emphasizing Commodities

Forest Management and Fire

Nonlethal Fire Regime

Grasslands

Use fire-management response strategy and prescribed burn treatments on 2,400 acres of existing grasslands within the forest to restore and maintain historical levels of herbaceous and seral shrub vegetation. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals (seven to ten years) for the Nonlethal Fire Regime.

Woodlands and Old Growth

Use fire-management response strategy, silvicultural, mechanical, and prescribed burn treatments on 2,300 acres of existing ponderosa pine woodlands within the forest to maintain pine and bunchgrass communities. Burn activities will be consistent with historical fire return intervals for ponderosa pine woodlands within the Nonlethal Fire Regime.

Use a combination of silvicultural, mechanical, and prescribed fire treatments to restore 3,420 acres of encroached woodlands by the year 2029. Maintain these sites with a fire-management response strategy and periodic prescribed fire treatments that are consistent with historical fire return intervals for ponderosa pine woodlands within the Nonlethal Fire Regime.

Parklike Stands and Old Growth

Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 22 to 34% by the year 2089. These two clusters are composed of old stands of ponderosa pine with moderate to closed canopies. This objective will be accomplished through the use of a fire-management response strategy, mechanical treatments in unavailable and restricted strata, planned ignitions, and silvicultural treatments. These clusters will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Climax Stands

Reduce Clusters E, H, I & L to less than 20% of their combined RMV ranges by the year 2089 through the use of planned ignitions and timber harvest treatments. This group of clusters is composed of mature and old stands of mostly Douglas-fir with moderate to closed canopies.

Forest Health

Decrease favorable habitat conditions for bark beetle complexes by increasing Cluster J to an RMV range of 10 to 17% by the year 2089. Cluster J is composed of stands of large, ponderosa pine trees with moderate canopy closure. This objective will be accomplished through the use of planned ignitions and timber harvest treatments.

Manage Cluster G at the lower end of its density range and at the lower end of its RMV range of 12 to 32% through the use of harvest treatments and prescribed fire. Cluster G is composed of mature pine stands with moderate to closed canopies.

Reduce the impacts of common root rot complexes, Douglas-fir dwarf mistletoe, and Western spruce budworm by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20% by the year 2089. This group of clusters is composed of mature and old stands of Douglas-fir with moderate to closed canopies.

Alternative 3 (cont.)

Mixed Fire Regime

Early-Seral Vegetation

Maintain Cluster A at an RMV range of 20 to 30% through a fire-management response strategy and silvicultural, mechanical, and prescribed fire treatments. This cluster is composed of young, open stands of ponderosa pine and western larch.

Parklike Stands and Old Growth

Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 10 to 20% by the year 2089. These two clusters are composed of old stands of ponderosa pine and larch with moderate to closed canopies. This objective will be accomplished through the use of a fire-management response strategy, mechanical treatments in unavailable and restricted strata, planned ignitions, and silvicultural treatments. These clusters will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Forest Health

Reduce the impacts of common root rot complexes, Douglas-fir dwarf mistletoe, and Western spruce budworm by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20% by the year 2089. This group of clusters is composed of mature and old stands of Douglas-fir and occasionally grand fir with moderate to closed canopies.

Lethal Fire Regime

Early-Seral Vegetation

Maintain Clusters A, B, and C at a combined RMV range of 15 to 50% using a fire-management response strategy, and silvicultural, mechanical, and prescribed fire treatments. This group of clusters is composed of young stands of lodgepole pine, spruce, grand fir, alpine fir, and larch with open, moderate, and closed canopies.

Old Growth

Restore old-growth lodgepole pine by increasing Clusters F and G to a combined RMV range of 20 to 45% by the year 2089. These clusters are composed of mature stands of larch, lodgepole, and spruce with moderate and closed canopies. They will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Restore old-growth spruce and fir by increasing Clusters K and L to a combined RMV range of 10 to 25% by the year 2089. These clusters are composed of mature and old stands of larch, spruce, and fir with moderate to closed canopies. They will meet the size and density characteristics of old growth, and a portion will be managed for full old-growth conditions as described in the Tribes Interim Old-growth Definition (and future amendments).

Timberline Fire Regime

Whitebark Pine

Reintroduce periodic fire to 25% of whitebark pine habitats by the year 2029 using a combination of a fire-management response strategy, timber harvest activities, mechanical treatments, and planned ignitions.

Alternative 3 (cont.)

General

General Management Philosophy

Utilize state-of-the-art tools and management techniques and focus on forest product yield from the available forest base, while meeting RMVs by the year 2089.

Stocking

In the available and restricted acreage bases, meet tree stocking standards within 5 years whereever harvest occurs or whereever openings occur as a result of planned and unplanned ignitions or natural disturbance. In the unavailable acreage base, allow natural processes to restock the site with tree seedlings whereever openings occur as a result of planned or unplanned ignitions or other natural disturbance.

Salvage

Within the available forest base, salvage harvest 80% of commercial forest products damaged by windthrow, planned and unplanned ignitions, and insects and disease within 6 months of detection of the damage. Within the restricted forest base, the same guideline applies except that salvage operations will be permitted only where they will not compromise other resource values.

Utilize mechanical and planned ignition treatments to mitigate extreme fuel-loading hazards within one to three years after blowdown or bug kill events that cover 25 acres or more.

Tribal Member Employment Opportunities

Provide 3 to 4 million board feet of timber per year as small-business set-asides for Tribal members, subject to market conditions and available Tribal labor.

Post and Pole

Manage approximately 5,000 acres for lodgepole pine post and pole and other small products on a 40 year rotation.

Fire Hazard Reduction

Use mechanical and/or prescribed fire treatments on 2,000 acres of closed canopy wildland-residential intermix per decade to produce suppression-zone fuel breaks to decrease the likelihood of loss to catastrophic fire. Maintain fuel breaks with periodic prescribed fire treatments where feasible.

Grazing

Grassland Types Favored

Enhance the production of present forage species.

Alternative 3 (cont.)

Range Condition

Manage grasslands to restore them to a healthy ecological (fair or better) condition.

Riparian Areas

Manage grazing in riparian areas to restore nonfunctional and functioning-at-risk riparian areas to a fully functional level under the Montana Riparian Association classification system.

Tools

Use stocking rate and season-of-use-adjustments; rest/rotation grazing systems; cross, riparian, and boundary fencing; and stockwater developments to meet range condition and riparian area objectives.

Weeds

Aggressively manage noxious weeds on 80% of infested areas.

Wildlife

Habitat Effectiveness

Increase big game habitat effectiveness to an average of 30% (4 miles of open road per square mile) in all fire regimes by the year 2009. Road closure methods will include abandonment and gates.

Mature Forest

Restore and maintain Clusters G, H, K, and L at the following RMV ranges by the year 2009 to provide forest areas within each landscape that offer high canopy cover for wildlife. This objective will be accomplished by deferring harvest and thinning or where appropriate, through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	25 to 60%
Mixed Fire Regime	30 to 80%
Lethal Fire Regime	30 to 70%

Hiding Cover

Restore and maintain Clusters B, C, and D at the following RMV ranges by the year 2009 to provide areas within each landscape that offer hiding cover for big game. This objective will be accomplished through the use of silvicultural prescriptions and fire.

Alternative 3 (cont.)

Hiding Cover RMV ranges:

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	0 to 25%
Mixed Fire Regime	20 to 40%
Lethal Fire Regime	15 to 40%

Snags and Woody Debris

Restore and maintain Clusters I, J, K, and L at the following RMV ranges by the year 2089 to provide areas within each landscape that offer snag habitat for cavity-nesting wildlife species and down and dead woody debris for wildlife. This objective will be accomplished by deferring harvest and thinning or where appropriate, through the use of silvicultural prescriptions and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	20 to 45%
Mixed Fire Regime	5 to 30%
Lethal Fire Regime	10 to 35%

Early-Seral Habitat

Restore and maintain Clusters A, B, and C at the following RMV ranges by the year 2009 to provide areas within each landscape that offer forage and breeding habitat for early-seral wildlife species. This objective will be accomplished through the use of silvicultural treatments and fire.

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	20 to 30%
Mixed Fire Regime	20 to 30%
Lethal Fire Regime	10 to 30%

Riparian Areas

Maintain and restore the species composition of 60% of forested riparian areas so that the type and number of species is the same as that of undisturbed reference riparian areas. Methods used will include the removal of noxious weeds or other invasive nonnative species and management prescriptions that reverse conifer densification in the Nonlethal and Mixed Fire Regimes.

Alternative 3 (cont.)

Water and Fish

Roads

Increase minimum total road spacing to 800 feet on slopes greater than 35% and to 1,000 feet on slopes less than 35%.

Achieve a total road density of less than 7.0 miles of road per square mile by removing 10% of spurs in currently roaded areas.

Improve the condition of 70% of the road segments that are severely degrading stream channels.

Use full road rip, some recontouring and/or the installation of cross drains, and the removal of all culverts and bridges when removing roads.

Prepare a Reservation-wide transportation plan by the year 2005. The plan will provide for management of all system and non-system Reservation roads in a manner consistent with road spacing, density, and improvement objectives.

Early-Seral Vegetation

Maintain Clusters A1 and A2 within the following RMV ranges:

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	20 to 30%
Mixed Fire Regime	20 to 30%
Lethal Fire Regime	10 to 30%

The combined percentages of the Mixed and Lethal Fire Regimes will equal less than 30%.

Channel Complexity

Ensure that a full range of channel complexity occurs over 60% of channel length by 2019.

Riparian Areas

Inventory 80% of all forested riparian areas by the year 2004 using the methods set forth by the Montana Riparian Association (MRA).

Alternative 3 (cont.)

Water Quality

Remove or treat 70% of identified point- and non-point pollution sources by 2019. Sources will be identified by the Natural Resources and Forestry Departments.

Fish

Maintain or enhance cutthroat and bull trout populations in all drainages where they currently exist.

Restore cutthroat trout to two drainages within the Reservation.

Scenery and Recreation

Scenic Integrity Level

Meet established Scenic Integrity Level (SIL) objectives for all areas. Conduct the following visual rehabilitation projects to meet desired SIL standards (table 3-18). See Appendix M for more details.

Table 3-18. Visual Rehabilitation Projects

Area	Completion Date
Big Draw (Dendroctonus)	2001
Revais	2003
Hot Springs	2003
Garden Creek	2005
Hellroaring and Station Creeks	2008
St. Marys, Evaro, Stevens, and Charity	2008
Valley	2008

Diversified Recreation Opportunity Levels

Meet Diversified Recreation Opportunity Level (DROL) objectives for all areas (table 3-19). Prepare a Reservation-wide recreational use plan by the year 2005. The plan will be based upon existing DROLs and will provide for planning and management of recreation resources (Appendix O contains definitions of DROL classifications).

Alternative 3 (cont.)

Table 3-19. DROL classifications and management restrictions

Area	DROL Classification	Special Restrictions
Chief Cliff	Semi-Primitive Motorized	No commercial logging activities
Irvine West Face	Semi-Primitive Motorized	Maintain natural appearance, require full rehabilitation of any new roadway construction after use.
Revais Creek Riparian Area	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Seepay Riparian Area	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of viewshed along full length of corridor.
Dog Lk, Inlet Marsh & Camas to Cutoff Rd	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Hot Springs Creek	Roaded Natural	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Little Bitterroot Canyon	Semi-Primitive Motorized	Prohibit logging, protect and maintain river corridor' s outstanding natural envirnonment for cultural and recreational uses, use manager ignited fires to achieve seral cluster goals.
Little Bitterrroot-Basso-Mill Creek	Roaded Natural	Maintain as scenic drive corridor, maintain and protect main transportation routes with the stream and river corridor for cultural and recreational uses, buffer road from logging and maintain natural appearance of foreground viewshed along roadway.
Upper Dry Fork Reservoir	Roaded Natural	Maintain lower reaches of Dry Fork Creek and Reservoir and the surrounding riparian vegetation for cultural and recreational purposes, buffer all foreground viewshed areas from logging, and prohibit all logging within immediate use areas.
Boulder Road Scenic Route	Roaded Natural	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.
Hellroaring Road	Roaded Natural	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.
Wilderness Buffer Zone	Roaded Natural	No commercial logging activities, expand the wilderness fire plan to include the Buffer Zone land tracts and cluster goals.
Jocko River Corridor	Semi-Primitive Motorized	Maintain as a scenic drive corridor, buffer road from logging activites, maintain natural appearance of foreground viewshed along roadway.

Alternative 3 (cont.)

Table 3-19. DROL classifications and management restrictions (continued)

Area	DROL Classification	Special Restrictions
Kelly' s Ridge	Semi-Primitive Motorized	Maintain current roadless acreage.
South Fork Primitive Area	Primitive	No commercial logging activities.
South Fork Road System (Fingers and Corridors)	Semi-Primitive Motorized	Maintain outstnding scenic roadway qualities, utilize native materials on stream crossings and other roadway facilities whenever practicable.

Trails and Campsites

Redirect winter recreation activities that currently occur throughout the Reservation to the North Missions Landscape by creating up to 11 miles of cross-country trails and up to 20 miles of groomed snow mobile trail systems between Blue Bay and Boulder by the year 2003. The snowmobile trail grooming will be done in cooperation with the US Forest Service and the Montana Department of Fish, Wildlife and Parks.

Develop a trail-use fee system for the use of the groomed snowmobile tails and new cross country ski trails proposed for the North Missions Landscape. The fees would be used to fund the maintenance of these trails.

Develop interpretive trails at Swartz Lake (by the year 2002) and Blue Bay (by the year 2003) for educational and group use.

Culture

Tribal Member Subsistence Activities

Meet RMV objectives for forest vegetation in order to increase variety, texture, diversity, and vegetation mosaics and to enhance Tribal member subsistence hunting, plant collecting, and other traditional uses.

Limited Public Access Areas

Designate the following Limited Access Areas (table 3-20) by the year 2002 in order to provide a variety of natural areas and recreational settings that Tribal members can use for solitude, cultural activities, and recreational pursuits. Limited Public Access Areas are areas in which some or all uses are closed to the non-Tribal public.

Alternative 3 (cont.)

Table 3-20. Limited Public Access Areas

Landscape	Limited Public Access Area
Southwest Landscape:	One of the following: Entire Southwest Landscape; Magpie drainage; Seepay and Burgess drainages.
West Landscape:	All forested Tribal lands except the Dog Lake Area, the Upper and Lower Dry Fork Reservoir areas, and the Hot Springs drainage area.
Salish Mountains Landscape:	The eastern portion of the Lower Flathead River corridor from Buffalo Bridge to Sloans Bridge.
North Missions Landscape:	The Hellroaring drainage area.
Missions Landscape:	One of the following: the McDonald Lake to Mollman drainage, the Swartz Lake and Terrace Lake drainage; the McDonald Peak Grizzly Bear Conservation Zone.
Jocko Landscape:	Continue to maintain the South Fork Primitive Area.

Cultural Area, Trail and Campsite Protection

Develop a plan to identify, inventory, and maintain culturally important areas, trails, and campsites within the Reservation by the year 2004.

Cultural Plants

Beginning in the year 2002, utilize Tribal ethnobotanists to identify sites within proposed sale management areas that may contain plants important to the cultures of the Tribes.

Socio-Economic

Income

Provide income to the Tribal government from an estimated annual harvest of 700 thousand board feet of ponderosa pine and 15.9 million board feet of other species for the first thirty-year period. At current stumpage rates these volumes will generate approximately $3,744,000. This includes three to four million board feet set-aside for Indian loggers in small sales and paid permits. (The stumpage values used for Indian loggers is 36% of the contract stumpage. This is the average value of Indian stumpage versus non-Indian stumpage for the period 1988 through 1997.)

Employment

Provide employment to between 85 and 105 Tribal government employees.

Provide employment to about 185 other wood products workers based on an annual harvest of approximately 16.6 million board feet, generating about 5.8 million in wages annually.

Alternative 3 (cont.)

Tribal Member Business Assistance

Provide information on site specific resources to Tribal members' developing business plans for forest-related concessions or outfitting enterprises

Communication and Education

Nature Interpretation and Points Of Interest

Develop interpretive trails at Boulder (the Blue Bay Interpretive Trail) by 2003 and Swartz Lake (the Swartz Lake Interpretive Trail) by 2002.

Develop "points of interest" stops along V-1000 & V-1200 roads in Valley Creek and Saddle Mountain by 2005.

Personnel

Develop and fill a public information officer position by December 2005.

Alternative 4: No Action

Forest Management and Fire

Harvest

Harvest between 22 and 25 million board feet per year from the available and restricted portion of the forest.

Forest Health

Use even-aged regeneration treatments on 80% or more of the stands that have been moderately to severely impacted by dwarf mistletoe, root rot, and bark beetles by the year 2059.

General Management Philosophy

Utilize state-of-the-art tools and management techniques and focus on maximizing forest products yield from the available forest base.

Stocking

In the available and restricted acreage bases, meet tree stocking standards within 5 years whereever harvest occurs or whereever openings occur as a result of planned and unplanned ignitions or natural disturbance. In the unavailable base, allow natural processes to restock the site with tree seedlings whereever openings occur as a result of planned or unplanned ignitions or other natural disturbances.

Salvage

Within the available forest base, salvage harvest 95% or more of all economically feasible commercial forest products damaged by windthrow, insects, disease, planned or unplanned ignitions or other agents. Salvage operations will occur within 6 months of detection of the damage. Within the restricted forest base, the same guideline applies except that salvage operations will be permitted only where they will not compromise other resource values.

Tribal Member Employment Opportunities

Provide 1 to 2 million board feet of timber per year as small-business set-asides for Tribal members, subject to market conditions and available Tribal labor.

Roads

Maintain an average road spacing of 900 to 950 feet and an open road density of 4.0 or less miles per square mile.

Grazing

Grassland Types Favored

Maintain native grasslands and desirable introduced species.

Alternative 4 (cont.)

Riparian Areas
Manage grazing in sensitive riparian areas to reduce impacts.

Tools
Use cross, riparian, and boundary fencing and stockwater developments to meet range condition and riparian area objectives.

Weeds
Aggressively manage noxious weeds on 80% of infested areas.

Restoration
Identify and prioritize restoration needs. Manage livestock grazing more intensively in restoration areas to ensure these areas are restored. Reseed roads and disturbed sites with grasses adapted to the site.

Wildlife

Habitat Effectiveness
Increase habitat effectiveness for elk to 30% (4 miles of open road per square mile) in all fire regimes by 2009. Road closure methods will include using gates and abandonment.

Big Game Habitat
Maintain a total cover-to-forage ratio of 40:60 to maintain big game habitat in each watershed and landscape.

Hiding Cover
Leave undisturbed security areas of at least 3,000 acres adjacent to all logging units on big game summer ranges. Maintain a favorable balance of hiding and thermal cover and forage areas on winter ranges.

Old Growth
Maintain old-growth wildlife habitat within streamside corridors.

Riparian Areas
Maintain and restore the species composition of 60% of forested riparian areas so that the type and number of species is the same as that of undisturbed reference riparian areas. Methods used will include the removal of noxious weeds or other invasive nonnative species and management prescriptions that reverse conifer densification in the Nonlethal and Mixed Fire Regimes.

Alternative 4 (cont.)

Water and Fish

Roads

Maintain current total road spacing of 700 feet on slopes greater than 35% and 1000 feet on slopes less than 35%.

Achieve a total road density of less than 7.0 miles of road per square mile by removing 10% of road spurs in currently roaded areas.

Improve the condition of 50% of the road segments that are severely degrading stream channels.

Use partial road rip, some installation of cross drains, and the removal of all culverts and bridges when abandoning roads.

Early-Seral Vegetation

Maintain the percent of the landscape in a clearcut condition within the following ranges:

Fire Regime	Percent of Fire Regime
Non-lethal Fire Regime	< 30%
Mixed Fire Regime	< 30%
Lethal Fire Regime	< 15%

The combined percentages of the Mixed and Lethal Fire Regimes will equal less than 30%.

Channel Complexity

Ensure a full range of channel complexity occurs over 40% of channel length by 2019.

Riparian Areas

Inventory 80% of all forested riparian areas by the year 2004 using the methods set forth by the Montana Riparian Association (MRA).

Water Quality

Remove or treat 70% of identified point- and non-point pollution sources by 2019. Sources will be identified by the Natural Resources and Forestry Departments.

Alternative 4 (cont.)

Fish

Maintain or enhance cutthroat and bull trout populations in all drainages where they currently exist.

Restore cutthroat trout to two drainages within the Reservation.

Scenery and Recreation

Scenics

Utilize seed tree cuts, green tree retention, and other silvicultural techniques in even-aged units to minimize the visual impact of timber harvesting.

Recreation

Use the Recreation Opportunity Spectrum to guide the inventory and management of recreational resources and to provide a range of recreational opportunities.

Where timber production is the primary resource value of the land base, minimize areas of conflict between recreation use and timber management. Develop mitigation measures through coordination of the Forestry and Natural Resources Departments.

Culture

Limited Public Access Areas

Maintain existing Limited Public Access Areas.

Tribal Member Subsistence Activities

Enhance Tribal member subsistence hunting and plant collecting opportunities wherever possible.

Cultural Area, Trail and Campsite Protection

Develop a plan to identify, inventory, and maintain culturally important areas, trails, and campsites within the Reservation by the year 2004.

Cultural Plants

Beginning in the year 2002, utilize Tribal ethnobotanists to identify sites within proposed sale management areas that may contain plants important to the cultures of the Tribes.

Alternative 4 (cont.)

Socio-Economic

Income

Provide income to the Tribal government from an estimated annual harvest of 1.0 million board feet of ponderosa pine and 21.5 million board feet of other species for the first thirty-year period. At current stumpage rates these volumes will generate approximately $5,626,000. This includes one to two million board feet set-aside for Indian loggers in small sales and paid permits. (The stumpage values used for Indian loggers is 36% of the contract stumpage. This is the average value of Indian stumpage versus non-Indian stumpage for the period 1988 through 1997.)

Employment

Provide employment to between 85 and 105 Tribal government employees.

Provide employment to about 240 other wood products workers based on an annual harvest of 22.6 million board feet, generating about $7.8 million in wages annually.

Tribal Member Business Assistance

Provide information on site specific resources to Tribal members' developing business plans for forest-related concessions or outfitting enterprises

Communication and Education

Nature Interpretation and Points Of Interest

Develop interpretive trails at Boulder (the Blue Bay Interpretive Trail) by 2003 and Swartz Lake (the Swartz Lake Interpretive Trail) by 2002.

Develop "points of interest" stops along V-1000 & V-1200 roads in Valley Creek and Saddle Mountain by 2005.

Personnel

Develop and fill a public information officer position by December 2005.

Alternative 5: Custodial

Forest Management and Fire

Salvage

Salvage an estimated 3.0 million board feet from insect and disease outbreaks, wildfire, windstorms, hazard reduction, right-of-way clearing, homesite clearing, etc.

Tribal Member Employment Opportunities

Accomplish most harvest, with the exception of that from intermittent large events such as large wildfires, though small-businesses owned by Tribal members.

Post and Pole

Manage 5,000 acres for lodgepole pine post and pole products on a 40-year rotation. Acreage will be reduced to 2,000 acres by 2019 as a result of a limited road maintenance program anticipated under a custodial level of management.

Grazing

Grassland Types Favored

Maintain the current mix of native grasslands and desirable introduced species.

Riparian Areas

Manage grazing in sensitive riparian areas to reduce impacts.

Tools

Use cross, riparian, and boundary fencing and stockwater developments to meet range condition and riparian area objectives.

Weeds

Manage noxious weeds along main roads.

Wildlife

Habitat Effectiveness

Increase big game habitat effectiveness to 50% (2 miles of open road per square mile) in the Lethal Fire Regime and to 40% (3 miles of open road per square mile) in the Nonlethal and Mixed Fire Regimes by 2009. Road closures will be accomplished through abandonment.

Alternative 5 (cont.)

Mature Forest

Provide Clusters G, H, K, and L to supply closed canopies for wildlife in each landscape by 2009. This objective will be accomplished by salvage-only harvesting.

Snags

Provide Clusters I, J, K, and L by the year 2089 to supply areas within each landscape with snag habitat and down and dead woody debris for wildlife. This objective will be accomplished by allowing natural succession to proceed with minimal forest management.

Riparian Areas

Maintain and restore the species composition of 60% of forested riparian areas so that the type and number of species is the same as that of undisturbed reference riparian areas. Methods used will include the removal of noxious weeds or other invasive nonnative species and management prescriptions that reverse conifer densification in the Nonlethal and Mixed Fire Regimes.

Water and Fish

Roads

Abandon all non-arterial roads.

Use partial road rip, installation of cross drains, and the removal of all culverts and bridges when removing roads.

Early-Seral Vegetation

Maintain the percent of the landscape that is in a clearcut condition at less than 20%.

Channel Complexity

Ensure that a full range of channel complexity occurs over 70% of channel length by 2019.

Riparian Areas

Inventory 80% of all forested riparian areas by the year 2004 using the methods set forth by the Montana Riparian Association (MRA).

Water Quality

Remove or treat 70% of identified point- and non-point pollution sources by 2019. Sources will be identified by the Natural Resources and Forestry Departments.

Alternative 5 (cont.)

Fish

Maintain cutthroat and bull trout populations in all drainages where they currently exist.

Restore cutthroat trout to two drainages within the Reservation.

Scenery and Recreation

Scenics

Mitigate visual impacts of salvage operations through the use of state-of-the-art silvicultural techniques and by meeting established SIL objectives.

Recreation

Minimize areas of conflict between recreation use and salvage operations.

Coordinate mitigation measures through the Tribal Forestry and Tribal Natural Resources Department.

Culture

Limited Access Areas

Maintain existing Limited Access Areas.

Tribal Member Subsistence Activities

Enhance Tribal member subsistence hunting and plant collecting opportunities whenever possible.

Site Protection

Identify and protect areas with immediate forest health problems that contain important cultural, historical, or spiritual use sites. Comply with the Culture Committees and Preservation Office's recommendations for these sites. Field personnel will immediately report the inadvertent discovery of any potential site to the Tribal Preservation Office for their investigation.

Cultural Trail and Campsite Protection

As funds are available, identify, preserve, and enhance trails and campsites important to the culture of the Tribes. Develop a plan to identify and maintain trails and campsites as planned by 2004.

Alternative 5 (cont.)

Cultural Plants

Identify areas within sites with immediate forest health problems that may contain plants important to the cultures of the Tribes. Comply with the Culture Committees' and Preservation Office's recommendations for these areas.

Socio-Economic

Income

Provide income to the Tribal government from an estimated annual harvest of 400 thousand board feet of ponderosa pine and 2.6 million board feet of other species for the first thirty-year period. At current stumpage rates these volumes will generate approximately $289,000. Most of this harvest would be accomplished by Indian loggers (the exception would be the occasional very large salvage operation).

Employment

Provide employment to between 30 and 45 Tribal government employees.

Provide employment to about 35 other wood products workers based on an annual harvest of 3 million board feet.

Table 3-21. Objective Matrix

In this table, objectives are compared across alternatives. The objectives, however, have been shortened to fit within the matrix. Complete objectives can be found in the preceding section. Objectives that apply to all alternatives are not listed in this table.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Forest Management and Fire					
Non-Lethal Fire Regime					
Grasslands					
Existing Grasslands	Use prescribed fire to restore natural fire intervals to 7,200 acres of existing grasslands.	Use prescribed fire to restore natural fire intervals to 5,400 acres of existing grasslands.	Use prescribed fire to restore natural fire intervals to 2,400 acres of existing grasslands.	N/A	
Encroached Grasslands	Restore and maintain 9,500 acres of encroached grasslands by the year 2089.	Restore and maintain 8,244 acres of encroached grasslands by the year 2089.	N/A	N/A	
Woodlands					
Existing Woodlands (Disturbances include silvicultural treatments and prescribed fire)	Establish 10-to-15-year disturbance intervals on 7,600 acres of existing woodlands by the year 2089.		Establish 10-to-15-year disturbance intervals on 2,300 acres of existing woodlands primarily on low elevation, dry, rocky, steep southwest slopes by the year 2089.	N/A	
Encroached Woodlands (Restoration through silvicultural treatments and prescribed fire. Maintenance through prescribed fire.)	Restore and maintain 7,400 acres of encroached woodlands to an open structure by the year 2089.	Restore and maintain 400 acres of encroached woodlands to an open structure by the year 2089.	Restore and maintain 3,420 acres of encroached woodlands to an open structure by the year 2089.	N/A	
Parklike Stands and Old Growth					
Restoration (Through the use of planned ignitions, harvest, and mechanical treatments.)	Increase Clusters J and K to an RMV range of 25 to 80% by the year 2089.	Icrease Clusters J and K to a combined RMV range of 15 to 55% by the year 2089.	Increasing Clusters J and K to a combined RMV range of 22 to 34% by the year 2089.	N/A	
Maintenance	Restore natural fire return intervals (of 15 to 25 yrs).	N/A			

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Climax Stands					
Climax Stands (Reductions through the use of prescribed burns and timber harvest.)	Reduce Clusters E, H, I & L to less than 20% of their combined RMV ranges by the year 2089.	Reduce Clusters E, H, I & L to less than 20% of their combined RMV ranges by the year 2089.	Reduce Clusters E, H, I & L to less than 20% of their combined RMV ranges by the year 2089.	N/A	
Forest Health					
Bark Beetles (Reductions through the use of prescribed burns and timber harvest.)	By 2089 decrease favorable habitat conditions for bark beetle complexes by increasing Cluster J to an RMV range of 20 to 60%.	By 2089 decrease favorable habitat conditions for bark beetle complexes by increasing Cluster J to an RMV range of 10 to 40%.	By 2089 decrease favorable habitat conditions for bark beetle complexes by increasing Cluster J to an RMV range of 10 to 17%.	By 2059 use even-aged regeneration treatments on 80% or more of stands that have been moderately to severely impacted by bark beetles.	N/A
Cluster G (Through the use of timber harvest and prescribed fire.)	N/A	Manage Cluster G at the lower end of its density range and for species that are non-host for the prevalent pathogen.	Manage Cluster G at the lower end of its density range and at the lower end of its RMV range of 12 to 32%.	N/A	
Root rot, mistletoe, & budworm	By 2089 reduce the impacts of these forest health problems by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20%.			By 2059 use even-aged treat-ments on 80% or more of stands that have been impacted by mistletoe and root rot.	N/A
Mixed Fire Regime					
Early Seral Vegetation					
Cluster A (Through timber harvest treatments and planned and unplanned ignitions.)	Maintain Cluster A at an RMV range of 15 to 20%	Maintain Cluster A at an RMV range of 0 to 25%	Maintain Cluster A at an RMV range of 20n to 30%	N/A	
Parklike Stands and Old Growth					
Restoration (Through the use of prescribed burns, harvest and mechanical treatments.)	Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 10 to 20% by 2089.	Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 5 to 20% by 2089.	Restore parklike forest structures by increasing Clusters J and K to a combined RMV range of 10 to 20% by 2089.	N/A	
Forest Health					
Root rot, mistletoe, & budworm	Reduce the impacts of these forest health problems by decreasing Clusters E, H, I, and L to an RMV range of 0 to 20% by 2089.			N/A	

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Lethal Fire Regime					
Early Seral Vegetation					
Clusters A, B, & C (Through timber harvest and prescribed burns.)	Maintain Clusters A, B, and C at a combined RMV range of 15 to 50%.	Maintain Clusters A, B, and C at a combined RMV range of 15 to 40%.	Maintain Clusters A, B, and C at a combined RMV range of 15 to 50%.	N/A	
Old Growth					
Lodgepole Pine	Restore old growth lodgepole pine by increasing Custers F and G to a combined RMV range of 24 to 60% by the year 2089.	Restore old growth lodgepole pine by increasing Clusters F and G to a combined RMV range of 35 to 55% by the year 2089.	Restore old growth lodgepole pine by increasing Clusters F and G to a combined RMV range of 20 to 45% by the year 2089.	N/A	
Spruce and Fir	Restore old growth spruce and fir by increasing seral clusters K and L to a combined RMV range of 30 to 100% by the year 2089.	Restore old growth spruce and fir by increasing seral clusters K and L to a combined RMV range of 15 to 30% by the year 2089.	Restore old growth spruce and fir by increasing seral clusters K and L to a combined RMV range of 10 to 25% by the year 2089.	N/A	
Timberline Fire Regime					
Whitebark Pine Restoration					
Mapping	Map the extent of whitebark pine by the year 2009.		N/A		
Prescribed Fire	Reintroduce periodic fires to 75% of whitebark pine habitats by the year 2029 using both planned and unplanned ignitions.	Reintroduce periodic fires to 50% of whitebark pine habitats by the year 2029 using both planned and unplanned ignitions.	Reintroduce periodic fires to 25% acres of whitebark pine habitats by the year 2029 using both planned and unplanned ignitions.	N/A	
Blister Rust Program	Cooperate with other agencies on the development of a whitebark pine blister rust program that would be implented on the Reservation by 2019.	N/A			
Disease Resistant Seed Source	Through cooperation with other agencies develop a first-generation, disease-resistant whitebark pine seed source for out-planting by the year 2029.	N/A			

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
General					
General Management Philosophy					
	Focus primarily on meeting RMVs by the year 2089.	Focus on the full range of human uses of the forest while meeting RMVs by the year 2089.	Focus on forest product yield from the available forest base, while meeting RMVs by the year 2089.	Focus on maximizing the yield of forest products from the available forest base.	Limit timber harvesting activities within the forest to salvage operations.
Stocking					
	Where timber harvest occurs, meet tree stocking standards within 15 years. Where openings occur as a result of prescribed burns or natural disturbances, allow natural processes to restock the site with seedlings.	Where timber harvest occurs, or where openings occur as a result of prescribed burns or natural disturbance in available and restricted acreage bases, meet tree stocking standards within 10 years. In the unavailable acreage base, allow natural processes to restock the site with seedlings.	Where harvest occurs, or where openings occur as a result of planned and unplanned ignitions or natural disturbance in available and restricted acreage bases, meet tree stocking standards within 5 years. Where openings occur as a result of planned or unplanned ignitions or other natural disturbance in the unavailable base, allow natural processes to restock the site with seedlings.		N/A
Salvage					
	Within the available forest base, salvage harvest no more than 20% of commercial forest products within 6 months of detection of damage. Within the restricted forest base, salvage will be permitted only where it does not compromise other values.	Within the available forest base, salvage harvest no more than 50% of commercial forest products within 6 months of detection of the damage. Within the restricted forest base, salvage will be permitted only where it does not compromise other values.	Within the available forest base, salvage harvest 80% of commercial forest products within 6 months of detection of the damage. Within the restricted forest base, salvage will be permitted only where it does not not compromise other values.	Within the available forest base, salvage harvest 95% or more of all economically feasible commercial forest products within 6 months of detection of the damage. Within the restricted forest base, salvage will be permitted only where it does not compromise other values.	Salvage an estimated 3.5 million board feet from insect and disease outbreaks, wildfire, windstorms, hazard reduction, right-of-way clearing, homesite clearing, etc.
Tribal Member Employment Opportunties					
	Provide 1 to 2 million board feet of timber per year as small business set-asides for tribal members, subject to market conditions and available tribal labor.	Provide 2 to 3 million board feet of timber per year as small business set-asides for tribal members, subject to market conditions and available tribal labor.	Provide 3 to 4 million board feet of timber per year as small business set-asides for tribal members, subject to market conditions and available tribal labor.	Provide 1 to 2 million board feet of timber per year as small business set-asides for tribal members, subject to market conditions and available tribal labor.	Accomplish most harvest, with the exception of that from intermittent large events such as large wildfires, though small businesses owned by Tribal members.

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Fire Hazard Reduction					
	Use mechanical and/or prescribed fire treatments on 6,000 acres of closed canopy wildland-residential intermix per decade to produce suppression-zone fuel breaks to decrease the likelihood of loss to catastophic fire. Maintain fuel breaks with periodic prescribed fire treatments where feasible.	Use mechanical and/or prescribed fire treatments on 4,000 acres of closed canopy wildland-residential intermix per decade to produce suppression-zone fuel breaks to decrease the likelihood of loss to catastophic fire. Maintain fuel breaks with periodic prescribed fire treatments where feasible.	Use mechanical and/or prescribed fire treatments on 2,000 acres of closed canopy wildland-residential intermix per decade to produce suppression-zone fuel breaks to decrease the likelihood of loss to catastophic fire. Maintain fuel breaks with periodic prescribed fire treatments where feasible.	N/A	
Grazing					
Grassland Types Favored					
	Improve/maintain the biodiversity of existing grassland types with an emphasis on enhancing native species.	Improve and maintain the biodiversity of existing grassland types.	Enhance production of forage species.	Maintain native grassland communities and desirable introduced species.	
Range Condition					
	Manage grasslands for healthy ecological condition (good or better).	Manage grasslands for healthy ecological condition (fair or better).		N/A	
Riparian Areas					
Montana Riparian Classification	Manage grazing in riparian areas to restore nonfunctional and functioning-at-risk areas to the highest level under the MRA system.	Manage grazing in sensitive riparian areas to restore all nonfunctional and functioning-at-risk riparian areas to a fully functional level under the MRA system.		Manage grazing in sensitive riparian areas to reduce impacts.	
Tools					
	Use stocking rate and season-of-use adjustments; rest/rotation grazing systems; cross, riparian, and boundary fencing; and stockwater developments to meet range condition and riparian area objectives.			Use cross, riparian, and boundary fencing and stockwater developments to meet range condition and riparian area objectives.	

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Weeds					
	Aggressively manage weeds on 90% of infested areas.	Manage noxious weeds on 80% of infested areas.			Manage weeds along main roads. No reseeding of forest roads.
Restoration					
	N/A			Restoration sites will be identified and prioritized. Reseeding will be with grasses adapted to site.	Restoration sites will not be identified.
Wildlife					
Riparian Areas					
Species Composition and Diveristy	Maintain and restore the species composition of 80% of riparian areas so the type and number of species is the same as undisturbed riparian areas.	Maintain and restore the species composition of 70% of riparian areas so the type and number of species is the same as undisturbed riparian areas.	Maintain and restore the species composition of 60% of riparian areas so the type and number of species is the same as undisturbed riparian areas.		
Habitat Effectiveness					
Open Road Densities	Increase big game habitat effectiveness to an average of 50% (2 ml of open road/section) in the Lethal Fire Regime, and to an average of 40% (3 ml of open road/section) in the Non-lethal and Mixed Fire Regimes by the year 2009.	Increase big game habitat effectiveness to an average of 40% (3 miles of open road per square mile) in the Lethal Fire Regime, and to an average of 30% (4 miles of open road per square mile) in the Nonlethal and Mixed Fire Regimes by the year 2009.	Increase big game habitat effectiveness to an average of 30% (4 miles of open road per square mile) in all fire regimes by the year 2009.	Increase habitat effectiveness for elk to 30% (4 ml of open road/section) in all fire regimes by 2009.	Increase big game habitat effectiveness to 50% (2 ml of open road/section) in the Lethal Fire Regime and to 40% (3 ml of open road/section) in the Non-lethal and Mixed Fire Regimes by 2009.
Road Closure Methods	Road closure methods will include permanent abandoment in the Lethal Fire Regime and gates and recontouring in the Nonlethal and Mixed Fire Regimes.		Road closure methods will include abandonment and gates.	Road closure methods will include using gates and abandonment.	Road closures will be accomplished through abandonment.
Mature Forest					
	Restore and maintain seral clusters G, H, K, and L at the following RMV ranges by the year 2009: Non-lethal at 10 to 45% Mixed at 22 to 55% Lethal at 55 to 90%	Restore and maintain seral clusters G, H, K, and L at the following RMV ranges by the year 2009: Non-lethal at 10 to 40% Mixed at 30 to 60% Lethal at 50 to 75%	Restore and maintain seral clusters G, H, K, and L at the following RMV ranges by the year 2009: Non-lethal at 25 to 60% Mixed at 30 to 80% Lethal at 30 to 70%	Maintain old growth wildlife habitat within streamside corridors.	Maintain seral clusters G, H, K, and L to provide closed canopy cover for wildlife in each landscape by 2009. This objective will be accomplished by salvage-only harvesting.

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Hiding Cover					
	Restore and maintain seral clusters B, C, and D at the following RMV ranges by the year 2009: Non-lethal at 0 to 25% Mixed at 20 to 40% Lethal at 20 to 45%		Restore and maintain seral clusters B, C, and D at the following RMV ranges by the year 2009: Non-lethal at 0 to 25% Mixed at 20 to 40% Lethal at 15 to 40%	Leave security areas of at least 3,000 acres adjacent to all logging units on big game summer ranges. Maintain a balance of hiding and thermal cover and forage on winter ranges.	N/A
Snags and Woody Debris					
	Restore and maintain seral clusters I, J, K, and L at the following RMV ranges by the year 2089: Non-lehtal at 25 to 90% Mixed at 10 to 30% Lethal at 30 to 60%	Restore and maintain seral clusters I, J, K, and L at the following RMV ranges by the year 2089: Non-lethal at 15 to 65% Mixed at 5 to 30% Lethal at 15 to 40%	Restore and maintain seral clusters I, J, K, and L at the following RMV ranges by the year 2089: Non-lethal at 20 to 45% Mixed at 5 to 30% Lethal at 10 to 35%	N/A	Restore and maintain seral clusters I, J, K, and L by the year 2089 to provide areas within each landscape that offer snag habitat species and down and dead woody debris.
Early Seral Habitat					
	Restore and maintain seral clusters A, B, and C at the following RMV ranges by the year 2009: Non-lethal at 25 to 75% Mixed at 30 to 60% Lethal at 15 to 50%	Restore and maintain seral clusters A, B, and C at the following RMV ranges by the year 2009: Non-lethal at 20 to 80% Mixed at 15 to 60% Lethal at 15 to 40%	Restore and maintain seral clusters A, B, and C at the following RMV ranges by the year 2009: Non-lethal at 40 to 80% Mixed at 40 to 65% Lethal at 15 to 50%	N/A	
Water and Fish					
Roads					
Road Spacing	Increase minimum total road spacing to 1000 feet on slopes >35% and to 1,500 feet on slopes <35%.	Increase minimum total road spacing to 800 feet on slopes >35% and to 1,200 feet on slopes <35%.	Increase minimum total road spacing to 800 feet on slopes >35% and to 1,000 feet on slopes <35%.	Maintain current total road spacing of 700 feet on slopes >35% and 1000 feet on slopes <35%.	Abandon all non-arterial roads.
Total Road Density	Achieve a total road density of <6 miles of road per section by removing 20% of road spurs in currently roaded areas.	Achieve a total road density of <6.5 miles of road per section by removing 15% of road spurs in currently roaded areas.	Achieve a total road density of <7.0 miles of road per section by removing 10% of road spurs in currently roaded areas.		N/A

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Roads					
Road Segments Degrading Stream Channels	Improve 100% of the road segments that are severely degrading stream channels.		Improve 70% of the road segments that are severely degrading stream channels.	Improve 50% of the road segments that are severely degrading stream channels.	N/A
Road Removal or Abandonment	Use full road rip, some recontouring, and the removal of all culverts and bridges to remove roads.	Use full road rip, some recontouring and /or the cross drains, and the removal of all culverts and bridges to remove roads.		Use partial road rip, cross drains, and the removal of all culverts and bridges to remove roads.	Use partial road rip, cross drains, and the removal of all culverts and bridges to remove roads.
Planning	Prepare a Reservation-wide transportation plan by the year 2005.			N/A	
Early Seral Vegetation					
	Maintain seral clusters A1 and A2 within the following RMV ranges: Non-lethal at 20 to 40% Mixed at 15 to 25% Lethal at 10 to 30% Mixed and Lethal combined will equal less than 30%	Maintain seral cluster s A1 and A2 within the following RMV ranges: Non-lethal at 10 to 30% Mixed at 0 to 25% Lethal at 10 to 20% Mixed and Lethal combined will equal less than 30%	Maintain seral cluster s A1 and A2 within the following RMV ranges: Non-lethal at 20 to 30% Mixed at 20 to 30% Lethal at 10 to 30% Mixed and Lethal combined will equal less than 30%	Maintain the percent of the landscape in a clearcut condition within the following ranges: Non-lethal at 20 to 30% Mixed at 20 to 30% Lethal at 10 to 30% Mixed and Lethal combined will equal less than 30%	Maintain the percent of the landscape that is in clearcut condition at less than 20%.
Channel Complexity					
	Ensure a full range of channel complexity occurs over 80% of channel length.	Ensure a full range of channel complexity occurs over 70% of channel length.	Ensure a full range of channel complexity occurs over 60% of channel length.	Ensure a full range of channel complexity occurs over 40% of channel length.	Ensure a full range of channel complexity occurs over 70% of channel length.
Water Quality					
Water Quality	Remove or treat 100% of identified point- and nonpoint pollution sources.	Remove or treat 80% of identified point- and nonpoint pollution sources.	Remove or treat 70% of identified point- and nonpoint pollution sources.		

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Fish					
Maintenance	Maintain or enhance cutthroat and bull trout populations in all drainages where they currently exist.				Maintain cutthroat and bull trout populations in all drainages where they currently exist.
Restoration	Restore cutthroat to three drainages and bull trout to one drainage within the Reservation.	Restore cutthroat to two drainages and bull trout to one drainage within the Reservation.	Restore cutthroat to two drainages within the Reservation.		
Scenery and Recreation					
Scenery					
Scenic Integrity Level (SIL)	Meet established SIL objectives for all areas.			Utilize seed tree cuts, green tree retention and other silvicultural techniques in even-aged units to minimize the visual impact of timber harvesting.	Mitigate visual impacts of salvage operations through the use of state-of-the-art silvicultural techniques and by meeting established SIL objectives.
Scenic Corridors	Evaluate the designation of Highway 200 as a scenic highway, and develop Scenic Corridor Plans for Highway 200 and for Highway 35 by the year 2008.			Evaluate the designation of Highway 200 as a scenic highway, and develop Scenic Corridor Plans for Highway 200 by the year 2008.	
Recreation					
	Meet Diversified Recreation Opportunity Level (DROL) objectives for all areas of the Reservation. Prepare a Reservation-wide recreational use plan based upon existing DROLs which will provide for planning and management of recreation resources by the year 2005.			Use the Recreation Opportunity Spectrum to guide inventory and management of recreational resources and to provide a range of recreation opportunities.	Minimize areas of conflict between recreation use and salvage operations.
Roadless and Wilderness Areas					
	Designate 10 areas totaling 56,922 acres as roadless areas and 5 areas totaling 38,191 acres as wilderness areas or wilderness additions within one year of Forest Plan approval. Develop management plans for these areas within three years of Forest Plan approval.	Designate 6 areas totaling 33,118 acres as roadless areas and 4 areas totaling 26,969 acres as wilderness areas or wilderness additions within one year of Forest Plan approval. Develop management plans for these areas within three years of Forest Plan approval.	N/A		

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Trails and Campsites					
Crosscountry Ski and Snowmobile Trails	Redirect winter recreation activities to the North Missions Landscape by creating up to 11 miles of cross-country trails and up to 20 miles of groomed snow mobile trail systems between Blue Bay and Boulder by the year 2003. The snowmobile trail grooming will be done in cooperation with the US Forest Service and the Montana Department of Fish, Wildlife and Parks.			NA	
Trail Maintenance and Monitoring	Enhance trail maintenance for Three Lakes Peak, Black Tail, and Burgess Lake; increase monitoring for the Reservation Divide and Seepay Trails.		NA		
Campsite Maintenance and Monitoring	Increase maintenance at Vanderburg Cultural Camp, Jocko River, Job Corps Campsites 1 and 2, Twin Lakes, South Fork Gate Cabin, Middle Fork Campground, and eight sites in the South Fork of the Jocko Primitive Area by the year 2005; increase monitoring of impromptu campsites in the Revais, Magpie and Seepay Creek drainages.		NA		
Trail-use Fee System	Develop a trail-use fee system by the year 2003.			NA	
Interpretive Trails	Develop interpretive trails at Swartz Lake (by 2002) and Blue Bay (by 2003) for educational and group use.		NA		
Culture					
Tribal Member Subsistence					
	Meet RMV objectives for forest vegetation in order to increase variety, texture, diversity, and vegetation mosaics and to enhance Tribal Member subsistence hunting and plant collecting.			N/A	
Limited Public Access Areas					
	Designate five new Limited Public Access Areas by the year 2002.			Maintain existing Limited Public Access Areas	
Cultural Area, Trail, and Campsite Protection					
	Develop a plan to identify inventory, and maintain culturally important areas, trails, and campsites within the Reservation by the year 2004.				Identify and protect areas with stand health problems that contain cultural, historical, or spiritual sites. Comply with Culture Committees' and Preservation Office's recommendations. Develop a plan to identify and maintain trails and campsite by 2004.

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Cultural Plants					
	Beginning no later than the year 2002, utilize the Tribal Ethnobotanist to identify sites within proposed sale management areas that may contain plants important to the cultures of the Tribes.				Identify areas within sites with immediate forest health problems that may contain plants important to the cultures of the Tribes. Comply with the Culture Committees and Preservation Office's recommendations for these areas.
Socio-Economic					
Income					
Timber	Provide income from an annual harvest of 700 thousand board feet of ponderosa pine and 14.2 million board feet of other species for the first thirty year period. (At current stumpage rates these volumes would generate $3.645 million annually.) This includes one to two million board feet set aside for Indian loggers in small sales and paid permits.	Provide income from an annual harvest of 700 thousand board feet of ponderosa pine and 17.4 million board feet of other species for the first thirty year period. (At current stumpage rates these volumes would generate $4.3 million annually.)This includes two to three million board feet set aside for Indian loggers in small sales and paid permits.	Provide income from an annual harvest of 700 thousand board feet of ponderosa pine and 15.9 million board feet of other species for the first thirty year period. (At current stumpage rates these volumes would generate $3.744 million annually.) This includes three to four million board feet set aside for Indian loggers in small sales and paid permits.	Provide income from an annual harvest of 1.0 million board feet of ponderosa pine and 21.5 million board feet of other species for the first thirty-year period. (At current stumpage rates these volumes would generate $5.6 million annually.) This includes one to two million board feet set aside for Indian loggers in small sales and paid permits.	Provide income from an annual harvest of 400 thousand board feet of ponderosa pine and 2.6 million board feet of other species for the first thirty-year period. (At current stumpage rates these volumes would generate $289,000 annually.) Most of this would be harvested by Tribal loggers.
Employment					
Tribal Government Employees	Provide employment to between 85 and 105 Tribal government employees.				Provide employment to between 30 and 45 Tribal government employees.
Non-Government Wood Products Workers	Provide employment to about 165 workers based on an annual harvest of approximately 14.9 million board feet.	Provide employment to about 200 workers based on an annual harvest of approximately 18.1 million board feet.	Provide employment to about 185 workers based on an annual harvest of approximately 16.6 million board feet.	Provide employment to about 240 workers based on an annual harvest of 22.6 million board feet.	Provide employment to about 35 workers based on an annual harvest of 3 million board feet.

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

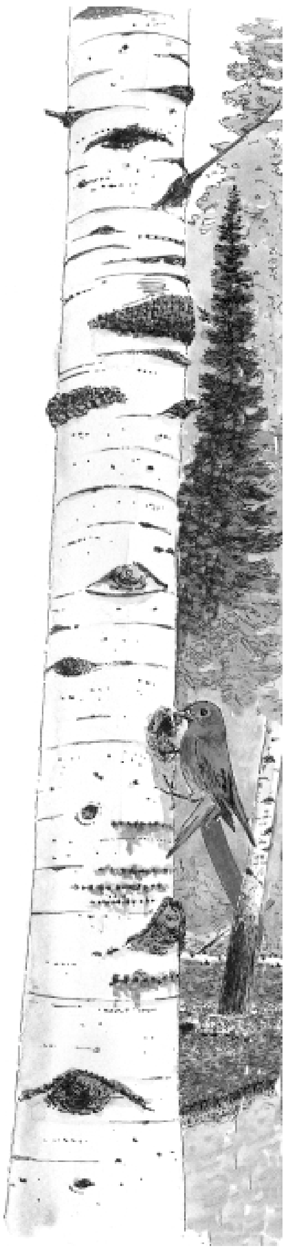
Table 3-21. Objective Matrix (cont.)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Tribal Member Business Assistance					
	Provide information on site specific resources to Tribal Members developing business plans for forest-related concessions or outfitting enterprises.				N/A
Communication and Education					
Nature Interpretation and Points of Interest					
	Develop interpretive trails at Boulder by 2002 and Swartz Lake by 2003.				N/A
	Develop “points of interest” stops along V-1000 & V-1200 roads in Valley Creek and Saddle Mountain by 2005.				N/A
Personnel					
	Develop and fill a public information officer position by December 2005.				N/A

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Chapter Four
Environmental Consequences

Contents



Introduction

The purpose of this chapter is to report the environmental consequences of each alternative. The environmental consequences form the scientific and analytical basis for the comparison of the alternatives. Our focus is on the most significant effects, rather than all possible effects.

The chapter is organized by resource—vegetation, fuels and air quality, forest health, grazing, wildlife, water, fish, scenery and recreation, culture, economic and socio-economic, and communication and education. Each of these sections includes the following subsections:

Summary of Key Effects	A brief section that summarizes the major impacts associated with each alternative
Assumptions	The assumptions the ID Team made in order to conduct its evaluation
Limitations	The limits the team faced in its analysis with respect to data or methodology
Methodology	The methods used by the team to conduct its analysis of effects
Effects	The effects that each alternative is expected to have on the resource

Much of our analysis is based on several computer models. The fundamentals of each of these models are described in the appropriate section. The most significant of the models is the *vegetation model*. It is used to predict the vegetative conditions that are likely to occur under each of the alternatives, the kinds of human-caused disturbances that might be expected, and the volume of timber that might be produced. We believe the predictions from this model are relatively reliable for any given cluster or cluster group, but the predictions are not spatial. That is, the vegetation model does not tell us where a specific disturbance might occur, and therefore, much of our analysis is not spatial.

Environmental Consequences

Vegetation

Introduction

This section describes the effects of the alternatives on the vegetative component of the forest. It analyzes how each alternative would affect the structure and composition of the forest—the size of the trees, the density and layering of the canopy, and species composition—over both the short and long term. It also examines the issues raised during the scoping process that relate directly to vegetation, issues such as sustainablility, old growth, lodgepole pine availability, clearcutting, and long-term vegetation change.

Most of the effects are described in terms of seral clusters or cluster groups and fire regimes. Descriptions of the seral clusters can be found on the bookmark located at the beginning of this document and on pages 102 and 103. Other terms used that may be unfamiliar include historical range of variability (HRV), existing condition, and desired condition. These terms are defined on pages 97, 98, and 99, as well as in the glossary.

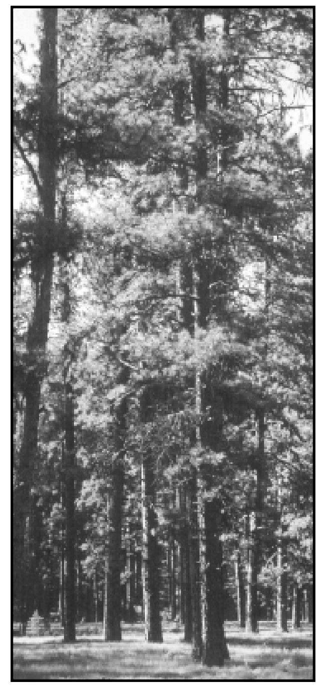


Figure 4-1. Our analysis of vegetation focuses on how each of the alternatives would affect vegetative structure and composition, namely the size of the trees, the density and layering of the canopy, and species composition. We looked at average changes over both the short and long term periods.

Summary of Key Effects and Conclusions

Effects on Vegetation Structure, Density, and Species

The alternatives that would best restore the vegetative patterns, structures, densities, and species characteristic of the pre-European settlement era are Alternatives 1, 2, and 3, respectively. Changes predicted to occur in seral clusters or cluster groups within each fire regime are summarized below. The analysis focuses on the effects alternatives would have on key cluster groups. If a desired condition calls for a reduction of a cluster group, that group is also discussed, even if it is not a key group. An example would be a cluster group encroached by Douglas-fir due to the absence of fire. Key cluster groups are not discussed if the alternatives would result in minor differences between the alternatives.

Nonlethal Fire Regime

Alternatives 1 and 2 are predicted to produce the most acres of Cluster A1, which is composed of young stands with open canopies of mostly ponderosa pine. Much of Cluster A1 would result from interior-sod restoration treatments, the kinds of treatments emphasized under these two alternatives.

Alternatives 1 and 2 are predicted to produce the most acres of Cluster A2. Cluster A2, composed of mature and old stands with open canopies of mostly ponderosa pine, would result from woodland restoration activities. Woodland restoration is emphasized under these two alternatives.

Figure 4-2. In the Lethal Regime, Cluster Group F/G contains mature stands with moderate and closed canopies of western larch, lodgepole pine, and spruce. Alternative 2 would produce the most acres of this cluster group.

Alternative 4 is predicted to produce the most acres of Cluster Group F/G, a group made up of mature stands with moderate and closed canopies of mostly ponderosa pine. The group includes some parklike stands of young ponderosa pine. Our model predicts that the amount of Cluster Group F/G that would be produced under Alternatives 1, 2, and 3 would fall within the desired conditions for those alternatives.

The vegetation model predicts that Alternatives 3 and 5 would produce the most acres of Cluster Group J/K, which are old stands with moderate and closed canopies of mostly ponderosa pine, some of which would be parklike.

Alternatives 1 and 3 are predicted to bring about the greatest reduction in acres of Cluster Group E/I/H/L, which is composed of mature and old stands with moderate and closed canopies of mostly Douglas-fir. The group increases in the absence of fire and is one of the least desirable groups in the Nonlethal Fire Regime.

Mixed Fire Regime

Alternatives 1, 2, and 3 are predicted to produce the most acres of Cluster A. Cluster A is characterized by stands of young to old trees with open canopies of ponderosa pine and western larch.

Our vegetation model predicts that Alternatives 1, 2, 3, and 4 will produce the most acres of Cluster Group F/G—mature stands with moderate and closed canopies of mostly ponderosa pine and western larch, some of which would be parklike in character.

Alternatives 1 and 5 are expected to produce the most acres of Cluster Group J/K in the Mixed Fire Regime This group is composed of old stands with moderate and closed canopies of mostly ponderosa pine and western larch. Some of these stands would be parklike.

Lethal Regime

Alternative 2 is predicted to produce the most acres of Cluster Group F/G (fig. 4-2). In the Lethal Regime, this group contains mature stands with moderate and closed canopies of western larch, lodgepole pine, and spruce. Lodgepole pine old growth occurs in this group. Alternatives 1, 3 and 4 are predicted to generate nearly the same number of acres as Alternative 2.

The vegetation model predicts Alternative 5 will produce the most acres of Cluster Group E/I/H/L, a group composed of mature and old stands with closed canopies of mostly grand and alpine fir. It includes old growth. The vegetation model predicts the amount of this cluster group produced under Alternatives 1, 2, and 3 would fall within the desired condition for each of those alternatives. It also predicts that the amount of this group produced under Alternative 4 would fall within the historical range of variability.

Effects on Sustainability

Sustainability is measured by the ability of an alternative to restore the structure and composition of forest vegetation to pre-contact conditions. Pre-contact conditions are those likely to have occurred prior to settlement of the Reservation by people of European descent. Alternative 1 is predicted to result in the most sustainable vegetation.

Effects on Succession

The general successional trends predicted for the key cluster groups within each fire regime are as follows:

Nonlethal Fire Regime

Alternatives 1 and 2 are predicted to increase Cluster A2—mature, open-canopied stands of ponderosa pine.

All of the alternatives are predicted to increase acres of Cluster Group J/K—old stands of ponderosa pine with moderate and closed canopies.

Cluster Group F/G, composed of mature, moderate- and closed-canopied stands of ponderosa pine, is predicted to increase under all the alternatives except Alternative 2.

All of the alternatives are expected to reduce the acres of Cluster A1—young, open-canopied ponderosa pine stands.

Cluster Group E/I/H/L, composed of mature and old stands of Douglas-fir, is predicted to decrease under all of the alternatives except Alternative 5.

Figure 4-3. Cluster Group C/D is composed of young, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce. All alternatives are predicted to increase this cluster group.

Mixed Fire Regime:

All alternatives are projected to increase Cluster Group C/D, which is composed of young, moderate- and closed-canopied stands of ponderosa pine and western larch (fig. 4-3).

Under all the alternatives, Cluster Group F/G—mature, moderate- and closed-canopied stands of ponderosa pine and western larch—is predicted to increase.

All of the alternatives are projected to increase Cluster Group J/K, composed of old, moderate- and closed-canopied stands of ponderosa pine and western larch.

Cluster A—young, mature, and old, open-canopied stands of ponderosa pine and western larch—is projected to decrease under all of the alternatives.

Lethal Fire Regime

All of the alternatives are projected to increase Cluster Group C/D, which is composed of young, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce.

Cluster Group F/G—mature, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce—are predicted to increase under all of the alternatives except Alternative 5.

All of the alternatives are projected to decrease Cluster A, which is composed of young, mature, and old, open-canopied stands of western larch, lodgepole pine, and spruce.

All of the alternatives are projected to decrease Cluster Group J/K, which is composed of old, moderate- and closed-canopied stands of western larch and spruce.

Cluster Group E/I/H/L, mature and old stands of grand fir and alpine fir with moderate and closed canopies, is predicted to decrease under all of the alternatives except Alternative 5.

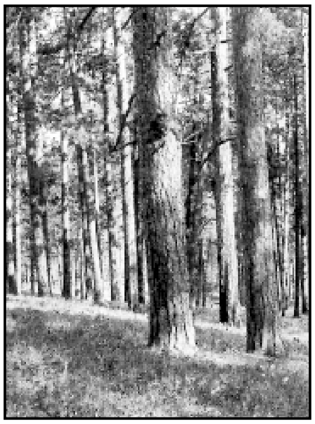


Figure 4-4. In the Nonlethal Fire Regime, most old growth would be Cluster Group J/K, parklike stands of old ponderosa pine.

Effects on Old Growth

Alternatives 1, 2, and 3 would produce old-growth patterns, structures, densities, and species composition that are more similar to that of the pre-contact era than Alternatives 4 and 5.

The Nonlethal Fire Regime

Alternatives 1, 2, and 3 are projected to produce large, long-term increases in Cluster Group J/K. This group would include parklike stands of old, ponderosa pine trees (fig. 4-4)

The Mixed Fire Regime

Alternatives 1, 2, and 5 are predicted to produce large increases of Cluster Group J/K. This cluster group would include parklike stands of old ponderosa pine and western larch, particularly under Alternatives 1 and 2.

The Lethal Fire Regime

Small, long-term increases of Cluster Group F/G are projected under all of the alternatives except Alternative 5. Old-growth lodgepole pine would occur within this group.

Large, long-term increases of Cluster Group J/K are projected under Alternatives 2 and 5. Old-growth western larch and spruce would occur within this group.

Alternative 5 is projected to produce a moderate increase of Cluster Group E/I/H/L. Under other alternatives, the group is expected to decrease. Old-growth grand fir and alpine fir would be represented in this group.

Effects on Clearcutting

Clearcuts are one type of even-aged management. Other even-age systems include seed tree and shelterwood (see pages 48 and 49). Our modeling only allowed us to estimate the acres of even-age treatments as a whole, not the individual systems.

Acres receiving even-aged treatments during the short term are projected to be highest under Alternative 2, followed by Alternatives 3, 4, 1, and 5, respectively. Over the long term, Alternative 2 is expected to have the most even-aged acres, followed by Alternatives 1, 3, 4, and 5. For comparison purposes, an average of 975 acres per year received even-aged treatments under the 1982 plan. This average ranks between Alternatives 4 and 5 in the short term and Alternatives 3 and 4 in the long term.

Many of the negative impacts associated with even-aged management prescriptions, especially clearcuts, would be mitigated under Alternatives 1, 2, and 3. Clearcuts would have many trees retained as individuals or in islands. These leave trees will make the cuts appear and function more like natural openings. More seed tree and shelterwood cuts would also occur. These treatments retain ponderosa pine and western larch for regeneration purposes. Retaining these species would also enhance the visual quality of even-aged treatments. The size and shape of even-aged treatments would be more like vegetation patterns associated with the pre-contact era. Refer to the Scenery and Recreation section of this chapter for more discussion of even-aged prescriptions.

Effects on Lodgepole Pine Availability

Two factors control the availability of lodgepole pine: access and the volume of lodgepole growing in the forest. Access, the primary factor affecting availability, would be greatest under Alternative 4. The vegetation model projected a small increase in Cluster Group C/D under Alternative 4. That cluster group includes most of the lodgepole pine harvested by Indian loggers.

Assumptions

The ID Team made a number of assumptions when they developed their vegetation models and when they assessed the impacts of the alternatives on vegetation.

Major Assumptions

The ID Team assumed that the prescriptions used in the Alternatives 1, 2, and 3 would emulate natural disturbance regimes and that the resulting vegetative structures would be similar to those of the pre-contact era. All three alternatives would use more fire than the other alternatives. Underburns would involve some degree of thinning, depending on the alternative. Of the three, it is assumed that Alternative 1 would best emulate natural disturbance regimes, followed by Alternatives 2 and 3, respectively. Alternatives 4 and 5 were not designed to simulate natural disturbance regimes.

The ID Team assumed that if the desired condition is based upon the HRV, the range of future conditions would be sustainable.

The ID Team assumed that the volume of timber cut under the 1982 Forest Management Plan could be maintained under Alternative 4. Timber production realized during the 1982 plan was close to the amount of timber produced over the last 30 years. During that time, volume production was affected by market influences, wood products purchaser competition, resource specialist staffing, and the Tribes' desire to maintain multiple use practices. Given this history and using data from the Continuous Forest Inventory, the ID Team assumed that the timber production goal set for Alternative 4 was reasonable.

The ID Team assumed that wildfires would occur on about the same number of acres for all of the alternatives. The vegetation model could not account for the likely increase in wildfires that would result from an increase in fuels.

The IDT assumed that the development of old cluster groups would produce old growth. Portions of Cluster Groups J/K and E/I/H/L in each fire regime would consist of old-growth stands. Portions of Cluster Group F/G would contribute to lodgepole pine old growth in the Lethal Fire Regime. These cluster groups should meet the minimum old-growth criteria established in the *Interim Flathead Reservation Old-growth Characteristics* (1994). Associated characteristics such as snags, decay, and down woody material could be achieved through periodic disturbances or could develop through the use of other mitigation measures.

The IDT assumed that each alternative's set of desired conditions is attainable at some point in the future.

The IDT assigned different salvage rates for Alternatives 1, 2, and 3. Fewer trees would be salvaged under these alternatives than under more traditional management approaches. More dead or dying trees would be left to provide structural diversity for wildlife.

When Alternatives 1, 2, and 3 were modeled, the goal was to achieve a certain desired condition for each alternative. A desired condition consisted of different percentages of seral clusters and was expressed as a range. For example, the desired condition for Cluster A in the Lethal Fire Regime under Alternative 1 was 10 to 30%; to meet the desired condition, Cluster A would have to occupy from 10 to 30% of the fire regime.

When Alternative 5 was modeled, the goal was to duplicate the volume cut under the salvage and small permit sales program of the last decade.

The ID Team assumed that if the desired condition is based upon the HRV, the range of future conditions would be sustainable.

Limitations

Several limitations influenced the modeling process and our analysis of the effects of the alternatives on forest vegetation.

Major Limitations

The number of prescriptions and timing choices were limited by the ID Team to reduce complexity and save time in modeling. A restricted number of prescription and timing choices may have limited the number of feasible solutions available to the vegetation model. For example, underburning and uneven-aged treatments had only one timing choice, and that occurred in period one (the first ten years). Acres selected by the vegetation model for treatments with one timing choice were not available to prescriptions with multiple timing choices, such as permanent and temporary even-aged treatments. As a result, treatments with multiple timing choices selected acres in certain times that were unreasonable. To compensate, the ID Team averaged acres for short and long-term periods to assess the effects of alternatives on forest vegetation. The averaged data should be more practical.

It may take more time than the vegetation model was allowed to achieve some of the desired condition goals because of the difference between today's forests (in terms of structure, density, and composition) and what's desired.

Woodland and sod restoration treatments were not included in the vegetation model but were modeled in other ways. We merged the results with the output from the vegetation model in order to estimate the overall seral cluster distribution across the entire forest.

Alternative 4's modeling objective was to confine the annual timber production to that realized under the 1982 plan. The vegetation model accomplished the objective but did not replicate the acres of clearcuts achieved under the 1982 plan, especially in the later periods. The primary reasons for this are: (1) the vegetation model was unable to replicate clearcut acreage because its objective function placed a cap on harvest volume, and (2) a limited number of prescriptions and timing choices restricted large increases in clearcuts after the first management period. Had the vegetation model replicated clearcut acres in amounts achieved under the old plan, the timber production objective for Alternative 4 would have been exceeded in future periods. This occurred because the standing inventory available for harvest increased each period. Since the objective function could not be exceeded, the vegetation model selected other treatments that yielded less timber in order to meet the alternative's annual timber production goal.

Modeling failed to meet desired condition goals for certain seral clusters in Alternatives 1, 2, and 3. The ID Team set the objectives within the vegetation model in order to minimize variation around the midpoint of the desired condition for each seral cluster. But achieving each seral cluster midpoint was impossible because the midpoints for all of the seral clusters exceeded 100%. In addition, it may take more time than we allowed in the vegetation model to achieve the desired condition goals because of the difference between today's forests (in terms of structure, density, and composition) and the desired

The methodology used for this EIS allows for a more quantitative assessment of the interaction of tree growth, wildlife cover, fire severity, berry production, and a number of other forest characteristics that the ID Team felt were important.

condition. More prescriptions and timing choices may have made it possible to attain the desired condition goals sooner.

Modeling failed to account for variability caused by disturbance regimes other than fire. Insects, disease, and climate are examples of other kinds of disturbances. The desired conditions for Alternatives 1, 2, and 3 were developed using the HRV as a starting point and were then refined using local data, professional judgment, and data published in Volume 1 of *Upper Columbia River Basin Draft Environmental Assessment* (1997). As more knowledge is gained, HRV and desired condition percentages will be adjusted.

Methodology

Modeling Harvest and Assessing Impacts

The development of a forest plan requires predicting the future. While the primary focus of this EIS is the next ten years, the effects of immediate actions will extend considerably beyond. Thus, a snapshot of more distant times is helpful and is included in the analysis.

In this EIS, we have departed from the traditional approaches used in estimating the annual allowable cut (AAC) and in assessing the impacts of the alternatives. While older methods did a reasonable job of estimating growth and determining a probable harvest, they were limited in their capacity to integrate non-timber concerns into final harvest figures. In these older methods, non-timber objectives were typically handled by policy statements. Another problem was that managers could not predict, with any specificity, future forest vegetative conditions, and so they were limited in their assessment of the impacts of proposed management scenarios.

The methodology used for this document allows a more quantitative assessment of the interaction of tree growth, wildlife cover, fire severity, berry production, and a number of other forest characteristics. In our vegetation model, the forest was classified into 27 structural types, called seral classes, each describing tree size, stand density, species composition and layering (or the numbers of canopy levels present). This delineation by structure allowed the ID Team to assess how changes in the forest might affect uses and resources. A forest's structure and composition have positive and negative effects on a multitude of forest elements: water production, forage, hiding cover for wildlife, interior bird diversity, and so on. Since these effects can be characterized, knowledge of the structure of a landscape at any given point in time allows us to assess these elements, and the probable effects of harvest, wildfire, or lack of disturbance.

As for harvest volumes, previous forest plans utilized accepted, but simpler prediction models. Earlier methods had several shortcomings. They could not directly assess the effects of multiple resource issues on yield estimates, and they could not take into account all treatment choices. They were also limited to the next 10-year period for yield estimates.

The methodology used in this EIS was selected to remedy some of these shortcomings. Prediction was completed using two types of models: (1) a complex tree growth model that predicts future development of forest stands under various silvicultural treatments and (2) a linear programing model. The latter is what we are calling the *vegetation model*. It allowed us to integrate treatment choices from the first model, with varied constraints, to produce an optimal or 'best' solution for our determined goal.

Models consist of mathematical estimates of what things should do under certain assumptions. Modeling at its best is only a simplistic estimate of a very complex biological system. Yet for all its shortcomings, current forest modeling techniques can give us a better understanding of the future than earlier methods.

The simulation of treatments is also necessarily limited to just a few of the many possible choices. Treatments for this proposal were selected to span the range of likely effects that natural fire would have caused across the landscape.

Treatments included an even-aged treatment (clearcutting); an uneven-aged treatment that developed and maintained five age classes; an underburn treatment that led to the development of larger, old trees; and a no-treatment option.

The above treatment categories suggest a long-term plan, not just a final harvest. As an example, the clearcutting option included assumptions of maintaining visual quality through use of green tree retention and assumptions of site preparation and timely reforestation. Precommercial thinning, weeding, and commercial thinnings were also simulated where necessary.

The timing and a brief description of each prescriptions is shown on the prescription key (table 4-1). A more detailed discussion of the vegetation model and its prescriptions is included in Appendix B.

Figure 4-5. Cutting, when used with prescribed fire, can come closer to simulating natural fires, although it can never replace it entirely. Here, after a harvest, the remaining understory is burned. The season (fall) and method of burn (strip-head fire) protect the leave trees.

Can Logging Simulate Natural Fires?

Today, the battle against the encroachment of climax species like Douglas-fir is accomplished primarily with chainsaws by taking out mature and immature climax trees. Nature would have used fire and taken out mostly immature climax trees. Foresters are also removing more seral trees now than nature would have because stocking levels are so high. On the east side of the Reservation, we no longer have much of the large, old ponderosa pines that natural fires favored because, in the past, most were cut when the practice was to high-grade stands for the most valuable timber. But cutting, when used with prescribed fire, can come closer to simulating natural fires, although it can never replace it entirely. There are just too many subtle relationships and processes that evolved with and depend on the myriad of effects that natural fires generate.

Clearcutting and seed tree methods can simulate stand-replacement fires if they are accompanied by broadcast burning on steep slopes (fig. 4-5) and piling or trampling on gentle slopes to achieve site preparation and tree regeneration.

Individual tree selection can simulate light ground fires if accompanied by underburning.

Group selection and small clearcuts can simulate mixed intensity fires such as those that dominate the Mixed Fire Regime if accompanied by site preparation by mechanical means or fire.

Table 4-1. This prescription key describes each of the prescriptions used in the vegetation model.

Prescription	Fire Regimes Applied
Let existing stand grow, harvest at a later date when merchantable.	Mixed and Lethal
Let grow and begin uneven-aged management in the future when stand becomes merchantable.	Nonlethal and Mixed
No treatment	All fire regimes
Let grow until stand gets of merchantable size, then begin periodic underburn treatments.	All fire regimes
Do an even-aged treatment now (period 1).	Mixed and Lethal
Let stand grow, initiate even-aged treatment beginning next 10-year period.	Mixed and Lethal
Let stand grow, initiate even-aged treatment beginning after 20 years (period 3).	Mixed and Lethal
Let stand grow, initiate even-aged treatment beginning after 40 years (period 5).	Mixed and Lethal
Let stand grow, initiate even-aged treatment beginning after 70 years (period 8).	Mixed and Lethal
Even-age harvest now (period 1) to address forest health issues, then let stand grow to a point where uneven-aged harvests can begin.	Nonlethal and Mixed
Let stands grow to 10 years, then begin even-age harvests (period 2), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Let stand grow 20 years, then begin uneven-aged harvests (period 3), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Let stand grow 40 years, then begin uneven-aged harvests (period 5), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Let stand grow 70 years, then begin uneven-aged harvests (period 8), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Individual tree selection	Nonlethal and Mixed
Underburn every 10 years	Nonlethal and Mixed
No treatment	All fire regimes

Summary of the Modeling Process

A brief summary of the key steps in our modeling process follows.

Steps in our Modeling Process

Assessments are based upon model predictions of how close an alternative comes to meeting a set of desired conditions, which are described in terms of vegetative structure, density, and species composition.

1. Creation of Seral Classes and Clusters

We divided the forest into 27 structural types, called seral classes, each describing tree size, stand density, species composition, and layering (or the numbers of canopy levels present). We then grouped these 27 seral classes into 13 seral clusters according to their ecological function. Lumping simplified the evaluation and planning processes.

2. Define and Delineate Fire Regimes

We defined fire regimes by the kind of fire disturbance that occurred during the pre-contact era. Regimes were classified by fire frequency, intensity, and pattern. Three fire regimes are used to assess the effects of alternatives. They are the Nonlethal, Mixed, and Lethal Fire Regimes. A forth fire regime, the Timberline, was not used in the assessment of effects because it occupies such a small part of the forest.

3. Determine Acreages

We determined the acres occupied by each seral class and fire regime and the acres of various management designations.

4. Develop Yield Tables

We developed a yield table for each seral class-fire regime combination. A yield table shows change over time for a forest and reflects management activities. A representation of an average seral class was constructed from local Continuous Forest Inventory (CFI) plots and grown into the future utilizing a computer model known as the Forest Vegetation Simulator. Several treatment possibilities were applied to each seral class. Each yield table displayed trees per acre, species, board and cubic foot volumes, seral classes, and other information at 10 year intervals.

5. Enter Yield Tables into a Linear Programming (Vegetation) Model

We put the various yield tables for each seral class-fire regime combination into a linear programming model, which we call our vegetation model.

6. Estimate HRVs

The ID Team used the Prognosis model (Wykoff, Crookston, Stage, 1982) (now titled the Forest Vegetation Simulator) to estimate the historical range of variability (HRV). Essentially, the HRV is a steady state of vegetation resulting from simulations of historic fire disturbance.

7. Identify Cluster Groups and Establish RMV Ranges for each

To simplify and facilitate discussion on the effect of alternatives on forest vegetation, the ID Team lumped similar functioning seral clusters into cluster groups (table 4-2). Based on what we estimated to be the pre-contact seral cluster distribution or HRVs, the team developed recommended management variabilities (RMVs) for the seral clusters and cluster groups. These are shown in table 4-3. The team did not set RMVs for the Timberline Fire Regime because it occupies such a small proportion of the forest.

8. Enter the Ranges into the Vegetation Model and Run the Model

We entered desired condition ranges into the vegetation model as constraints in such a fashion as to assure that the desired mix of seral clusters were developed over time. The vegetation model was run with various objective functions while meeting the above constraints. In most cases, the objective was to minimize deviation about the midpoint of a seral cluster's desired condition for a given alternative. Outputs included ratios of seral clusters and volumes of timber through time.

All of the alternatives are predicted to produce harvest volumes considerably lower than that those projected during previous plan periods. This can be attributed to two key factors. First, previous plans assumed that there was an intensive acreage base suitable for timber harvest of around 300,000 acres. All of the alternatives that have been modeled in this EIS assume fewer acres. Second, previous plans assumed that disease ridden stands, which occupy a significant part of the forest, would be harvested within a 50-to-60-year period and replaced by young stands. Alternatives 1, 2, and 3 focus on meeting structural goals. The net result of this is the holding of some presently infested and infected stands for long periods of time. These declining stands become inefficient at producing wood fiber and therefore result in a net reduction of forest-wide harvest levels.

Methods used to Assess the Effects on Vegetation

In this section, the assessments are based upon model predictions of how close an alternative comes to meeting a set of desired conditions, which are described in terms of vegetative structure, density, and species composition. The discussion of effects is based on a series of graphs that show the RMV, the existing condition, the desired condition, and the percent of acres each cluster group is predicted to occupy within a fire regime under a given alternative. The percentages are *averages* expected to occur over short and long-term periods. The short-term is defined as the first 30 years and the long-term as the last 90 years of the modeling period.

It should be noted that desired conditions are given only for the three ecosystem management alternatives (Alternatives 1, 2, and 3). Alternatives 4 and 5 are not ecosystem management alternatives and therefore do not have desired condition goals for seral clusters. The effects of Alternatives 4 and 5 are described by comparing long-term predictions for each cluster group with the RMV. More details, including seral cluster group percentages and the desired condition percentages for each fire regime and alternative are given in Appendix C.

Table 4-2. Descriptions of cluster groups

Cluster or Cluster Group	Characteristics	General Descrption[1]
Non-lethal Fire Regime		
Cluster Group A1	Young, open canopy, seral species	Recently disturbed[2], sod, encroached, mostly ponderosa pine, less than 10" dbh, less than 40% canopy closure
Cluster Group A2	Mature and old, open canopy, seral species	Frequently disturbed, woodlands, some potential for park like stands, mostly ponderosa pine, 10" dbh and greater, less than 40% canopy closure
Cluster Group B	Young, moderate canopy, climax species	Likely undisturbed since regeneration, encroached, mostly Douglas-fir, less than 10" dbh, 40 to 69 % canopy closure
Cluster Group C/D	Young, moderate canopy, seral species	Frequently disturbed, mostly ponderosa pine, Douglas-fir may dominate the understory in multi-layered stands, less than 10" dbh, 40% and greater canopy closure
Cluster Group F/G	Mature, moderate and closed canopies, seral species	Frequently disturbed, potential for parklike stands, mostly ponderosa pine, 10 to 21.9" dbh, 40% and greater canopy closure
Cluster Group J/K	Old, moderate and closed canopies, seral species	Frequently disturbed, potential for parklike and old growth stands, mostly ponderosa pine, 21" dbh and larger, 40% and greater canopy closure
Cluster Group E/I/H/L	Mature and old, moderate and closed canopies, climax species	Less frequently disturbed, encroached, some potential for old growth stands, mostly Douglas-fir, 10" dbh and greater, 40% and greater canopy closure
Mixed Fire Regime		
Cluster Group A	Young, mature and old, open canopy, seral species	Frequently disturbed, mostly ponderosa pine and western larch, all sizes, less than 40% canopy closure
Cluster Group B	Young, moderate canopy, climax species	Undisturbed since regeneration, encroached, mostly Douglas-fir and occasionally grand fir, less than 10" dbh, 40 to 69% canopy closure
Cluster Group C/D	Young, moderate and closed canopy, seral species	Less frequently disturbed, mostly ponderosa pine and western larch, Douglas-fir and occasionally grand fir may dominate the understory in multi-layered stands, less than 10" dbh, 40% and greater canopy closure
Cluster Group F/G	Mature, moderate and closed canopies, seral species	Less frequently disturbed, potential for parklike stands, mostly ponderosa pine and western larch, 10 to 21.9" dbh, 40% and greater canopy closure
Cluster Group J/K	Old, moderate and closed canopies, seral species	Frequently disturbed, potential for parklike and old growth stands, mostly ponderosa pine and western larch, 21" dbh and larger, 40% and greater canopy closure
Cluster Group E/I/H/L	Mature and old, moderate and closed canopies, climax species	Infrequently disturbed, encroached, some potential for old growth stands, mostly Douglas-fir and occasionally grand fir, 10" dbh and greater, 40% and greater canopy closure

[1] This sections describes characteristics of individual components rather than the Cluster Group as a whole.
[2] Disturbances include prescribed fires such as underburns and regeneration cuts as well as natural disturbances such as blowdown, insect and disease outbreaks, and wildfires.

Table 4-2. Descriptions of cluster groups (continued)

Cluster or Cluster Group	Characteristics	General Descrption
Lethal Fire Regime		
Cluster Group A	Young, mature and old, open canopy, seral species	Recently disturbed, mostly larch, lodgepole pine or spruce, all sizes may be present, less than 40% canopy closure
Cluster Group B	Young, moderate canopy, climax species	Undisturbed, mostly grand fir and alpine fir, less than 10" dbh, 40 to 69% canopy coverage
Cluster Group C/D	Young, moderate and closed canopies, seral species	Undisturbed, mostly larch, lodgepole pine or spruce, grand and alpine fir may dominate the understory in multi-layered stands, less than 10" dbh, 40% and greater canopy cover
Cluster Group F/G	Mature, moderate and closed canopies, seral species	Undisturbed, potential for lodgepole pine old growth, mostly larch, lodgepole pine or spruce, 10 to 21.9" dbh, 40% and greater canopy closure
Cluster Group J/K	Old, moderate and closed canopies, seral species	Undisturbed, potential for old growth larch and spruce, mostly larch and spruce, 21" dbh and greater, 40% and greater canopy closure
Cluster Group E/I/H/L	Mature and old, moderate and closed canopies, climax species	Undisturbed, potential for old growth stands, mostly grand fir and alpine fir, 10" dbh and greater, 40% and greater canopy closure

Fire Regime	Cluster or Cluster Group	Existing Condition (EC)	Recommended Management Variability (RMV)
Non-lethal			
	A1	19.1	5 to 30
	A2	12.9	10 to 40
	B	4.9	0 to 10
	C/D	10.6	0 to 15
	F/G	23.9	10 to 64
	J/K	1.7	15 to 80
	E/H/I/L	30.2	0 to 20
Mixed			
	A	18.1	0 to 30
	B	3.3	5 to 15
	C/D	15.6	13 to 27
	F/G	28.3	24 to 79
	J/K	2.0	5 to 20
	E/H/I/L	32.7	0 to 20
Lethal			
	A	12.1	10 to 30
	B	6.4	0 to 5
	C/D	22.8	15 to 40
	F/G	27.3	20 to 60
	J/K	2.0	5 to 100
	E/H/I/L	29.5	10 to 100

Table 4-3. The existing condition and the recommended management variabilities (RMV) for seral clusters and seral cluster groups. The values represent the percent of total acres within the fire regime occupied by that cluster or cluster group.

Effects of the Alternatives on Forest Vegetation

In this section, the effects of the alternatives on vegetation are described in terms of: (1) ecosystem sustainability, (2) succession, (3) old growth, (4) clearcuts, and (5) lodgepole pine availability. The section on succession is intended to address the concern expressed during scoping meetings over undesirable long-term vegetation change.

The term *key cluster group* includes any cluster group that is a major or common component of the desired condition. A major component makes up 30% or more of a fire regime, a common component 15 to 29%. A minor component makes up less than 15%.

General Effects on the Cluster Groups

In general, Alternatives 1, 2, and 3, in that order, would best develop the vegetation patterns, structures, densities, and species compositions that most resemble those of the pre-contact era. These alternatives depend on fire to emulate natural disturbances more than Alternatives 4 and 5.

Specific Effects on Cluster Groups

The pages that follow describe the specific effects that each of the alternatives would have on the cluster groups.

Cluster A1 in the Nonlethal Fire Regime

Description

This cluster contains young trees. Canopies are open and ponderosa pine is the predominant species. Most of the acres in this cluster have been recently disturbed. Some were historically grassland surrounded by timber (what we refer to as interior sod), but have been encroached upon by ponderosa pine. Some of the areas that were originally grassland would receive restoration treatments under one or more of the alternatives (fig. 4-6).

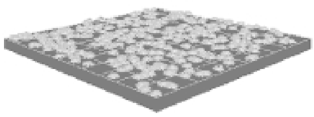


Figure 4-6 (above). In the Nonlethal Regime, Cluster A1 contains young trees and open canopies of mostly ponderosa pine.

Value

If desired conditions are met, the cluster would be a minor component of the fire regime under Alternative 1 and a common component under Alternatives 2 and 3 (fig. 4-7).

Alternatives 1, 2, and 3[1]

Of the three ecosystem management alternatives, Alternative 1 is the only one predicted to fall within the desired condition over the long term. Alternative 2 is predicted to fall just short of the desired condition over the long term, and Alternative 3, well short of it.

Alternatives 4 and 5

The vegetation model predicted that over the long term under Alternatives 4 and 5, less than 1% of the fire regime would be in Cluster A1, an amount well below the RMV.

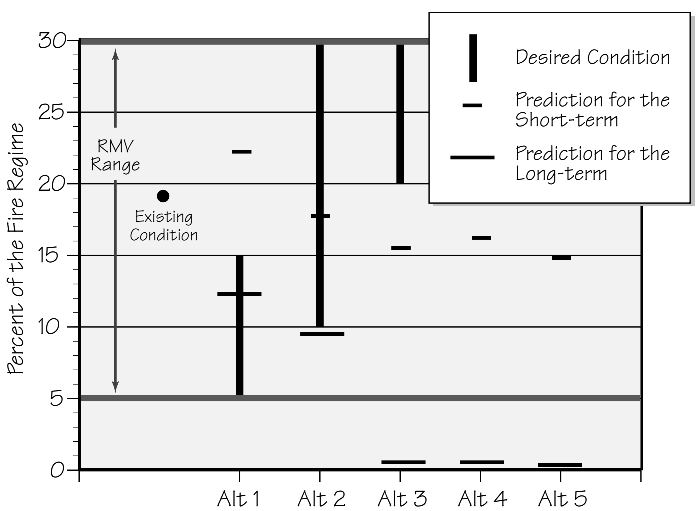
Discussion

Alternatives 1 and 2 are predicted to have much more of Cluster A1 than Alternatives 3, 4, and 5 because Alternatives 1 and 2 have interior-sod restoration treatments. The other alternatives do not. Interior-sod restoration treatments produce Cluster A1 acres.

The reader is reminded that the modeling of interior-sod and woodland restoration in Alternatives 1 and 2 occurred outside the vegetation model. Therefore, Alternatives 1, 2, and 3 fell short of reaching the desired condition for Cluster A1 until that data was merged with the vegetation model output. It is not clear why the vegetation model failed to meet Cluster A1 goals. It could be due to the emphasis placed on older and larger vegetation structures. The same concern applies to Cluster A2.

Table 4-4 illustrates harvest prescriptions and the "no treatment" acres by fire regime and period. Table 4-5 displays the cluster's acres resulting from interior-sod and woodland and parkland restoration in the Nonlethal Fire Regime during both the short- and long-term periods. Many inferences in this section are based on the data from these tables.

Figure 4-7 (below). The chart below shows the RMV, existing condition, desired condition, and model prediction for the cluster. Alternatives 4 and 5 do not have desired condition bars because they are not ecosystem management alternatives.



[1] Unless stated otherwise, all discussions of model predictions for cluster groups refer to the percentage predicted for the long-term period.

Table 4-4. Acres treated each decade during the short and long term periods

Treatment	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
Non-Lethal Fire Regime										
Uneven-aged Zone 1[1]	1,491	1,491	3,697	3,697	8,374	8,374	26,927	26,927	4,247	4,247
Uneven-aged	3,970	3,970	11,564	11,564	3,321	3,321	18,326	18,326	369	369
Temporary Even-aged	373	676	700	625	2,772	527	4,706	387	231	140
Sod Restoration[2]	10,845	9,542	6,458	7,615	0	0	0	0	0	0
Woodland Restoration[3]	10,955	8,881	10,305	5,395	0	0	0	0	0	0
Parkland Restoration[4]	4,271	2,237	4,472	2,190	0	0	0	0	0	0
Harvest Subtotals	**31,906**	**26,797**	**37,196**	**31,085**	**14,467**	**12,222**	**49,959**	**45,640**	**4,847**	**4,756**
Underburn Zone 1	4,397	4,397	3,534	3,534	4,173	4,173	25	25	304	304
Underburn	11,499	11,499	8,048	8,048	1,845	1,845	16	16	19	19
No Treatment Zone 1	13,923	13,923	14,249	14,249	25,028	25,028	10,623	10,623	33,024	33,024
No Treatment	6,978	6,978	9,637	9,637	24,741	24,741	7,024	7,024	40,627	40,627
Mixed Fire Regime										
Uneven-aged Zone 1	5,307	5,307	5,397	5,397	6,590	6,590	11,154	11,154	2,955	2,955
Uneven-aged	1,831	1,831	3,700	3,700	8,052	8,052	21,289	21,289	3,736	3,736
Temporary Even-aged	1,963	574	1,458	1,221	2,024	976	4,356	315	203	22
Permenant Even-aged Zone 1	5,249	5,249	6,005	6,005	5,002	5,002	777	777	91	91
Permenant Even-aged	4,715	1,284	5,552	1,144	5,167	433	2,208	381	1,637	55
Harvest Subtotals	**19,065**	**14,245**	**22,113**	**17,468**	**26,835**	**21,053**	**39,784**	**33,916**	**8,621**	**6,858**
Underburn Zone 1	14,891	14,891	5,836	5,836	5,553	5,553	36	36	425	425
Underburn	10,243	10,243	3,466	3,466	5,372	5,372	45	45	16	16
No Treatment Zone 1	13,872	13,872	22,078	22,078	22,201	22,201	27,378	27,378	35,875	35,875
No Treatment	26,500	26,500	26,122	26,122	27,949	27,949	28,340	28,340	65,665	65,665

[1] Zone 1 acres contain immature stands in which most treatments, excluding an occasional precommercial thinning, are deferred from treatment (e.g. uneven-aged and underburns) until they reach an age where the treatment is appropriate.
[2] Interior-sod Restoration on encroached acres treated outside the vegetation model. The acres here cannot be compared to the acreage in table 3-22. This table shows cumulative burn acres. An individual acre can be burned more than once during a period. The acreage figure given here counts an acre each time it is burned. In table 3-22, an individual acre is counted only once, regardless of how many treatments it receives.
[3] Woodland Restoration on encroached and other Nonlethal Fire Regime acres treated outside the vegetation model. This table shows cumulative burn acres. An individual acre can be burned more than once during a period. The acreage figure given here counts an acre each time it is burned. In table 3-22, an individual acre is counted only once, regardless of how many treatments it receives.
[4] Parkland Restoration on encroached and other Nonlethal Fire Regime acres treated outside the vegetation model. This table shows cumulative burn acres. An individual acre can be burned more than once during a period. The acreage figure given here counts an acre each time it is burned. In table 3-22, an individual acre is counted only once, regardless of how many treatments it receives.

Table 4-4. Acres treated each decade during the short and long term periods (continued)

	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Treatment	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
Lethal Fire Regime										
Uneven-aged Zone 1	3,414	3,414	2,257	2,257	2,465	2,465	6,780	6,780	0	0
Uneven-aged	194	194	1,778	1,778	4,010	4,010	10,235	10,235	19	19
Permenant Even-aged Zone 1	7,684	7,684	8,584	8,584	4,872	4,872	2,223	2,223	0	0
Permenant Even-aged	4,000	1,501	5,945	1,114	4,498	2,743	2,407	1,466	607	54
Harvest Subtotals	**15,293**	**12,794**	**18,564**	**13,733**	**15,846**	**14,090**	**21,646**	**20,705**	**626**	**72**
No Treatment Zone 1	57,382	57,382	57,616	57,616	61,147	61,147	59,481	59,481	68,485	68,485
No Treatment	97,634	97,634	94,903	94,903	82,335	82,335	93,872	93,872	122,203	122,203

Table 4-5. Parkland, woodland, and restoration acres

Cluster Groups		A1	A2	B	C/D	F/G	J/K	E/I/H/L	Totals
Existing Condition	Alternative 2	7,250	7,583	537	1,125	5,509	56	0	22,060
	Alternative 1	7,216	7,825	997	2,491	6,136	57	5,894	30,616
Short Term	Alternative 2	7,903	9,694	205	785	3,398	56	20	22,060
	Alternative 1	10,580	10,578	533	1,231	3,198	57	4,441	30,616
Long Term	Alternative 2	7,158	7,466	73	637	4,813	1,828	85	22,060
	Alternative 1	8,790	8,766	54	1,007	6,509	1,964	3,527	30,616

[1]This table shows the acres of seral cluster groups that result from parkland, woodland, and interior-sod restoration treatments within the Nonlethal Fire Regime. These estimates were developed outside of the vegetation model.

Cluster A2 in the Nonlethal Fire Regime

Description
This cluster has mature and old trees and open canopies. It consists largely of ponderosa pine, and there is some potential for parklike stands. It is likely that these acres have been recently disturbed (fig. 4-8).

Value
If desired conditions are met, the cluster would be a major component of the fire regime under Alternative 1 and a common component under Alternatives 2 and 3 (fig. 4-9).

Alternatives 1, 2, and 3
Of the ecosystem management alternatives, Alternative 2 is the only one predicted to fall within the desired condition. Alternative 1 fell short of the desired condition and Alternative 3 fell well short of it.

Alternatives 4 and 5
Under Alternatives 4 and 5, Cluster A2 is projected to fall below the RMV range.

Discussion
The largest percentages of Cluster A2 are predicted for Alternatives 1 and 2 because these alternatives emphasized the restoration of woodland structures, and woodlands are a feature of Cluster A2.

The vegetation model predicted that Alternatives 3, 4 and 5 would produce few acres of Cluster A2. This is likely due to the emphasis on older and larger trees in this fire regime. Woodland structures were not emphasized in these two alternatives.

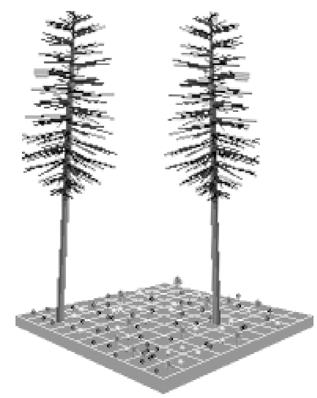


Figure 4-8 (above). In the Nonlethal Fire Regime, Cluster A2 contains mature and old trees and open canopies of mostly ponderosa pine.

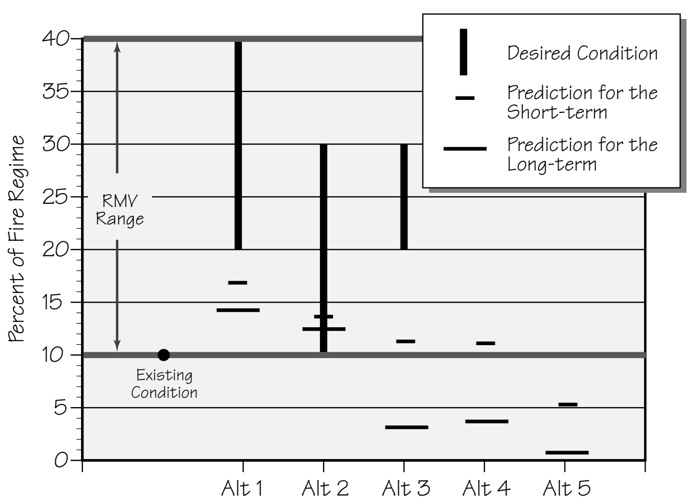


Figure 4-9 (left). The RMV, existing condition, desired condition, and model prediction for the cluster

Cluster B in the Nonlethal Fire Regime

Description

This cluster has young trees and moderate canopies. Douglas-fir dominates, and it is unlikely any disturbance has occurred since regeneration (fig. 4-10).

Value

If desired conditions are met, the cluster would be a minor component of the fire regime under Alternatives 1, 2, and 3 (fig. 4-11).

Alternatives 1, 2, and 3

All three alternatives are predicted to produce Cluster B at the lowest end of the desired condition range for each alternative during the long term.

Alternatives 4 and 5

The vegetation model projected that Alternatives 4 and 5 would produce Cluster B on less than 1% of the acres over the long term. These percentages would fall within the RMV.

Discussion

Currently, less than 5% of the fire regime is occupied by Cluster B. It is unlikely that succession resulting from any kind of disturbance or lack of it, would produce very much Cluster B within this fire regime.

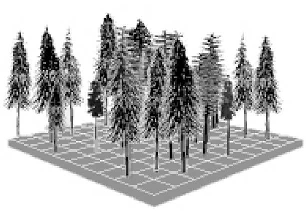
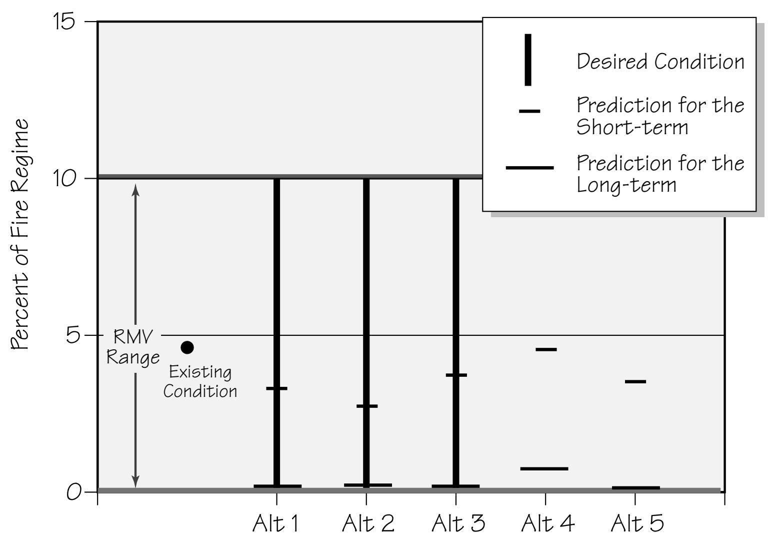


Figure 4-10 (above). In the Nonlethal Regime, Cluster B contains young Douglas-fir trees and moderate canopies.

Figure 4-11 (right). The RMV, existing condition, desired condition, and model prediction



Cluster Group C/D in the Nonlethal Fire Regime

Description

This cluster group consists of young trees and has moderate and closed canopies. Its dominant species is ponderosa pine. Douglas-fir may dominate in the understory of multilayered stands. The group has likely been recently disturbed (fig. 4-12).

Value

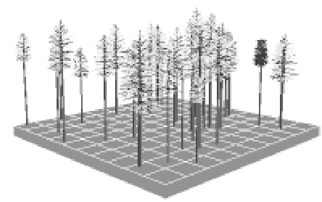
If desired conditions are met, the cluster would be a minor component of the Nonlethal Fire Regime under Alternatives 1, 2, and 3 (fig. 4-13).

Alternatives 1, 2, and 3

Under Alternatives 1 and 2, Cluster Group C/D is predicted to fall at the upper end of the desired condition range during the long term. Under Alternative 3, the group is expected to exceed the desired condition in the long term.

Alternatives 4 and 5

The vegetation model predicted that under Alternative 4, Cluster Group C/D would fall within the RMV. Under Alternative 5 the group is predicted to exceed the RMV.



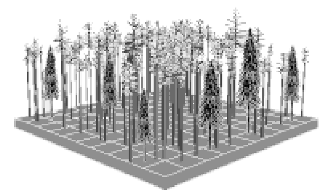


Figure 4-12 a and b (above). The Cluster Group C/D contains young trees and has moderate and closed canopies. In the Nonlethal Regime the overstory is mostly ponderosa pine, while the understory is dominated by Douglas-fir.

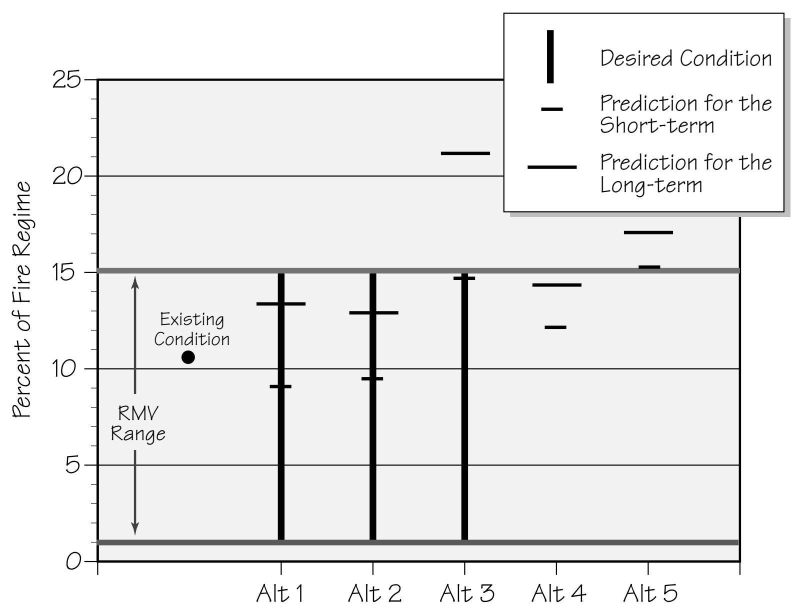


Figure 4-13 (left). The RMV, existing condition, desired condition, and model prediction

Cluster Group F/G in the Nonlethal Fire Regime

Description

This cluster group contains mature trees and has moderate and closed canopies. Ponderosa pine dominates. Most of the acres have been recently disturbed. As a whole, the group offers some potential for parklike stands (fig. 4-14).

Value

If desired conditions are met, the Cluster Group F/G would be a common component of the fire regime under Alternatives 1 and 2 and a major component under Alternative 3 (fig. 4-15).

Alternatives 1, 2, and 3

The vegetation model predicts that under all three ecosystem management alternatives, Cluster Group F/G will fall within the desired condition range.

Alternatives 4 and 5

Under both Alternatives 4 and 5, the group is expected to fall within the RMV.

Discussion

Alternatives 3 and 4 are predicted to produce the greatest percentage of Cluster Group F/G due to the emphasis these alternatives place on uneven-aged treatments in the Nonlethal Fire Regime.

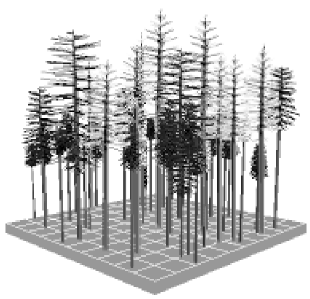


Figure 4-14 (above). In the Nonlethal Regime, the Cluster Group F/G contains mature trees with moderate and closed canopies of mostly ponderosa pine.

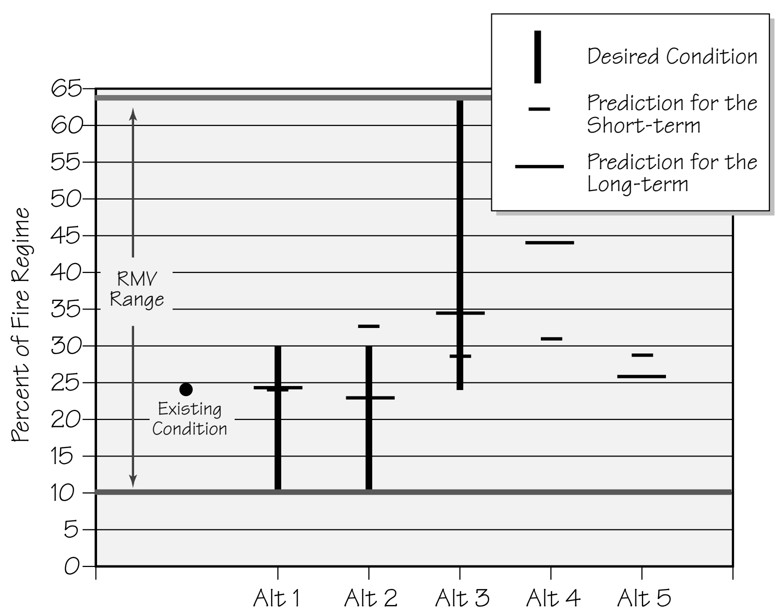


Figure 4-15 (right). The RMV, existing condition, desired condition, and model prediction

Cluster Group J/K in the Nonlethal Fire Regime

Description

This cluster group contains old trees and has moderate and closed canopies. Ponderosa pine dominates the species composition. It is likely that most of the acres have been disturbed recently. The group offers potential for old-growth and parklike stands (fig. 4-16).

Value

If the desired conditions are met, Cluster Group J/K would be a major component of the fire regime under Alternatives 1 and 2 and a common component under Alternative 3 (fig. 4-17).

Alternatives 1, 2, and 3

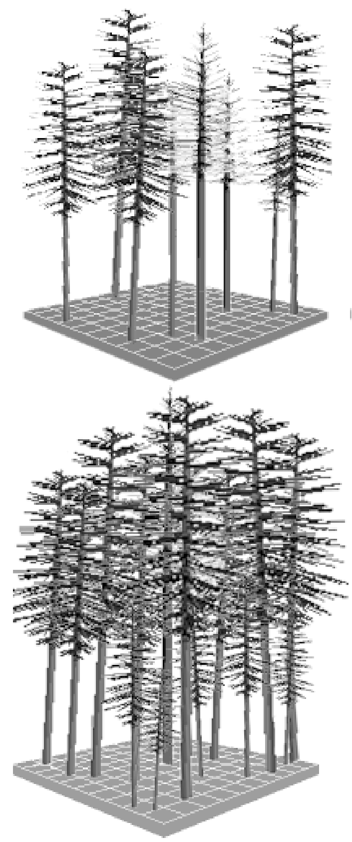
The vegetation model predicts that under Alternatives 1 and 3, Cluster Group J/K will fall short of reaching the desired condition, although the long term prediction for Alternative 3 comes close. Under Alternative 2, the prediction is that the group will fall within the desired condition over the long term.

Alternatives 4 and 5

Under Alternative 5, Cluster Group J/K is expected to fall within the RMV during the long term. Under Alternative 4 the group is expected to fall below the RMV.

Discussion

We assume that if the vegetation model had had more time, it would have generated more acres of Cluster Group J/K within Alternatives 1, 2, and 3.



Figures 4-16 a and b (above). In the Nonlethal Regime, the Cluster Group J/K contains old trees with moderate and closed canopies of mostly ponderosa pine.

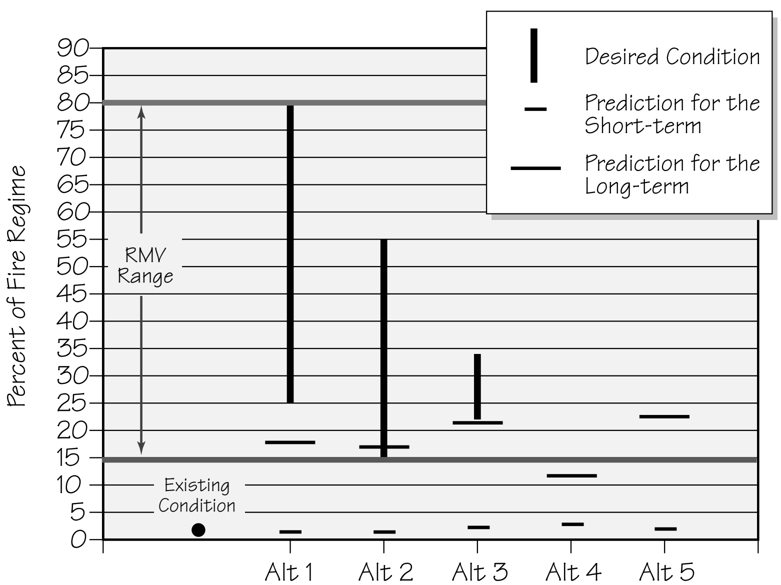
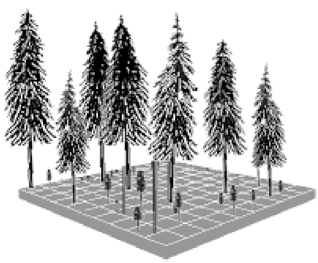


Figure 4-17 (left). The RMV, existing condition, desired condition, and model prediction

Cluster Group E/I/H/L in the Nonlethal Fire Regime



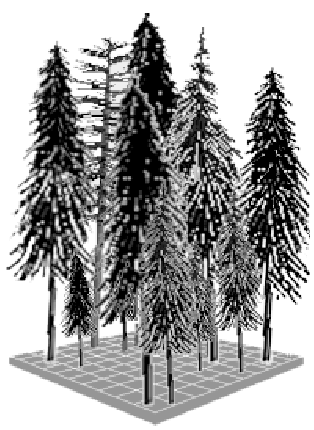
Description

This cluster group consists of mature and old trees and has moderate and closed canopies (fig. 4-18). Douglas-fir is the dominant species. Cluster Group E/I/H/L is less frequently disturbed than Cluster Group J/K, has some encroached stands, and offers some potential for old growth.

Value

If desired conditions are met, this cluster group would be a minor component of the fire regime under Alternatives 1, 2, and 3 (fig. 4-19).

Alternatives 1, 2, and 3



Alternative 1 is the only alternative of the three that is predicted to fall within the desired condition, and it does so only in the long term. Alternatives 2 and 3 are predicted to exceed the desired conditions.

Alternatives 4 and 5

Under Alternatives 4 and 5, the vegetation model predicts that Cluster Group E/I/H/L will exceed the RMV.

Discussion

Alternative 5 may have generated more acres of Cluster Group E/I/H/L within the vegetation model because the alternative had fewer treatments (including underburns) and more "no treatment" acres than any of the other alternatives. The way the vegetation model created this group was by applying the "no treatment" prescription.

Figure 4-18 a and b (above). The Cluster Group E/I/H/L in the Nonlethal Regime contains mature and old trees with moderate and closed canopies of mostly Douglas-fir.

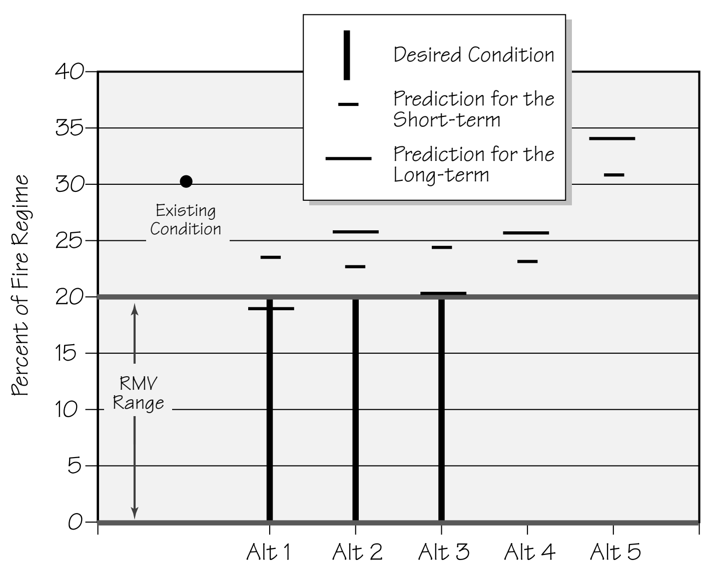


Figure 4-19 (right). The RMV, existing condition, desired condition, and model prediction

Cluster A in the Mixed Fire Regime

Description

This cluster contains young, mature and old trees and has open canopies. Some stands are dominated by ponderosa pine, others by a combination of ponderosa pine and western larch (fig. 4-20). These stands are frequently disturbed.

Value

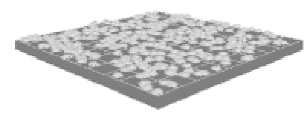
If desired conditions are met, the cluster would be a common component of the fire regime under Alternatives 1 and 3 and a minor component of the fire regime under Alternative 2 (fig. 4-21).

Alternatives 1, 2, and 3

Under Alternatives 1 and 3, Cluster A is predicted to fall short of the desired condition over the long term. Under Alternative 2 the cluster is expected to fall within the desired condition range.

Alternatives 4 and 5

Over the long term, Alternatives 4 and 5 are predicted to produce less than 3% of Cluster A, an amount that falls within the RMV.



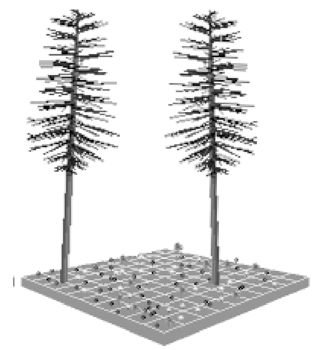


Figure 4-20 a and b (above). Cluster A in the Mixed Regime contains young, mature, and old trees with open canopies of mostly ponderosa pine and western larch.

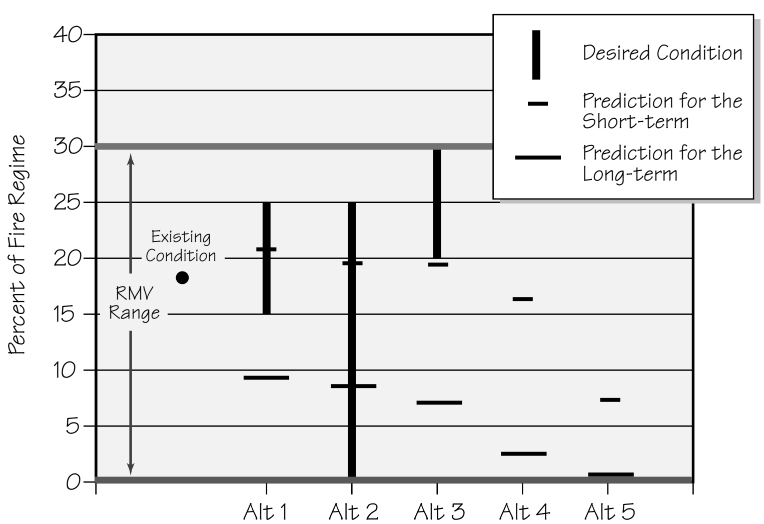


Figure 4-21 (left). The RMV, existing condition, desired condition, and model prediction

Cluster B in the Mixed Fire Regime

Description

This cluster is composed of young trees and has moderate canopies. Douglas-fir usually dominates although some stands are mostly grand fir (fig. 4-22). It is unlikely any disturbance has occurred in these stands since regeneration.

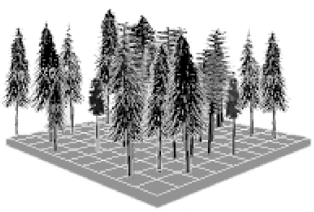


Figure 4-22 (above). In the Mixed Fire Regime, Cluster B contains young trees and moderate canopies of mostly Douglas-fir or occasionally grand fir.

Value

If desired conditions are met, this cluster would be a minor component of the fire regime under all three of the ecosystem management alternatives (fig. 4-23).

Alternatives 1, 2, 3, 4, and 5

Under all three of the ecosystem management alternatives, Cluster B is expected occupy 1% or less of the fire regime in the long term. That percentage is well below the ranges of the desired condition goals.

Discussion

Currently, this cluster group makes up a very small component of the fire regime. It is predicted to remain small under all of the alternatives.

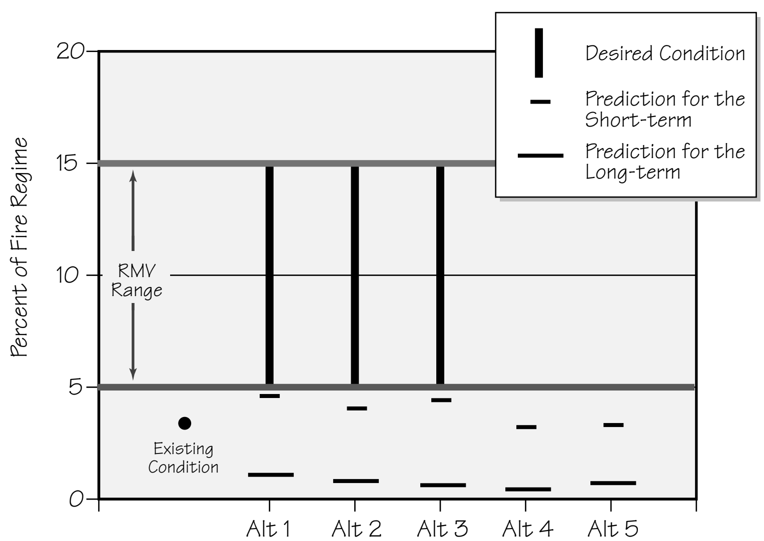


Figure 4-23 (right). The RMV, existing condition, desired condition, and model prediction

Cluster Group C/D in the Mixed Fire Regime

Description
This cluster group consists of young trees and has moderate and closed canopies. Within the Mixed Fire Regime, it is dominated by ponderosa pine or ponderosa pine and western larch. Douglas-fir and occasionally grand fir may dominate the understory in multilayered stands (fig. 4-24). Most of the acres have been recently disturbed.

Value
If desired conditions are met, this group would be a common component of the fire regime under Alternatives 1, 2, and 3 (fig. 4-25).

Alternatives 1, 2, and 3
Over the long term, Cluster Group C/D is predicted to be at the upper end of the desired condition range of all three ecosystem management alternatives.

Alternatives 4 and 5
The vegetation model predicted that under Alternatives 4 and 5, Cluster Group C/D would fall within the RMV.

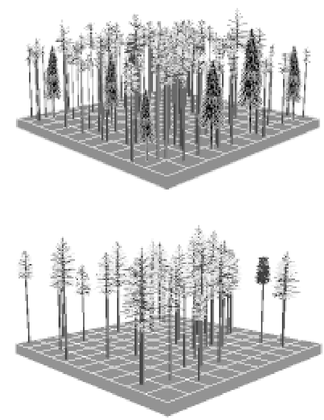


Figure 4-24 a and b (above). In the Mixed Fire Regime, Cluster Group C/D contains young trees and has moderate and closed canopies. The overstory is mostly ponderosa pine or ponderosa pine and western larch. In multi-storied stands, the understory is dominated by Douglas-fir or occasionally by grand fir.

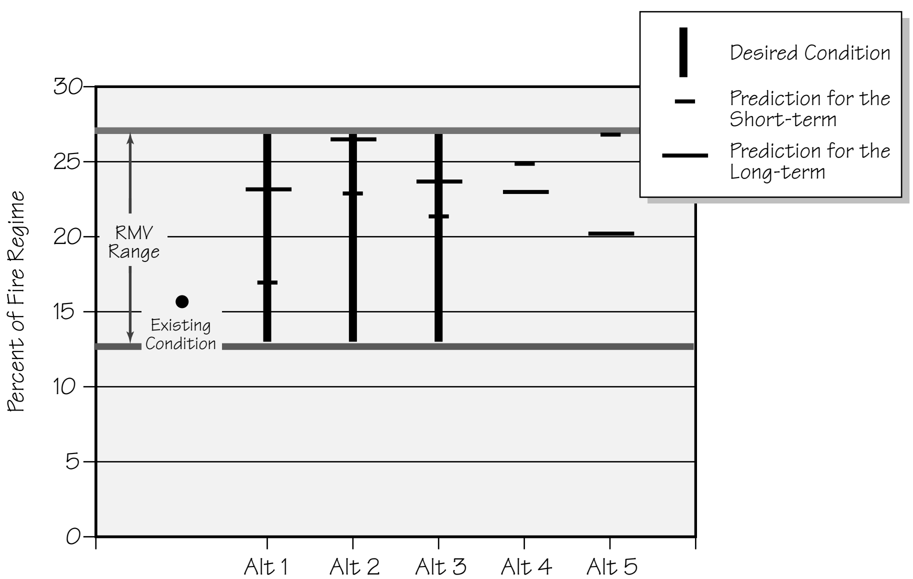
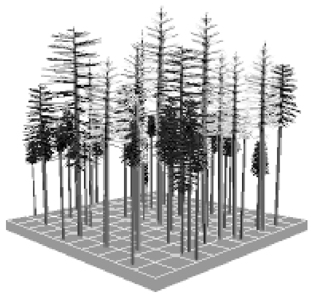


Figure 4-25 (left). The RMV, existing condition, desired condition, and model prediction



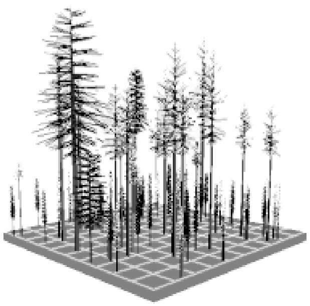


Figure 4-26 a and b (above). Cluster Group F/G contains mature trees with moderate and closed canopies. In the Mixed Fire Regime, the group is comprised of mostly ponderosa pine or ponderosa pine and larch.

Cluster Group F/G in the Mixed Fire Regime

Description

This cluster group contains mature trees and has moderate and closed canopies. Ponderosa pine dominates some stands, a mix of ponderosa pine and western larch. Most of the acres in this group have been recently disturbed. The cluster group offers potential for parklike stands (fig. 4-26).

Value

If desired conditions are met, this cluster group would be a major component of the Mixed Fire Regime under Alternatives 1, 2, and 3 (fig. 4-27).

Alternatives 1, 2, and 3

Under all three of the ecosystem management alternatives, Cluster Group F/G is predicted to fall within the desired condition ranges over the long term.

Alternatives 4 and 5

Under Alternatives 4 and 5, this group is expected to fall within the RMVs over the long term.

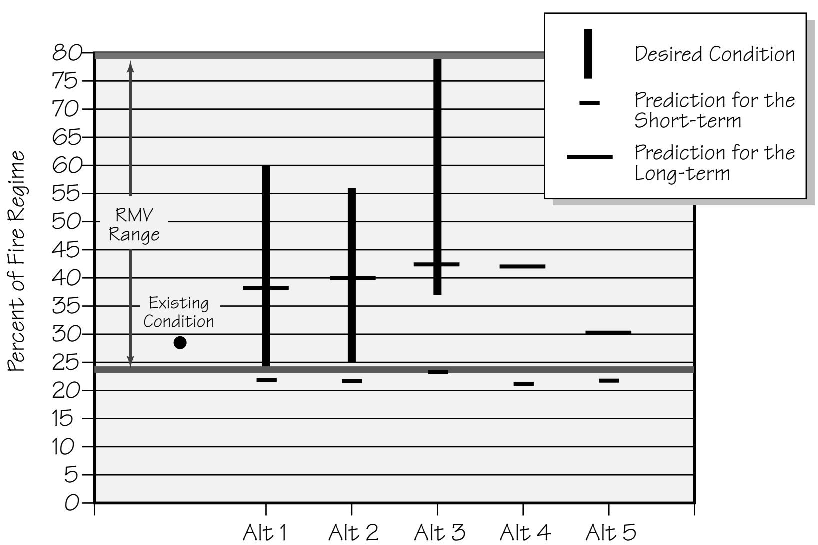
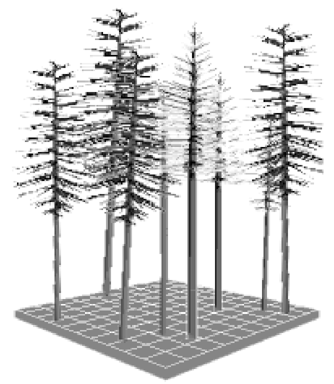


Figure 4-27 (right). The RMV, existing condition, desired condition, and model prediction

Cluster Group J/K in the Mixed Fire Regime

Description
This cluster group contains old trees and has moderate and closed canopies. Some stands are dominated by ponderosa pine, others by ponderosa pine and western larch (fig. 4-28). Most of the acres have recently been disturbed. The group offers potential for old-growth and parklike stands.



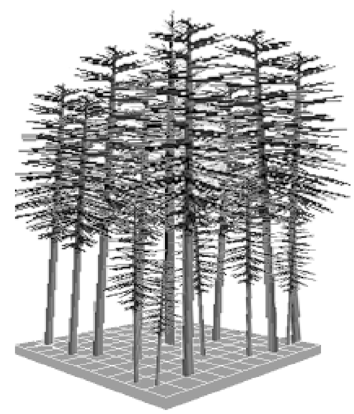


Figure 4-28 a and b (above). Cluster Group J/K in the Mixed Fire Regime contains old trees with moderate and closed canopies of ponderosa pine or ponderosa pine and western larch.

Value
If desired conditions are met, Cluster Group J/K would be a common component of the fire regime under Alternative 1 and a minor component of the fire regime under Alternatives 2 and 3 (fig. 4-29).

Alternatives 1, 2, and 3
The vegetation model predicts that over the long term, this group will fall within the desired condition range of all three of the ecosystem management alternatives.

Alternatives 4 and 5
Under Alternatives 4 and 5, Cluster Group J/K is expected to fall within the RMV.

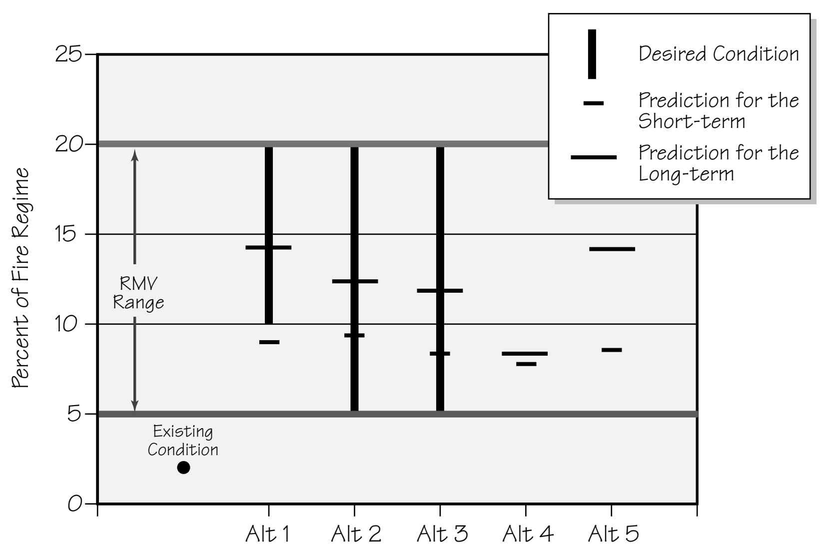
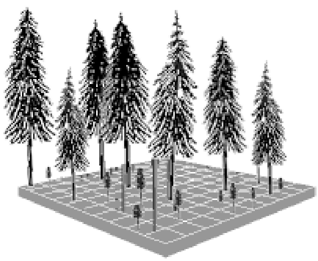


Figure 4-29 (left). The RMV, existing condition, desired condition, and model prediction



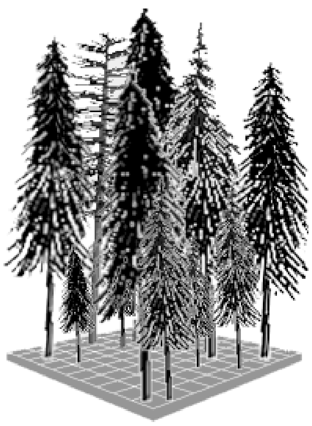


Figure 4-30 a and b (above). Cluster Group E/I/H/L in the Mixed Fire Regime contains mature and old trees with moderate and closed canopies of mostly Douglas-fir or occasionally grand fir.

Cluster Group E/I/H/L in the Mixed Fire Regime

Description

This cluster group consists of mature and old trees and has moderate and closed canopies. The group is dominated by Douglas-fir although grand fir dominates some stands. Cluster Group E/I/H/L is less frequently disturbed than Cluster Group J/K, has some encroached stands, and offers some potential for old growth (fig. 4-30).

Value

If desired conditions are met, this group would be a minor component of the fire regime under all three ecosystem management alternatives (fig. 4-31).

Alternatives 1, 2, and 3

Under all three of the ecosystem management alternatives, Cluster Group E/I/H/L is expected to fall within the ranges of the desired conditions for the long-term period.

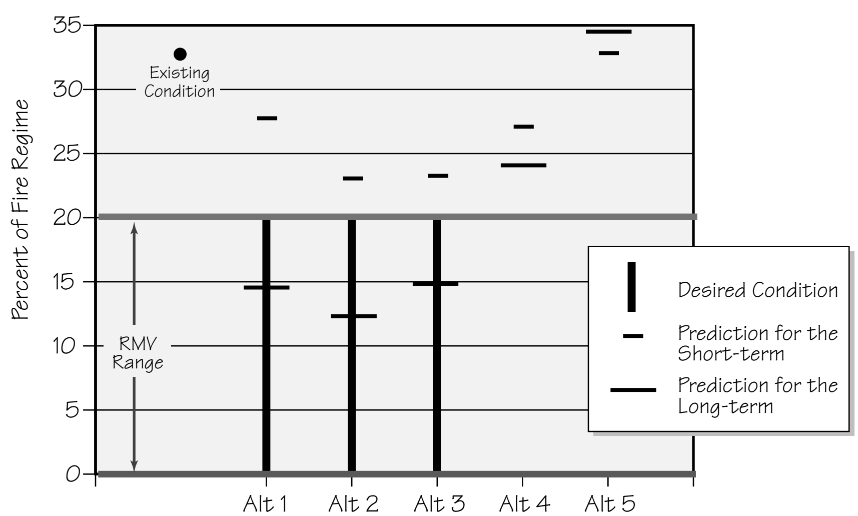
Alternatives 4 and 5

It is expected that under both Alternatives 4 and 5, Cluster Group E/I/H/L will exceed the RMV.

Discussion

The vegetation model predicted that over the long term Alternatives 4 and 5 will yield the most acres of Cluster Group E/I/H/L. This is because there are more "no treatment" prescriptions under these two alternatives.

Figure 4-31 (right). The RMV, existing condition, desired condition, and model prediction



Cluster A in the Lethal Fire Regime

Description

This cluster contains young, mature and old trees and has open canopies. Western larch, lodgepole pine, or spruce dominate. Stands are frequently disturbed (fig. 4-32).

Value

If desired conditions are met, this cluster would be a common component of the fire regime under Alternatives 1, 2, and 3 (fig. 4-33).

Alternatives 1, 2, and 3

Under all three of these alternatives, this cluster is projected to fall short of the desired condition in the long-term period.

Alternatives 4 and 5

It is expected that under Alternatives 4 and 5, Cluster A will fall short of the RMV over the long term.

Discussion

This cluster is an important component of this fire regime. It occurs after stand replacing disturbances, fires, and other events that create openings where regeneration results. Over time, the regeneration develops into older and denser cluster groups.

It is not clear why modeling failed to produce more acres of Cluster A. It is possible that the emphasis the ID Team placed on older and denser clusters had an influence. Acres that the vegetation model allocated to these other groups in order to meet desired condition goals may well have limited the acres available to this cluster.

Figure 4-32 a and b (above). Cluster A in the Lethal Fire Regime contains young, mature, and old trees and has open canopies of mostly western larch, lodgepole pine, or spruce.

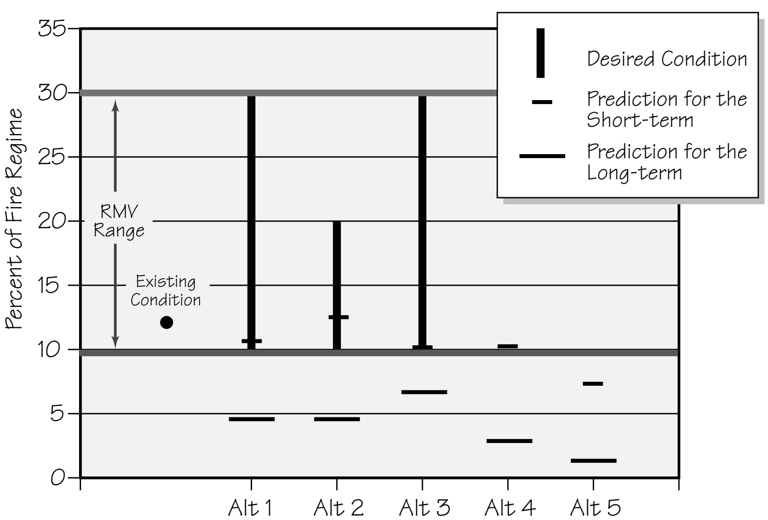


Figure 4-33 (left). The RMV, existing condition, desired condition, and model prediction

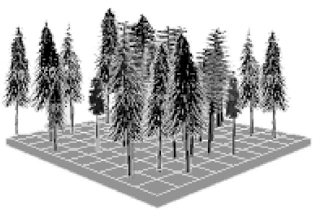


Figure 4-34 (above). Cluster B in the Lethal Fire Regime contains young trees and has moderate canopies of mostly grand fir and alpine fir.

Figure 4-35 (right). The RMV, existing condition, desired condition, and model prediction

Cluster B in the Lethal Fire Regime

Description

This cluster is composed of young trees and has moderate canopies. Grand fir and alpine fir dominate. It is unlikely any disturbance has occurred in these stands since regeneration (fig. 4-34).

Value

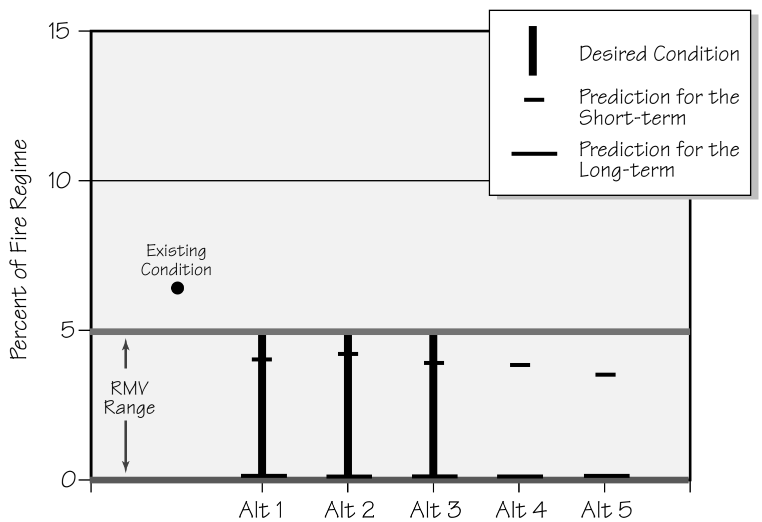
If desired conditions are met, this cluster would be a minor component of the fire regime under all three of the ecosystem management alternatives (fig. 4-35).

Alternatives 1, 2, and 3

Under Alternatives 1, 2, and 3, Cluster B is predicted to fall within the ranges of the desired conditions during the long-term period.

Alternatives 4 and 5

The cluster is projected to be within the RMV under these two alternatives.



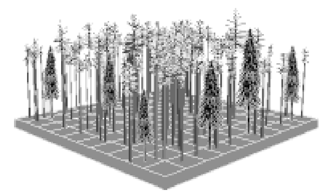
Cluster Group C/D in the Lethal Fire Regime

Description
This cluster group consists of young trees and has moderate and closed canopies. Within the Lethal Fire Regime, the dominant species are western larch, lodgepole pine, and spruce. Grand and alpine fir may dominate the understory of multilayered stands (fig. 4-36). Most of the acres have been recently disturbed.

Value
If the desired conditions are met, this group would be a major component of the fire regime under Alternatives 1 and 2 and a common component under Alternative 3 (fig. 4-37).

Alternatives 1, 2, and 3
Under all three of the ecosystem management alternatives, this group is predicted to fall within the ranges of the desired conditions during the long-term period.

Alternatives 4 and 5
The cluster is projected to be within the RMV under both Alternative 4 and Alternative 5.



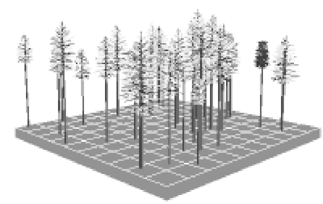


Figure 4-36 a and b (above). Cluster Group C/D contains young trees and has moderate and closed canopies. The overstory in the Lethal Fire Regime is mostly western larch, lodgepole pine, and spruce. In multi-storied stands, the understory is dominated by grand fir and alpine fir.

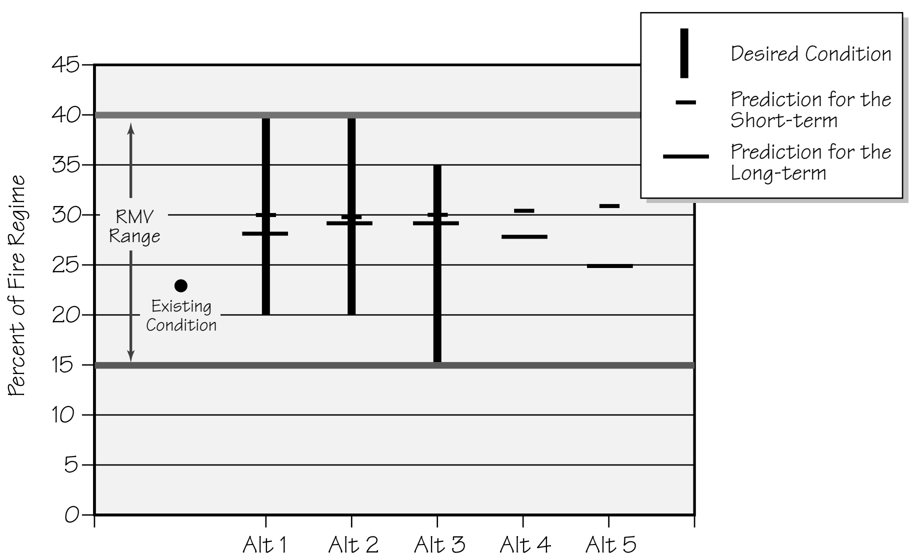
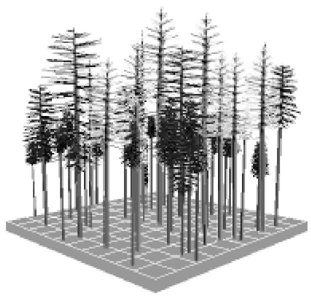


Figure 4-37 (left). The RMV, existing condition, desired condition, and model prediction



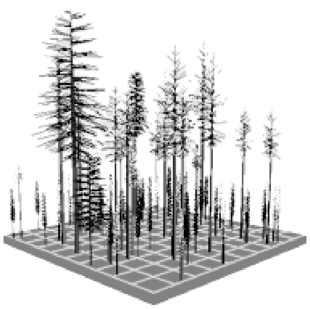


Figure 4-38 a and b (above). Cluster Group F/G contains mature trees and has moderate and closed canopies. In the Lethal Fire Regime, it is comprised mostly western larch, lodgepole pine, and spruce.

Cluster Group F/G in the Lethal Fire Regime

Description

This cluster group contains mature trees and has moderate and closed canopies. It is comprised mostly of western larch, lodgepole pine, and spruce, and most of the acres have been recently disturbed (fig. 4-38). The group offers potential for lodgepole pine old growth.

Value

If the desired conditions are met, this group would be a major component of the fire regime under all of the ecosystem management alternatives (fig. 4-39).

Alternatives 1, 2, and 3

The vegetation model predicted that under Alternatives 1 and 3, Cluster Group F/G would fall in the lower ranges of the desired conditions. Under Alternative 2, the group is predicted to fall short of the desired condition. Still, Alternative 2 is projected to produce more of Cluster Group F/G than any of the other alternatives.

Alternatives 4 and 5

The vegetation model predicted that under these two alternatives, Cluster Group F/G would fall within the RMV.

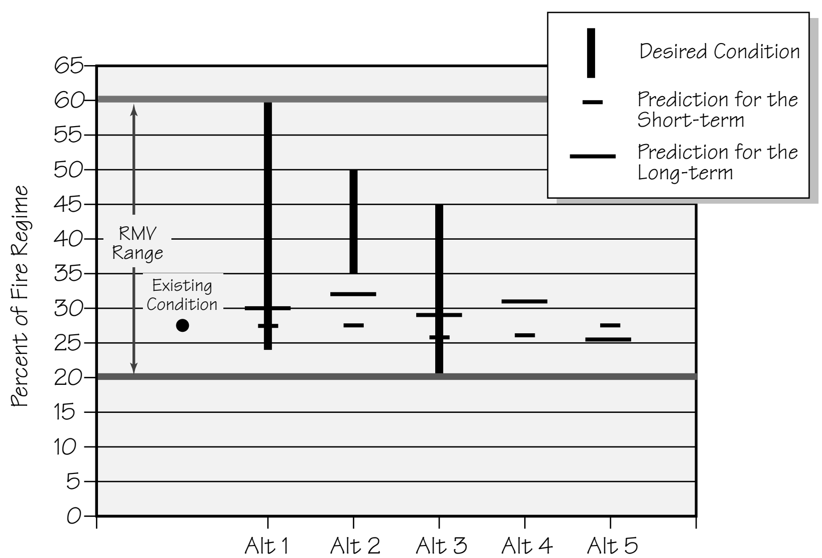
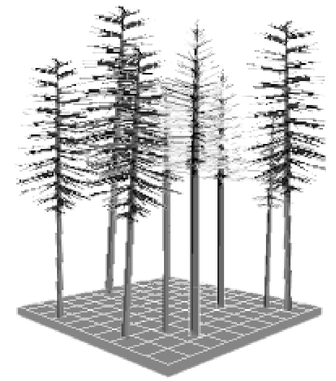


Figure 4-39 (right). The RMV, existing condition, desired condition, and model prediction



Cluster Group J/K in the Lethal Fire Regime

Description
This cluster group contains old trees and has moderate and closed canopies. Western larch and spruce dominate. Most of the acres have recently been disturbed. The group offers potential for old-growth stands of western larch and spruce (fig. 4-40).

Value
If the desired conditions are met, Cluster Group J/K will be a major component of the fire regime under Alternative 1, a common component under Alternative 2, and a minor component under Alternative 3 (fig. 4-41).

Alternatives 1, 2, and 3
The vegetation model predicted that under Alternatives 2 and 3, this group would fall within the ranges of the desired conditions, but Alternative 1 would fall short.

Alternatives 4 and 5
It is predicted that Cluster Group J/K will fall within the RMV under Alternatives 4 and 5.

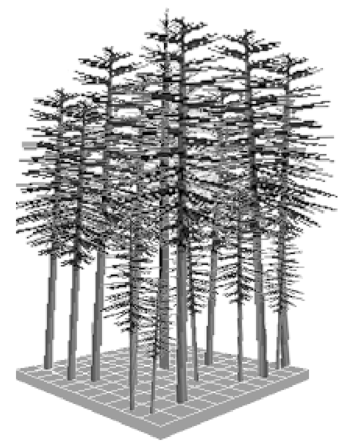


Figure 4-40 a and b (above). Cluster Group J/K in the Lethal Fire Regime contains old trees with moderate and closed canopies of western larch and spruce.

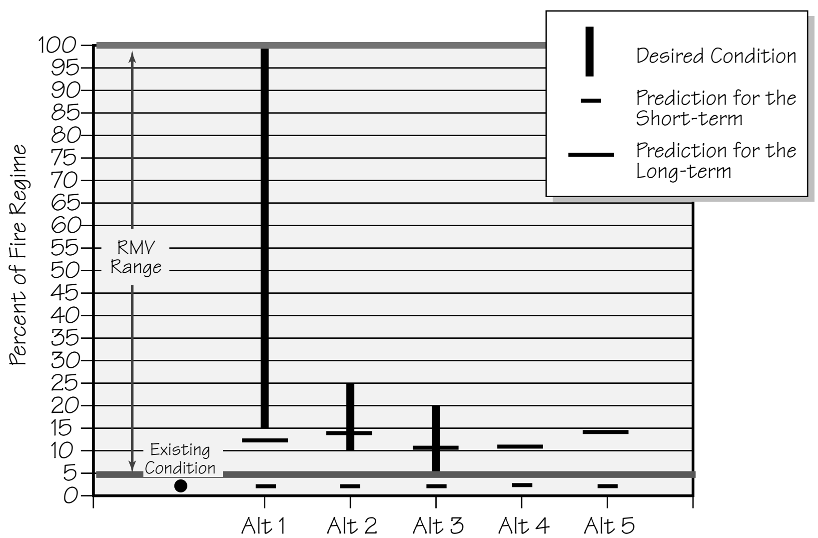


Figure 4-41 (left). The RMV, existing condition, desired condition, and model prediction

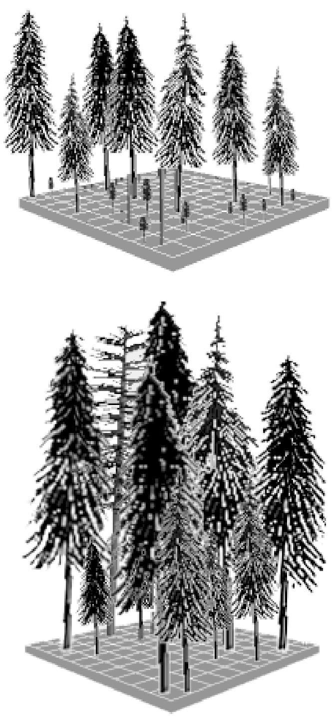


Figure 4-42 a and b (above). Cluster Group E/I/H/L in the Lethal Fire Regime contains mature and old trees with moderate and closed canopies of mostly grand fir and alpine fir.

Cluster Group E/I/H/L in the Lethal Fire Regime

Description

This cluster group consists of mature and old trees and has moderate and closed canopies. The group is dominated by grand fir and alpine fir. Cluster Group E/I/H/L is less frequently disturbed than Cluster Group J/K and offers some potential for old growth (fig. 4-42).

Value

If the desired conditions are met, Cluster Group E/I/H/L would be a major component of the fire regime under Alternative 1 and a common component under Alternatives 2 and 3 (fig. 4-43).

Alternatives 1, 2, and 3

Under Alternatives 2 and 3, the vegetation model projects Cluster Group E/I/H/L to fall within the ranges of the desired conditions. Under Alternative 1, the prediction is for this group to fall just short of the desired condition. Alternative 1 is, however, predicted to produce more acres of Cluster Group E/I/H/L than the other ecosystem management alternatives.

Alternatives 4 and 5

Under Alternatives 4 and 5, Cluster Group E/I/H/L is expected to fall within the RMV.

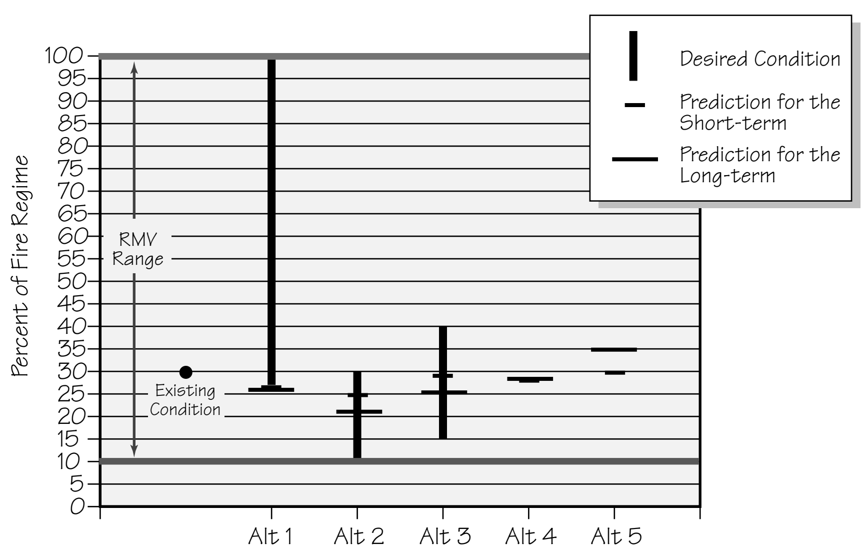


Figure 4-43 (right). The RMV, existing condition, desired condition, and model prediction

Effects on Sustainability

The desired conditions for each alternative are based on the historical ranges of variability or HRVs. The ID Team assumed that those alternatives producing clusters within the range of desired conditions would be sustainable. Alternatives that produce clusters outside of the desired condition may also be sustainable, but present more of a risk.

To come up with a single measure of sustainability, The ID Team combined the ranges of the desired conditions for Alternatives 1, 2, and 3 into a single range, which we call the recommended management variability or RMV (see fig. 4-44 for a hypothetical example). To compare the sustainability of all the alternatives, the team calculated the percentage of cluster groups within an alternative that fell below the RMV. They did the same for those that fell within the RMV, and those that fell above the RMV. The totals provided a general measure of each alternative's relative sustainability Fig. 4-45).

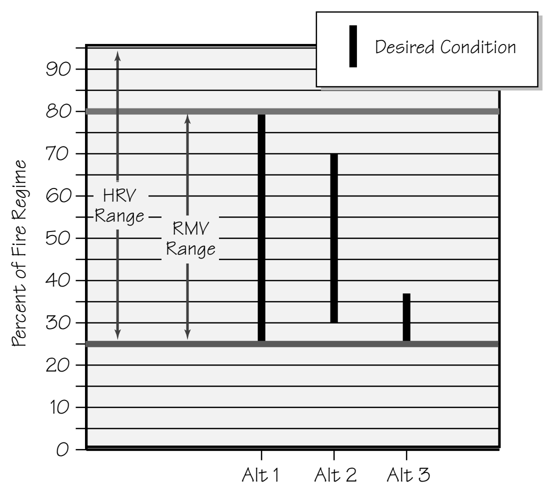


Figure 4-44. The recommended management variability or RMV is equal to the combined ranges of the desired condition of the three ecosystem management alternatives (this is a hypothetical example).

Alternatives 1, 2, and 3

Of the three ecosystem management alternatives, Alternative 1 is predicted to have the most cluster groups within RMVs. Under Alternatives 2 and 3 in the Mixed and Lethal Fire Regimes, the vegetation model predicted that over 90% of the cluster groups will fall within the RMVs. A much smaller percentage fall inside the RMVs in the Nonlethal Fire Regime.

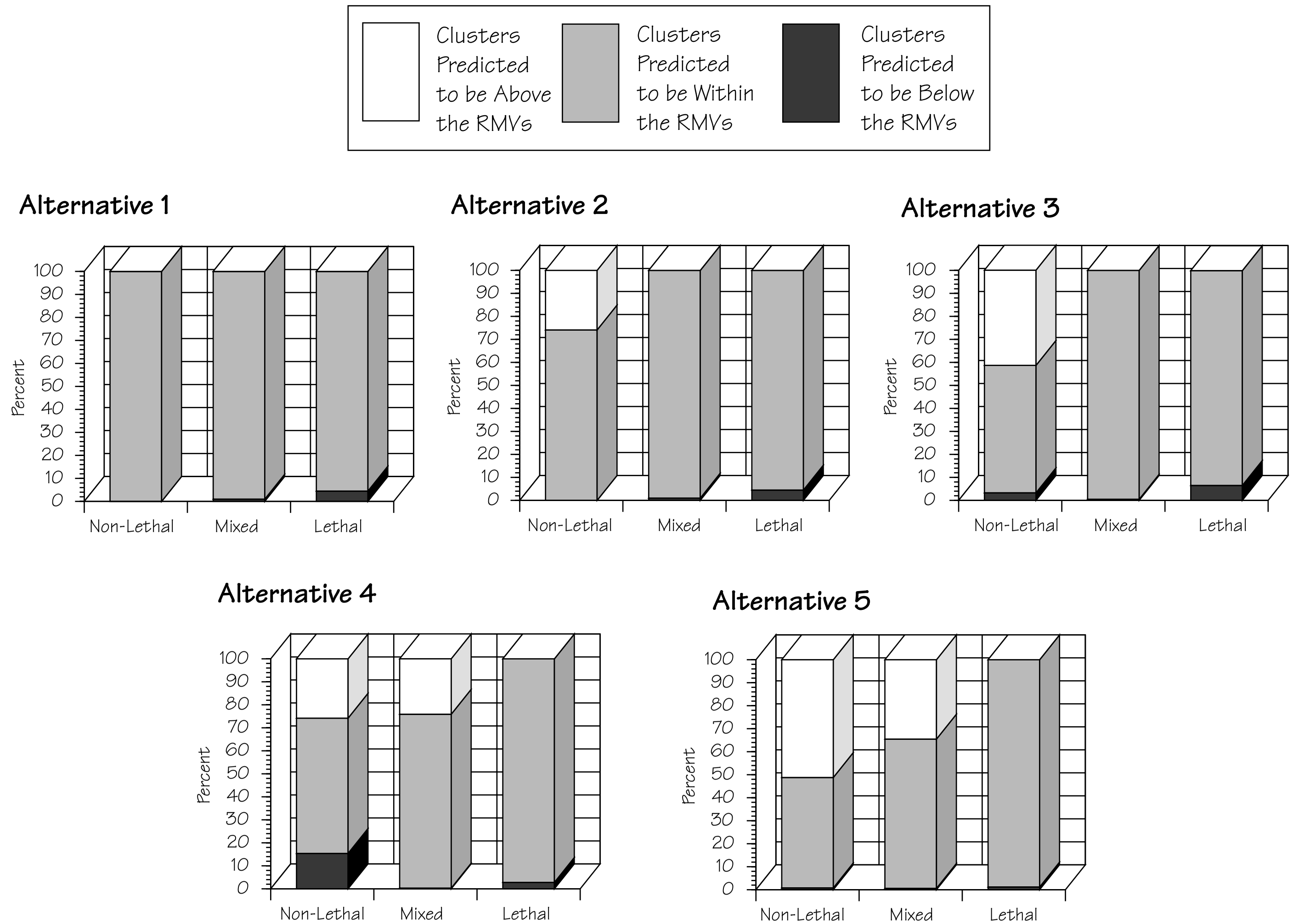
Alternatives 4 and 5

Alternatives 4 and 5 are predicted to have the most cluster groups within the RMVs in the Lethal Fire Regime. The Mixed and Nonlethal Fire Regimes had smaller percentages within the RMVs. More details are presented in Appendix C.

All Alternatives

According to this measure of sustainability, the vegetation model predicts that out of all the alternatives, Alternative 1 would be the most sustainable. It is followed by Alternatives 2, 3, 4 and 5, respectively.

Figure 4-45. The percentage of seral clusters falling above, within, and below the RMVs is an indication of each alternative's sustainability.



The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Effects on Succession

To address scoping concerns about long-term undesirable vegetation changes in the forest, we examined the effects of the alternatives on succession. The effects are described as: (1) the transition from the existing condition to the long-term period and (2) the alternative's ability to emulate pre-contact disturbance processes. Transitions that are not consistent with the desired condition goals are considered undesirable.

Predicted changes in cluster groups are described as large (greater than a 10% change), moderate (6 to 10% change), and small (less than 5% change). Table 4-6 shows the successional trend of cluster groups by alternative for each fire regime. The last row of the table shows the cumulative change. A total of 0.0% suggests a balance between losses and gains.

Landscape patterns and succession

Alternatives 1, 2, and 3 would use treatments such as prescribed fires, wildfires, and harvesting to emulate historic disturbances and to produce vegetative patterns, structures, densities, and species mixes that are more like pre-contact conditions than would be produced by the management treatments of Alternatives 4 and 5. It is predicted that under Alternative 1, landscape patterns and natural succession would most resemble those of the pre-contact era. Alternative 1 is followed by Alternatives 2 and 3, respectively.

The Nonlethal Fire Regime

General Trend

All of the alternatives are expected to increase the amount of young and old moderate- and closed-canopied ponderosa pine stands.

All of the alternatives except Alternative 2 should increase mature, moderate- and closed-canopied stands of ponderosa pine. The vegetation model predicts that under Alternative 2, a small decrease in these stands will occur.

All of the alternatives are expected to reduce the amount of young, open-canopied ponderosa pine stands and young, moderate-canopied Douglas-fir stands.

Cluster A1: Young, open-canopied ponderosa pine stands

Moderate long-term decreases of this structure are expected to occur under Alternatives 1 and 2. Large decreases should occur under Alternatives 3, 4, and 5. The decreases are probably due to the emphasis placed on older and denser groups, specifically Cluster Groups F/G and J/K.

Cluster A2: Mature and old, open-canopied ponderosa pine stands

Small long-term increases in this group are predicted to occur under Alternatives 1 and 2. The vegetation model projected moderate long-term decreases under Alternatives 3, 4, and 5.

The increases of Cluster A2 under Alternatives 1 and 2 resulted from woodland restoration treatments. As with Cluster A1, the decreases may be due to an emphasis on older, denser groups.

Cluster B: Young, moderate-canopied Douglas-fir stands

Small decreases are expected to occur to this cluster under all of the alternatives. These decreases are consistent with the desired condition goals of Alternatives 1, 2, and 3.

Table 4-6. The successional trend of cluster groups by alternative for each fire regime. A positive percentage in the short term or long term represents a gain over and above the current condition, while a negative percentage represents a loss. The last row of the table shows the cumulative change. A total of 0.0% in the bottom row suggests a balance between losses and gains.

		Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Fire Regime & Seral Cluster Group	**Current Condtion**	**Short Term**	**Long Term**	**Short Term**	**Long Term**	**Short Term**	**Long Term**	**Short Term**	**Long Term**	**Short Term**	**Long Term**
Non-Lethal Fire Regime											
Cluster Group A1	19.1%	3.2%	-7.0%	-1.2%	-9.8%	-3.4%	-18.7%	-2.8%	-18.7%	-4.0%	-18.9%
Cluster Group A2	10.0%	6.7%	4.0%	3.5%	2.2%	1.0%	-7.1%	0.8%	-6.5%	-4.9%	-9.4%
Cluster Group B	4.6%	-1.3%	-4.4%	-1.9%	-4.4%	-0.8%	-4.6%	-0.1%	-3.9%	-1.1%	-4.5%
Cluster Group C&D	10.6%	-1.6%	2.7%	-1.2%	2.2%	4.0%	10.5%	1.5%	3.7%	4.6%	6.4%
Cluster Group F&G	23.9%	0.3%	0.3%	8.6%	-1.1%	4.6%	10.4%	6.9%	20.0%	4.7%	1.8%
Cluster Group J&K	1.7%	-0.5%	15.9%	-0.5%	15.2%	0.4%	19.4%	0.8%	9.8%	0.0%	20.6%
Cluster Group E,I,H&L	30.2%	-6.7%	-11.4%	-7.4%	-4.3%	-5.7%	-10.0%	-7.0%	-4.4%	0.7%	4.0%
Totals:	**100.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Mixed Fire Regime											
Cluster Group A	18.1%	2.6%	-8.9%	1.4%	-9.6%	1.2%	-11.1%	-1.8%	-15.7%	-10.9%	-17.5%
Cluster Group B	3.3%	1.1%	-2.3%	0.6%	-2.6%	1.1%	-2.8%	-0.2%	-3.0%	-0.1%	-2.7%
Cluster Group C&D	15.6%	1.2%	7.5%	7.2%	10.8%	5.7%	8.0%	9.2%	7.3%	11.2%	4.4%
Cluster Group F&G	28.3%	-6.7%	9.7%	-6.8%	11.5%	-4.8%	13.9%	-7.3%	13.7%	-6.8%	1.9%
Cluster Group J&K	2.0%	6.9%	12.2%	7.4%	10.3%	6.3%	9.8%	5.7%	6.4%	6.6%	12.1%
Cluster Group E,I,H&L	32.7%	-5.1%	-18.2%	-9.8%	-20.4%	-9.5%	-17.9%	-5.6%	-8.7%	0.1%	1.8%
Totals:	**100.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Lethal Fire Regime											
Cluster Group A	12.1%	-1.5%	-7.6%	0.4%	-7.5%	-2.3%	-5.5%	-2.0%	-9.3%	-4.8%	-10.9%
Cluster Group B	6.4%	-2.4%	-6.3%	-2.2%	-6.3%	-2.5%	-6.3%	-2.6%	-6.3%	-2.9%	-6.3%
Cluster Group C&D	22.8%	7.2%	5.2%	6.9%	6.2%	7.2%	6.2%	7.5%	4.9%	7.9%	2.0%
Cluster Group F&G	27.3%	0.0%	2.5%	0.0%	4.6%	-1.6%	1.6%	-1.3%	3.6%	0.0%	-1.9%
Cluster Group J&K	2.0%	-0.2%	9.9%	0.0%	11.6%	0.0%	8.3%	0.0%	8.7%	0.0%	11.9%
Cluster Group E,I,H&L	29.5%	-3.2%	-3.7%	-5.1%	-8.6%	-0.7%	-4.3%	-1.7%	-1.6%	-0.1%	5.1%
Totals:	**100.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

Cluster Group C/D: Young, moderate- and closed-canopied ponderosa pine stands

Modeling predicted a large increase for this group under Alternative 3, a moderate increase under Alternative 5, and a small increase under Alternatives 1, 2, and 4.

These trends are to be expected because today's young, open-canopied ponderosa pine stands are expected to grow into moderate- and closed-canopied stands. The increases expected under Alternatives 1, 2, and 3 are consistent with the desired condition goals.

Cluster Group F/G: Mature, moderate- and closed-canopied ponderosa pine stands

Large long-term increases are predicted in this group under Alternatives 3 and 4. A small long-term increase is predicted for Alternatives 1 and 5. A small long-term decrease is expected under Alternative 2.

The trends predicted for Alternatives 1, 2, and 3 are consistent with the desired condition. The large increase expected under Alternative 4 is probably due to the amount of uneven-aged treatments. This alternative produces three times more uneven-aged treatment acres than the other alternatives. Uneven-aged treatments develop and maintain this cluster group through time.

Cluster Group J/K: Old, moderate- and closed-canopied ponderosa pine stands

Large, long-term increases of this cluster group are predicted for all of the alternatives except Alternative 4. There, a moderate increase is expected.

These increases are consistent with the desired condition for Alternatives 1, 2, and 3. The moderate increase expected under Alternative 4 is probably due to uneven-aged treatments. Uneven-aged treatments maintain mature trees and inhibit the development of the old trees associated with this cluster group. The large increase expected under Alternative 5 is harder to explain. It could be because there is currently an abundance of mature stands, mostly Cluster Group F/G, that will develop into J/K.

Cluster Group E/I/H/L: Mature and old, moderate- and closed-canopied Douglas-fir stands

A small increase of this cluster group is predicted to occur under Alternative 5. The vegetation model predicted a large, long-term decrease under Alternative 1, a moderate decrease under Alternative 3, and small decreases under both Alternatives 2 and 4.

The predicted increase in Alternative 5 is due to the limited amount of harvesting and fire that will increase the amount of Douglas-fir.

Decreases in Cluster Group E/I/H/L are consistent with the desired condition goals of Alternatives 1, 2, and 3. The decrease of this group under Alternative 4 was expected because Alternative 4 emphasizes the development of younger ponderosa pine stands.

The Mixed Fire Regime

General Trend

The vegetation model predicts that all of the alternatives will have long-term increases in young, mature, and old moderate- and closed-canopied stands of ponderosa pine and western larch.

The vegetation model also predicted that all of the alternatives will have long-term decreases in open-canopied, young, mature, and old stands of ponderosa pine and western larch. Young, moderate-canopied stands of Douglas-fir and grand fir are also expected to decrease.

Mature and old stands of Douglas-fir and grand fir with moderate and closed canopies are predicted to decrease under all of the alternatives except Alternative 5.

Cluster A: Young, mature and old open-canopied stands of ponderosa pine and western larch

Moderate, long-term decreases of Cluster A are predicted to occur under Alternatives 1 and 2. Large decreases are expected to occur under Alternatives 3, 4, and 5.

The ID Team did not anticipate the decreases that are predicted to occur under Alternatives 1 and 3. A decrease in Cluster A in the Mixed Fire Regime is inconsistent with the desired condition goals of these alternatives. It is possible that the emphasis placed upon Cluster Group F/G affected the ability of the vegetation model to maintain open-canopied ponderosa pine and western larch stands.

The decrease predicted for Alternative 2 is consistent with the desired condition goal for that alternative. The large decreases predicted under Alternatives 3, 4, and 5 may be due to the amount of uneven-aged treatments. Uneven-aged treatments generally maintain older and larger trees. Disturbances are necessary to create this cluster, so the large decrease predicted to occur under Alternative 5 is not surprising.

Cluster B: Young, moderate-canopied stands of Douglas-fir and grand fir

The vegetation model predicts that small, long-term decreases of this cluster will occur under all of the alternatives.

These decreases are inconsistent with the desired condition goals of Alternatives 1, 2, and 3. The predicted decrease may have occurred because the vegetation model had limited successional pathways leading to this cluster group. Since the development of initial seral cluster goals, the ID Team has learned that this cluster may not play a very important role in achieving overall structural goals. The team will likely make changes to the desired condition goals for this cluster in the future as more knowledge is gained about its importance.

Cluster Group C/D: Young, moderate- and closed-canopied stands of ponderosa pine and western larch

The vegetation model predicted a large increase for this cluster group under Alternative 2; a moderate increase under Alternatives 1, 3, and 4; and a small increase under Alternative 5.

As Cluster A stands grow, they transition into this group. Much of the predicted increase is likely due to this progression. The increases are consistent with the desired condition goals of Alternatives 1, 2, and 3. The increase projected for Alternative 4 is likely due to harvest treatments that create young ponderosa pine and western larch stands. The increase predicted for Alternative 5 is the smallest. Alternative 5 would have fewer disturbances that would produce this cluster group.

Cluster Group F/G: Mature, moderate- and closed-canopied stands of ponderosa pine and western larch

Large, long-term increases of this cluster group are predicted for Alternatives 2, 3, and 4. Moderate and small increases are predicted for Alternatives 1 and 5, respectively.

The increases predicted for Alternatives 1, 2, and 3 are consistent with the desired condition goals of those alternatives. Cluster Group F/G results from underburning and uneven-aged treatments, both of which are emphasized under these alternatives. Alternative 4 also emphasizes uneven-aged management, which accounts for the predicted increases under that alternative. Conversely, under Alternative 5 there would be few disturbances.

Cluster Group J/K: Old, moderate- and closed-canopied stands of ponderosa pine and western larch

The vegetation model projected large, long-term increases of Cluster Group J/K under Alternatives 1, 2, and 5 and moderate increases under Alternatives 3 and 4.

The predicted increases under Alternatives 1, 2, and 3 are consistent with the desired condition goals of those alternatives and most likely are the result of maturing Cluster Group F/G stands. Uneven-aged treatments that tend to maintain mature stands, such as Cluster Group F/G, account for the moderate increases under Alternatives 3 and 4.

Cluster Group E/I/H/L: Mature and old moderate- and closed-canopied stands of Douglas-fir and grand fir

A small increase in Cluster Group E/I/H/L is predicted under Alternative 5, but large decreases are predicted to occur under Alternatives 1, 2, and 3. Alternative 4 is expected to have a moderate decrease.

Under Alternative 5 the kinds of treatments that would reduce this cluster group are limited.

The decreases projected for Alternatives 1, 2, and 3 are consistent with the desired condition goals of those alternatives. All three emphasize underburning and harvest treatments that are designed to reduce Douglas-fir and grand fir. Alternative 4 emphasized the development of younger cluster groups through harvesting and reforestation treatments.

The Lethal Fire Regime

General Trend

All of the alternatives are predicted to have increases in young, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce. Old, moderate- and closed-canopied stands of western larch and spruce are also expected to increase under all the alternatives.

The vegetation model projected that all of the alternatives except Alternative 5 will increase mature, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce.

All of the alternatives had decreases in young, mature, and old open-canopied stands of western larch, lodgepole pine, and spruce and young, moderate-canopied stands of grand fir and alpine fir.

Mature and old moderate- and closed-canopied stands of grand fir and alpine fir are predicted to decrease under all of the alternatives except Alternative 5.

Cluster A: Young, mature and old open-canopied stands of western larch, lodgepole pine, and spruce

The vegetation model predicted that a large decrease in this cluster will occur under Alternative 5 and that moderate decreases will occur under Alternatives 1, 2, 3, and 4.

The decreases predicted for Alternatives 1, 2, and 3 are inconsistent with desired condition goals. The decrease anticipated under Alternative 4 is probably due to the alternative's annual harvest constraint.

Cluster B: Young, moderate-canopied stands of grand fir and alpine fir

All of the alternatives are projected to have moderate, long-term decreases in Cluster B. These decreases are consistent with the desired condition goals of Alternatives 1, 2, and 3. The predicted decrease may have occurred because the vegetation model had limited successional pathways leading to this cluster group.

Cluster Group C/D: Young, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce

Moderate, long-term increases of are predicted for this group under Alternatives 1, 2, and 3, while small increases are anticipated under Alternatives 4 and 5.

The projected increases in the cluster group under the first three alternatives are consistent with desired condition goals and are likely due to the transition of Cluster A stands. All of the alternatives except Alternative 5 use even-aged treatments, where reforestation with western larch, lodgepole pine, and spruce is emphasized.

Cluster Group F/G: Mature, moderate- and closed-canopied stands of western larch, lodgepole pine, and spruce

Moderate increases of this cluster group are expected to occur under all of the alternatives except Alternative 5, which should see a small decrease.

The increases are consistent with desired condition goals. The difference between Alternative 5 and the other alternatives suggests that harvesting is responsible for much of the increase in Cluster Group F/G.

Cluster Group J/K: Old, moderate- and closed-canopied stands of western larch and spruce.

The vegetation model predicted large, long-term increases of this group under Alternatives 2 and 5 and moderate increases under Alternatives 1, 3, and 4.

The increases are consistent with desired condition goals. The increases are the result of existing stands of Cluster Group F/G transitioning into the J/K group over the long-term. Harvest treatments may curb the development of old stands, which is probably why Alternative 5 has larger projected increases.

Cluster Group E/I/H/L: Mature and old moderate- and closed-canopied stands of grand fir and alpine fir

Alternative 5 is predicted to have a moderate increase in this group, while Alternatives 1, 3, and 4 are projected to see small decreases and Alternative 2 a moderate decrease.

The predicted increase in this vegetative structure under Alternative 5 may be due to the limited level of harvesting.

The decrease expected under Alternative 1 is inconsistent with desired condition goals, but the decreases projected for Alternatives 2 and 3 are consistent. All of the decreases can probably be attributed to timber harvesting.

Effects on Old Growth

The topic of old growth generated considerable attention during the scoping process; the public is concerned about the fate and development of old growth on the Reservation.

Kohm and Franklin (1997) believe that in today's forests, natural succession alone will not necessarily produce the same kinds of old-growth stands and habitats that occurred during pre-contact times. The reasons they cite are changes such as: (1) fire suppression in the 20th century; (2) the establishment of exotic species; (3) the fact that logging has changed stand structures, densities, and species compositions; and (4) changes in climate and weather patterns. They suggest silvicultural treatments such as regeneration cuts, thinnings, and prescribed fires may be needed to facilitate understory conifer establishment and reduce shrub density and the overstocking of the conifers in the overstory. These steps can benefit the development of old-forest characteristics on many sites.

In this section, the effects of the alternatives on old growth are discussed in terms of: (1) the alternative's ability to develop cluster groups associated with old growth and (2) how processes contributing to the structural development of old growth emulate historic disturbance regimes.

The ID Team identified the cluster groups in which old-growth stands can occur. The team assumed most of these groups would provide minimum old-growth characteristics, specifically a minimum number of trees of minimum size. Achieving other old-growth characteristics may require natural disturbances or the use of silvicultural treatments.

The Nonlethal Fire Regime

Most old growth would occur in Cluster Group J/K, a group that includes parklike stands of old ponderosa pine. Cluster Group E/I/H/L would also include some late-seral old-growth stands.

Long-term increases in Cluster Group J/K are predicted for all of the alternatives. Alternative 5 is projected to have largest increase (20.6%). Alternatives 1, 2, and 3 are expected to have large increases as well, while Alternative 4 will likely see a moderate increase.

The model forecasted a small, long-term increase for Cluster Group E/I/H/L under Alternative 5 and decreases under the remaining alternatives.

The vegetative patterns, structures, densities, and species compositions expected to develop under Alternatives 1, 2, and 3 would be more similar to historic old-growth conditions than would occur under Alternatives 4 and 5. The first three alternatives would use prescribed fire, wildfire, and harvesting to mimic historic disturbances.

The Mixed Fire Regime

Old growth would most likely occur within Cluster Group J/K, a group that includes parklike stands of old ponderosa pine and western larch. Cluster Group E/I/H/L also offers potential for late-seral old growth.

Cluster Group J/K is predicted to increase under all of the alternatives. Large increases are projected for Alternatives 1, 2, and 5, with Alternative 1 increasing the most (12.2%). Alternatives 3 and 4 are projected to see moderate, long-term increases in this group.

Moderate to large, long-term decreases in Cluster Group E/I/H/L are projected for all of the alternatives except Alternative 5, which is expected to increase 1.8%.

The Lethal Fire Regime

Western larch, lodgepole pine, grand fir, spruce, and alpine fir would contribute to old growth in this fire regime. Cluster Group F/G would contain some lodgepole pine old growth, and there is potential for old-growth western larch and spruce in Cluster Group J/K and old-growth grand fir and alpine fir in Cluster Group E/I/H/L.

Small long-term increases in Cluster Group F/G are projected for all of the alternatives except Alternative 5, which is predicted to see a decrease of 1.9%. The largest increase, 4.6%, is anticipated for Alternative 2.

Large long-term increases in Cluster Group J/K are expected to occur under Alternatives 2 and 5. Alternative 5 should see the greatest acreage increase (11.9%). The remaining alternatives are projected to have only moderate increases.

The vegetation model projected a moderate, long-term increase in Cluster Group E/I/H/L under Alternative 5. Minor decreases are predicted for all of the other alternatives except Alternative 2, which is expected to see a moderate decrease.

The effects of fire exclusion on vegetation in the Lethal Fire Regime have not been as pronounced as in the Nonlethal and Mixed Fire Regimes. In the Lethal Fire Regime, fires occurred at much longer intervals, longer than the era of fire suppression has lasted. Consequently, the vegetative patterns that would result from Alternatives 1, 2, and 3 will likely resemble pre-contact conditions better than Alternatives 4 and 5. However, the vegetation model predicts less variation in vegetative structure, density, and species composition. Over the long term, old growth is expected to change more in terms of pattern than structure, density, and species composition.

Thinning should be evaluated as a tool to help develop old-growth stands in the Lethal Fire Regime. Thinning and extended rotations were not evaluated in the modeling process, but should be considered operationally.

Effects on Clearcuts

Clearcuts have historically been a controversial issue, especially since the implementation of the 1982 plan. One of the chief concerns expressed during scoping was the visual impact that this type of harvesting has on scenery. This section discusses the effects the alternatives would have on the acres of clearcuts; later sections address other issues.

Clearcuts are one type of even-aged management. Other even-age systems include seed tree and shelterwood (see pages 48 and 49). Our modeling only allowed us to estimate the acres of even-age treatments as a whole, not the individual systems.

Under the 1982 plan, an estimated 975 acres received even-age treatments annually (Gould 1998). Over the short term, Alternative 2 is projected have the most even-aged acres, followed by Alternatives 3, 4, 1, and 5 (Appendix D).

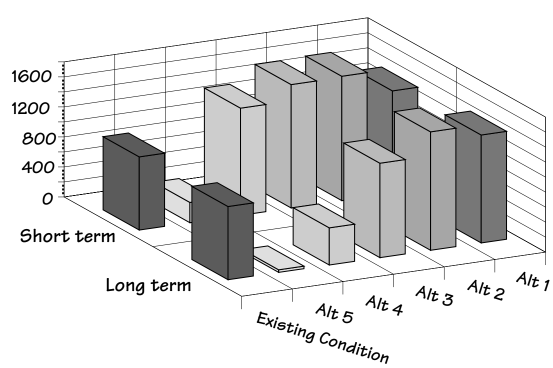


Figure 4-46. Even-aged acres per year during both the short and long term for each alternative.

The even-aged acres resulting from the 1982 plan, illustrated in figure 4-46, would rank between Alternatives 4 and 5. Alternative 2 also has the most even-age treatments in the long-term period, followed by Alternatives 1, 3, 4, and 5. Even-aged acres estimated for the existing condition would rank between Alternatives 3 and 4.

Many of the negative impacts associated with even-aged management prescriptions, especially clearcuts, would be mitigated under Alternatives 1, 2, and 3. Clearcuts would have many trees retained as individuals or in islands. These leave trees will make the cuts appear and function more like natural openings. More seed tree and shelterwood cuts would occur. These treatments retain ponderosa pine and western larch for regeneration purposes. Retaining these species would also enhance the visual quality of even-age treatments. The size and shape of even-age treatments would be more like vegetation patterns associated with the pre-contact era. Refer to the Scenery and Recreation section of this chapter for more discussion of even-age prescriptions.

Alternative 4 was designed to match the volume produced under the 1982 plan, but the vegetation model predicted fewer even-aged acres in the long term. The primary reasons for this are: (1) the vegetation model was unable to replicate even-age acreage because its objective function placed a cap on harvest volume, and (2) a limited number of prescriptions and timing choices restricted large increases of clearcut acres after the first management period. However, we feel that the vegetation model's estimate is reasonable because the harvest treatments emphasized are consistent with policy in the 1982 plan, and the volume cap is the best objective function that could have been used in the vegetation model to characterize Alternative 4.

Effects on Lodgepole Pine

The availability of lodgepole pine was an important scoping issue. Lodgepole is a key species harvested by Indian loggers. Several local markets use small-size lodgepole pine for manufacturing post and poles and small dimension lumber.

The effects of the alternatives on the availability of lodgepole pine will be described in terms of: (1) the trends of cluster groups associated with the species; and (2) access.

Trend of Lodgepole Pine

Cluster Group C/D in the Lethal Fire Regime includes most of the lodgepole pine stands harvested by Indian loggers. This group is projected to increase under all of the alternatives. Moderate, long-term increases are expected under Alternatives 1, 2, and 3, and small increases under Alternatives 4 and 5. The largest increase, 6.2%, is predicted for Alternatives 2 and 3. The smallest, 2.0%, is predicted for Alternative 5.

Lodgepole Pine Access

Although lodgepole pine increases under all of the alternatives, the access to lodgepole pine stands is expected to be reduced under all of the Alternatives except Alternative 4. The effects of the alternatives on roads are discussed in the fisheries section of this chapter.

Alternative 5 is expected to have the lowest road densities, followed by Alternatives 1, 2, 3, and 4, respectively. Lodgepole pine would be least accessible under Alternatives 5 and 1 and most accessible under Alternatives 3 and 4.

Fuels Management and Air Quality[1]

Summary of Key Effects and Conclusions

Our ability to restore and sustain forest health rests in large part on understanding and applying fire-related information to complex management issues.

— Robert Mutch, 1994

Major Effects

The effects of the alternatives on fuels and air quality depend on the acres receiving harvest treatments. Over the long term, the acres receiving timber harvest treatments are predicted to increase under Alternative 4. Under Alternatives 2 and 3, the acres are expected to trend upward slightly. Under Alternative 1 they are expected to decrease over both the short- and long-term periods. Under Alternative 5, the acres harvested are predicted to drop by nearly 75 percent. Alternatives 1, 2, and 3 will emphasize fuels management and the restoration of encroached areas.

Prescribed fire treatments and annual smoke emissions will increase under Alternatives 1, 2, and 3. During the long-term period, prescribed fires will also increase under Alternative 4 because of the relatively high levels of timber harvesting and broadcast burning that would occur.

Broadcast burns, which have the highest emission production rates, will be emphasized under Alternatives 1, 2, and 3. Pile and burn treatments will likely decrease under all alternatives except Alternative 4, primarily because uneven-age harvest acres are expected to decline.

Most of the alternatives are predicted to increase the amount of underburn treatments in order to achieve encroachment, restoration, and maintenance objectives. The highest levels of underburn acres will occur under Alternatives 1 and 2. Alternative 5 will have the lowest levels.

The emission model suggests that emissions from prescribed fires will cause temporary impacts on local air quality. The modeling also suggests that total suspended particulate levels may not exceed National Ambient Air Quality Standards if prescribed fires are conducted under appropriate smoke management guidelines for smoke dispersal. The local area typically has good spring and early fall smoke dispersal weather conditions, although overall burn days are expected to decline by about 10 to 12 percent in the short term (USFS, 1994).

Daytime heating and general westerly wind flows help to raise smoke plumes high into the atmosphere and then disperse them rapidly. Prescribed fires are not attempted during the unfavorable atmosphere and wind flow conditions of fall and winter.

[1] Fire Management Response Strategy Classifications are described in Appendix A.

Local topography also favors good smoke dispersion above sensitive valley population centers and view areas. Problems could occur however with emissions sliding down slopes into populated areas during unfavorable nighttime conditions.

Alternatives with the highest levels of fuels management and prescribed fires will likely be better at restoring pre-contact structures and compositions. Alternatives 1 and 2 would be the most successful at restoring grassland, ponderosa pine, western larch, and large tree components. These steps would reduce the fuel loadings and emission production levels from large, severe wildfires. Alternatives 4 and 5 would tend to produce denser forest structures that would be more prone to crown-fire conditions with higher emission production levels. Wildfires would occur more frequently, burn with higher intensity, and be of larger size and longer duration. Wildfires would also be more apt to occur during the summer when weather conditions are unfavorable for smoke dispersion.

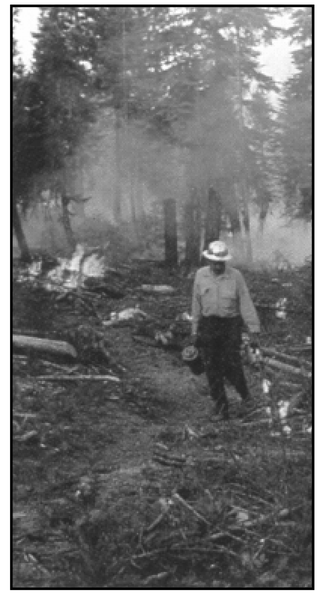


Figure 4-47. Harvest treatments combined with prescribed fire will have to be implemented gradually over time to reduce the large volumes of dead material in the forest. Prescribed fires are one of the most important parts of the restoration strategy.

Alternatives 1, 2, and 3 will require an increase in fire management funding and staffing to meet prescribed fire acre targets. Alternatives 4 and 5 may result in a slight decrease in fire management staffing for fuels management, but at the same time, there would probably be a need for more fire suppression manpower due to increased fire risk.

The modeling suggests that visibility could be degraded by emissions from prescribed fires. It is inferred that decreased visibility could also occur under some alternatives due to more intense wildfire episodes.

Increased haziness would likely occur under Alternatives 1, 2, and 3 from the increased level of prescribed burning. These potential episodes would be temporary in nature, but would occur more frequently than wildfires.

Alternatives 4 and 5 would be most likely to produce vegetative fuel loading conditions that would result in more wildfires. This would affect more of the local area with haze. It can be inferred that the higher concentrations of suspended particulates would reduce visibility in affected areas (more so than prescribed fires) and the effect would be of longer duration.

In general, this analysis indicates that wildfire impacts on air quality may be greater in magnitude than emissions from prescribed fires. The Flathead Agency follows smoke management guidelines that only permit prescribed fires during weather and fuel moisture conditions that are most favorable for the dispersion of smoke.

More detailed air quality assessments should be made at subsequent planning levels so emissions can be more accurately quantified. The locations and actual weather conditions associated with programmatic fuels-management burn projects should be known to properly predict emission rates and specific air quality impacts on populated areas and local visibility.

Assumptions

Major Assumptions

The impacts of prescribed fires and wildfires on air quality and public health vary because of differences in the distribution of acres burned and the amount of fuel consumed per acre, as well as differences in seasonal weather patterns.

Prescribed fires and wildfires affect air quality.

The impacts of prescribed fires and wildfires on air quality and public health, a major concern during scoping, vary because of differences in the distribution of acres burned and the amount of fuel consumed per acre (due to fuel moisture and arrangement differences), as well as differences in seasonal weather patterns (prescribed fires occur in during the spring and fall, and wildfires occur during the summer).

Prescribed fires and wildfires do not occur evenly spaced throughout the year, but rather in a pattern better described as episodes (*Eastside Draft EIS for Columbia Basin Ecosystem Management Project*; Volume 1 May, 1997).

- For wildfires, a favorable combination of weather conditions and ignition sources (usually lightning) needs to occur. When weather associated with intense fire behavior and multiple ignitions occurs, the result can be multiple large fires. When extended periods of cool temperatures and precipitation occurs during summer and fall seasons, very few small fires typically occur.

- For prescribed fires, weather is one of the primary factors that determines whether an area can be burned and still meet management objectives. When weather conditions become favorable for prescribed burning, they are usually favorable over a large area, which means that there could be lots of prescribed fires.

For modeling purposes, we can select representative weather conditions in the spring and fall when prescribed fire activities would occur. Also, we can select representative weather conditions in summer when wildfires would occur.

For modeling purposes, vegetation model data can be used to estimate future harvest acres (by type and method) and prescribed fire activities. This in turn allows us to calculate a range of possible smoke emission levels by time period and alternative.

For modeling purposes, the vegetation model's short- and long-term assessment period vegetative structures can be used to evaluate the changes in fire risk, fire severity, and smoke emission potential that result from various levels of timber harvest and fuels-treatment activities.

This analysis assumes financial and technical resources will be adequate to fully implement each alternative.

Limitations

Whether an area complies with National Ambient Air Quality Standards (NAAQS) is largely determined by localized conditions over time; models used to evaluate programmatic changes cannot really answer whether NAAQS will be attained or violated, especially within the time-frame used in this analysis. At best, analyses at this level can give a *general* assessment of *relative* impacts from prescribed fires and wildfires.

Model predictions do not encompass cumulative impacts from all sources. Therefore, a comparison of emissions produced and dispersion scenarios does not constitute an appropriate evaluation of NAAQS impacts. It can be assumed that other background particulate from prescribed fire sources outside the agency boundaries will impact local air quality, but the timing of these impacts could not be determined for inclusion in our models.

To understand the significance and proper application of the results of these analysis, it is essential to note the limitations of modeling smoke dispersion and visibility impacts. An appropriate smoke dispersion model, one that could provide evaluation information for over a century of prescribed fire and wildfire activities, could not be found. Most dispersion analysis is conducted to provide predictive screening assessments prior to prescribed fire activities. The model's performance as a planning tool for long-term assessments has not been successful because weather and other essential prescribed fire parameters cannot be predicted very far into the future. The best we can do is determine local smoke dispersion characteristics under historical weather conditions and assess predicted smoke emission levels from modeled harvest and burn method activities. We believe that such an analysis can provide an appropriate tool for estimating impacts of particulate matter concentrations and impaired visibility.

Assessment data was produced for a yearly average (burn treatment acres, smoke emissions, etc.) but actual values will vary greatly from year to year due to weather conditions, available funding, and manpower needed to complete projects. These factors could not be evaluated. Acres treated and smoke emissions produced could be more or less than the average; values in the tables that follow could vary by as much as 40% or more.

Methodology

We used models to assess short- and long-term impacts of smoke emissions from prescribed fires and wildfires on air quality within and adjacent to the Flathead Agency. Estimates were made of the effects of particulate matter emitted from wildfires on health standards and visibility and from a range of prescribed fires that could result from activities proposed by each of the alternatives.

We used the vegetation model to simulate initial harvest treatment acres for the assessment periods. These acres were further modeled to estimate harvest treatment acres for each of the alternatives (table 4-7).[1] Model estimates of uneven-age and even-age treatment acres were stratified by burn method—pile, broadcast, underburn—to project average fuels-treatment acres for both the short- and long-term assessment periods. Another modeling process

[2] The proposed harvest treatment acres, shown in table 4-7, reflect lower overall harvest acres than the figures found in the Vegetation Impact Assessment because these numbers from a different sort of the data to prepare vegetation model figures for burn method determination and emission assessment.

was used to estimate possible changes in fire risk, wildfire severity, and smoke emission potential based on the average short-term and long-term vegetative structures that equal high, moderate, and low potentials. Harvest treatment and burn method acres in a large portion of the encroachment strata under Alternatives 1 and 2 were calculated outside the vegetation model to more accurately simulate restoration-harvest activities in the grassland and woodland components of the Nonlethal Fire Regime.

Table 4-7. Estimated harvest method acres for short- and long-term assessment periods by EIS Alternative. Also included are the average acres from the existing condition period, which spanned the years from 1982 to 1991 (L. Gould 1998).

Harvest-Method Acres by Alternative

Short-Term	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	1983-91
Uneven-aged (acres/yr)	600	1,750	1,540	4,985	410	3,487
Temporary Even-aged (acres/yr)	235	215	480	905	45	508
Permanent Even-aged (acres/yr)	1,520	1,945	1,295	560	230	467
Proposed (acres/ry)	2,355	3,865	3,315	6,450	685	4,462
Vs. Existing Condition (1982-91)	-47%	-13%	-26%	+31%	-85%	*
Long-Term	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**1983-91**
Uneven-aged (acres/yr)	1,620	2,840	3,280	9,470	1,135	*
Temporary Even-aged (acres/yr)	125	185	150	70	15	*
Permanent Even-aged (acres/yr)	1,570	1,715	1,305	485	20	*
Proposed (acres/ry)	3,315	4,740	4,735	10,025	1,170	*
Vs. Existing Condition (1982-91)	-26%	+6%	+6%	+55%	-74%	*
Difference from Short-Term	+30%	+18%	+30%	+36%	+41%	*

We used an emission model to calculate expected fuel consumption and total suspended particulate (TSP) produced by cover and burn method type, and probable season of burn for prescribed fires and wildfires. Input data for this model included timber harvest activity acres for prescribed fires from the air quality harvest treatment model; vegetative cover types; and projected burn methods (i.e., pile, broadcast, underburn, natural). Input data for wildfires were from the *Flathead Agency 1997 Fire Management Planning Assessment Fire Occurrence Data Base* and associated burned acre vegetative cover types. The output of the Emissions Model is in estimated annual tons of TSP produced by prescribed fires and wildfires by assessment period.

Models Used

The modeling domain covers the area within the exterior boundaries of the Flathead Agency and is about 55 miles by 60 miles for all models.

Assessing the impacts of a range of land management activities on air quality is a complex matter. It becomes even more complicated when the assessment encompasses an entire ecosystem and the modeling period is decades long. In this case we assessed impacts over a 100-year span. In general, our approach was to portray typical and reasonably foreseeable scenarios, as opposed to worst-case air quality impacts from various levels of prescribed fires and wildfires. Modeling efforts used agency averages and meteorological data that was representative of the Flathead Agency area and past burn seasons. Had worst-case dispersion conditions been used in the model, much higher air quality impacts would have resulted.

Vegetative structures and expected harvest treatment activities are the major emphasis of the vegetation and air quality assessment models, but other information such as harvest volumes, typical fire regime cover types, fuel loadings, fuel treatments, fire risk potential, and smoke emission potential can be inferred. Burn methods and desired fire return intervals for fire regime restoration and maintenance burning can also be inferred for each alternative. These inferences and professional judgements went into the models used in the assessment of air quality smoke emissions, dispersion characteristics, particulate matter concentrations, and visibility impacts.

Our air quality assessment model emphasized vegetative structures and expected harvest treatment activities, but other information such as harvest volumes, typical fire regime cover types, fuel loadings, fuel treatments, fire risk potential, and smoke emission potential could be inferred and supplemented our analysis.

Changes in wildfire frequency and intensity under each alternative and the impacts associated with these changes could not be properly assessed, but basic trends in fire frequency, size, and smoke dispersion characteristics could be inferred from the structure predictions of the vegetation model, from expected fuel loading conditions, and from possible fire behavior based on historical data.

From the vegetation model, average per-decade harvest treatments under each of the alternative were stratified into the short-term (first 30 years) and long-term (subsequent 90 years) assessment periods. Fuel treatments and probable burn methods were assigned to Alternative 4 based on practices from the existing condition period (1982-91). The burn methods were then determined for Alternatives 1, 2, 3, and 5 based on management philosophies—higher levels of restoration and maintenance underburn treatments to achieve objectives under Alternatives 1, 2, and 3 (as opposed to higher percentages of pile burn treatments under Alternatives 4 and 5) along with greater levels of uneven-age underburn treatments to restore historical fire return intervals. It was assumed that all permanent even-age acres would be broadcast burned and that 15% of all uneven-age acres would receive pile-burn treatments.

The frequency of underburn treatments was determined by establishing consistent fire-return intervals for the various fire regimes. For grassland maintenance in the Nonlethal Regime the interval was 10 years; for woodland maintenance in the Nonlethal Regime it was 15 years; for pine-parkland restoration in the Nonlethal Regime it was 20 years; and for larch-parkland restoration in the Mixed Regime it was 25 years. These fire return intervals were the same for all alternatives. The vegetation model had different levels of underburn treatment acres due to the availability of commercial harvest acres and various land management concerns about scenery, roadless areas, and recreation. Aggregate acres for encroachment-restoration harvest treatments and maintenance-underburn treatments in the Nonlethal Fire Regime were calculated outside the vegetation model and added into the burn-method treatment acres later for Alternatives 1 and 2. Once completed, burn-method acres for the short- and long-term periods were imported into the smoke emissions model for each alternative.

Impacts from possible changes in fire-effects potentials based on probable cluster distributions—young and open stands versus older and closed stands, for example—were evaluated for the short- and long-term assessment periods from the vegetation model. Each seral cluster structure was assigned a value of high, moderate, or low potential for fire risk (loss of forest vegetation structures to catastrophic wildfire events), fire severity (based on vegetative structures that have enough crown-canopy closure to support crown fires), and smoke emission potential (vegetative structures that have moderate to high fuel loadings). Levels of change in cluster distribution acres for the short- and long-term periods were evaluated to determine increased or decreased fire risk, fire severity, and smoke emission potential for each alternative.

Particulate emissions for prescribed fire and wildfire activities were calculated for each alternative using the First Order Fire Effect Model (FOFEM). This model was developed by the Forest Service to predict particulate emissions from pile, broadcast, and underburn fuel treatments and wildfires. The model provides an assessment of the probable impacts of prescribed fires and wildfires by providing predictions of emissions based on specific burn prescription parameters (fuel loadings, expected levels of fire intensity, abundance of herbaceous and shrub material, average duff depths, and season of burn). The input—cover types, typical fuel loadings, and fuel moistures—was assigned to the burn method acres and adjusted to agency averages as needed. Cover types used were determined from fire regime forest vegetation stratifications and agency Continuous Forest Inventory (CFI) data (Becker 1998).

The output, in pounds per acre of PM_{10} and $PM_{2.5}$, by burn type and alternative, was converted to an average ton per acre of TSP for final evaluation. These calculations were made for both prescribed fire and wildfire.

Effects[3]

Our analysis is based in part on the following three tables which show: (1) the estimated acres of burns by alternative (table 4-8), (2) the estimated smoke emissions from prescribed fires (table 4-9), and (3) the estimated smoke emissions from wildfires (table 4-10).

Table 4-8. Summary of estimated burn methods acres for short- and long-term assessment periods by alternative. The table also includes the average acres for the 1982-91 existing condition period (Flathead Agency FMPA, 1997). For comparison purposes, the Flathead Agency Division of Fire prescribe burned 800 acres of piles, 600 acres of broadcast, and 725 acres of underburn for a total of 2,125 acres in 1997.

Burn Method Acres by Alternative

Short-Term	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	1982-91
Pile (acres/yr)	218	285	399	998	63	1,176
Broadcast Burn (acres/yr)	921	924	817	293	195	160
Underburn (acres/yr)	3,955	2,831	1,124	228	277	245
Total (acres/yr)	5,094	4,040	2,340	1,519	535	1,581
Vs. EC (1982-91)	+222%	+156%	+ 48%	- 4%	- 66%	*
Long-Term	**Alt 1**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**	**1982-91**
Pile Acres/Year	185	259	388	839	92	*
BCB Acres/Year	328	366	236	60	13	*
UB Acres/Year	4,399	3,118	1,256	228	348	*
Total Acres/Year	4,912	3,743	1,880	1,127	453	*
Vs. EC (1982-91)	+211%	+137%	+ 19%	- 29%	- 71%	*
Vs. Short-term	- 4%	- 7%	- 20%	- 26%	- 15%	*

[3] Fire Management Response Strategy Classifications are described in Appendix A.

Prescribed Burn Smoke Emissions

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	1982-91
SHORT-TERM	947	887	713	467	142	470
Vs. EC (1982-91)	+101%	+89%	+52%	<1%	-70%	*
LONG-TERM	707	574	414	351	61	*
Vs. EC	+50%	+22%	-12%	-25%	-87%	*
Vs. Short-term	-25%	-35%	-42%	-25%	-57%	*
Vs. EC (1982-91)	+222%	+156%	+48%	-4%	-66%	*

Table 4-9. Summary of estimated prescribed burn smoke emissions in tons/ year of total suspended particulate by alternative. The table also includes the average TSP of prescribed burns for the 1982-91 period (Flathead Agency FMPA, 1997). The TSP for the 1997 burn year was an estimated 571 tons.

Wildfire Smoke Emissions

YEAR	Acres of grassland	Non-lethal FR	Mixed FR	Lethal FR	Total Acr/Yr.	Tons/Yr of PM_{10}	Tons/Yr of $PM_{2.5}$	Total Tons of TSP
1993	79	85	70	43	293	40	30	73
1994	7,621	3,581	2,824	1,168	15,198	1,456	1,235	2,691
1987-96	955	320	318	163	1,757	165	140	305

Table 4-10. Estimated annual tons of particulate matter produced from various unplanned ignition events calculated from the 1997 Flathead Agency FMPA historical fire occurrence data base.

Acres Receiving Harvest Treatments

Alternative 1

The vegetation model predicts that Alternative 1 would have the fourth highest number of acres receiving timber harvest treatments per year during both the short- and long-term periods. The total number of acres would increase 30% between the short- and long-term periods. Uneven-age harvest acres would decline over the short-term, then increase slowly over the long-term to about 1,600 acres per year. Temporary even-age harvest would also decline to an average of about 125 acres per year. Long-term, permanent even-age harvest would increase to an average of 1,570 acres per year.

Alternative 2

Alternative 2 is predicted to have the second highest number of acres receiving timber harvest treatments per year during both the short- and long-term periods. The number of acres would increase about 18% between the short- and long-term periods. Uneven-age harvest acres would decline over the short-term, then increase over the long-term to about 2,800 acres per year. Temporary even-age harvest would decline to an average of about 185 acres per year, while permanent even-age harvest would increase to an average of 1,945 acres per year in the short term, and then decrease to 1,715 acres per year over the long term.

Alternative 3

Alternative 3 is predicted to have the third highest level of proposed annual timber harvest in both the short- and long-term periods. The average number of acres harvested per year would be similar to Alternative 2 over the long term. The number of acres would increase about 30% between the short- and long-term assessment periods. Uneven-age harvest acres would decline over the short-term, then increase over the long-term to about 3,280 acres per year. Temporary even-age harvest would decline to an average of about 480 acres per year over the short term and about 150 acres per year over the long term. Permanent even-age systems would increase to an average of 1,300 acres per year in the short and long terms.

Figure 4-48. A spring prescribed fire in a ponderosa pine and Douglas-fir stand. Prescribed fire treatments and smoke emissions will increase under Alternatives 1, 2, 3, and 4.

Alternative 4

Alternative 4 is expected to have the highest level of proposed annual timber harvest during both periods. The number of acres would increase about 36% between the short- and long-term periods. Uneven-age harvest acres would increase to about 9,500 acres per year. Temporary even-age harvest would increase to an average of 900 acres per year over the short term and then decline to an average 70 acres per year in the long term. Permanent even-age harvests would increase to an average of 560 acres per year in the short term, then decrease to about 485 acres per year over the long term.

Alternative 5

Alternative 5 would have the lowest level of proposed annual timber harvest in both the short- and long-term periods. Timber harvest acres would increase about 41% between the short- and long-term periods. Uneven-age harvest acres would decrease over the short term, then increase over the long term to about 1,135 acres per year. Temporary even-age harvest would decrease to an average of about 45 acres per year over the short term and an average of 15 acres per year over the long term. Permanent even-age treatments would also decrease over the short term to 230 acres per year and 20 acres per year over the long term.

Acres Receiving Prescribed Fire Treatments

Alternative 1

Under Alternative 1, the alternative with the most prescribed burning, the total treated acres would increase from 1,580 acres per year (the amount burned during the existing-condition period) to 5,100 acres over the short term and to 4,900 acres over the long term. Underburning would be the primary prescribed fire treatment. During the long term, 4,400 acres would be underburned each year, up sharply from the 245 acres burned per year during the existing-condition period. Relative to the existing condition, pile burn treatments would drop by about 85% in the long term, while broadcast burn treatments would increase by about 475% in the short term and about 105% in the long-term.

Alternative 2

Alternative 2 would have the second highest average prescribed fire treatment acres. Total treated acres would increase to 4,040 acres over the short term. Over the long term 3,743 acres per year would be treated. Underburn treatments would increase to about 3,750 acres per year. Pile burn treatments would decrease an average of 78% in the long-term period. Broadcast burns would increase to an estimated 764 acres per year in the short term and then decrease to about 366 acres per year in the long term.

Figure 4-49. Under Alternative 1, an average of 4,900 acres would receive prescribed fire treatments each year during the long-term period.

Alternative 3

Alternative 3 would have the third highest average prescribed fire treatment acres. Total treated acres would increase to 2,340 acres over the short term, then decrease to about 1,880 acres over the long term. Underburn treatments would increase to an average of about 1,236 acres per year. Pile burn treatments would decrease an average of 67% over the long term. Broadcast burns would increase to an estimated 657 acres per year in the short term and then decrease to about 236 acres per year during the long term.

Alternative 4

Under Alternative 4, the number of acres receiving prescribed burn treatments would decrease to 1,520 acres over the short term and about 1,130 acres over the long term. Underburn treatments would average 228 acres per year for both assessment periods. Pile burn treatments would decrease about 29% over the long-term period, and broadcast burns would increase to an estimated 293 acres per year in the short term and then decrease to about 60 acres per year in the long term.

Alternative 5

Annual prescribed fire acres would experience a large decrease under Alternative 5. Total treated acres would drop to 535 acres over the short term and to about 453 acres over the long term. Underburn treatments would average 277 acres per year over the short term and 348 acres per year over the long term. Underburns would be designed only to reduce the fire hazard and enhance wildlife habitat in the Nonlethal Fire Regime. Pile burn treatments would decrease about 92% in the long-term period. Broadcast burns would decrease to an estimated 195 acres per year in the short term and to 13 acres per year in the long term.

Smoke Emissions from Prescribed Fires and Wildfires

Alternative 1

Smoke emissions from prescribed fires are expected to be highest under Alternative 1. Emissions from timber harvest slash disposal activities, ecosystem management restoration harvests, and underburn maintenance activities could produce an average of 950 tons per year of total suspended particulate (TSP) in the short term and an average 707 tons per year in the long term. That compares to an average of 470 tons per year during the existing-condition period and 571 tons in 1997. It is assumed that overall emissions from wildfires would decrease under this alternative due to the aggressive restoration of encroached areas. Restoration would result in lighter fuel conditions and vegetative structures that would provide barriers to the growth of large fires. (See Appendix U for a windrose depicting prevailing winds.)

Figure 4-50. Over the long term, smoke emissions are predicted to range from 707 tons per year of total suspended particulate (TSP) under Alternative 1 to 61 tons per year under Alternative 5.

Alternative 2
This alternative is predicted to have the second highest level of smoke emissions from prescribed fires. Prescribed fires are expected to produce an estimated 887 tons per year of TSP in the short term and an average of 574 tons per year during the long term. Overall emissions from wildfires would likely decrease the most under this alternative.

Alternative 3
This alternative is predicted to have the third highest level of smoke emissions from prescribed fire. Prescribed fires are expected to produce an estimated 713 tons per year of TSP in the short term an average of 414 tons per year in the long term. Overall emissions from wildfires are predicted decrease moderately under this alternative.

Alternative 4
Alternative 4 is predicted to have the fourth highest level of smoke emissions from prescribed fire. Prescribed fire would produce an estimated 467 tons per year of TSP in the short term and an average of 351 tons per year in the long term. We predict that overall emissions from wildfires would increase under this alternative due to moderate levels of timber harvest slash disposal and the absence of underburn treatments.

Alternative 5
Alternative 5 activities would result in the lowest levels of smoke emissions from prescribed fire. Prescribed fires would produce an estimated 142 tons per year of TSP in the short term and 61 tons per year in the long term. It is assumed that overall emissions from wildfires would increase under this alternative due to low levels of timber harvest and fuels treatment activities.

Fire Risk Potential

Alternative 1
Based on the forest structures and densities predicted by the vegetation model, Alternative 1 would have the lowest increase in fire risk potential (fig. 4-51). High potential vegetative structures would increase only 1% in the short term and 2% over the long-term period. Alternative 1 ranks third in fire severity potential, a measure of crown fire potential (fig. 4-52).

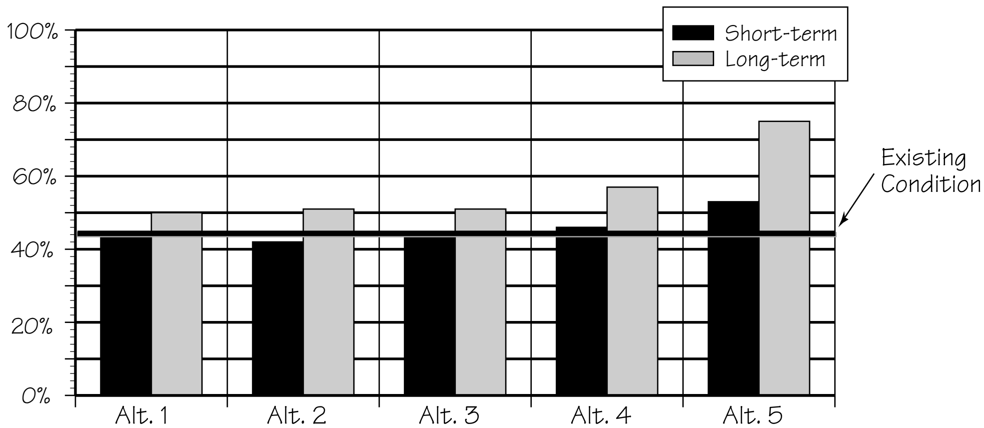


Figure 4-51. Fire risk as measured by high potential clusters. This chart shows the change in fire risk relative the existing condition. Alternatives 1, 2, and 3 rank about the same in their ability to reduce high potential fire risk vegetative structures over the short- and long-term assessment periods.

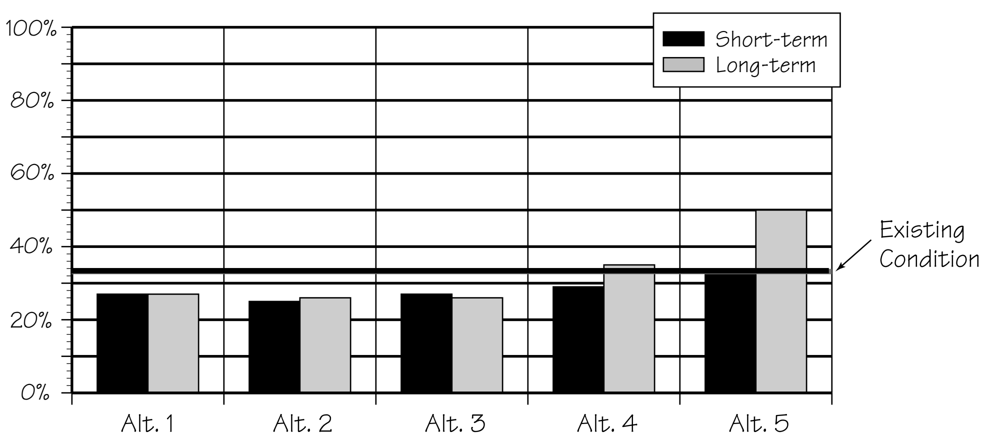
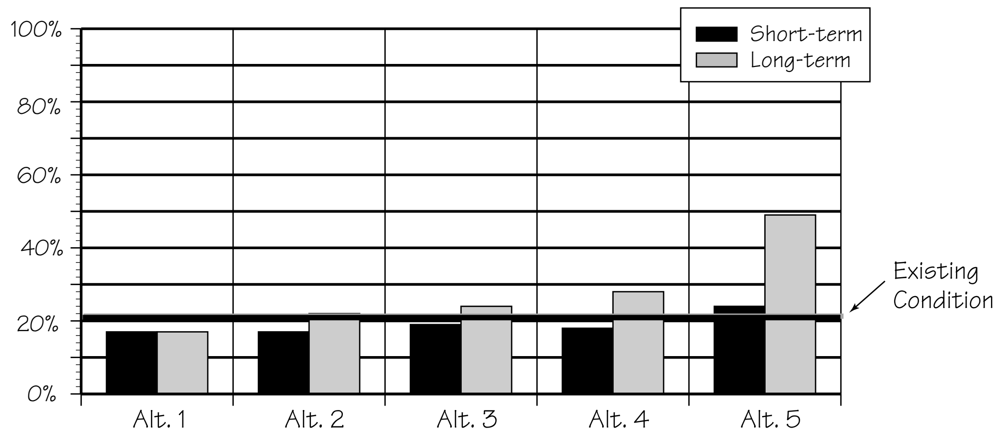


Figure 4-52. Change in fire severity relative to the existing condition based as measured by high potential clusters. Alternative 2 is the best for fuels management. Under Alternatives 1 and 3, high potential fire severity vegetative structures are slightly higher over the long term, but would still be considered good from a management standpoint.

Figure 4-53. This graph shows the change in smoke emissions relative to the existing condition as measured by high potential clusters. Alternative 1 is the only alternative that reduces vegetative structures with a high potential for smoke emissions. It would be the best alternative for fire and fuels management.



Under this alternative there would be a short-term increase of 7% and a long-term increase of 12%. Alternative 1 ranks second in smoke emission potential as shown in the chart above.

Alternative 2

Alternative 2 would have the second lowest increase in fire risk potential. High potential vegetative structures would not change much in the short term and increase by only 4% in the long term. From the standpoint of management, this alternative has the best fire severity rating and the most favorable ranking for smoke emission potential.

Alternative 3

Alternative 3 would have the third lowest increase in fire risk potential. High potential vegetative structures would not change much in the short term and would increase by only 4% over the long-term period. Alternative 3 has the third best fire severity potential rating and ranks fourth in its smoke emission potential.

Alternative 4

Alternative 4 would have the fourth lowest increase in fire risk potential. High potential vegetative structures would not change much in the short term and would increase by only 5% over the long-term period. Alternative 4 also ranks fourth for fire severity potential. It ranks third for smoke emission potential.

Alternative 5

Alternative 5 would have the highest increase in fire risk potential. High potential vegetative structures would increase by 7% in the short term and by 17% over the long-term period. The fire severity potential of this alternative is also worse than any of the other alternatives. Alternative 5 ranks highest for smoke emission potential, too; it is the only alternative that increased smoke emission potential in either of the assessment periods.

Figure 4-54. Surface fires, like the one shown here, can reduce the stocking of young Douglas-fir trees. In the absence of periodic fires, Douglas-fir increased exponentially, bringing forest health problems with it.

Forest and Stand Health

Introduction

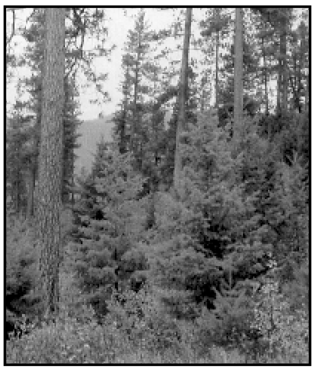


Figure 4-55. Douglas-fir, which is replacing ponderosa pine, is very vulnerable to defoliation and mortality from spruce budworm and root disease.

Throughout the Reservation, forest health has been affected by a number of factors, among them: fire exclusion, grazing, harvesting practices, delays in harvest, and the invasion of exotic species. The most significant impacts have resulted from fire exclusion. This policy has led to high levels of forest pathogens like root rot and bark beetle complexes. These problems, along with general stagnation, have reduced the forest's ability to provide, on a sustainable basis, both commodity and non-commodity benefits.

Summary of Key Effects and Conclusions

Alternatives 1, 2, and 3

Alternatives 1, 2, and 3 have similar desired condition goals for vegetative structural diversity and are therefore predicted to have somewhat similar levels of most pathogens over both the short- and long-term periods. The effects of these three alternatives on forest pests like mistletoes, root rot complexes, and defoliators will be greatest in the Nonlethal Fire Regime and least in the Lethal Fire Regime. The effort to mimic pre-contact forest conditions and the expanded use of fire as a management tool will help to reduce overall pest levels.

Alternatives 4 and 5

Stand health can be estimated by the abundance of the Cluster Group E/I/H/L, which is especially susceptible to pathogens. Based on this criteria, the vegetation model predicts that of these two alternatives, Alternative 4 will have a higher level of stand health. The stands that Alternative 4 would target for harvest would be those with the most significant pathogen problems. However, little attention would be paid to overall forest structure. The vegetation model predicts that Alternative 5 would have a low level of stand health. Under Alternative 5 the forest would be allowed to grow. There would be very little harvest and minimal use of prescribed fire. The vegetation model predicts that under these conditions, there would be a gradual shift towards climax conditions, making the forest more vulnerable to pathogens.

Assumptions

Traditionally the issue of health was viewed at the stand and tree level. If a stand was composed of vigorous, insect- and disease-free trees, it was considered healthy. To be sure, having a predominance of healthy trees and stands in the traditional sense is important. But *forest health* takes a broader view.

From the perspective of forest health, pathogens—whether mistletoe or bark beetles—are considered a necessary part of the forest and fundamental to its functioning. When pathogens are in excess across large areas, it reflects imbalances in forest structures or disrupted processes. This imbalance usually has to do with species composition (too much climax vegetation) and/or tree densities (stands that are too dense). Thus, an assessment of forest health, as opposed to tree or stand health, takes a 'top-down' perspective and considers more than just the levels of various pathogens present.

While there is no definitive definition of what a healthy forest is, there are two key elements that seem essential. First, a healthy forest has the ability to recover from catastrophic change. That is, it has the ability to replace itself within normal successional time frames. Second, a healthy forest contains a mix of structures that provide a wide range of habitats (Kold, Wagner, and Covington, 1994). It could also be said that healthy forests depend on a host of 'lesser' plants and animals that interact in a myriad of beneficial ways, many of which we do not yet understand.

While there is no definitive definition of what a healthy forest is, there are two key elements that seem essential. First, a healthy forest has the ability to recover from catastrophic change. Second, a healthy forest contains a mix of structures that provide a wide range of habitats.

The effects of fire on processes like nutrient cycling in the soil and duff reduction for tree regeneration are generally favorable. Fire also favors seral tree species such as western larch, ponderosa pine, and lodgepole pine, which helps to maintain species diversity by counterbalancing the natural successional processes that favor climax species. Good species diversity reduces the chance of an epidemic of any single pathogen. In addition, most serious forest health issues on the Reservation occur on sites where climax species such as Douglas-fir, subalpine fir, and grand fir are dominant. While these species are a valuable part of the forest, recurrent fire helps to control their abundance.

Scientific understanding of the relationship between the use of fire and forest pathogens is still in its infancy and growing. While the ecology of fire and mistletoes in lodgepole pine is well documented, there is little conclusive data to help the land manger with respect to direct fire effects on various root rot complexes or the behavior of mountain pine beetle. On the other hand, scientists have shown that the duration and intensity of western spruce budworm (*Christoneura occidentals*) outbreaks have increased with a decrease in fire frequency in western Montana, even though the frequency of outbreaks has not changed (Anderson et al., 1987).

Limitations

Modeling techniques are at best very crude predictors of what will actually happen with vegetation in the forest. Thus, in this analysis, trends and tendencies are discussed primarily in terms of broad structural classes, what we call seral clusters or cluster groups.

Further, the ability of models to look at the interaction of forest pathogens is limited. Dwarf mistletoes were adequately modeled using the Forest Vegetation Simulator, but the effects of various defoliators and the common root rot complexes could not be accurately estimated over a long-term period.

We could, however, estimate tree growth rates from an extensive and statistically significant Continuous Forest Inventory data base. Because recent past growth reflects the interaction of all potential pathogens, we assumed that the short term effects of pathogens on forest growth, and thus structural development, could be predicted. For the long term, we assumed that the gradual manipulation of forest structures towards desired condition goals would render the effects of pathogens less significant over time.

Another aspect of forest pathogen interactions is the effect that a pathogen in one area has on another nearby area that is at risk. We could not adequately model this "contagion" or spatial aspect, and so it is not reflected directly in any of our output. All of the vegetation modeling of tree growth was done at the stand level; we did not assume that an outbreak in one stand would affect another.

Figure 4-56. Western spruce budworm has all but defoliated this dense stand, composed mostly of Douglas-fir.

Methodology

The two key indicators of forest health that are used in this analysis are (1) stand structure and (2) ecosystem process. These are used to indicate *relative* levels of health. While the vegetation model predicted stand structures for different ten-year time periods, the detail is not sufficient to assess the specific effects on all the forest pathogens that are present in the forest. Instead, our analysis focuses on the probable effects on a few key indicator pathogens based on anticipated general trends in seral clusters and cluster groups. (For cluster trends see table 4-6 and Appendix C.) Predicted increases or decreases in a seral cluster or cluster group are described as large when they represent greater than a 10% change, moderate when the change is in the range of 5 to 10%, or small when it falls below 5%.

The effects of process (the use or fire vs. mechanical treatments, etc.) on health are also analyzed, but in a very general way. For example, it is assumed that more prescribed fire is generally beneficial.

Effects

Because Alternatives 1, 2, and 3 have fairly similar ranges of desired conditions, the trends of forest pathogens will be similar. When it comes to forest health, two features distinguish these alternatives: the amount of prescribed burning and the amount of grassland, woodland, and parkland restoration. These activities will probably not affect the levels of insects and disease in the immediate future, but may well contribute to the long-term health of the forest as structures gradually move towards more 'natural' ranges.

Table 4-11 shows the seral clusters that are most susceptible to the key pathogens that occur on the Reservation.

Alternatives 1, 2, and 3

Nonlethal Fire Regime

In this fire regime, the development of climax stands with varied structures is a major concern. Stands made dense from a developing understory of Douglas-fir provide ideal conditions for the development of defoliators like western spruce budworm, Douglas-fir dwarf mistletoes, and the buildup of root rot complexes. The most problematic cluster group, E/I/H/L, is dominated by Douglas-fir, and it currently occupies almost a third (30.2%) of the Nonlethal Fire Regime.

Cluster	Western Spruce Budworm	Armilaria Root Rot	Annosum Root Rot	Mountain Pine Beetle	Western Pine Beetle	Pine Engravers	Doug-fir Mistletoe
A			Yes				
B	Yes						
C				Yes[1]		Yes	
D				Yes[1]		Yes	
E	Yes	Yes					Yes
F			Yes		Yes		Yes
G			Yes	Yes	Yes		
H	Yes	Yes					Yes
I	Yes	Yes					
J			Yes		Yes		
K			Yes		Yes		
L	Yes	Yes					Yes

[1]Primarily in the Lethal Fire Regime in pure lodgepole pine stands

Table 4-11. The occurrence of key pathogens by seral cluster. A particular pathogen may not always be present in a cluster even though it may be indicated in this table. Nor does the table show all possible occurrences; some pests will be found in clusters other than those indicated here.

Moderate decreases are predicted for Cluster Group E/I/H/L over the short term under all three alternatives. Over the long term, Alternatives 2 and 3 are predicted to have moderate decreases, while Alternative 1 will likely see a large decrease.

Cluster G, composed of dense stands of moderate-sized ponderosa pine, is the most susceptible to mountain pine beetle outbreaks. Small increases in these stands are expected under Alternatives 1 and 2 over the long term, but these will probably have a minimal effect on the beetle population. A large, long-term increase in Cluster G is expected under Alternative 3.

The vegetation model projected a large, long-term increase in Cluster Group J/K for all three alternatives. The gradual buildup of these stands of large, old trees could lead to population increases of opportunistic bark beetles like western pine beetle and red turpentine beetle. However, there may not be a direct relationship between the increase of old-growth stands and these pathogens.

Mixed Fire Regime

In this fire regime, the climax Cluster Group E/I/H/L is predicted to undergo small to moderate declines over the short term under these three alternatives. But the group is projected to see large declines over the long term. The long-term percentages for the group meet the desired condition goals of all three alternatives.

Cluster G is expected to undergo large, long-term increases under all three alternatives. The increases will likely boost mountain pine beetle and other beetle activity unless silvicultural treatments move these stands to the lower end of the density range of Cluster G. These treatments, coupled with the aggressive use of fire, could significantly reduce the overall effects of common pathogens.

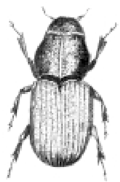


Figure 4-57. The mountain pine beetle is the primary insect predator of lodgepole pine. It can kill thousands of acres of trees when conditions are right. An outbreak on the North Fork of the Flathead in the 1970s killed over 170,000 acres of trees.

Lethal Fire Regime

This fire regime has relatively long fire return intervals (70 to 100 years). So under natural fire conditions, species composition is generally more inclined towards climax species—Douglas-fir, grand fir, and subalpine fir—and ever increasing stand densities.

While the percentage of this fire regime in Cluster Group E/I/H/L (29.5%) is similar to that of the Nonlethal and Mixed regimes, the group is expected to see only small reductions under Alternatives 1 and 3 and a moderate reduction under Alternative 2 over the long term. Current levels of mortality from stand stagnation, root rots, mistletoes, and defoliators are expected to continue now and into the long-term future.

While Alternative 1 may not produce the lowest levels of common pathogens, it would be the most aggressive in the use of fire and in its attempt to restore the forest to historic ranges of structural variability. Alternative 2 would be slightly less aggressive. These two alternatives should create the highest level of forest health as the term is currently defined. Alternative 3 would use even less fire and would have the most liberal desired condition goals. Consequently, it would have a slightly lower level of forest health relative to the other two ecosystem management alternatives.

Alternative 4

Stand health, rather than forest health is the focus of this alternative. It does not seek to restore the forest structures to a pre-contact condition. Rather it would target stands with the highest levels of pathogens and stands with low or negative growth for harvest. Thus, Alternative 4 is primarily aimed at increasing the mean annual growth of the forest and reducing the presence of specific forest pathogens.

The vegetation model predicts that in the short term, there would be little difference in actual forest structures between the five alternatives, and thus their forest health rating would be similar. However, because one of Alternative 4's primary objectives is to eliminate severe stand health problems, over the long term it is expected to have the lowest level of the common pest problems.

Alternative 5

Like Alternative 4, this alternative is not considered an ecosystem-management-based alternative. The vegetation model predicts a gradual increase in Cluster Group E/I/H/L in all fire regimes. Under the other four alternatives, this cluster group decreases.

Cluster Group J/K is predicted to increase at a rate equal to or greater than the other alternatives. Given enough time, this group will become climax clusters, sharply increasing the percentage of climax species in the forest. The process will be aided by the fact that Alternative 5 does not include the use of underburning, which would forestall climax succession. Nor does it include harvesting to reduce stand densities.

This alternative is predicted to have the highest levels of forest pests. Root rots, common defoliators, mistletoes, and bark beetles will steadily increase over time as will the fire hazard. Meanwhile, productivity will drop. Alternative 5 ranks lowest in terms of both forest health and stand health.

Grazing

Summary of Key Effects

Effects on Livestock Grazing

Abandoned roads will result in a loss of forage and more limited access to forage over the long term as trees and shrubs reclaim the road beds. Alternative 5 would result in the lowest total road density, followed by Alternatives 1, 2, 3, and 4, respectively. The abandonment methods that would be used under Alternative 1 would have the most impact on livestock access, followed by Alternatives 2, 3, 4, and 5 respectively.

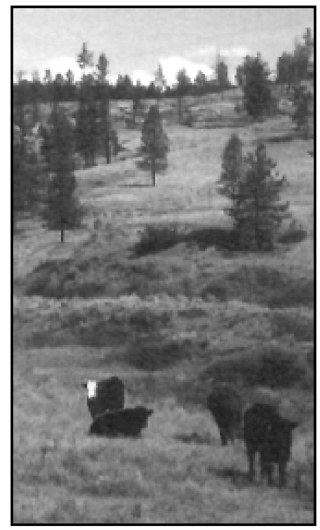


Figure 4-58. Alternative 3 is expected to have slightly higher forage potential in all but the Lethal Fire Regime. In the Lethal Fire Regime, Alternative 1 ranks highest.

Temporary road closures can benefit livestock by reducing conflicts with recreationists and other forest visitors. Open road densities decrease the most under Alternatives 1 and 5. Reductions proposed under the other alternatives are generally modest and would likely have minor impacts on livestock grazing.

Based on the desired conditions goals of Alternatives 1, 2, and 3, Alternative 3 would have the highest forage potential in both the Nonlethal and Mixed Fire Regimes, followed by Alternatives 1 and 2, respectively. In the Lethal Fire Regime, Alternative 1 ranks highest, followed by Alternatives 2 and 3. The vegetation model estimates less forage potential overall than might be expected from the desired condition. It also shows that there is probably little difference in forage potential between the five alternatives. The only exception is in the Nonlethal Fire Regime where Alternatives 1 and 2 are predicted to have a greater forage potential, due in part to grassland and woodland restoration efforts and increases in underburning.

Under Alternative 1, grazing would be managed to maintain and improve the diversity of existing grassland ecosystems with an emphasis on enhancing native plant communities. Alternative 2 would seek to maintain and improve the diversity of existing grassland ecosystems. Alternative 3 would favor forage species production. Alternatives 4 and 5 would maintain native grasslands and desirable introduced species.

Based on range condition and riparian area goals, it is expected that Alternative 1 would result in the most sustainable and resilient forest grassland ecosystem, followed by Alternatives 2 and 3.

Alternative 1 would aggressively manage noxious weeds on 90% of infested areas. Alternatives 2, 3, and 4 would be less aggressive in their approach and would manage 80% of infested areas. Alternative 5 would be the least aggressive.

Assumptions

Major Assumptions

We assume that nonpermanent road closures will benefit livestock producers because in most situations the closure will not prevent live-stock use; that is, producers would still have access. The closures, however, would reduce livestock harassment and rustling.

For the purposes of our analysis we made assumptions about the forage production capabilities of each seral cluster group. We assigned each a score of between 1 and 5, with 1 representing the lowest production capability and 5 representing the highest. Because each alternative has a different seral cluster group distribution, we were then able to develop a relative ranking of the forage production capabilities of the five alternatives.

We assume that the abandonment of roads will result in a net loss of access to forage for livestock. In many situations, the removal of culverts and the recontouring or ripping of the road bed will keep livestock out of areas. In addition, as shrubs and trees reclaim abandoned roads, forage will decrease.

We assume that nonpermanent road closures will benefit livestock producers because in most situations the closure will not prevent livestock from using the road but will reduce harassment and rustling.

Riparian restoration efforts may result in restrictions on livestock grazing in riparian areas and thereby reduce the available forage over the short term. Over the long term, however, restored riparian areas will be made available to livestock at least seasonally and will result in higher forage production.

The complete restoration of native grasslands is not possible; introduced species are simply too well established in too many places. Our assumption is that certain practices will favor native grassland types and substantially improve the condition of most Reservation grassland communities over time.

This assessment assumes that staffing and financial and technical resources will be adequate to fully implement each alternative.

Limitations

The last range inventory conducted on the Reservation was completed in 1980. Although this survey is badly outdated, it contains the best information available on Reservation rangelands. The lack of current range inventory data represents a major limitation in our assessment.

Methodology

To assess the overall impact each alternative would have on forage, we rated each seral class on a scale of 1 to 5 and then averaged seral class scores across cluster groups.

Cluster or Cluster Group	Assumed Forage Production Capability
A1	4.5
A2	4.25
B	2.7
C/D	3
F/G	2.3
J/K	3.5
E/I/H/L	2.2

Table 4-12. Assumed forage production capacity of each cluster group. Scores represent a relative rather than an absolute ranking. Groups with the lowest rankings (such as B and E/I/H/L) would typically be too dense to provide accessible or usable forage.

We then multiplied the seral cluster group score by the midpoint of each seral cluster group's desired condition. For example, our rating for Cluster A1 is 4.5. Our desired condition range for that group under Alternative 1 was 5 to 15%, which has a midpoint of 10. So 4.5 x 10 = 45. We then totaled these seral cluster group ratings for the first three alternatives to get an overall forage production score for each. In this way, we were able to rank the forage production capabilities of Alternatives 1, 2, and 3 based on their desired conditions. Alternatives 4 and 5 could not be ranked in this way because they are not ecosystem management based alternatives and do not have desired condition ranges.

We did a similar computation using our vegetation model predictions; that is, we multiplied the seral cluster group score by the model prediction for that particular cluster group. For example, our rating for Cluster A1 is 4.5. The vegetation model predicted Cluster A1 would make up 12.1% of the forest under Alternative 1. So 4.5 x 12.1 = 54.4. We totaled these ratings to get a model prediction for the forage value of each alternative.

Effects

Roads

Total Road Density

Alternative 5 would result in the lowest total road density, followed by Alternatives 1, 2, 3, and 4, respectively. Each road that is abandoned will result in a loss of forage over the long term as trees and shrubs reclaim the road bed. This would have a negative impact on livestock grazing. Road abandonment methods can also have impacts on how well livestock are able to utilize forage. Some methods are more likely to create barriers to livestock movement and could prevent cattle from reaching areas that otherwise would have been utilized. These areas can be significant in size. The abandonment methods that would be used under Alternative 1 would have the most negative impact on livestock access, followed by Alternatives 2, 3, 4, and 5 respectively.

Open Road Density

Temporary road closures will have a positive impact on livestock because they tend to reduce conflicts with recreationists and other forest visitors. Livestock can generally move around locked gates and producers can be provided with keys to the gates so they can access their stock. Open road density is a relative measure of the number closed roads. Open road densities decrease the most under Alternatives 1 and 5. Reductions proposed under the other alternatives are for the most part modest and would probably have minor impacts on livestock grazing.

Vegetation

Forage Production

Each of the alternatives would produce a different amount of forage. In figure 4-59, the white bars represent the estimated forage producing potential of each alternative based on the desired condition of the forest vegetation. Alternatives 4 and 5 lack desired condition bars because they are not ecosystem-management-based alternatives. Based on the desired conditions of the three ecosystem management alternatives, the analysis shows that in the Nonlethal Fire Regime, Alternative 3 scores the highest, followed by Alternatives 1 and 2, respectively. This same pattern holds in the Mixed Fire Regime. But in the Lethal Fire Regime, Alternative 1 ranks highest, followed by Alternatives 2 and 3. Note that with exception of Alternative 1 in the Lethal Fire Regime, there is little difference between the three ecosystem management alternatives.

Figure 4-59 also shows forage potential based upon our model predictions. The vegetation model estimates less forage potential overall than that predicted by the desired condition. In the Nonlethal Fire Regime, the vegetation model predicts that Alternative 2 would have the most forage potential, followed by Alternatives 1, 3, 5, and 4 respectively. In the Mixed Fire Regime, it again predicts Alternative 2 will have the highest potential, followed by 1, 3, 4, and 5, respectively. In the Lethal Fire Regime, Alternative 3 has the highest potential, followed by Alternatives 2, 1, 4, and 5. The predicted differences between the alternatives are small.

Grassland, Woodland, and Parkland Restoration

Woodland and grassland restoration would benefit livestock by increasing forage substantially across the Reservation. Only the first three alternatives would restore grasslands, woodlands and parklands. Alternative 1 would restore or maintain 62,308 acres, Alternative 2 would restore 49,466 acres, and Alternative 3 would restore 18,821.

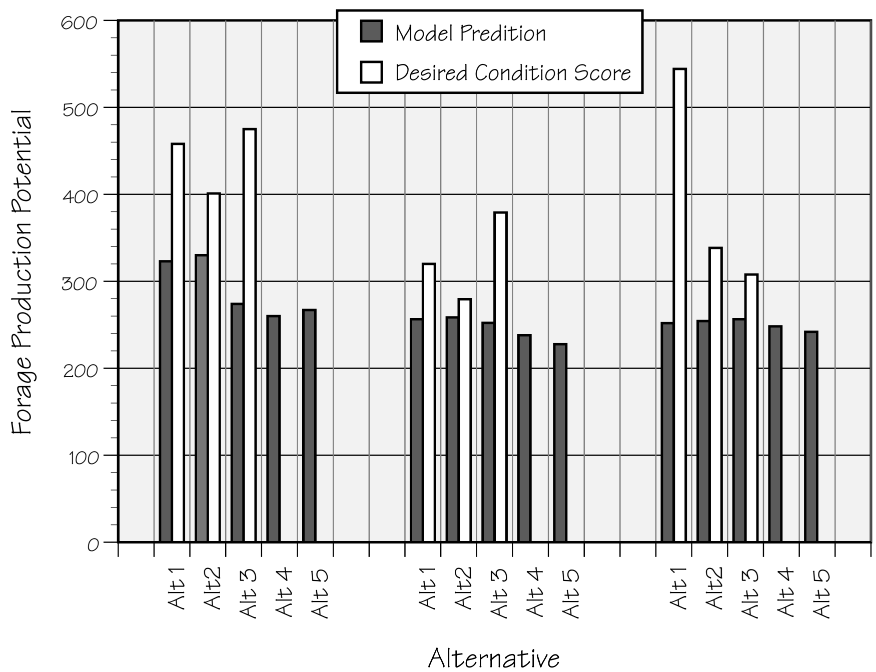


Figure 4-59. Average predicted forage production potential of each alternative over the long term based on the desired condition (white bars) and the vegetation model (dark gray bars). This analysis is a relative ranking of potential, not an actual measure of forage quantity.

Underburn Acres

Underburning increases the production of grasses by removing dead growth from previous years, killing shrubs and trees, speeding the recycling of nutrients, and generally stimulating growth. Figure 4-60 shows the number of acres that, based on our model projections, would receive underburn prescriptions over both the short and long terms. Over both periods, Alternative 1 ranks the highest, followed by Alternatives 2, 3, 5, and 4, respectively.

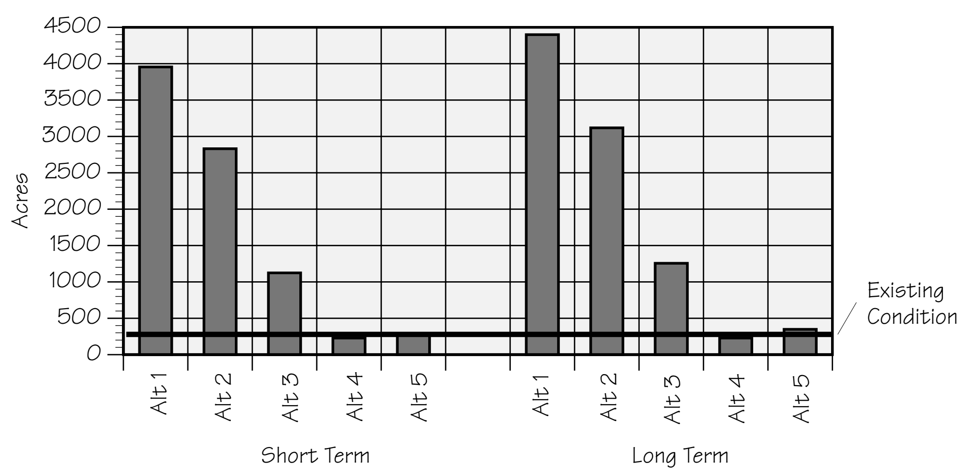


Figure 4-60. The acres predicted to receive underburn treatments under each alternative over the short- and long-term periods

Grassland Types Favored

The alternatives differ in the emphasis they place on restoring or maintaining native grassland types. Under Alternative 1, grazing would be managed to maintain or improve existing grassland types with an emphasis on enhancing native plant communities, specifically the Palouse Prairie and intermountain grassland types. Because native grass species are generally less tolerant of heavy grazing than introduced species, native plant communities would have to be utilized at a less intensive level than existing grassland communities, which are a mix of introduced and native species. Alternative 2 would seek to improve or maintain the diversity of existing grassland ecosystems, while Alternative 3 would favor introduced species over native. Alternatives 4 and 5 would simply maintain the current mix of native grasslands and desirable introduced species.

Range and Riparian Condition

Under Alternative 1, a variety of tools would be used to restore grasslands to good or better condition. Alternatives 2 and 3 would use those same tools to restore grasslands to a fair or better condition. Under Alternatives 4 and 5, improvements would be planned and implemented over a longer period of time due to a lack of financial and technical resources. Given these objectives, we predict Alternative 1 would result in the most sustainable and resilient forest grassland ecosystem, followed by Alternatives 2 and 3. The same ranking pertains for how the alternatives would improve the condition of riparian areas. Under Alternatives 1, 2, and 3, managers would have more tools at their disposal to improve range and riparian conditions and the standard to which they would be striving would be higher than under Alternatives 4 and 5. These additional tools and higher standards would lead to a speedier and more complete restoration of areas adversely impacted by grazing.

Weeds

The alternatives call for different levels of noxious weed control on forest grasslands. Alternative 1 would aggressively manage weeds on 90% of infested areas. Alternatives 2, 3, and 4 would be less aggressive and would manage 80% of infested areas. Under Alternative 5 weeds would not be managed to meet forest plan objectives. However, the lower road densities anticipated under Alternative 5 will mean reduced traffic which will help reduce the spread of weeds.

Figure 4-61. The restoration activities proposed under Alternatives 1 and 2 should greatly improve forage conditions for livestock in the Nonlethal Fire Regime, the regime most used by livestock. Shown at right is a parklike stand of ponderosa pine; restoring these stands is a major goal of Alternative 1 and 2.

Wildlife

Summary of Key Effects

Thermal Cover

Alternatives 1 and 2

Thermal cover is projected to decrease in the Nonlethal Fire Regime and increase in the Mixed and Lethal Fire Regimes. In the Nonlethal Fire Regime, the changes would benefit old-growth wildlife and increase winter range for elk and mule deer. Some habitat loss is expected for white-tailed deer. In the Mixed and Lethal Fire Regimes, forest carnivores and many birds and small mammals could benefit from increases in thermal cover.

Figure 4-62. Under Alternatives 1 and 2, winter range for elk and mule deer is expected to increase in the Nonlethal Fire Regime.

Alternative 3

Predicted increases in thermal cover in the Lethal Fire Regime could increase habitat quality for some big game species. Expected increases in fragmentation could decrease habitat connectivity for forest carnivores and some bird species, while favoring wildlife found in forest edge habitats. Projected increases in thermal cover in the Nonlethal Fire Regime, when combined with the lower emphasis this alternative places on prescribed fire, could improve habitat for forest-edge species, while negatively affecting species requiring old-growth ponderosa pine habitat.

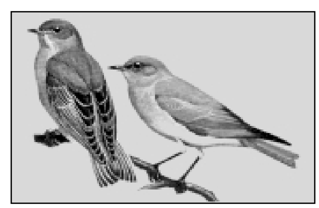


Figure 4-63. Alternative 3 could improve habitat for forest edge species like the mountain bluebird.

Alternative 4

The vegetation model predicts that thermal cover will increase. However, under the first ten years of the 1982 plan, thermal cover decreased on the commercial forest base. This discrepancy is explained in the vegetation section of this chapter under the heading *Limitations*. This alternative is also predicted to result in a lower potential for old-growth species and increased fragmentation due to intensive timber harvesting.

Alternative 5

Thermal cover is predicted to increase enough to exceed the RMVs under this alternative. Wildlife diversity is predicted to decrease over time as the forest continues to grow and become increasingly dense, although some old-growth species would benefit.

Hiding Cover

Alternatives 1 and 2

Significant increases in hiding cover are predicted in the Mixed and Lethal Fire Regimes, while slight decreases are predicted for the Nonlethal Fire Regime. Increases in hiding cover could allow for better use of the total range by big game species.

Alternative 3

Increases in hiding cover are predicted in all fire regimes. This could increase habitat utilization for big game but may favor white-tailed deer over elk and mule deer in the Nonlethal Fire Regime.

Figure 4-64. Good hiding cover, defined as vegetative cover capable of screening a standing elk or deer at 200 feet, allows big game to fully utilize their range.

Alternative 4

Increases in hiding cover are predicted, but any benefits to big game from this increase may be negated by increased fragmentation and higher road densities.

Alternative 5

Hiding cover is predicted to increase during the short-term. Over the long term, the vegetation model predicts that the highest quality hiding cover will decrease due to the low level of forest management activities, although increases in layering and density should occur in Clusters F and G, and this should provide some hiding cover. If road densities drop as predicted under this alternative, hiding cover will be less critical for big game.

Large-snag Density

Alternatives 1 and 2

Large-snag densities would be closest to pre-contact levels under these two alternatives, but restoration would take considerable time. Old-growth wildlife species including many songbirds, raptors, and small mammals would benefit from the restoration of old-growth forest structures.

Figure 4-65. Large snags provide nesting habitat for about one quarter of all bird species in the northern Rockies. They are also key to many small mammals and forest carnivores.

Alternative 3

Conditions would be similar to those of Alternatives 1 and 2 except that managers would emphasize uneven-aged forest management instead of prescribed fire and thinning in the Nonlethal Fire Regime. Uneven-aged management would not fully restore pre-contact conditions of habitat structure or the spatial patterns favorable to some old-growth wildlife species.

Alternative 4

The vegetation model predicts that there would be snag habitat under this alternative, however, under the first ten years of the 1982 plan, large snag densities decreased on the commercial forest base. Intensive forestry, including short rotation-age management and the priority placed on forest health, did not allow conditions of high snag densities to develop.

Alternative 5

Large-snag densities would increase over time under Alternative 5 as would habitat for old-growth wildlife, despite losses in overall wildlife habitat diversity.

Down Woody Debris

Alternatives 1 and 2

Under Alternatives 1 and 2, habitat restoration activities would increase the amount of down woody debris in the Mixed and Lethal Fire Regimes. However, down woody debris is predicted to decrease in the Nonlethal Regime. The increases would provide habitat for many birds, small mammals, reptiles, and amphibians and would substantially increase wildlife diversity.

Figure 4-66. Down woody debris is important for nutrient cycling, soil productivity, and soil structure. It also provides important habitat for many wildlife species.

Alternative 3

Down woody debris would increase in all fire regimes. The Nonlethal Fire Regime would have more down woody debris than pre-contact conditions because prescribed fire would not be used much in restoration efforts. These conditions would maintain habitat for some species of birds and small mammals.

Alternative 4

Down-woody-debris habitat would decrease due to intensive forest management. Fragmentation of down-woody-debris habitat would also increase. Habitat for small mammals, birds, reptiles, amphibians, and forest carnivores would be at very low levels.

Alternative 5

Down-woody-debris habitat goals would be met in all fire regimes and provide abundant habitat for many wildlife species. Some conflicts with salvage logging could be expected.

Early-Seral/Forage

Alternative 1

Early-seral/forage habitat is predicted to be highest under this alternative. It would increase in all fire regimes except the Lethal Regime, where it would gradually decrease over the long-term. Both summer and witner habitat for big game, some bird species, and bears would increase. Big game winter range, which is usually located on southerly exposures at elevations less than 5000 feet, is generally more productive when it is in an early seral stage of development.

Alternative 2

Early-seral/forage habitat would increase but not as much as under Alternative 1. Fragmentation would gradually decrease over time.

Alternatives 3 and 4

Early-seral/forage habitat would gradually decrease in all fire regimes. This would result in less available forage for certain birds, small mammals, big game, and bears. An increase in fragmentation and road densities will cause losses in security habitat and may reduce the availability of some early-seral/forage areas.

Alternative 5

Early-seral/forage habitat under Alternative 5 would be the lowest of all the alternatives due to the low level of forest management. The loss of this habitat would generally lower wildlife populations and overall wildlife diversity. However, species requiring dense and mature structures or old-growth forests would benefit.

Figure 4-67. Early-seral forage habitats provide important forage for wildlife.

Assumptions

Major Assumptions

Wildlife and their habitats are important to the well-being of the Confederated Salish and Kootenai Tribes.

Unregulated fuelwood harvest will continue to have an impact on snag retention unless some sort of permit or regulatory system is implemented.

Wildlife habitat and species diversity has been reduced due to human-caused impacts like fire suppression and exclusion, grazing, road building, and timber harvesting.

Other human activities (population growth, housing development, highway construction, agriculture, etc.), which are outside the scope of this plan, will continue to have an incremental and cumulative negative effect on some native wildlife populations.

Fire is an important ecological process that influences wildlife habitat on the landscape and is a critical factor in habitat restoration.

Funding will be available to implement restoration activities.

Road closure objectives will be effectively implemented by target dates in order to achieve habitat security objectives for big game and threatened and endangered species.

Grazing management objectives will be effectively implemented. This is necessary to achieve the restoration of mountain-grassland and riparian types.

The increase in noxious weeds is a serious threat to native plant and animal communities.

Limitations

The most obvious limitation in the analysis of the effects of the alternatives is that the vegetation model is not spatial. Consequently, we could not quantitatively predict future spatial patterns for the alternatives. The spatial nature of habitat mosaics on a landscape is just as important as wildlife habitat characteristics are at the stand level. The highly variable effects of fire differ according to forest types, slope, aspect, and fuels. These factors affect spatial patterns on the landscape, which in turn influence wildlife.

The increase in noxious weeds is a serious threat to native plant and animal communities.

Large herds of grazing ungulates did not exist on the Flathead Indian Reservation historically. Therefore livestock grazing, as it exists today in many areas of the Reservation, does not mimic the grazing of wildlife during the pre-contact era. Grazing, in some instances, should be considered an additive and cumulative effect on the wildlife resource. In some areas, overgrazing has altered the natural fire regime by eliminating the ground cover needed to start and maintain a fire. Therefore, our objective of using prescribed fires to promote big game winter range recovery may not be feasible in parts of the forest. The vegetation model, however, assumes that fire prescriptions will be successful wherever they are applied.

The use of prescribed fire also threatens to exacerbate noxious weed infestations. This, too, may keep us from achieving our objective of restoring grassland habitats.

We also assume in this EIS that silvicultural practices will mimic historic fire disturbances. But timber harvesting, even when coupled with prescribed fire, may not duplicate the complex and subtle part fire plays in nutrient cycling, soil productivity, and providing habitat for wildlife. For example, clearcuts intended to mimic stand replacement fire events will not necessarily meet the needs of species with narrow habitat requirements like black-backed woodpeckers, which depend on large patches of burned timber. Habitat for these kinds of species may only be provided by natural fire events that occur in wilderness or primitive areas, where fire suppression is not as critical as in other, more populated zones.

Methodology

We performed an effects analysis on 169 species of wildlife found in the forested parts of the Flathead Indian Reservation. Species that do not use the forest for at least part of their life history were omitted from the analysis. We also limited the analysis to terrestrial vertebrates (but included reptiles and amphibians). Because there are so many species to consider at such a large-scale planning level, we have chosen to use the coarse filter/fine filter approach in modeling these impacts (Noss 1987, Hunter 1990).

We grouped the majority of wildlife species by habitat affinities, according to forest cover type and seral class. We then used the vegetation model output to estimate the effects of each alternative on individual species groups. We used model output and vegetation, timber, and grazing objectives to determine cumulative effects. For specific habitat affinities and cumulative effects by species see Appendices H and I.

Hutto (1995), Saab and Rich (1997), Dobkin (1992) and Hejl et al. (1995) provide information on bird habitat use. Big game habitat associations and management are from Thomas et al. (1979) and Christensen et al. (1993). Our analysis of fragmentation effects for the existing condition is based on Ripple et al. (1991). A full list of wildlife species and their habitat associations can be found in Appendices H and I.

We addressed the impacts of each alternative on wildlife on the basis of five parameters, which we chose based on their importance to the majority of wildlife species on a stand-level basis. We compared output from the vegetation model to RMVs to estimate the effect of an alternative on a particular wildlife parameter.

We addressed the impacts of each alternative on wildlife on the basis of five parameters, which we chose based on their importance to the majority of wildlife species on a stand-level basis.

Parameters Used in the Analysis

Thermal Cover

Thermal cover is required by all wildlife to maintain thermoregulation (body temperature and energy levels) and to provide protection from predators. Thermal cover is determined by canopy cover, forest structure, and stand size. In this discussion, the term thermal cover encompasses mostly mature and old-growth stands that have a dense canopy cover (>70%), a multilayered structure, and patch sizes of at least 40 acres (Thomas et al. 1979). Seral Clusters G, H, K, and L were used in the analysis of this parameter.

Hiding Cover

Hiding cover is defined as vegetative cover capable of screening a standing adult elk or deer at 200 feet (Thomas et al. 1979). Hiding cover is important for big game because it reduces vulnerability from hunting and allows animals to more fully utilize their range. Hiding cover is critically important in areas of moderate to high road densities within the forest. This type of cover is best represented as early- to mid-seral forest (dense stands of saplings and poles). Seral Clusters B, C, and D were used in the analysis.

Large-snag Density

Large snags are important to many forest wildlife species. Approximately 25% of all birds in the forests of the Northern Rocky Mountains are considered cavity nesters (McClelland et al. 1979). Dead trees are an important place for woodpeckers, flickers, and sapsuckers to feed. Other wildlife, including small mammals and forest carnivores, use snags for denning. Large snags with cavities and loose bark are important as nest and roosting areas for bats (Christy and West 1993, Thomas 1988). Large snags include trees greater than 20 inches dbh. Late-seral and old-growth stands contain higher densities of these snags than younger stands or stands that have undergone intensive management. Seral Clusters I, J, K, and L were used in the analysis.

Down Woody Debris

This parameter is similar to the Large-snag Density parameter except that it is specific to other types of wildlife, particularly mammals, reptiles, and amphibians. Down woody debris is defined as a log of at least 6 inches at the butt end and at least 8 feet long (Bull et al. 1997). Both of these parameters are closely tied to late-seral or old-growth stand characteristics. Down woody material serves several critical functions in forested habitats, including nutrient cycling, soil productivity, soil structure, forest structure, and critical microhabitat for many wildlife species (Franklin et al. 1981). This habitat feature also provides denning and resting sites for many forest carnivores, including fishers (Arthur et al. 1989, Powell and Zielinski 1994), pine martens (Buskirk et al. 1989, Corn and Raphael 1992), and lynx (Koehler and Aubrey 1994, Koehler 1990). Seral Clusters I, J, K, and L were used in the analysis.

Early-Seral/Forage Habitat

These habitats consist of small, natural forest meadows, brush fields, vegetated avalanche chutes, and recent clearcuts. Scree slopes are not included, although drier forest types, like the ponderosa pine/bitterbrush type, are. These ponderosa pine woodlands, found on south- and west-facing slopes, consist of very open stands dominated by grasses, forbs, and shrubs with few widely scattered ponderosa pine or Douglas-fir trees. All of these habitats are dominated by forbs, grasses, or shrubs. They are used by white-tailed deer and moose for browse. Berry-producing shrubs, often abundant, provide food for bears and songbirds. Woodlands are also important to species like the western rattlesnake and golden eagle. Big game winter range is most productive when in the early seral stages of succession. The use of prescribed fire will rejuvenate the habitat and maintain its productivity. They also provide important brood-rearing habitat for blue and ruffed grouse. Seral Clusters A, C, I, and J were used in the analysis.

In this section we also address Issue Statements received during public scoping and from the Forest Plan Ad Hoc Committee. These include the impact of clearcuts, grazing, and roads on wildlife, and the status of threatened and endangered species and old-growth dependent species.

This section addresses the direct, indirect, and cumulative impact of each of the alternatives on the parameters and Issue Statements.

Effects on Key Wildlife Parameters

Thermal Cover

Alternative 1

As stands in the Nonlethal Fire Regime are harvested, thinned, and burned to mimic historic fire effects, thermal cover is predicted to decrease during the short-term and increase slightly over the long-term. In order to match natural fire return intervals, frequent harvest entries would be necessary. The removal of encroached Douglas-fir and young ponderosa pine thickets would result in a more open understory dominated by grasses and shrubs and an overstory of large-diameter ponderosa pine and a moderate tree canopy. This type of management would reduce the quality of thermal cover. Over time these areas would become less attractive to white-tailed deer and more attractive to elk, mule deer, mountain cottontail, and many bird species.

Table 4-13. Predicted amounts of thermal cover (as a percent of total fire regime acres) for Alternative 1.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	19.5	28.4	41.9
Long-term Model Prediction	29.2	44.2	64.5
RMV	10-59	22-80	30-90
Existing Condition	27.5	33	32.1
Desired Condition	10-45	22-55	54-90

In the Mixed and Lethal Fire Regimes, thermal cover is predicted to gradually increase through normal successional processes. This should benefit forest carnivores and birds. The fact that the size, arrangement, and position of patches would mimic the patterns created by natural fire disturbances would benefit many species of wildlife.

Alternative 2

The effects that this alternative would have on thermal cover are similar to those of Alternative 1. Less emphasis would be placed on understory burning than in Alternative 1, and that could allow for slight increases in thermal cover in the Nonlethal Fire Regime during the long term.

Table 4-14. Predicted amounts of thermal cover (as a percent of total fire regime acres) for Alternative 2.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	21.0	28.9	41.0
Long-term Model Prediction	30.6	46.1	62.8
RMV	10-59	22-80	30-90
Existing Condition	27.5	33	32.1
Desired Condition	10-40	30-57	50-75

Alternative 3

Stand health concerns would be given a high priority under this alternative. The vegetation model predicts that thermal cover would increase in all fire regimes. Fragmentation from silvicultural treatments designed to address forest health problems is also expected to increase under this alternative. This would have negative impacts on some forest carnivores and old-growth bird species. At the same time, it could increase habitat for species that require more forest edge.

Under Alternative 3, less emphasis would be placed on understory burning, while uneven-aged management would increase. The result would be a more moderate-canopied forest, particularly in the Nonlethal Fire Regime. Another consequence might be increased fragmentation in some areas and more edge habitats. Over the long-term, this type of management would likely benefit species like white-tailed deer, black bear, and ruffed grouse that thrive in forest-edge habitats. Species requiring pre-contact old-growth pine forests would loose habitat.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	28.4	29.3	41.8
Long-term Model Prediction	52.1	46.5	58.9
RMV	10-59	22-80	30-90
Existing Condition	27.5	33	32.1
Desired Condition	24-57	30-80	30-70

Table 4-15. Predicted amounts of thermal cover (as a percent of total fire regime acres) for Alternative 3.

Alternative 4

The vegetation model predicts increases in thermal cover in the Mixed and Lethal Fire Regimes. Under the last ten-year plan, however, thermal cover was lost in areas like the West Landscape due to intensive timber harvesting. This discrepancy between vegetation model predictions and what actually happened under the 1982 plan is explained in the vegetation section of this chapter under the heading *Limitations*. The level of fragmentation is also expected to be high under Alternative 4.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	23.8	25.9	40.3
Long-term Model Prediction	22.2	40.6	62.0
RMV	10-59	22-80	30-90
Existing Condition	27.5	33	32.1
Desired Condition	NA	NA	NA

Table 4-16. Predicted amounts of thermal cover (as a percent of total fire regime acres) for Alternative 4.

Alternative 5

Thermal cover would increase substantially under this alternative in all fire regimes. Long-term projections indicate that thermal cover would increase over the next 20 to 80 years. Because harvesting would be limited to salvage and because there would be a lack of prescribed fire, stands would become mature and uniformly dense. Thermal cover requirements would be met in the short-term but would quickly exceed RMVs during the long term. This would have a detrimental impact on many wildlife species, particularly big game and bird species that require early-seral habitats. Wildlife diversity would gradually decrease.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	31.8	34.1	44.2
Long-term Model Prediction	75.3	72.4	73.8
RMV	10-59	22-80	30-90
Existing Condition	27.5	33	32.1
Desired Condition	NA	NA	NA

Table 4-17. Predicted amounts of thermal cover (as a percent of total fire regime acres) for Alternative 5.

Hiding Cover

Alternative 1

A slight decrease in hiding cover is predicted in the Nonlethal Fire Regime. Hiding cover in the Mixed and Lethal Fire Regimes is predicted to gradually increase. During the long-term period, the Mixed and Lethal Fire Regimes would experience the largest increase in hiding cover. The densification of the Nonlethal Fire Regime would reverse under this alternative. In all fire regimes, hiding cover would be near optimum levels but would fluctuate with logging and natural-fire disturbances. When combined with effective road management, increases in hiding cover could result in better utilization of big game ranges.

Table 4-18. Predicted amounts of hiding cover (as a percent of total fire regime acres) for Alternative 1.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Predition	13.5	20.5	32.4
Long-term Model Prediction	13.4	24.1	28.1
RMV	0-25	18-42	15-40
Existing Condition	15.1	18.9	29.2
Desired Condition	0-25	18-42	20-45

Alternative 2

The impacts of Alternative 2 on hiding cover are similar to those of Alternative 1. Hiding cover in the Mixed Fire Regime, now at the low end of the RMV range, will increase under this alternative.

Table 4-19. Predicted amounts of hiding cover (as a percent of total fire regime acres) for Alternative 2.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Predition	13.1	24.2	32.3
Long-term Model Predition	13.0	27.1	29.1
RMV	0-25	18-42	15-40
Existing Condition	15.1	18.9	29.2
Desired Condition	1-25	18-42	20-45

Alternative 3

Hiding cover is predicted to increase over the short-term period in all fire regimes. During the long term, hiding cover will go up in the Nonlethal and Mixed Fire Regimes and remain about the same in the Lethal Regime. The increases would result from normal successional processes. There would be more hiding cover in the Nonlethal Fire Regime under this alternative than the other alternatives, in part because uneven-aged management would be emphasized over prescribed fire. Uneven-aged management would create more of a mosaic of tree sizes and age classes, while the use of prescribed fire would create a more uniform forest with fewer size and age classes. Increases in hiding cover under this alternative would allow species such as white-tailed deer and black bears to remain in low elevation forests, which could mean continued problems with these species in some developed areas.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Predition	17.3	23.5	32.3
Long-term Model Predition	21.1	24.2	29.1
RMV	0-25	18-42	15-40
Existing Condition	15.1	18.9	29.2
Desired Condition	1-25	18-42	15-40

Table 4-20. Predicted amounts of hiding cover (as a percent of total fire regime acres) for Alternative 3.

Alternative 4

During the short-term period, hiding cover is predicted to increase in all fire regimes under Alternative 4. Over the long term, it is predicted to increase in the Mixed Regime, remain about the same in the Nonlethal Regime, and decrease slightly in the Lethal Regime. Alternative 4 would result in a fragmented patchwork of hiding cover, recent clearcuts, and mature dense forest. High road densities would be necessary to access and fully regulate the forest. The high number of roads would insure the need for well distributed hiding cover throughout the commercial forest base. White-tailed deer would benefit from this type of management. Mule deer and elk would be negatively impacted.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Predition	16.1	25.0	32.4
Long-term Model Predition	15.0	23.3	27.8
RMV	0-25	18-42	15-40
Existing Condition	15.1	18.9	29.2
Desired Condition	NA	NA	NA

Table 4-21. Predicted amounts of hiding cover (as a percent of total fire regime acres) for Alternative 4.

Alternative 5

During the short-term period, hiding cover is predicted to increase, but the amount would depend upon fire and insect and disease conditions. Very low-intensity forest management would result in low levels of the highest quality hiding cover throughout the forest, although increases in layering and density should occur in Clusters F and G, which should provide some cover. Low levels of hiding cover may not be a concern if road densities decrease as expected. Hiding cover becomes less critical when road densities are low.

Table 4-22. Predicted amounts of hiding cover (as a percent of total fire regime acres) for Alternative 5.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	17.6	26.3	32.5
Long-term Model Prediction	17.1	20.7	24.9
RMV	0-25	18-42	15-40
Existing Condition	15.1	18.9	29.2
Desired Condition	NA	NA	NA

Large-snag Density

Alternative 1

Goals for snag habitat would be met in all fire regimes. Snag levels would be lowest in the Nonlethal Fire Regime where frequent underburning would keep tree densities low. Large snags would consist primarily of dead ponderosa pine, with some scattered Douglas-fir. This type of habitat would be beneficial to bird species like flammulated owl, northern flicker, Lewis' woodpecker, Vaux's swift, and many mammals, including the northern flying squirrel and bats. All of these cavity-nesting species are found in large old-growth ponderosa pine stands with open grassy or shrub-dominated understories.

Large-snag habitat would be restored in the Mixed and Lethal Fire Regimes over time. RMVs would be met during the long-term period, however the desired condition goals would not be achieved because a longer time is required to build these structures. The trends are positive, however. As managers shifted their emphasis away from correcting stand-health problems to mimicing natural successional processes associated with the fire-insect-disease cycle, large contiguous patches of mature and old-growth forests would be maintained. Adjacent to these stands would be large, harvested areas. This mosaic would have a low to moderate level of fragmentation, a pattern reflecting the pre-contact condition.

Unregulated timber harvesting, including firewood cutting, may make it difficult to retain snags in areas that receive lots of use like Pistol Creek, Mollman, and Moss Peak.

Table 4-23. Predicted amounts of large-snag habitat (as a percent of total fire regime acres) for Alternative 1.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	1.3	8.9	3.5
Long-term Model Prediction	23.0	20.4	23.1
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	25-90	10-30	30-40

Alternative 2

The impacts of Alternative 2 on snags would be similar to those associated with Alternative 1.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	1.5	9.3	3.9
Long-term Model Prediction	23.6	16.9	22.3
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	15-65	5-30	15-40

Table 4-24. Predicted amounts of large-snag habitat (as a percent of total fire regime acres) for Alternative 2.

Alternative 3

Large-snag density is predicted to increase in all fire regimes. This alternative would not seek the complete restoration of pre-contact forest conditions and functions. In certain areas, commodity production would be emphasized. Impacts are predicted to be similar to Alternatives 1 and 2 except that silvicultural techniques would not rely as much on prescribed fire, especially in the Nonlethal Fire Regime. Spatial patterns would be more fragmented than during the pre-contact era.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	2.1	8.5	3.8
Long-term Model Prediction	31.1	17.6	19.4
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	22-44	5-30	10-35

Table 4-25. Predicted amounts of large-snag habitat (as a percent of total fire regime acres) for Alternative 3.

Alternative 4

According to the vegetation model, large-snag habitat goals would be met in all fire regimes. However, under the 1982 plan the emphasis on stand health made it difficult to retain snag habitat. This was because many of the stands with high snag densities also had a high probability of meeting old-growth habitat definitions in which insects and diseases play an important role. Once stand growth culminated, the stand was either logged or thinned to reduce competition. Large snags did not have time to develop. The resulting trend was toward single, isolated large snags or small patches of snags in inaccessible areas that were widely spread over a watershed or landscape. In addition, leaving snags in clearcuts as mitigation provided only short-term benefits. The recruitment of new snags takes at least 150 to 300 years to develop after a stand has been logged. That length of time far exceeded the rotation age.

Table 4-26. Predicted amounts of large-snag habitat (as a percent of total fire regime acres) for Alternative 4.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediciton	2.4	8.1	3.9
Long-term Model Prediction	16.5	14.6	19.7
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	NA	NA	NA

High road densities under this alternative could also jeopardize snag retention. Increased access would lead to a large number of snags being lost to firewood cutters and other unregulated tree cutters.

Another likely effect of this alternative would be a fragmented forest with clearcuts and residual snag habitats forming a checkerboard pattern. The increased edge and small patches of remnant snag habitats would not satisfy the requirements of many forest-interior wildlife species. These fragmented habitats, with their increased levels of predation and decreased productivity, could act as a population sink for several species.

If harvesting occurs on a short rotation age with stand health as a prime motive for harvesting, then snag formation is unlikely to occur. In addition, continued unregulated firewood cutting in old-growth forests would have a long-term negative impact on snag retention.

Alternative 5

The vegetation model predicts that large-snag density goals would be met in all fire regimes. Only salvage harvesting would be allowed under this alternative, and fire exclusion policies and suppression practices would continue. As a consequence, many areas would become dense mature forest and would remain that way until a stand replacement fire occurred. Intensive salvage logging of snag habitat would occur along forest roads. Pioneer or non-system roads could increase in order to access salvage areas, particularly in moderate terrain. It is possible, therefore, that areas with gentle to moderate topography could become devoid of large-snag habitat.

Table 4-27. Predicted amounts of large-snag habitat (as a percent of total fire regime acres) for Alternative 5.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	1.9	8.7	3.8
Long-term Model Prediction	42.2	29.5	30.1
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	NA	NA	NA

Down Woody Debris

Alternative 1

Down-woody-debris habitat goals would be achieved during the long-term period under this alternative. Restoration activities in the Nonlethal Fire Regime would likely result in less down woody material on the forest floor due to the frequency of prescribed fire and the gradual reduction in fuel on the forest floor. This could negatively impact species like Oregon juncos and hairy woodpeckers that use down woody material.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	1.3	8.9	3.5
Long-term Model Prediction	23.0	20.4	23.1
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	25-90	10-30	30-40

Table 4-28. Predicted amounts of down-woody-debris habitat (as a percent of total fire regime acres) for Alternative 1.

In the Mixed and Lethal Fire Regimes, natural processes would, over the long term, increase the level of down woody material on the forest floor. Clearcutting with post-harvest broadcast burning would serve to mimic natural stand replacement fire events. Rotation age would mimic natural fire return intervals, and units would be designed to imitate the size, shape, and arrangement of natural fragmentation patterns. The cycling of down woody material between cut and uncut stands would therefore be similar to that of the pre-contact era. During the long-term period, this alternative would increase potential habitat for a variety of animals, including pileated woodpecker, amphibians, southern red-backed vole, pine marten, fisher, lynx, black bear, and grizzly bear.

Alternative 2

In general, the impacts of Alternative 2 would be similar to those of Alternative 1 except that in the Mixed Fire Regime, treatments designed to address forest health concerns are expected to leave fewer acres of down-woody-debris habitat.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	1.5	9.3	3.9
Long-term Model Prediction	23.6	16.9	22.3
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	15-65	5-30	15-40

Table 4-29. Predicted amounts of down-woody-debris habitat (as a percent of total fire regime acres) for Alternative 2.

Alternative 3

According to the vegetation model, down-woody-debris habitat goals would be achieved over the long term. This alternative would seek to meet RMVs, but would also focus on improving stand health. In the Nonlethal Fire Regime under this alternative, the amount of down-woody-debris habitat would be higher than under Alternatives 1 or 2 because fewer acres would be subject to prescribed fire. However, this would deviate somewhat from the pre-contact condition. Stand health concerns may conflict with objectives to retain old-growth forest, which could ultimately lower the amount of potential down-woody-debris habitat.

Table 4-30. Predicted amounts of down-woody-debris habitat (as a percent of total fire regime acres) for Alternative 3.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	2.1	8.5	3.8
Long-term Model Prediction	31.1	17.6	19.4
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	22-44	5-30	10-35

Alternative 4

Relative to other alternatives, Alternative 4 would have a low percentage of down-woody-debris habitat. The emphasis on improving stand health and the short rotation periods would have a negative impact on down-woody-debris habitat. The fragmentation of existing down-woody-debris habitat would continue to increase.

Table 4-31. Predicted amounts of down-woody-debris habitat (as a percent of total fire regime acres) for Alternative 4.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	2.4	8.1	3.9
Long-term Model Prediction	16.5	14.6	19.7
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	NA	NA	NA

Alternative 5

The vegetation model predicts that Alternative 5 would have the highest levels of down-woody-debris habitat. It should be noted, however, that under Alternative 5 dead and dying timber would be salvaged. These stands contain the best down-woody-debris habitat. Therefore, there could be some conflict between down-woody-debris habitat goals and salvage targets. Access to salvage areas is expected to drop as roads are reclaimed by vegetation.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	1.9	8.7	3.8
Long-term Model Prediction	42.2	29.5	30.1
RMV	15-90	5-30	10-40
Existing Condition	1.9	4.3	3.8
Desired Condition	NA	NA	NA

Table 4-32. Predicted amounts of down-woody-debris habitat (as a percent of total fire regime acres) for Alternative 5.

Early-Seral/Forage Habitat

Alternative 1

Early-seral/forage habitat is projected to be higher under Alternative 1 than it would be under the other alternatives. This is especially true with the Nonlethal Fire Regime. The increase would benefit big game and many bird species, although some species, like white-tailed deer and black bears, may lose some cover as dense forest areas are thinned and burned. Early-seral/forage habitat is predicted to increase slightly in the Mixed Fire Regime and then fluctuate around the levels that currently exist. In addition, it is predicted that the level of fragmentation will decrease as managers restore pre-contact vegetative patterns on the landscapes.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	43.9	36.1	27.8
Long-term Model Prediction	44.5	29.1	12.9
RMV	30-100	10-60	15-55
Existing Condition	40.7	30.1	29.3
Desired Condition	45-100	25-55	15-55

Table 4-33. Predicted amounts of early-seral/forage habitat (as a percent of total fire regime acres) for Alternative 1.

The vegetation model predicts that early-seral/forage habitat will decrease gradually in the Lethal Fire Regime as succession proceeds. The decrease would reduce the amount of available forage for big game and breeding habitat for some early-seral wildlife species. According to the vegetation model, RMVs for this fire regime would not be met. However, the desired condition would allow more early-seral forage habitat than what the model predicts will occur.

During the short-term period, the effect of increases in early-seral/forage habitat will vary depending upon road densities and changes in grazing practices. Larger patch sizes in the Lethal Fire Regime will require lower road densities in order to provide security habitat for big game and grizzly bears. Otherwise, these species are less likely to move far into a large clearcut. Grazing intensity and duration in many areas of the forest would have to be reduced in order to provide necessary forage and ground cover for wildlife and to insure that fine fuels are available for prescribed burning. Critical areas include Valley Creek, Selow Creek, and the Lonepine area.

Alternative 2

The vegetation model predicts that this alternative would result in slightly less early-seral/forage habitat than Alternative 1 would. Fragmentation over the long-term period is predicted to decrease because harvest units will be designed to mimic natural patterns and disturbances. Most of the RMVs and desired condition goals would be met except in the Lethal Fire Regime.

Table 4-34. Predicted amounts of early-seral/forage habitat (as a percent of total fire regime acres) for Alternative 2.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term	38.7	38.9	28.6
Long-term	37.2	26.2	13.0
RMV	30-100	10-60	15-55
Existing Condition	40.7	30.1	29.3
Desired Condition	30-100	10-55	15-45

Alternatives 3

Stand health concerns and timber production goals would receive a high priority during harvest planning. According to the vegetation model, during the short term the amount of early-seral/forage habitat would be similar to that of today's forests. But over the long term, this type of habitat would gradually decline. Long-term projections do not meet the desired condition goals for the Nonlethal and Mixed Fire Regimes. Early-seral/forage habitat would not meet RMV levels in the Nonlethal Regime. This would have a negative impact on big game, as well as several nongame bird species.

Table 4-35. Predicted amounts of early-seral/forage habitat (as a percent of total fire regime acres) for Alternative 3.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	37.2	36.9	27.6
Long-term Model Prediction	22.5	24.2	16.6
RMV	30-100	10-60	15-55
Existing Condition	40.7	30.1	29.3
Desired Condition	50-92	30-66	15-55

Higher road densities under this alternative could lower the quality of early-seral/forage habitat by making many areas unavailable for wildlife due to a lack of security. Intensive grazing could also increase competition on winter ranges, especially in areas where restoration activities are planned.

The vegetation model predicted a gradual loss of early-seral/forage habitat in the Nonlethal Fire Regime during the short-term period. The loss should occur because there would be less of an emphasis on underburning and more acres of forest would receive the "no treatment" prescription. Only about 7% of the forested acres in the Nonlethal Fire Regime would be treated in any 10-year period. Continuous season-long grazing may reduce ground cover—grasses, forbs, and shrubs—and could eliminate forage and nesting opportunities for many species.

Alternative 4

Long-term model projections indicate that there would be a gradual decrease in early-seral/forage habitat. Most of the RMVs would be met except in the Lethal Fire Regime. The previous forest management plan used temporary even-aged management as a method to improve stand health, and during the past 10 years, early-seral/forage habitat increased. This apparent discrepancy is probably due to the anticipated shift toward more uneven-aged treatments under this alternative.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	39.0	36.5	28.0
Long-term Model Prediction	22.1	13.7	11.7
RMV	30-100	10-60	15-55
Existing Condition	40.7	30.1	29.3
Desired Condition	NA	NA	NA

Table 4-36. Predicted amounts of early-seral/forage habitat (as a percent of total fire regime acres) for Alternative 4.

Alternative 5

Early-seral/forage habitat levels are predicted to gradually decrease. RMVs and desired condition goals would not be achieved. The future of early-seral/forage habitats would depend on infrequent natural fires and low intensity salvage logging. The majority of the forest would develop into a mature forest. Road density would become lower over time as roads are abandoned. Species requiring large stands of mature forest and low road densities would benefit. Lower habitat quality and reductions in species diversity would likely result from this type of low-intensity management. This could have negative effects on big game, small mammals, and many bird species.

Table 4-37. Predicted amounts of early-seral/ forage habitat (as a percent of total fire regime acres) for Alternative 5.

	Nonlethal Fire Regime	Mixed Fire Regime	Lethal Fire Regime
Short-term Model Prediction	32.7	30.6	24.6
Long-term Model Prediction	11.5	6.3	4.6
RMV	30-100	10-60	15-55
Existing Condition	40.7	30.1	29.3
Desired Condition	NA	NA	NA

Issues Addressed During Scoping Process

Clearcutting and Even-aged Management

In this section, the early-seral/forage habitat parameter is used to assess the effects of clearcutting and other forms of even-aged management. Even-aged management, which includes clearcutting, is used as a forest management tool to harvest trees in an economically efficient way and to create stands of trees of the same size and age class. In some ways, it can simulate the effect of a stand replacement fire. However, even-aged management does not entirely duplicate the complex ecological processes associated with natural fire; processes like nutrient cycling and insect and disease control may not be replicated.

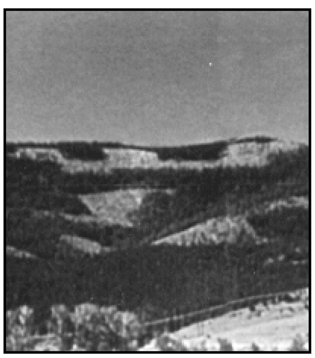


Figure 4-68. The effects of clearcutting on wildlife was a concern expressed during the scoping process.

The direct effects of even-aged management depend on an array of factors: the species of wildlife being managed, the size and shape of the harvest unit, the location of the unit as related to topography, the amount of edge habitat created, the juxtaposition of the unit in relation to other openings in the area, the amount of leave trees remaining after harvest, and the miles of open roads in the area. The method of removing the trees also influences the effects on wildlife. Skyline yarding, mechanized harvest, tractor yarding, and whole tree skidding all affect the impact on wildlife. Post harvest treatments also impact the effect of even-aged harvest on wildlife. Treatments such as slashing, thinning, dozer piling, and burning can have a major impact on the effect of timber harvest on wildlife.

Low levels of even-aged management within a mature forest matrix may favor late seral wildlife species such as pileated woodpecker and fisher. But these units may provide limited habitat potential for elk, mule deer, or ruffed grouse.

Moderate levels of even-aged management may benefit many early-seral wildlife species and provide an expanded forage base for big-game animals. If planned wisely, these units may retain late-seral forest cover and connectivity for other species.

Extensive even-aged management and associated fragmentation may favor only early- to mid-seral wildlife species such as song sparrows, snowshoe hare, and white-tailed deer. Extensive fragmentation from even-aged management may sever important wildlife movement corridors, eliminate old growth habitats, and increase mortality (through predation) for some wildlife species.

Indirect effects on wildlife include impacts from the roads needed to access areas. These roads increase human access and can lead to decreased habitat security, wildlife displacement, and increased human-bear conflicts. Roads may also act as an avenue for noxious weed introductions and allow easier access by cattle. Even-aged management can also increase water yields and sedimentation levels within a watershed and may have negative effects on riparian zones and wetlands.

Alternative 1

In the Mixed and Lethal Fire Regimes, this alternative would decrease fragmentation and restore forest connectivity in mid- and upper-elevation forests. It would also begin to restore late-seral and old-growth habitats. Even-aged management in these fire regimes would mimic the size, timing, and location of natural disturbances and would be used to replace partial stand replacement and stand replacement fire events. Clearcutting could displace some wildlife species for a long period of time—until the forest grows back to its pre-fire condition. These events would occur in some but not all watersheds within a landscape.

In the Nonlethal Fire Regime, the decrease in stand density will mean a change in the wildlife community, especially for birds and small mammals. Species that favor dense stands with young to mature trees will be replaced by species requiring open stands of large ponderosa pine. The level of fragmentation would be low in this fire regime.

A loss of hiding cover for big game will occur in the Nonlethal Fire Regime. At the same time, forage for big game species will increase. The increase in forage will have to be combined with effective road, weed, and grazing management if these habitats are to be restored for wildlife. Conditions for wildlife may never improve in areas that are near urban zones, that are intensively grazed, or that have serious long-term weed problems.

Biodiversity at the landscape scale would be enhanced under this alternative. In most habitats wildlife would benefit. However, benefits to old-growth wildlife habitats will take many years to develop.

Figure 4-69. Clearcuts can improve habitat for early-seral wildlife species and for species that require abundant forest edges. But extensive clearcutting can cause fragmentation and have negative effects on species that require late-seral habitats.

Alternative 2

In some parts of the Mixed and Lethal Fire Regimes, clearcuts designed to address stand health problems may increase fragmentation, which could further exacerbate problems for wildlife species that require large contiguous forest patches. Clearcuts will, however, mimic natural patterns and will improve habitat for early-seral wildlife species and species that require abundant forest edges. This alternative would have modest benefits for wildlife because it would restore some mature forest areas that are needed to maintain biodiversity.

Alternatives 3 and 4

The primary beneficiary of these two alternatives would be early-seral wildlife like white-tailed deer and snowshoe hare. Species requiring the structure and functioning of old-growth habitat would likely be negatively impacted.

Fragmentation is predicted to increase slightly in some areas. Under Alternative 3, the partial restoration of pre-contact forest patterns would also be emphasized. There would be limited habitat security for big game in some areas because of high road densities and smaller patch sizes. While restoration activities would occur under Alternative 3 in some areas of the Nonlethal Fire Regime, uneven-aged treatments would be emphasized over prescribed fire, which could decrease the effectiveness of habitat restoration for some wildlife species.

Alternative 5

The low level of harvesting expected to occur under this alternative would result in less open habitat and species diversity during the long-term period. However, in some areas of the forest, salvage logging could result in extensive clearcutting as periodic large stand replacement fires occur. These harvests would displace wildlife until a new forest develops.

Grazing

The effects of grazing on wildlife and wildlife habitat depend upon stocking rates, the season of use, slope, aspect, the number and location of water sources, and other factors. Cattle in steep mountainous areas and palouse prairie types can be difficult to manage. Riparian zones, wetlands, foothill grasslands, and mountain shrub communities are typically heavily grazed while upland areas may be left untouched. Some of the habitats cattle favor have the highest biodiversity in the western U.S. (Szaro 1980, Knopf 1985). Grazing can have serious negative impacts on how well these habitats function and can result in decreases in plant and animal diversity and altered successional patterns. Competition with big game on winter range occurs when livestock graze foothill areas intensively over an entire season and leave little forage for elk and deer during winter months (Holechek et al. 1982). Off-site water developments in riparian areas, upland water developments, fences, lower stocking rates, and efforts to drive cattle can decrease the impacts that livestock have on wildlife.

In certain situations, light to moderate grazing can benefit wildlife (Anderson and Scherzinger 1975). For example, cattle can remove rank vegetation and that can increase structural diversity in grassland communities. Water development projects for grazing may also benefit wildlife by providing a dependable water supply for waterfowl, big game, and nongame species. However, water development sites need to be carefully planned with controlled access for cattle. Otherwise, constant heavy use by livestock will negate any benefits to wildlife.

Indirect effects of grazing on wildlife habitat can include increases in cowbird parasitism on songbird populations (Rothstein et al. 1986, Dobkin 1992). Livestock grazing can also alter natural fire ecology patterns in fire-tolerant forested habitats, particularly ponderosa pine habitats. These forest types depend on frequent understory fires to maintain an open canopy, wide tree spacing, and a lush understory of grasses and shrubs. Heavy grazing eliminates fine fuels, decreases fire frequency, and increases the stem density of Douglas-fir stands. Where grazing is heavy fires occur less often and when they do occur, they are more severe (Bock et al. 1992, Belsky and Blumenthal 1997, Painter and Belsky 1993).

Alternative 1

A primary objective of this alternative is to improve and maintain the biodiversity of existing grassland types with an emphasis on enhancing the palouse prairie and intermountain grassland types native to the Reservation. This would be accomplished through the use of a variety of tools including riparian fencing, rest-rotation pasture systems, and adjustments in stocking rates and season of use. These tools would be applied on a case-by-case basis. Riparian fencing could have immediate benefits for wildlife if riparian vegetation is present. Many riparian types are quick to recover from intensive grazing once livestock have been excluded. Complete restoration may involve planting riparian species in reaches that have lost the ability to regenerate naturally.

In some areas, mountain grassland types and the wildlife communities associated with them would benefit from adjusting stocking rates and rest-rotation management. Grassland bird species would increase and spring habitat for grizzly bears and big game winter range would improve. Many areas, however, no longer support native vegetation, but have been taken over by nonnative grasses and noxious weeds. These areas also lack enough fine fuels to support prescribed or natural fires, which will make restoration difficult. In fact, native wildlife populations are not expected to fully recover under this alternative. However, the changes that would occur would be a significant improvement.

Alternatives 2 and 3

Under these two alternatives, riparian zones and mountain grassland areas would improve only slightly for wildlife. It will take decades to bring non-functioning riparian areas up to a functional condition. In order to restore riparian areas that are in extremely poor condition and that show no signs of shrub or tree regeneration, cattle may need to be excluded for several years, and the sites will need to be replanted with native species.

A primary objective of Alternative 1 is to enhance the palouse prairie and intermountain grassland types. Enhancing these native communities would benefit wildlife on the Reservation.

Alternatives 4 and 5

No change from the current condition is predicted under these two alternatives. Wildlife habitat would be of low quality in low to mid-elevation riparian and mountain grassland areas and areas where road densities are high and cattle have easy access. Competition with big game on traditional winter ranges would remain at high levels and would continue to have a significant impact on big game populations. Other native wildlife—upland game birds, song birds, reptiles, amphibians, and small mammals—would also be significantly impacted due to losses in vegetative structure and food, and lowered water quality caused by intensive livestock grazing.

Roads

The forest transportation system provides many benefits to the public. Roads are needed to access areas for logging, recreation, and traditional Indian uses of the forest. However, roads generally have a direct negative effect on wildlife because they destroy and fragment habitat and travel corridors, increase the vulnerability of game animals and threatened and endangered species, create avenues for noxious weed invasions, and increase livestock access into sensitive habitats. Most of the main access roads lie in creek bottoms. These roads have seriously impacted many of the Reservation's riparian zones and riparian wildlife communities.

Open road density (the number of miles of open road per square mile) is a measure of habitat effectiveness for big game (Christensen et al. 1993). As open road density increases, habitat effectiveness decreases. To increase habitat effectiveness, roads need to be closed either temporarily (with gates) or permanently (by ripping and seeding, or recontouring the road bed).

Alternative 1

Open road densities are expected to decrease significantly in all fire regimes. Habitat effectiveness would be increased to the following levels in each fire regime by 2029:

Fire Regime	Habitat Effectiveness
Nonlethal Fire Regime	40% (3 miles/sq. mile)
Mixed Fire Regime	40% (3 miles/sq. mile)
Lethal Fire Regime	50% (2 miles/sq. mile)

Security habitat for big game and grizzly bears would be high at mid and upper elevations and low to moderate at low elevations. Potential security habitat for nesting bald eagles would improve in some low elevation areas near large water bodies. Competition between livestock and big game would be significantly reduced due to restricted access in winter range areas and riparian zones. This would improve big game populations in many parts of the forest. Water quality improvements resulting from fewer riparian roads, reduced livestock access, and lower levels of siltation would benefit riparian wildlife.

Figure 4-70. Road density (the number of miles of road per square mile) is a measure of habitat effectiveness for big game. As road density goes up, the effectiveness of habitat goes down, as the graph on the facing page shows.

Alternative 2

Moderate decreases in open road densities are expected in the Lethal Fire Regime, while slight decreases are predicted for the Nonlethal and Mixed Regimes. The objectives for habitat effectiveness are:

Fire Regime	Habitat Effectiveness
Nonlethal Fire Regime	30% (4 miles/sq. mile)
Mixed Fire Regime	30% (4 miles/sq. mile)
Lethal Fire Regime	40% (3 miles/sq. mile)

This alternative would moderately increase security habitat for big game and grizzly bears at high elevations, but it would not significantly affect security at low to mid elevations. Security areas for bald eagles would be maintained where active nesting occurs. Some areas at low to mid elevations near large water bodies may not provide adequate security for new nest sites. There would be only small to moderate improvements in low elevation riparian habitats.

Alternative 3

The habitat effectiveness objective for this alternative is:

Fire Regime	Habitat Effectiveness
Nonlethal Fire Regime	30% (4 miles/sq. mile)
Mixed Fire Regime	30% (4 miles/sq. mile)
Lethal Fire Regime	30% (4 miles/sq. mile)

This alternative is similar to Alternative 2 except habitat effectiveness at upper elevations would be slightly lower. Big game would gain moderate benefits from increases in security during the summer months.

Alternative 4

Open road densities are expected to decrease slightly in all fire regimes. This would provide a low level of security for big game and grizzly bears. Competition between big game and livestock would continue. Riparian wildlife populations would continue to suffer at low and mid elevations. Habitat effectiveness objectives are:

Fire Regime	Habitat Effectiveness
Nonlethal Fire Regime	30% (4 miles/sq. mile)
Mixed Fire Regime	30% (4 miles/sq. mile)
Lethal Fire Regime	30% (4 miles/sq. mile)

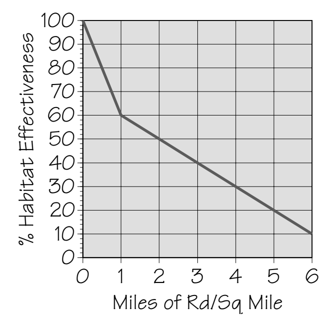


Figure 4-70a. The influence of open road density on habitat effectiveness for elk is shown in this graph. As road densities goes up, the effectiveness of the habitat drops off precipitously. For example, four miles of open road per square mile means that the habitat is only 30% effective.

Alternative 5

Open road densities are expected to significantly decrease in all fire regimes. These decreases would occur over an extended period of time as roads are abandoned. No short-term benefits for wildlife would be expected. The objectives for habitat effectiveness are:

Fire Regime	Habitat Effectiveness
Nonlethal Fire Regime	40% (3 miles/sq. mile)
Mixed Fire Regime	40% (3 miles/sq. mile)
Lethal Fire Regime	50% (2 miles/sq. mile)

Long-term benefits include significantly higher security for big game and grizzly bears. However, these benefits would be countered somewhat by losses in habitat diversity.

Threatened, Endangered, and Sensitive Species

Threatened and endangered species are legally protected under the Endangered Species Act. All Federal agencies are required to assess the impacts of land management activities on these species. Indian lands are held in trust for the Tribes, and therefore major land management decisions are considered Federal actions pursuant to Federal laws. On the Flathead Indian Reservation, four species of terrestrial wildlife are currently listed by the Endangered Species Act: peregrine falcon (endangered), bald eagle (threatened), Rocky Mountain wolf (endangered), and grizzly bear (threatened). The lynx has been proposed for listing as a threatened species.

A Biological Assessment was not prepared for this EIS because of the lack of specificity and spatial arrangement of the actions proposed. The Confederated Salish and Kootenai Tribes Fish and Wildlife Programs will maintain their compliance with Section 7 of the

Endangered Species Act by preparing Biological Assessments for all project-level actions that may affect endangered or threatened species.

Under Alternative 5, open road densities are expected to significantly decrease in all fire regimes. The decreases would occur over an extended period of time as roads are abandoned and reclaimed by vegetation.

Effects Common To All Alternatives

All alternatives would meet the intent of the Endangered Species Act. Any land management decision would maintain existing habitat for threatened and endangered species and insure population viability. Recovery plans for threatened and endangered species are assumed to be adequate in their ability to maintain existing habitat. However, many of the impacts affecting these species come from continued development on the Reservation and the increasing human population. Residential development along the base of the Mission Mountain Range and around Flathead Lake on both Tribal and non-Tribal lands will continue to jeopardize threatened and endangered species. These impacts are predicted to continue in the future but are outside the scope of this EIS.

Alternative 1

Some of the activities that would be carried out under this alternative, especially the restoration activities planned for the Nonlethal Fire Regime, could impact potential eagle habitat. Existing and potential eagle habitat in the Nonlethal Regime occurs in the Elmo-Big Arm area, at low elevations of the North Missions Landscape, and in the Lonepine area. All areas with nesting eagles would remain protected. Over time, restoration activities could improve eagle habitat by increasing the number of large ponderosa pine trees. Large pines are used by eagles for nesting and perching. In some areas, however, prescribed burns and silvicultural treatments may have to be delayed until the fall months to avoid disturbing nesting eagles.

Grizzly bear habitat would be improved with the restoration of forest structures and huckleberry patches, and the reintroduction of fire into high elevation whitebark pine forests. Reentry periods for harvesting would be tied to natural fire return intervals, which would increase security for grizzly bears, especially as open road densities decline. Restoration of foothill grasslands may also provide new spring forage opportunities for bears.

Figure 4-71. Bald eagles are one of four species of animals on the Reservation that are currently listed by the Endangered Species Act.

Restoration activities in the Nonlethal and Mixed Fire Regimes would reduce hiding cover and may lead to local population declines in white-tailed deer populations. These areas may then become more favorable for mule deer. If that happens, impacts on wolves would be minimal. But if total deer numbers decline, wolves will be impacted. The loss of hiding cover in some areas may be offset by the corresponding increase in forage. If the increase is coupled with sound grazing practices and better road management, deer populations could actually increase in many areas.

No impacts on peregrine falcons are predicted under this alternative. Most potential nesting habitat is in inaccessible areas of the forest like the Mission Mountains Tribal Wilderness, the Flathead River Corridor, South Fork Primitive Area, and Chief Cliff. Prescribed burning may have to be timed to avoid disturbing nesting peregrines in some areas.

Two primary components of lynx habitat are recognized and analyzed in a determination of the effect of a management action on lynx: denning habitat and foraging habitat. Denning habitat meets the criteria of old growth stands, whereas foraging habitat is typically thick, closed-canopied stands of lodgepole pine, alpine fir, and/or spruce—stands that favor the snowshoe hare, the primary prey of lynx. Foraging habitat for lynx would increase from the existing situation under this alternative, while denning habitat would decrease.

Alternative 2

The impacts to threatened and endangered species under this alternative are expected to be similar to those under Alternative 1, except there would be less restoration. Managers would use a mix of restoration-based harvest prescriptions (understory burning, broadcast burning) and more traditional treatments.

Alternative 2 would impact white-tailed deer less than Alternative 1. In the Nonlethal Fire Regime, more hiding cover would be retained under this alternative, particularly in areas that are not planned for restoration. The higher white-tailed deer populations may be more attractive for wolves. The increase in foraging habitat could be beneficial to grizzly bears and bald eagles. Foraging habitat for lynx would increase, and denning habitat would decrease, but the changes would not be as significant as under Alternative 1.

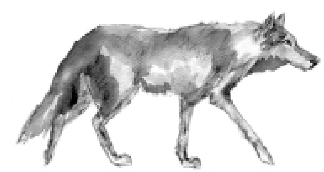


Figure 4-72. Wolves are likely to respond to fluctuations in deer populations. If structural changes in the forest increase deer populations, the numbers of wolves on the Reservation is expected to increase.

Alternative 3

In the North Missions, Mission, Jocko, and Salish Landscapes intensive forest management practices within bald eagle habitat could result in some indirect impacts on eagles. For example, thinning and overstory removals designed to combat stand health problems could reduce potential roosting and nesting cover. There would be fewer large snags retained because the forest would be managed in an early- to mid-seral state. Large snags provide important forage perches for eagles.

The high road densities predicted under this alternative will result in less security for grizzly bears and may increase bear mortality. Scarification practices to decrease vegetative competition and increase germination of conifers may result in a loss of berry-producing shrubs, a critical food source for grizzly bears. Large downed logs provide bears with insects and larvae. Downed logs may decrease as a result of intensive fuels management and conversion of the forest to early- and mid-seral stages. Impacts on wolves are not likely to occur through habitat alterations. Anticipated increases in white-tailed deer abundance may result in parts of the Reservation becoming more attractive to wolves. No impacts on peregrine falcons are expected under this alternative. Most potential nesting habitat is in inaccessible areas of the forest. These areas include the Mission Mountains Tribal Wilderness, the Flathead River Corridor, South Fork Primitive Area, and Chief Cliff. The effects of this alternative are similar to those of Alternative 1. There would be an increase in lynx foraging habitat and a decrease in denning habitat.

Alternative 4

Under this alternative, we anticipate the loss of some foraging habitat for wintering bald eagles in the Nonlethal Fire Regime. In the absence of forest restoration activities, the forest should become denser, and while this may improve the condition of roosting habitats, it could mean the loss of important foraging areas. In addition, logging to alleviate forest health problems could threaten the integrity of eagle habitat in some areas.

Grizzly bears and their habitats would be affected in parts of the Jocko, Missions, and North Missions Landscapes under this alternative. These impacts would be caused by habitat losses from certain logging and stand improvement activities, poor grazing practices, and an ineffective road management policy. Continued densification of the forest at low and mid elevations and intensive timber stand improvement practices in key berry-producing habitat would eliminate potential forage habitat for bears. High road densities within the forest and urban interface areas could lead to more human-bear conflicts, which may well increase bear mortality. A lack of big game security habitat in some landscapes caused by high road densities and an ineffective road management policy could indirectly affect wolf populations. Dense big game populations occur only in a few places of the Reservation, often near areas of human habitation. The re-colonization of these areas by wolves would probably lead to conflicts with livestock producers and illegal shootings. In more remote areas, wolves from packs adjacent to the Reservation will probably enter the Reservation sporadically. Peregrine falcon habitat would probably not be directly affected under this alternative. This alternative would result in a slight increase in foraging habitat for lynx, and a slight decrease in denning habitat.

Figure 4-73. Peregrines are not expected to be directly affected by any of the alternatives.

Alternative 5

The forest would become denser under Alternative 5, and that could improve eagle habitat over the short term by increasing roosting cover in the forests surrounding Flathead Lake. However, winter foraging habitat would be lost.

Grizzly bears would loose foraging habitat as the forest becomes more dense, something that has already occurred in the Missions Landscape. This trend would continue, and there would be additional losses in the North Missions and Jocko Landscapes. Road density is predicted to decrease slowly over time in some areas as forest roads begin to be reclaimed by vegetation. This would increase bear security, but without forage habitat bears may not benefit. Wolf and white-tailed deer populations could increase under this alternative in some areas. Deer populations could increase along mountain foothills and urban interface zones as hiding cover increases. Human habitations also provide security and nonnative food sources for deer. As the forest becomes denser at higher elevations, big game populations would decrease, and these areas would become less favorable for wolves. Peregrine falcon habitat would probably not be directly affected under this alternative, although the loss of bird and small mammal habitat may affect the prey base. Under this alternative, lynx foraging habitat would increase, as would lynx denning habitat.

Old Growth

Many species of wildlife require old-growth forest habitat. Usually, these species have narrow habitat tolerances and can only be found in old-growth conditions. A number of other species that do not rely on old-growth forest nevertheless use it, and it is an important component of their habitat.

In western Montana, old growth can take different forms. For example, an old-growth ponderosa pine forest looks very different from old-growth subalpine fir community. Old-growth pine can have a relatively simple structure—only 1 or 2 tree layers and an understory dominated by grass or shrubs. Old growth subalpine fir, on the other hand, may have 3 or more tree layers with spruce codominant in one or all of them and huckleberry bushes in the understory.

Historically, fire played a key part in maintaining some types of old growth; understory fires, for instance, perpetuated ponderosa pine and larch old growth. At the same time, stand replacement fires periodically destroyed other types of old growth, such as that found in subalpine fir forests. Insects, diseases, and windthrow increased the chances of wildfire and determined how extensively fire altered forest structures and composition. For information on the amount of old growth expected to occur under each alternative, see the vegetation section of this chapter.

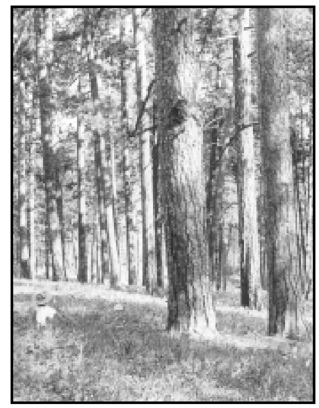


Figure 4-74. Old-growth pine stands like this one have only 1 or 2 tree layers and an understory dominated by grass or shrubs. Old-growth subalpine fir may have 3 or more tree layers and huckleberry in the understory.

Alternative 1

Old, moderate and closed canopy stands of ponderosa pine, western larch, spruce and lodgepole pine are predicted to increase during the long term. Many of these stands would provide habitat for old-growth dependent species. It would, however, take many years before these stands could develop on some landscapes. Old-growth patch sizes would be relatively large and kept in an unfragmented condition. This would restore habitat for many passerine bird species and small mammals, as well as denning and travelling habitat for lynx.

Ponderosa pine and dry Douglas-fir habitat types would be targeted for restoration in the Nonlethal Fire Regime. Restoration of these types would improve habitat for mule deer, elk, flammulated owls, and many other species. Other higher elevation types of old growth would have benefits for elk, bears, passerine birds, forest raptors, bats, and amphibians.

Alternative 2

Similar to Alternative 1, old-growth stands of ponderosa pine, western larch, spruce, and lodgepole pine are predicted to increase in the long term. Fragmentation is expected to be higher than it was during the pre-contact era, and patch sizes would be smaller. Some old-growth wildlife species will benefit from this alternative, particularly those that do not require extensive tracts of old-growth forest (areas greater than 1000 acres).

Restoration of old growth in some areas would take a considerable amount of time. Stands close to meeting the definitions of old growth but still considered late seral would be targeted for retention to meet old growth goals.

Alternative 3

This alternative is similar to Alternatives 1 and 2, except that old-growth stands of larch, spruce, and lodgepole pine are predicted to have smaller increases. Old growth structures, densities, and species compositions may be less like historic old growth than Alternatives 1 and 2 because less fire would be used under this alternative. More old growth would occur in the Mission Mountains Tribal Wilderness and the South Fork Primitive Area. Intensive forest management would maintain the majority of the rest of the forest in early- to mid-seral condition. Few objectives for old-growth wildlife would be implemented under this alternative. The exception would be areas where physical accessibility limits logging activity.

Alternative 4

Old stands of ponderosa pine, western larch, spruce, and lodgepole pine increase in this alternative as well, but to a much lesser extent than under Alternatives 1 and 2. Old-growth patterns, structures, densities, and species compositions would not appear like historic old growth. This would be especially true in the Nonlethal and Mixed Fire Regimes where fire would seldom be used. Most old growth would be relegated to wilderness and some roadless areas, places like the Missions Mountain Tribal Wilderness and the South Fork Primitive Area. Some roadless areas would be subjected to logging by roadless methods periodically, depending on market conditions. Old-growth wildlife habitat would receive a low priority, and associated wildlife populations would continue to decline.

Alternative 5

Old, moderate and closed canopy stands of all species (except lodgepole pine) are predicted to increase under this alternative. This would benefit several old-growth dependent species of wildlife—pileated woodpecker, fisher, and brown creeper are examples. Big game species, black bear and grizzly bear, and other species that require a more diverse forest would be negatively impacted.

Water

Summary of Key Effects

Watershed Condition and Aquatic and Riparian Impacts

Alternatives 1, 2, and 3 are designed to address aquatic and riparian ecosystem concerns. All three alternatives are expected to result in overall improvements in watershed condition. Aquatic and riparian ecosystems should also improve. Alternative 4 incorporates overall watershed concerns, but does not explicitly address aquatic and riparian ecosystems. Activities initiated under Alternative 4 are expected to maintain current watershed conditions or lead to further degradation. Alternative 5 would result in an overall improvement of watershed conditions, however aquatic and riparian impacts associated with grazing would not improve.

Figure 4-75. Impacts to instream water quality from forest practices are generally observed as elevated sediment loading, altered water temperatures, or elevated nutrient loading.

Sediment Loading

Sediment loading from roads would decrease incrementally under Alternatives 1, 2, and 3. Sediment loading under Alternative 4 would also decrease if the ongoing improvements occurring on the road network continue. Under Alternative 5, there would be a significant long-term decrease in sediment loading from roads.

Nutrient Loading

Fugitive dust and smoke significantly contribute to increases in nutrient loads in waterbodies, particularly open waterbodies like Flathead Lake. Alternatives 1, 2, and 3 call for an increase in prescribed burning, which will likely cause incremental increases in nutrient loading from airborne sources.

Grazing Impacts

Rangeland grazing, where livestock have unrestricted access to aquatic environments, can severely degrade instream water quality, inchannel habitat, and riparian conditions. Alternative 1 would increase livestock management efforts and seek to restore nonfunctional and at-risk riparian areas to their highest level of functionality. Grazing activities under this alternative have the potential to significantly improve aquatic conditions. Alternatives 2 and 3 would also increase livestock management efforts and would seek to restore riparian areas to a fully functional level. There should be incremental improvements in aquatic conditions under these two alternatives. Under Alternatives 4 and 5, aquatic conditions impacted by grazing are not expected to improve.

Cumulative levels of alteration to streamflow patterns

Potential forest management influences on streamflows are expected to improve for all alternatives except Alternative 4. Alternative 5 will have the least influence on streamflows, followed by Alternatives 1 and 2.

Water Quality Conditions

Water quality will improve with Alternatives 1, 2, and 5. Improvements will be less under Alternative 3. Alternative 4 will see the fewest improvements.

Aquatic Ecosystem Conditions

Improvement in aquatic ecosystems will be greatest under Alternatives 1, 2, and 5. Some improvement will occur under Alternative 3, and there would be very limited improvement under Alternative 4.

Figure 4-76. Alternatives were evaluated using the three major parameters: changes in streamflow patterns, aquatic ecosystem conditions, and water quality.

Assumptions

Since the proposed management actions are not spatially explicit, we assume that management activities will be approximately evenly distributed within watersheds in each landscape.

Active restoration activities, such as road closures or riparian prescriptions, will be completed with overall forestry sale activities within specific management areas and will be defined in project-level environmental assessments.

Limitations

Specific and spatially explicit outcomes, such as water yield increases, water quality impacts, and aquatic and riparian habitat improvement, cannot be evaluated without project-level management information. Based on this limitation, the section entitled *Effects on Key Hydrologic Parameters* describes relative trends in assessment parameters, and the degree of impact that each alternative will have relative to the existing condition and other alternatives.

Methodology

Alternatives are assessed by evaluating three key hydrologic parameters—cumulative levels of alteration to streamflow patterns, aquatic ecosystem conditions, and water quality conditions.

Parameters Used in the Analysis

Cumulative levels of alteration to streamflow patterns

Streamflows on the Reservation are regulated by snowmelt processes, and to a lesser extent, rain on snow runoff events. Forest management activities which can alter streamflow patterns include forest canopy removal, conifer densification, and construction of road networks.

Paired watershed studies in Colorado, California, and Oregon (Troendle and King, 1985; Keppelar and Ziemer, 1990; Harr et al., 1982) have demonstrated changes to streamflow patterns following forest management activities. However, as noted in MacDonald et al., 1991, the response is often difficult to predict and difficult to measure. Efforts to evaluate the change in streamflow response to forest management in Montana are limited. Recent work on the Kootenai National Forest (MacDonald et al. 1997) was not able to demonstrate a clear relationship between levels of forest management activity and peak streamflow response.

Conifer densification, generally a result of fire exclusion policies, may lead to increased onsite utilization of water for plant growth. The relationship between increased water use for plant growth and streamflow runoff is not well documented.

Road construction can influence streamflow response where roads intercept subsurface stormflow and where roads, through their decreased infiltration capacity, increase the amount of runoff. Roads that concentrate water and route it into the stream network increase the length of the channel network (drainage density), and this can increase the time of concentration of hillslope runoff in streams (Bowling and Lettenmaier 1997).

Aquatic ecosystem condition is evaluated as the sum of two components: channel complexity and riparian conditions. Because we lack spatial information about proposed activities, our analysis is based primarily on the intent of the alternatives.

Water Quality Conditions

Forest and grazing management activities may lead to water quality impairment. Water quality parameters that are most responsive to these activities include suspended or fine sediment concentrations, elevations in nutrient concentrations, and changes in water temperature.

Suspended and fine sediments are primarily added to Reservation streams from road prisms, stream crossings, and riparian grazing. Debris flows and earthflows are rare and are not considered a major source of fine sediment. One of the primary intentions of the Tribes' BMPs is to reduce or eliminate fine sediment introduction into streams.

Removal of riparian vegetation can lead to increases in summer water temperatures and decreases in winter water temperatures (MacDonald et al. 1991). Although historic riparian harvest was extensive on the Reservation, most stream corridors on the Reservation currently maintain an overstory canopy. This, combined with the relative small size of most watersheds and length of stream channels, moderate forest management influences on water temperature.

Nutrients—nitrogen and phosphorus—may increase following forest management activities. MacDonald et al. (1991) and Salminen and Bestcha (1991) indicate that forest management activities do not substantially influence phosphorus loads to streams. Macdonald et al. (1991) reports increases in nitrate-nitrogen following forest management activities, particularly burning, but nitrate-nitrogen levels generally return to pre-disturbance concentrations shortly after harvesting.

Aquatic Ecosystem Conditions

Aquatic ecosystems can be degraded by a number of riparian activities including harvest, road construction and stream crossings, and grazing. Aquatic ecosystems may also be degraded by off-site activities that alter either the water or sediment budget in a stream system. Examples include elevated sediment loading from drainage control features or stream channel adjustments following changes in peak streamflows.

Aquatic ecosystem condition is evaluated as the sum of two components: channel complexity and riparian condition.

Channel Complexity

Channel complexity is a term which is defined within the context of the stream-floodplain environment being evaluated. A high gradient, alpine stream may intrinsically have less channel complexity that a low gradient stream with a wide floodplain.

A set of criteria to define channel complexity are outlined below. As more monitoring data become available and our understanding of aquatic interactions evolves this definition may be refined. Channel complexity can be defined by the following measurable aquatic and riparian criteria.

Figure 4-77. Airborne nutrient sources derived from dust or smoke can add unwanted nutrients to open water bodies like Flathead Lake.

- Width of accessible floodplain and fluvial geomorphic features found in the floodplain environment. Geomorphic features may include cutoff channels, wetlands, or surface water/ground water interaction zones.
- Variability in streambed elevation in a downstream direction is a surrogate measure for the longitudinal diversity of the bed and indirectly hydraulic, depth, and habitat diversity.
- The amount, quality, and diversity of inchannel habitat features including pools, riffles, tailouts, side channels and other habitat features provides a measure of channel complexity.
- Substrate patchiness, or the variability in particle size distribution on the bed surface partly accounts for substrate habitat diversity and the amount of fine sediment covering or infiltrating into the streambed.
- Large woody debris in the channel and the potential for continued large woody debris recruitment are significant components of channel complexity in forested streams.
- Bank margin diversity, including overhanging banks, roughness elements on banks, and bank cover characteristics are a component of channel complexity.

Riparian Conditions

Riparian conditions are evaluated utilizing the riparian condition (Hanson et al. 1995). The CSKT maintain an ongoing effort to complete riparian functional assessments in forested watersheds.

Assessment Metrics

The following tables contain assessment metrics which are used (along with the intent of each alternative) to evaluate the effects of each alternative on the key hydrologic parameters.

A1 and A2 Seral Clusters

Fire Regime	Current Condition	Short-Term Model Prediction	Long-Term Model Prediction	Short-Term + Long-Term
Alternative 1				
Non-Lethal	32.5%	39%	26.1%	65.1%
Mixed	18.1%	20.7%	9.2%	38.8%
Lethal	12.1%	10.6%	4.5%	15.1%
Alternative 2				
Non-Lethal	31%	31.4%	21.5%	65.1%
Mixed	18.1%	19.5%	8.5%	28%
Lethal	12.1%	12.4%	4.5%	16.9%
Alternative 3				
Non-Lethal	29.1%	26.6%	3.4%	30%
Mixed	18.1%	19.3%	7%	26.3%
Lethal	12.1%	9.7%	6.6%	16.3%
Alternative 4				
Non-Lethal	29.1%	27.1%	3.9%	31%
Mixed	18.1%	16.3%	2.4%	18.7%
Lethal	12.1%	10.1%	2.8%	12.9%
Alternative 5				
Non-Lethal	29.1%	20.1%	0.7%	20.8
Mixed	18.1%	7.2%	0.6%	7.8%
Lethal	12.1%	7.2%	1.2%	8.4%

Table 4-38. The acreages in A1 and A2 clusters by fire regime for Alternatives 1 through 5. These two clusters have the greatest hydrological impact because they can modify stream runoff characteristics.

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Short-term Projection	2,355	3,865	3,315	6,450	685
Long-term Projection	3,315	4,740	4,735	10,025	1,170

Table 4-40. Accumulated harvest acres for each alternative. All types of harvest treatments are included. Harvest acres are expressed in units of acres per year.

Table 4-41. Predicted road densities for each alternative. These are future densities expressed as miles of road per square mile.

Road Density

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Total Road Miles	2,555	2,729	2,919	3,024	1,378
Total Road Density	5.7	6.0	6.3	6.5	3.0

Table 4-42. Predicted smoke emissions coming from prescribed fires for each alternative. Emissions are reported in tons per year of total suspended particulates.

Smoke Emissions from Prescribed Fires

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Short-term Predition	947	887	713	467	142
Long-term Prediction	707	574	414	351	61

Table 4-43. The relative level of improvement in riparian condition that is expected to occur under each alternative based on grazing management objectives

Grazing Impacts on Riparian Areas

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Predicted Level of Improvement	Greatest	Improved	Improved	No Change	No Change

Effects on Water

Alterations to Characteristic Streamflow Patterns

Based on harvest acres and projected road density, the alternatives would influence streamflows in the following order: Alternative 4 > Alternative 3 > Alternative 2 > Alternative 1 > Alternative 5. There is the potential that there would be a higher incidence of wildfire under Alternative 5 which may increase the impact of streamflows in individual watersheds.

Aquatic Ecosystem Complexity

Alternative 1

The intent of Alternative 1 is to remove roads that are severely impacting aquatic environments and to manage grazing to significantly reduce impacts on aquatic environments. These steps, combined with an objective to restore riparian areas, suggest that under Alternative 1 there would be a long-term trend of increasing aquatic ecosystem complexity. Over the short-term, aquatic ecosystem complexity will probably not increase; too much time is required to develop fully functional aquatic environments.

Alternative 2

The intent of Alternative 2 is to remove 100 percent of roads that are severely impacting aquatic environments, to manage grazing to reduce impacts on aquatic environments, and to restore riparian areas. Here, too, we predict a long-term trend of increasing aquatic ecosystem complexity, although the increase will be slightly less than it would be under Alternative 1.

Alternative 3

The intent of Alternative 3 is to remove 60 percent of road systems that are severely degrading aquatic resources. Grazing management will reduce impacts in riparian areas. We predict some increase in aquatic ecosystem complexity, but the trend will be slow relative to Alternatives 1 and 2.

Alternative 4

Alternative 4 would remove 50 percent of the road systems that are severely degrading aquatics. Grazing management would remain as it is under the current condition. We anticipate that increases in aquatic ecosystem complexity would not be observable over the long-term planning horizon.

Alternative 5

Under Alternative 5, about half of the road network would gradually be reclaimed by nature. Grazing management would remain as it is under the current condition. We anticipate that aquatic ecosystem complexity would increase under these conditions, but improvements would come slower than they would if modifications to grazing management were also made.

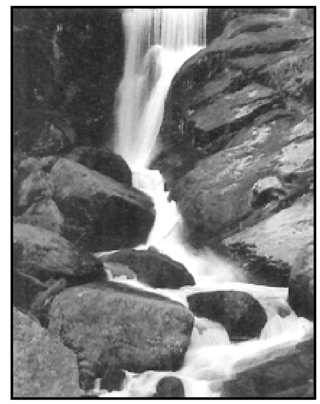


Figure 4-78. Sediment and nutrient loading associated with fine sediment from roads and riparian grazing activities are among the major water quality concerns.

Water Quality

Alternative 1

Sediment and nutrient loading associated with fine sediment from roads and riparian grazing activities should decrease over the long-term under Alternative 1. Over the short-term, sediment from the existing road network and grazing units will continue to reach the aquatic environment.

Under this alternative, the prescribed burning program would produce the most total suspended particulates, and therefore it has the greatest potential to increase the airborne load of bioavailable nutrients to waterbodies.

Alternative 2

Sediment and nutrient loading associated with fine sediment from roads and riparian grazing activities should decrease over the long-term planning horizon under this alternative. Over the short-term, sediment from the existing road network and grazing units will continue to impact streams.

The prescribed burning program will produce the second greatest quantity of total suspended particulates, and this alternative has the potential to increase nutrient loads to open waterbodies.

Alternative 3

Sediment and nutrient loads from the road network will be reduced, but the magnitude of the reduction will be limited and close to current conditions. Total suspended particulate smoke emissions will increase from the current condition, and there is some potential that there will be an increase in nutrient loads to waterbodies from airborne sources.

Alternative 4

Sediment and nutrient loads from the road network and riparian grazing activities would not be reduced from their current condition. Smoke emissions and airborne nutrient loads to open waterbodies would parallel the current condition.

Alternative 5

Water quality conditions would improve significantly under this alternative due to the retirement of the road network and the potential overall decrease in airborne smoke emissions.

Fisheries

Introduction

The primary influence that resource management has on the forest and its associated aquatic environment results from timber harvesting, grazing, and water diversions. The sum of the effects from these three activities is almost always detrimental to stream-dwelling organisms that require clean and cold water. The effects of the alternatives range from a modest improvement over the current condition to continued degradation.

Water diversions for irrigation can obstruct fish migrations, reduce flows, result in fish being lost into canals, increase pollution (when return flows meet stream channels), and cause channel adjustments (when used for conveyance). All of these impacts would exist under all of the alternatives, and therefore they will not be addressed in this analysis.

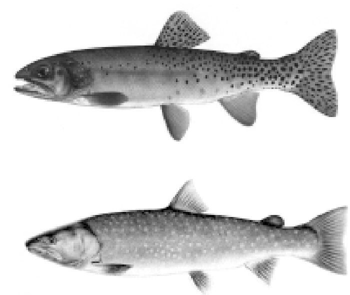


Figure 4-79. Westslope cutthroat trout (top) and bull trout (bottom) are two species sensitive to road densities in the forest.

Summary of Key Effects

Summary of Key Effects to the Aquatic Environment

Substrate condition should improve under Alternatives 1 and 5. This prediction is based on anticipated reductions in road miles, improvements in road standards, and improvements in bank stability resulting from adjustments in grazing management. At best, only small improvements are expected under Alternative 2. Alternatives 3 and 4 are predicted to result in further degradation of substrate condition due to increases in road miles and smaller investments in road improvements relative to the other alternatives.

Riparian condition should improve the most under Alternative 1, followed by Alternatives 2, 3, and 5. These improvements would be the result of improvements or changes in livestock management or, in the case of Alternative 5, reductions in road access. Alternative 4 would perpetuate the current condition.

Channel complexity and alterations to streamflow characteristics have a large influence on fish habitat. Both are addressed in the preceding section on water.

Summary of Effects to Fisheries

Alternative 1, which would have the least impact on the aquatic condition, has the potential to improve channel dimension and fish habitat. While the aquatic biological potential would improve, it would not reach the level of the pre-contact era. One of the objectives under this alternative is to restore four populations of native species. This should be achievable with the predicted improvement in aquatic condition and the investment in restoration.

Alternative 2 would have the third greatest impact on the aquatic condition. Aquatic biological potential would likely be maintained at current levels or could possibly improve with increased investments in mitigation. Alternative 2's restoration objective is to reestablish three populations of native species. This should be achievable if, as predicted, the aquatic condition is maintained or improved and the proper investment is made in restoration.

Figure 4-80. While managers emphasize native species, nonnatives like these brook and rainbow trout also occur in streams and lakes within the forest.

Alternative 3 would have the second greatest impact on the aquatic condition. Aquatic biological potential will likely decrease, and may even jeopardize the continued viability of some fish populations. The objective to restore two populations of native species may be achievable; many of the predicted impacts are not large in magnitude, and their spatial distribution could minimize impacts within specific watersheds.

Alternative 4 is expected to have the greatest impacts on the aquatic condition. Aquatic biological potential would likely decrease and may jeopardize the continued viability of some fish populations.

Alternative 5 would have the fourth greatest impact on the aquatic condition. Like Alternative 1, this alternative also has the potential to improve channel dimension and fish habitat relative to the existing condition. While aquatic biological potential would likely increase, it would not improve to the level of the pre-contact era.

Threatened Species

On the Flathead Indian Reservation, the bull trout is currently listed by the Endangered Species Act as a threatened species. Of the five bull trout populations on the Reservation, the population that resides in the Jocko and Flathead Rivers is most subject to being influenced by forestry activities. The reduction in roads and grazing planned under Alternatives 1 and 5 should improve conditions for bull trout and allow for the maintenance or restoration of segments of this population. Alternative 2 is not likely to appreciably improve conditions for bull trout, but it is also not likely to foreclose any options for restoration or for the maintenance of the population. Alternatives 3 and 4 would continue to reduce the quality of habitat for bull trout and would require that the impacts be addressed from a spatial standpoint to protect specific bull trout habitats.

Assumptions

We assume that timber harvesting activities, when conducted within the bounds of the historic natural variation of forest structure and under the direction of Best Management Practices (BMP's), will have a minor effect on watershed processes relative to the much larger effects of roading and grazing. This assumption is partly substantiated by the rarity of mass wastes associated with timber cutting on the Reservation.

We assume that fish populations in streams are at least partly controlled by habitat and that fish habitat in turn is at least partly controlled by roading and grazing. Habitat is one of many factors that control fish abundance (Fausch et al. 1988). Many of the controlling factors—the scale of habitat available to a population, fragmentation of life-history-specific habitats, the presence of exotic species—are independent of forestry impacts. Additional controlling factors are downstream dams, point-source water quality degradation, angler harvest, and catastrophic weather events.

Methodology

Timber harvest activity, with its associated road building and soil disturbance impacts, modifies watershed processes by changing erosion and runoff rates. In theory, Alternatives 1, 2, and 3 will modify vegetative cover and density within the ranges experienced during the pre-contact era. The location of harvest units within a watershed has the potential to impact the aquatic condition. But because site specific concerns (or the spatial arrangement of activities) will be addressed at the project level, rather than at this planning level, timber harvesting by itself is not expected to be the cause of abnormal change in aquatic condition. Therefore, outputs from the vegetation model are not used in this analysis.

Instead, our analysis is based on a subjective evaluation of the major human activities responsible for changes in channel condition: road building and cattle grazing.

Road networks within a drainage have the potential to severely modify watershed processes. Therefore, this assessment is based primarily on the scale of roading. The impact that roads have on aquatic systems has been thoroughly researched. The data show that roads: (1) increase peak flows (Jones and Grant 1996), (2) increase sediment delivery to the channel (Furniss et al. 1991), (3) increase drainage network and efficiency (Wemple et al. 1996), (4) present barriers to fish passage (Baker and Votapka 1990), and (5) by association are related to decreases in native fish populations (Quigley and Arbelbide 1997). Our prediction of impacts is based primarily on the miles of road on the landscape, and, secondarily, on the effects of grazing. Predictions of future road densities are based on four factors: (1) current densities, (2) proposed standards governing the spacing of roads to be built in the future, (3) future modifications to the spacing of existing roads, and (4) acres of designated roadless areas within the landscape. All four of these factors vary by alternative.

Predicting Road Densities

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Predicted future road density	5.67	5.99	6.29	7.09	2.97
Protected roadless acres	106,440	60,179	0	0	0
Percentage of lands currently roaded that will be modified to higher road spacing	20	15	10	0	0
Future road spacing in unroaded commercial acerage	1500 ft	1200 ft	1000 ft	746 ft	0

See Appendix K for further explanation of the method used to estimate future road miles within each landscape. Because roading accelerates erosion and delivery rates, we chose to monitor its affect by measuring stream substrate condition.

Table 4-44. Predictions of future road densities by alternative.

Figure 4-81. Timber harvesting activities, when conducted within the bounds of the historic natural variation of forest structure and under the direction of Best Management Practices (BMP's), will have a minor effect on watershed processes relative to the much larger effects of roading and grazing.

Stream Substrate Condition

Fine sediments are recruited from throughout the watershed and streambanks and deposited in stream channels. Peak flows move bedload and transport fine sediments downstream so that a balance is maintained between runoff and sedimentation. When the accumulation of fine sediments exceeds the natural flushing capacity of a stream, biological impacts result. Accumulations of fine sediments reduce hatching and emergence success of fish by reducing flow through the gravel where fish lay their eggs. They can also reduce fish food by reducing habitat for aquatic insects.

Tribal Forestry BMP's do not allow equipment operation in riparian areas, and only allow the harvest of trees in riparian areas when densities exceed that necessary to meet old-growth guidelines. Grazing rather than timber harvest is therefore the activity most likely to modify riparian vegetation. Predictions of riparian impacts from grazing are based on range condition and riparian area goals. When grazing occurs for extended periods (season long) or intensively (large numbers of animals per acre) there is a reduction in plant density and community type along the stream corridor. These vegetative changes result in a loss of stream bank strength or stability, which in turn increases the sediment generated from the banks. In response the channel adjusts to a wider and shallower dimension, conditions that are less productive for fish (Platts and Nelson 1985). Additionally, any reduction in streamside vegetation reduces cover for fish (Hunt 1976), shading (Platts and Nelson 1989), and the availability of fish food and organic matter such as insects and leaf litter (Chapman and Demory 1963, Cummins 1974). These changes degrade fish habitat, raise water temperature, and reduce carrying capacity for fish. Severe grazing may affect the large woody debris component of channel complexity by reducing regeneration of woody shrubs and conifers. Grazing has the potential to reduce density and diversity of riparian vegetation. Its impact can be monitored by measuring riparian condition.

Riparian Condition

Repeated grazing causes changes in the density and composition of riparian vegetation. These factors and several others are measured in an assessment procedure designed by the University of Montana Riparian and Wetland Research Program. Riparian vegetation performs valuable functions such as maintaining bank stability; stream shading; filtering runoff; and contributing physical, chemical, and biological inputs to the channel.

Other parameters useful in monitoring changes in fish habitat are channel complexity and alteration in streamflow characteristics. These are presented in the Water section of this chapter.

Limitations

This evaluation is intended to provide a relative comparison at a level sufficient to discern between the five alternatives. It provides a subjective evaluation of the direction of change and a simplistic estimate of the degree of change. The complexity of processes controlling the chosen parameters makes it impractical to achieve a more accurate prediction of change. It would also be potentially misleading considering the possible errors. The impacts to fish habitat resulting from management-related activities are not direct, but rather secondary or tertiary responses, which further complicates the analysis. For example, vegetation change does not directly change stream dimension, but may alter erosion and runoff patterns that in turn cause channel changes.

This evaluation is based on our estimate of the average condition across the entire forest and on a gross estimate of the sum of all activities. The relative mix of management-related activities and impacts will vary spatially, but those variances are not addressed in this analysis because there is no spatial component to the projection of future activities. Therefore impacts are not expected to be uniform across the forest. The potential for unacceptable impacts related to the spatial arrangement of activities will be addressed at the project level rather than in this planning process.

Effects

Stream Substrate Condition

Stream substrate condition is expected to change in the future to differing degrees by each alternative:

Predicted Changes in Stream Substrate

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Substrate Changes	+	0	0	--	++

Table 4-45. In this table the plus symbol indicates improvement in substrate condition, 0 no change, and the minus symbol a reduction in quality. Double symbols indicate a stronger response.

The estimations of change in substrate condition are based primarily on predicted road miles and planned road upgrades which are shown in table 4-46.

Road Miles, Planned Upgrades, and Predicted Future Road Densities

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Current road miles	2756	2756	2756	2756	2756
Future road construction	78	129	207	268	0
Future road reduction	279	157	44	0	1378
Final Road Miles	2555	2729	2919	3024	1378
Percent of road segments to be upgraded	100	80	70	50	0
Predicted Future Road Density	5.67	5.99	6.29	6.52	2.97

Table 4-46. The predictions in table 4-45 are based on the miles of road, planned additions and reductions, and upgrades shown here.

Based on predicted reductions in road miles and the expected improvement in road standard under Alternative 1, Alternatives 1 and 5 are expected to improve substrate condition. Alternatives 2 and 3 are expected to cause a small improvement or no change in substrate condition because only small changes in future road miles are projected. Alternative 4 is expected to degrade substrate condition because a larger increase in road miles is expected.

Riparian Condition

The alternatives are expected to have different effects on riparian condition:

Table 4-47. The plus symbol indicates improvement, the O no change in the quality of riparian condition. Double symbols indicate a stronger response.

Predicted Changes in Riparian Condition

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Riparian Condition	++	++	+	O	+

Alternative 1 calls for substantial improvements in riparian condition. These changes will improve fish habitat. Alternatives 2 and 3 call for similar improvements, but to a lesser degree than Alternative 1. Alternative 4, as a continuation of past practices, would attempt to reduce impacts only in sensitive areas and would have fewer livestock management tools at its disposal. It would perpetuate the current condition rather than facilitate any improvement. Alternative 5 would not employ any of the improved management practices planned under Alternatives 1, 2, and 3, but would result in reduced levels of livestock access over the long term. This is because under Alternative 5, a substantial percentage of the roads are expected to close with time, and this should facilitate an improved riparian condition.

Threatened Species

Of the five bull trout populations on the Reservation, the population that resides in the Jocko and Flathead Rivers is most subject to being influenced by forestry activities. (Most of the bull trout's range on the Reservation is within the forks of the Jocko River, in areas that are classified as noncommercial lands.) Our evaluation of the alternatives is based on the expected impacts on the Jocko-Flathead River population.

Bull trout are very sensitive to the parameters chosen for analysis. The reduction in roads and improvements in grazing management that would occur under Alternative 1 should improve conditions for bull trout and allow for the maintenance or restoration of segments of this population. Alternative 5, with its significant reduction in road miles, would yield a similar result. Alternative 2 is not likely to appreciably improve conditions for bull trout, but it is also not likely to foreclose options for restoration or for the maintenance of the population. Alternatives 3 and 4 would continue to reduce the quality of habitat for bull trout and would require that the impacts be addressed from a spatial standpoint to protect specific bull trout habitats.

A Biological Assessment was not prepared for this EIS because of the lack of specificity and spatial arrangement of the actions proposed. The Confederated Salish and Kootenai Tribes Fish and Wildlife Programs will maintain their compliance with Section 7 of the Endangered Species Act by preparing Biological Assessments for all project-level actions that may affect endangered or threatened species.

Scenery and Recreation

Summary of Key Effects

The scenic quality of a forest is affected by the interaction of a variety of factors, including roads, the presence of natural areas, the extent to which the overall pattern of vegetation appears natural and is perceived to function in a natural way, the type and frequency of silvicultural treatments, the amount of old growth, the number of acres burned, the condition of streams, the amount of grazing, and smoke from both planned and unplanned fires. Recreational opportunities are affected by many of these same factors as well as by the number of open roads; the acres of formally designated wilderness; Limited Public Access areas; and fishing, hunting, and wildlife viewing opportunities. The affects of these factors on scenery and recreation are summarized below.

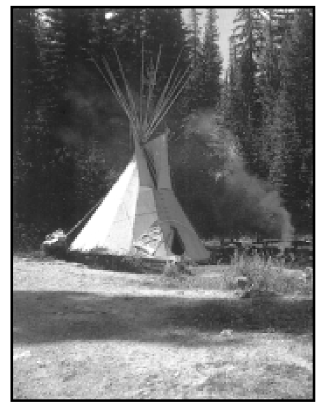


Figure 4-82. Alternatives 1 and 2 call for the most aggressive trail and campsite maintenance and monitoring programs.

The Scenic Impact of Roads

Roads have a major impact on scenery. Alternative 5 would decrease total road densities the most and so it would have the least impact on scenery. It would be followed by Alternatives 1, 2, 3, and 4, respectively. All the alternatives except Alternative 4 would require that any new roads that are constructed would have to meet Scenic Integrity Levels (SILs).

Recreational Access

Open road densities (as opposed to total road densities) would decrease the most under Alternatives 1 and 5. Alternative 2 also proposes a decrease in the Lethal Fire Regime. Otherwise, the reductions proposed are modest.

Alternatives 1, 2, and 3 would establish Limited Public Access Areas in five Reservation landscapes. These areas would decrease recreational opportunities for non-Tribal members but increase the quality of recreational experiences for Tribal members.

Trails and Campsites

Alternatives 1 and 2 call for the most aggressive trail and campsite maintenance and monitoring programs. Alternatives 1, 2, and 3 would enhance winter recreational opportunities with the addition of cross-country ski and groomed snowmobile trails. They would also add two new interpretive trails and develop and implement a fee system for trail use, the revenues from which would help to fund the Tribes' trail maintenance program.

Roadless and Wilderness Areas

Only Alternatives 1 and 2 would protect roadless acreage from future roading. Alternative 1 would prohibit roading on 68,245 acres in ten areas. Alternative 2 would prohibit roading on 33,118 acres in eight areas. Only Alternatives 1 and 2 designate more wilderness acreage; Alternative 1 adds 38,191 acres of Tribal wilderness, Alternative 2 adds 26,969 acres.

Naturalness of the Forest

The forest structures that would result from the implementation of Alternatives 1, 2, and 3 would appear and function more naturally than the existing forest. Over the long term, Alternative 1 would likely result in the most "natural" appearing forest, followed by Alternatives 2 and 3. Harvesting activities under Alternatives 1, 2, 3, and 5 would meet Scenic Integrity Levels (SILs), and Alternatives 1, 2, and 3 would visually rehabilitate selected areas that have been heavily impacted by logging in the past.

Silvicultural Prescriptions

Timber harvesting has a major impact on scenery. Harvesting under Alternative 5 would be limited to salvage operations and would have minimal impact on scenery. The vegetation model predicts that among the remaining four alternatives, Alternative 1 would emphasize underburning and thinning more than the other alternatives. Alternative 2 ranks first in the acres that would undergo even-aged treatments. Alternative 4 ranks first in uneven-aged treatments. Alternative 1 would have the longest reentry periods, followed by Alternatives 2, 3, and 4, respectively. Alternative 1 would also have the least obtrusive type of site preparation and has the lowest level of salvage recovery, followed by Alternatives 2, 3, and 4, respectively. In addition, Alternative 1 would produce the most smoke from planned burns, followed by Alternatives 2, 3, 4, and 5 respectively.

Woodland and Interior-sod Restoration

Over the short term, woodland and interior-sod (grassland) restoration will have negative impacts on scenery. Over the long term, however, these restoration efforts will enhance scenery. Only Alternatives 1 and 2 would restore grasslands and woodlands. Alternative 1 would restore 16,912 acres, while Alternative 2 would reclaim 8,653 acres.

Riparian Restoration

Riparian areas are important to recreationists. Alternative 1 would restore riparian areas to the highest level of functionality followed by Alternatives 2, 3, 5, and 4, respectively. Alternative 1 calls for the most fish restoration work, followed by Alternative 2.

Grazing

Alternative 1 would have the most positive visual impact on grazing lands, followed by Alternatives 2, 3, 5, and 4, respectively.

Assumptions

Major Assumptions

Natural Appearing Forests

For most observers, the most pleasing landscapes are those that both appear natural and function in a natural way. We assume that there is an emerging public consensus that a natural functioning forest is one in which the pattern of vegetation reflects pre-European disturbance patterns. These disturbance patterns differ by fire regime. Based on our research and modeling we estimate the following disturbance frequencies and patch sizes for each fire regime:

- Nonlethal: fire events generally disturbed 100% of the stands in which they occurred, killed fewer than 10% of established trees, and resulted in continuous, open, parklike stands. Fire frequencies ranged from 0 to 25 years.
- Mixed: fire severity in this regime was variable with stand mortality ranging from 10 to 90%, although, at times, individual patches of .5 to 200 acres experience either nonlethal or stand replacement levels of stand mortality. Fire frequencies were variable and fluctuated between 35 to 75 years.
- Lethal: stands suffered greater than 90% stand mortality after any fire event. Patch sizes ranged from 25 to 500 acres except in lodgepole stands where patch sizes ranged from 100 to 10,000 acres. Mosaics left residual trees or thickets .5 to 1 acre in size. Fire frequencies ranged from 100 to 250 years.

Our assumption is that, for most observers, the most pleasing landscapes are those that both appear natural and function in a natural way, and we assume that there is an emerging public consensus that a natural functioning forest is one in which the pattern of vegetation reflects pre-European disturbance patterns.

Clearcuts

Geometrically shaped clearcuts with sharp edges are noticed immediately by most people and generally strongly disliked. Other forms of logging, if noticed, also tend to be disliked by most forest visitors but are not perceived as negatively as clearcuts. On the other hand, selective logging or clearcuts designed to look like natural openings are often perceived as natural when viewed from background or midground distances, especially after ten to fifteen years of regrowth, and can even enhance the visual quality of an area by adding texture, variety, and color to a landscape. We assume the public will become more accepting of natural-appearing forest openings as their understanding of the role of fire in forests increases and as their knowledge of pre-European forest conditions grows.

Natural Areas

Most visitors can detect “natural” or undeveloped areas of a forest. Surveys show that an overwhelming majority of visitors view these areas in a highly favorable light and consider them to be an important aspect of the scenic beauty of an area. When they know that a particular "natural area" has been formally designated as wilderness, an even greater majority views it favorably.

Old Growth

Old growth forests are also viewed favorably by most visitors. Parklike stands of large, old ponderosa pine trees are considered very attractive by the vast majority of forest visitors.

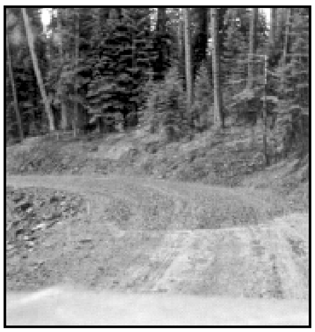


Figure 4-83. An individual's attitude toward roads depends on his or her perspective. For some, roads are viewed favorably because they provide motorized access to otherwise hard-to-reach-areas. For others, roads create problems for fish and wildlife and reduce the quality of a wildland recreational experience.

Trails, Pastures, and Grazing

Trails, "green pastures," "grazing," fire lookouts, and campgrounds are generally viewed favorably by visitors as well.

Overgrazing

Overgrazing is strongly disliked by most forest visitors. Overgrazed areas have a strong negative impact on scenery.

Smoke

Smoke in forests is strongly disliked by most visitors. Most believe it has a strong negative impact on scenery. Charred trees and stumps are also viewed negatively. We assume that this aesthetic will change over the next ten to fifteen years; smoke in forests will become more acceptable as the number of planned and unplanned ignitions increases and as the public's understanding of the importance of fire to healthy forest ecosystems increases.

Roads

An individual's attitude toward roads depends on his or her perspective. For some, roads are viewed favorably because they provide motorized access to areas that would otherwise be difficult to reach. Roads may make it easier for a fishermen to approach a section of stream, for example, or for a hunter to access and retrieve game, or for a family with small children or elders to reach a camping site. Even roads that are closed to motorized traffic are considered desirable by some forest visitors because they provide increased access for hikers, horseback riders, and bicyclists. Other recreationists view forest roads negatively. For them road densities are already too high. They believe roads harm fish by channeling silt into streams and changing stream flow patterns. They also believe roads can hurt sensitive wildlife by making it easier for the public to access areas that previously served as game sanctuaries. For some recreationists, the noise of motors and the increased number of visitors that result from roads detracts from the quality of their recreational experience by reducing opportunities for solitude in the forest. In addition, many visitors associate new roads with logging activities, which the majority of forest recreational visitors dislike. We assume most people believe new roads have an adverse affect on scenery. Research shows that roading is one of the most noticeable developments in the forest. That is because roads are usually unrelated visually to the landforms they traverse; the more they contrast in form, line, and color with their surroundings, the greater the visual impact. Visual impact is directly related to the amount of bare earth and rock exposed. Older roads with established vegetation along side are generally less obtrusive visually and many times are not considered to have a negative impact on scenery by most people.

Because the vegetation model is not a spatial model, our ability to analyze specific impacts of logging on scenery were limited.

Grassland Restoration

We assume that over the short-term, most of the public will view grassland restoration negatively. An educational/informational effort explaining the rationale behind restoration efforts may mitigate this reaction somewhat.

Methodology

We based our scenery analysis on the Landscape Management Program and Visual Management System of the U.S. Forest Service. After establishing representative viewpoints along major transportation routes and within population centers and recreation areas, we photographed the views and determined the scenic integrity level, the variety class, and the sensitivity of each. Scenery analysis methods are described in detail in McDonald and Thomas (1996).

Limitations

Because the vegetation model is not a spatial model, our ability to analyze specific impacts of logging on scenery were limited. Most impacts were inferred from factors such as the total volume harvested annually, the silvicultural methods emphasized, the frequency of entries, the acres of grassland and woodland restored, the amount of wood salvaged after fires, the amount of old growth maintained, and the number of acres burned.

The ID team was not able to determine existing open road densities.

Effects

Roads

Total Road Miles and Total Road Density

Alternative 5 would result in the fewest miles of open and closed roads in the forest, an estimated 50% drop from the existing condition. Alternative 1 would see about a 7% drop. Under Alternative 2, the total road miles would not change from the existing condition. Under Alternatives 3 and 4, total road miles would increase by about 6% and 10%, respectively.

The predicted future road densities that would exist under each alternative are presented in figure 4-84. As expected, Alternative 5 would have the lowest densities, followed by Alternatives 1, 2, 3, and 4, respectively. Even modest changes in total road densities can impact scenery, depending on the area and on the methods used to construct new roads or abandon old ones. Alternative 5 would dramatically reduce the impact roads have on scenery. Alternatives 1, 2, and 3 would also improve scenery in currently roaded areas but to a much lesser degree. Alternative 4 would not substantially change total road densities in currently roaded areas.

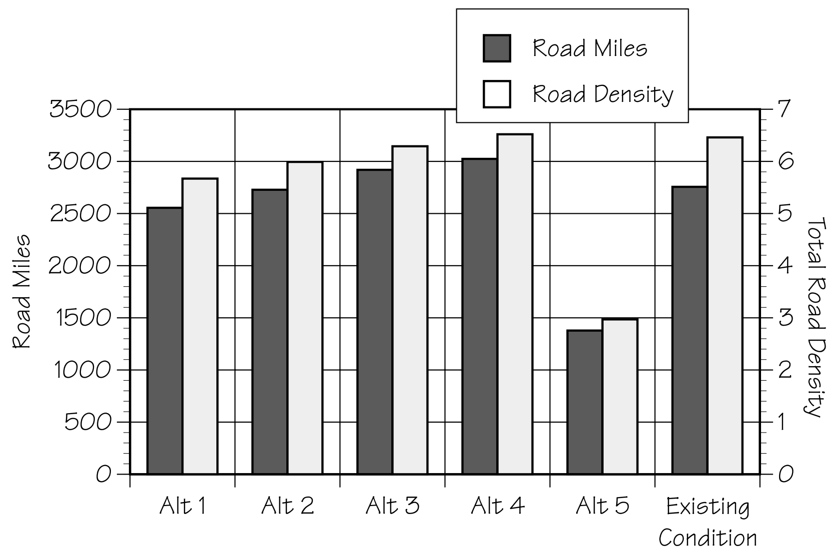


Figure 4-84. The total miles of road and the total road densities predicted under each alternative. Road miles include both open and closed roads. Total road density is the miles of open and closed roads divided by the square miles of roaded area.

Under Alternatives 1 through 4, new roads would be constructed in certain areas of the available forest that today are unroaded. Thus, Alternatives 1 through 4 would reduce the scenic quality of roadless acres to varying degrees. The number of square miles that are currently unroaded but that would be available for roading under each alternative are presented in table 4-48.

Table 4-48. The number of square miles that are currently unroaded but that would be available for roading under each alternative

Remaining Available Unroaded Area

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Predicted future road density	23.99	28.93	37.73	37.73	37.73

Open Road Density

Open road densities (as opposed to total road densities) would decrease the most under Alternatives 1 and 5. Alternative 2 also proposes a decrease in the Lethal Fire Regime. Otherwise, the reductions proposed are modest (fig. 4-85). It is likely that reductions at the level proposed by Alternatives 1 and 5 would adversely affect recreational access for those visitors who favor motorized forms of travel and who have become accustomed to the Reservation's relatively high open road densities. For example, recreational hunters who depend on roads may find they can reach favorite areas only by walking or horseback. The same is true for picnickers, campers, anglers, and sightseers. In many cases, however, the adverse impacts would be offset by improvements in wildlife habitat and increased opportunities for solitude. The scientific literature suggests hunting opportunities would increase (as would opportunities to observe wildlife) because of improved habitat and security. We anticipate the more modest reductions proposed under the other alternatives would have only minor impacts on recreational access.

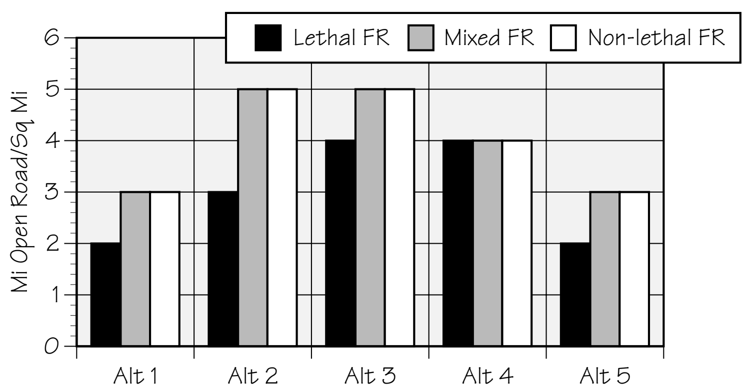


Figure 4-85. Open road density goals of each alternative. Densities are expressed as miles of open road per square mile. Information is not available on existing open road densities.

Scenic Integrity Levels

Under Alternatives 1, 2, and 3 all new roads would be constructed to meet Scenic Integrity Level (SIL) objectives (see Appendix M). Varying percentages of the road segments that are severely degrading stream channels would be improved under Alternatives 1 through 4 (fig. 4-86), and under the first three alternatives, a comprehensive, Reservation-wide forest transportation plan would be completed and implemented. Each of these steps would reduce the impact Reservation forest roads have on scenery. Each would also enhance recreational opportunities for visitors by improving the quality of recreational access.

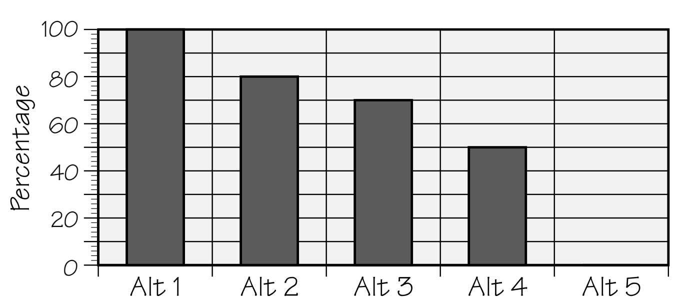


Figure 4-86. The percentage of stream channels that are severely degrading stream channels that would be improved under each alternative.

Trails and Campsites

It is expected that the completion and implementation of a Reservation-wide forest transportation plan, as proposed by Alternatives 1, 2, and 3, would improve visitor access to some trailheads. Alternatives 1 and 2 call for the most aggressive trail and campsite maintenance and monitoring program (table 4-49). Both alternatives would improve wildland recreational opportunities beyond what they are today by enhancing trail and campsite maintenance and monitoring. Alternatives 1, 2, and 3 would implement a trail-use fee system for the use of designated snowmobile tails and cross country ski trails within the North Missions Landscape. The fees would be used for the maintenance of these trails. They would also add cross-country ski trails, groomed snowmobile trails, and interpretive trails. Although the fee system will likely be unpopular with users at first, it is expected that over time the fees would become less of an issue, and the improved trails would result in higher quality backcountry experiences for most users. Under Alternative 4, the existing trail and campsite maintenance program would remain in place. Recreational opportunities would be expected to decline slightly over time under Alternative 4 due to increasing use from a growing local and regional population. Under Alternative 5 trail maintenance would drop to the level necessary to prevent resource degradation (custodial maintenance). Recreational opportunities would decline under this alternative because access to tails, campsites, picnic areas, and other recreational use areas would decline substantially.

Table 4-49. Trail and campsite improvement, maintenance, and management objectives by alternative.

Objective	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Trail Maintenance and Monitoring	Enhance maintenance for the Three Lakes Peak, Blacktail, and Burgess Lake Trails. Increase monitoring of the Reservation Divide and Seepay Trails.		Maintain current program.	Maintain current program.	Reduce current program to a custodial level of maintenance.
Winter Trails	Build and maintain 11 miles of cross-country ski trails (serving bicyclists, hikers, and horseback riders during summer) and groom 20 miles of existing and new snowmobile trails.			N/A	N/A
Interpretive Trails	Develop interpretive trails at Swartz Lake and Blue Bay.			N/A	N/A
Fee System	Develop a trail-use fee system to fund the trail mainteance program.			N/A	N/A
Campsite Maintenance and Monitoring	Increase maintenance at Vanderburg Cultural Camp, Jocko River, Job Corps Campsites 1 and 2, Twin Lakes, South Fk Gate Cabin and 8 sites in the South Fk Jocko Primitive Area. Improve monitoring of impromptu camps in Revais, Magpie, and Seepay Drainages		Maintain current program.	Maintain current program.	Reduce current program to a custodial level of maintenance.

Roadless and Wilderness Areas

Only Alternatives 1 and 2 would formally protect unroaded acreage from future roading. Alternative 1 would prohibit roading on 68,245 acres in ten areas. Alternative 2 would prohibit roading on 33,118 acres in eight areas. Although helicopter logging would be allowed in all but two of these areas (Ravalli/Valley Complex and Swartz Lake) under both alternatives, the prohibition on roading would help to preserve their scenic beauty and maintain opportunities for semi-primitive, non-motorized forms of recreation. Although Alternative 5 would not formally protect roadless areas, no new roads would be constructed for silvicultural purposes.

Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Oliver Point (Sal)	8,175	8,175	N/A	N/A	N/A
Big Draw Complex	11,573	N/A	N/A	N/A	N/A
Garceau	8,675	N/A	N/A	N/A	N/A
Burgess	3,328	2,219	N/A	N/A	N/A
Little Money (Bighorn Sheep)	1,564	1,561	N/A	N/A	N/A
Perma Point	3,815	N/A	N/A	N/A	N/A
Little Woman (Pistol Face)	8,156	N/A	N/A	N/A	N/A
Blue Bay (N. Missions)	6,452	4,756	N/A	N/A	N/A
Finley Lake	5,184	5,176	N/A	N/A	N/A
Total	**56,922**	**21,886**	**0**	**0**	**0**

Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Ravalli/Valley Complex (Ravalli/Hewolf)	11,166	11,166	N/A	N/A	N/A
Swartz Lake	157	157	N/A	N/A	N/A
Total	**11,323**	**11,323**	**0**	**0**	**0**

Tables 4-50 and 4-51. Roadless areas that would be protected from future roading. Helicopter logging would be allowed in the areas listed in the top table but prohibited in those listed in the bottom table.

Similarly, only Alternatives 1 and 2 call for the designation of more wilderness acreage. Under Alternative 1, two areas totaling 29,814 acres would be designated as new Tribal wilderness areas. Another three areas totaling 8,377 acres would be added to the existing Mission Mountains Tribal Wilderness Area. Under Alternative 2, two areas totaling 22,416 acres would be designated as new Tribal wilderness areas, and another two areas totaling 4,553 acres would be added to the existing Mission Mountains Tribal Wilderness Area. Road building and logging are prohibited in Tribal wilderness areas. The designations would help to preserve their scenic integrity and maintain opportunities for primitive recreation.

Table 4-52. New wilderness areas and additions that would be designated under each alternative

Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Thompson Peak	4,838	4,838	N/A	N/A	N/A
Sleeping Woman (Ninemile Divide)	24,976	17,578	N/A	N/A	N/A
South Missions Addition	2,152	N/A	N/A	N/A	N/A
North Missions Addition	6,076	4,404	N/A	N/A	N/A
Courville Creek Addition	149	149	N/A	N/A	N/A
Total	**38,191**	**26,969**	**0**	**0**	**0**

Figure 4-87. Under Alternatives 1, 2, and 3, a Reservation-wide recreational use plan that incorporates the Diversified Recreation Opportunity Level or DROL system would be completed by the year 2005.

Recreation Planning and Diversified Recreational Opportunity Levels

Under Alternatives 1, 2, and 3, a Reservation-wide recreational use plan that incorporates the Diversified Recreation Opportunity Level or DROL system would be completed by the year 2005. The plan will classify recreation settings on the Reservation according to the DROL system and develop management strategies consistent with an area's natural attributes (Appendix O). Comprehensive recreation planning through the DROL system will ensure a diversity of high quality recreational opportunities and promote continuity in management. Proposed DROL classifications are shown in table 4-53. Under Alternative 4, managers would use the Recreation Opportunity Spectrum to guide the inventory and management of recreational resources and to provide a range of recreation opportunities. Under Alternatives 4 and 5 managers would seek to minimize conflicts between recreational users and logging, but there would be no comprehensive recreational use plan. Management decisions would instead be made on a case-by-case basis and would be more haphazard, lacking the vision and consistent guidance that comes with good planning. The result would likely be lower quality recreational opportunities and facilities that are less likely to meet the needs of the public.

Limited Public Access Areas

Alternatives 1, 2, and 3 would establish new Limited Public Access Areas. These areas, which would place limits on certain types of non-Tribal member use or access, would increase Tribal member opportunities for solitude and provide substantial areas where, depending on the restrictions imposed, Tribal members might encounter fewer people. For non-Tribal members, the creation of Limited Public Access Areas will reduce opportunities. Limited Public Access Areas will also tend to concentrate nonmember use in those areas where use and access is unrestricted. Consequently, the establishment of these areas may result in lower quality recreational experiences for some nonmembers. The areas that have been proposed as Limited Public Access Areas are shown in table 4-54 and shown on the map in Appendix N.

Table 4-53. Diversified Recreation Opportunity Level or DROL system designations that would be completed under the alternatives. The plan will classify recreation settings on the Reservation according to the DROL system and develop management strategies consistent with an area's natural attributes

Area	DROL Classification	Applicable Alternatives	Management Guidelines
Chief Cliff	Semi-Primitive Motorized	1, 2, and 3	No commercial logging activities.
Irvine West Face	Semi-Primitive Motorized	1, 2, and 3	Maintain natural appearance, require full rehabilitation of any new roadway construction after use.
Revais Creek Riparian Area	Roaded Natural	1, 2, and 3	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Seepay Riparian Area	Roaded Natural	1, 2, and 3	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of viewshed along full length of corridor.
Dog Lk, Inlet Marsh & Camas to Cutoff Rd	Roaded Natural	1, 2, and 3	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Hot Springs Creek	Roaded Natural	1, 2, and 3	Maintain as scenic drive corridor, buffer road from logging activities, maintain natural appearance of foreground viewshed along roadway.
Little Bitterroot Canyon	Semi-Primitive Motorized	1, 2, and 3	Prohibit logging, protect and maintain river corridor' s outstanding natural envirnoment for cultural and recreational uses, use manager ignited fires to achieve seral cluster goals.
Little Bitterrroot-Basso-Mill Creek	Roaded Natural	1, 2, and 3	Maintain as scenic drive corridor, maintain and protect main transportation routes with the stream and river corridor for cultural and recreational uses, buffer road from logging and maintain natural appearance of foreground viewshed along roadway.
Upper Dry Fork Reservoir	Roaded Natural	1, 2, and 3	Maintain lower reaches of Dry Fork Creek and Reservoir and the surrounding riparian vegetation for cultural and recreational purposes, buffer all foreground viewshed areas from logging, and prohibit all logging within immediate use areas.
Boulder Road Scenic Route	Roaded Natural	1, 2, and 3	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.
Hellroaring Road	Roaded Natural	1, 2, and 3	Maintain as scenic drive corridor from Highway 35 to the range divide, buffer road from logging, maintain natural appearance of foreground viewshed along roadway.
Wilderness Buffer Zone	Roaded Natural	1, 2, and 3	No commercial logging activities, expand the wilderness fire plan to include the Buffer Zone land tracts and cluster goals.
Jocko River Corridor	Semi-Primitive Motorized	1, 2, and 3	Maintain as a scenic drive corridor, buffer road from logging activites, maintain natural appearance of foreground viewshed along roadway.
Kelly' s Ridge	Semi-Primitive Motorized	1, 2, and 3	Maintain current roadless acreage.
South Fk Prim Area	Primitive	1, 2, and 3	No commercial logging activities.
South Fk Rd Sys (Fingers & Corridors)	Semi-Primitive Motorized	1, 2, and 3	Maintain outstnding scenic roadway qualities, utilize native materials on stream crossings and other roadway facilities whenever practicable.
Hog Heaven Face Road Roadless Area	Primitive	2 and 3	Maintain current roadless acerage, restrict logging to helicopter yarding.
Irvine North Face Roadless Area	Primitive	2 and 3	Maintain current roadless acerage, restrict logging to helicopter yarding.
Thompson Peak Area	Semi-Primitive Motorized	2	Provide natural setting for backcountry, cultural, and recreational use; rehabilitate site to meet semi-primitive motorized classification; no commercial logging activities.

The Alternatives: (1) Full Restoration, (2) Modified Restoration, (3) Restoration Emphasizing Commodities, (4) No Action, (5) Custodial

Table 4-54. Limited Public Access Areas that would be designated under each alternative (see also Appendix N)

Landscape	Alternatives 1, 2, and 3	Alt. 4	Alt. 5
Southwest Landscape	One of the following areas: Entire Southwest Landscape; Magpie drainage; Seepay and Burgess drainages.	N/A	N/A
West Landscape	All forested Tribal lands except the Dog Lake Area, the Upper and Lower Dry Fork Reservoir areas, and the Hot Springs drainage area.	N/A	N/A
Salish Mountains Landscape	The eastern portion of the Lower Flathead River Corridor from Buffalo Bridge to Sloans Bridge.	N/A	N/A
N. Missions Landscape	The Hellroaring Drainage.	N/A	N/A
Missions Landscape	One of the following areas: from McDonald Lake to the Mollman drainage, the Swartz Lake and Terrace Lake drainage; the McDonald Peak Grizzly Bear Conservation Zone.	N/A	N/A

Figure 4-88. Natural openings created by fire were once a common and an accepted part of the Reservation's scenery.

Figure 4-89. Timber harvest treatments can be designed to appear and function more like natural openings.

Vegetation

RMVs and SILs

The forest structures that would result from the implementation of Alternatives 1, 2, and 3 would meet recommended management variabilities (RMVs), and would therefore appear and function more naturally than the existing forest. In addition, forest harvesting activities under these alternatives would meet SIL objectives through the use of natural cutting unit patterns, green-tree retention, seed-tree cuts, shelterwood cuts, and the blending of clearcuts with other prescriptions. Over the long term, these steps would improve the scenic quality of the Reservation's forested landscapes. The forest structures that would result from the implementation of Alternative 4 would appear and function much like the existing available forest, portions of which many people consider to be unnatural in appearance. Forest harvesting activities under this alternative will use green-tree retention in even-aged units to reduce the visual impact of clearcuts. Alternative 5 is a salvage only alternative, but salvage harvests would meet SIL objectives. Under Alternatives 1, 2, and 3, selected areas that have been heavily impacted by logging in the past would undergo visual rehabilitation so that they, too, meet SIL objectives. This step would improve the scenic quality of major viewsheds.

Silvicultural Treatments

While the three restoration alternatives (Alternatives 1, 2, and 3) are similar in important ways, the silvicultural systems emphasized under each are quite different, as are the sizes of treatment units, the volumes harvested, the frequency of entries, the acres of grassland and woodland restored, the amount of wood salvaged after fires, and the amount of old growth maintained. Alternatives 4 and 5 are even more different. Consequently, each of the alternatives would result in a different vegetative mosaic; each would likely be perceived differently by forest visitors in terms of naturalness and scenic beauty. The assessment that follows analyzes each of the various vegetative components that work together to affect our overall perception and enjoyment of scenery and recreational resources on the Reservation.

The volume of timber that would be harvested over each ten-year period varies by Alternative. While the total volume harvested each year has a large bearing on the extent to which scenic and recreational resources are impacted on the Reservation, other factors, such as how the logging is done, can play an even greater role. Table 4-55 shows the priority each type of silvicultural treatment would receive within each fire regime under each alternative. The emphasis placed on these different systems varies by alternative, and is governed to a large extent by the philosophy behind each alternative. The estimated short-term visual impacts associated with each of the various silvicultural treatments that are proposed are shown in table 4-56.

Table 4-55. The emphasis placed on different silvicultural treatments by each alternative. The symbol > means used more than, and the symbol = means the same as.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Non-lethal Fire Regime	Underburn and Thin > Uneven-aged Management > Temporary Even-aged Management > No Treatment	Uneven-aged Management > Underburn and Thin > Temporary Even-aged Management > No Treatment	Uneven-aged Management = Temporary Even-aged Management > Underburn and Thin > No Treatment	Uneven-aged Management = Temporary Even-aged Management > Underburn and Thin > No Treatment	Salvage cuts and unplanned ignition are the only treatments available
Mixed Fire Regime	Underburn and Thin = Permanent Even-aged Management > Uneven-aged Management = No Treatment > Temporary Even-aged Management	Uneven-aged Management = Permanent Even-aged Management > Temporary Even-aged Management = Underburn and Thin > No Treatment	Uneven-aged Management = Temporary Even-aged Management = Permanent Even-aged Management > Underburn and Thin > No Treatment	Uneven-aged Management = Temporary Even-aged Management = Permanent Even-aged Management > Underburn and Thin > No Treatment	Salvage cuts and unplanned ignition are the only treatments available
Lethal Fire Regime	Permanent Even-aged Management > No Treatment > Uneven-aged Management	Permanent Even-aged Management > Uneven-aged Management = No Treatment	Permanent Even-aged Management > Uneven-aged Management > No Treatment	Permanent Even-aged Management > Uneven-aged Management > No Treatment	Salvage cuts and unplanned ignition are the only treatments available

The vegetation model predicts that over the short term, Alternative 2 will rank first in the number of acres treated each year under temporary and permanent even-aged systems, followed by Alternatives 3, 4, 1, and 5 respectively. It projects Alternative 4 will rank first in the number of acres treated under uneven-aged systems, followed by Alternatives 2, 3, 1, and 5, respectively. Acres underburned during the short term are projected to be highest under Alternative 1, followed by Alternatives 2, 3, 4, and 5.

Table 4-56. Estimated short-term visual impacts of silvicultural treatments

Treatment	Visual Impact When Viewed from Foreground Distances	Visual Impact When Viewed from Midground Distances	Visual Impact When Viewed from Background Distances
No Treatment (NT)	No visual impact	No visual impact	No visual impact
Underburning and Thinning (UB)	Visual impacts from smoke will be significant. Underburning will have minor to moderate visual impacts on vegetative communities caused mostly by barren ground and charred tree boles. These impacts will generally disappear after a growing season or two. The impact of thinning will also be minor to moderate depending on how much slash is produced and how it is taken care of.	Visual impacts from smoke will depend on weather but may be significant. The effects of silvicultural activities on vegetation not readily apparent.	Visual impacts from smoke will depend on weather but may be significant. The effects of silvicultural activities on vegetation not readily apparent.
Uneven-aged Management (U)	Moderate visual impact from reductions in crown cover, skid trails, log decks, slash piles, stump, and tree scars.	Minor to moderate visual impact depending on the percent of crown cover removed	Minor to moderate visual impact or silvicultural activities not readily apparent depending on the percent of crown cover removed
Temporary Even-aged Management (T)	Initial strong to severe visual impact from reductions in crown cover, skid trails, log decks, slash piles, stump, and tree scars.. becoming moderate to strong in succeeding years.	Moderate to strong visual impacts depending on the extent to which treatments imitate natural openings in size, shape, and placement; the blending of clearcuts with other prescriptions; and the use of prescribed fire following logging.	Moderate to strong visual impacts depending on the extent to which treatments imitate natural openings in size, shape, and placement.
Permanent Even-aged Management (P)	Initial strong to severe visual impact from reductions in crown cover, skid trails, log decks, slash piles, stump, and tree scars.. becoming moderate to strong in succeeding years.	Moderate to strong visual impacts depending on the extent to which treatments imitate natural openings in size, shape, and placement; the blending of clearcuts with other prescriptions; and the use of prescribed fire following logging.	Moderate to strong visual impacts depending on the extent to which treatments imitate natural openings in size, shape, and placement.

Over the long term, the vegetation model once again predicts that Alternative 2 will rank first in the number of acres treated each year under temporary and permanent even-aged systems. It is followed by Alternatives 1, 3, 4, and 5 respectively. It also projects that over the long term, Alternative 4 will rank first in the number of acres treated under uneven-aged systems, followed by Alternatives 3, 2, 1, and 5, respectively. Acres underburned over the long term are highest under Alternative 1, followed by 2, 3, 5, and 4.

Entry Periods

Because the visual impacts associated with the logging or burning of an area subside with time, the frequency of disturbance has an impact on the scenic and recreational quality of an area. Entry periods for each of the alternatives are shown in figure 4-90.

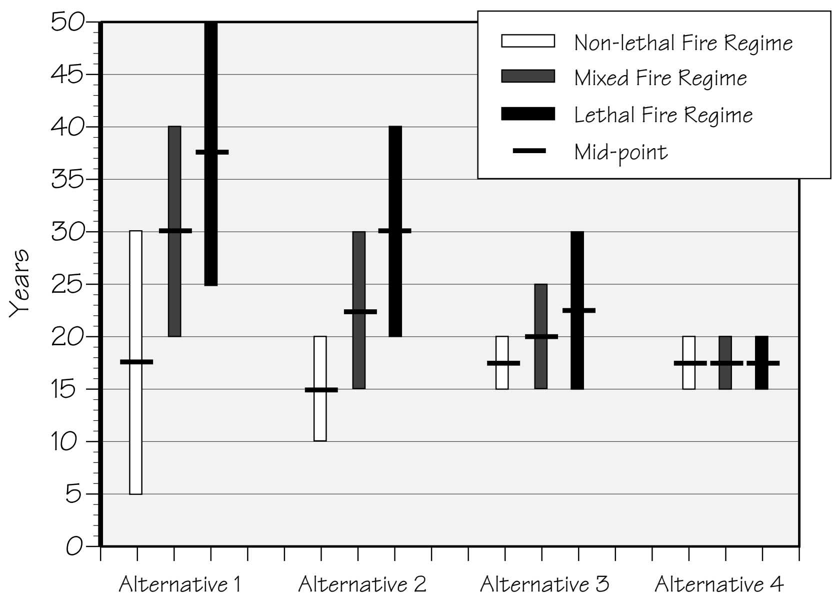


Figure 4-90. Entry periods anticipated under each alternative. Midpoints are represented by circles.

Alternative 5 is not shown on this chart because entry periods under a custodial regime would be determined entirely by natural disturbances, which are unpredictable. But among the other four alternatives, entry periods are planned for the most part. Alternative 1 has the longest time between silvicultural disturbances (except in the Nonlethal Fire Regime, where the primary treatment would be underburning).

Intermediate Entries

Scenery is also affected by the type of intermediate entry that would be used. Alternative 5, which calls for only minimal mechanical site preparation, would have the fewest short-term impacts on foreground scenery and recreation. Alternative 1 would use more extensive mechanical site preparation treatments and also employ underburning. Alternative 2 would add to this list the restricted use of herbicides, fertilization, and pruning, three activities that would have an even greater impact on foreground scenery. Under Alternative 3, herbicides, fertilization, and pruning would be emphasized more. They become standard tools under Alternative 4.

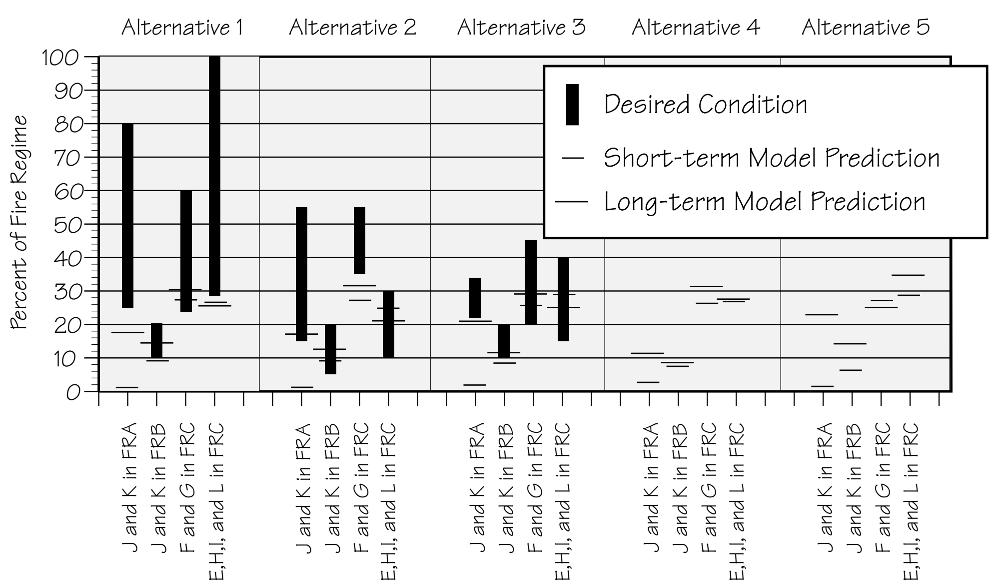
Salvage

Salvage operations can adversely affect scenery and, to a lesser extent, recreational opportunities over the short-term, especially when viewed from foreground distances. Alternative 1 would salvage the smallest percentage of commercial forest products from underburns, windthrow, insect and disease events. Only 20% or less of the gross volume would be salvaged under this alternative. Alternative 2 would salvage 50% or less, Alternative 3, 80% and Alternative 4, 95% of the gross volume.

Old Growth

The alternatives call for varying amounts of parklike stands and old growth, as shown in figure 4-91, where the gray bars represent the range of desired conditions for each type of old growth and the circles represent the vegetation model predictions of how close each alternative comes to meeting the desired condition over the long term. Alternatives 4 and 5 lack desired condition bars because they are not ecosystem-management-based alternatives. Increases in parklike stands and old growth will substantially enhance the scenic beauty of the forest, especially when viewed from foreground distances. These stands also provide high quality camping, picnicking, and hiking opportunities.

Figure 4-91. Desired condition goals and model predictions for old-growth-producing clusters under each alternative



Among the three restoration alternatives, Alternative 1 has the highest desired condition ranges for old growth followed by Alternatives 2 and 3 respectively. The vegetation model, however, predicts other alternatives may produce more clusters that meet minimum old-growth standards.

Grassland and Woodland Restoration

Only the first two alternatives would restore grasslands and woodlands. Alternative 1 would restore 16,912 acres, while Alternative 2 would reclaim 8,653. Impacts associated with these restoration efforts, such as smoke caused by burning and the removal of trees from areas that have been wooded for several decades will have strong negative impacts on scenery for most people, especially when viewed from midground and background distances. Public education efforts about the reasons for restoration may make these activities more visually acceptable to the public.

Riparian Restoration

The steps that would be taken to restore riparian zones (along with the improvement of the road segments that are severely degrading stream channels) would enhance the scenic beauty of stream courses and improve the quality of streamside recreational experiences. The alternatives vary in the level of restoration that would be conducted (as measured and defined by the MRA inventory process) as well as in the percentage that would have their species diversity restored. Alternative 1 ranks highest in riparian restoration, followed closely by Alternatives 2 and 3. Under Alternative 4, mangers would seek to restore only sensitive riparian areas and would have fewer tools at their disposal. Riparian areas would see little change. Alternative 5 would also seek to reduce livestock impacts in sensitive riparian zones, but the reduction in total road miles expected to occur under this alternative would help to improve riparian condition over the long term.

Grazing

While scenes of grazing cattle on healthy ranges are viewed favorably by most visitors, landscapes that have been overgrazed rank as one of the most disliked scenes. Alternative 1 would have the most positive visual impact on forest grazing lands, followed by Alternatives 2, 3, 5, and 4, respectively.

Fishing

The alternatives also vary in the amount of fish restoration work that would be conducted. Restoring native species to selected drainages will enhance recreational fishing opportunities, especially over the long term. Alternative 1, envisions the most fish restoration work, followed by Alternative 2. The fisheries restoration objectives of the remaining three alternatives do not differ from each other.

Smoke

Smoke can have a strong, if temporary, negative impact on scenery and recreationists, depending on the dispersal conditions, the fuel conditions, and the distribution of the acres that are burned. Our models predict that Alternative 1 will generate the most smoke (almost twice as much as that produced from planned ignitions between 1982 and 1991). Each of the succeeding alternatives will generate progressively less smoke.

Figure 4-92. Restoring native species to selected drainages will enhance recreational fishing opportunities, especially over the long term.

Culture

Summary of Key Effects

Roads
Road closures will have a net benefit on cultural resources and forest-based cultural activities as long as appropriate cultural access is maintained. Alternative 5 would result in the highest number of roads being closed, followed by Alternatives 1, 2, and 3 and 4, respectively. Only Alternatives 1, 2, and 3 would have a mechanism to protect cultural access. New roading can have significant negative impacts on cultural resources. Alternative 4 would result in the most new roading, followed by Alternatives 3, 2, 1, and 5 respectively.

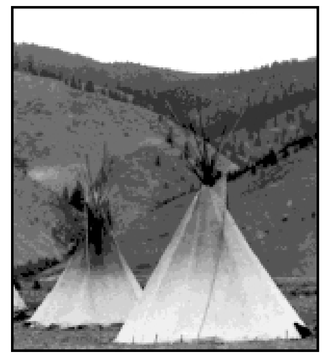


Figure 4-93. Opportunities for traditional uses of the forest have been degraded by logging, grazing, roading, and recreational activities.

Roadless and Wilderness Areas
Maintaining the roadless status of some of the existing roadless areas and protecting other lands as wilderness will benefit the cultural resources of the Tribes. Alternative 1 would maintain 68,245 acres of existing roadless country in ten areas. Helicopter logging would be allowed in all but two of them. Alternative 1 would also designate 29,814 acres in two areas as Tribal wilderness and add another 8,377 acres to existing wilderness. Alternative 2 would prohibit roading on 33,118 acres in eight existing roadless areas and designate 22,416 acres in two areas as Tribal wilderness. It would also add 4,553 acres to existing wilderness. None of the other alternatives would designate either roadless or wilderness areas.

Limited Public Access Areas
Designating Limited Public Access Areas—portions of the forest in which certain use or access is limited to Tribal members—is considered essential to the cultural well being of the Tribes. Alternatives 1, 2, and 3 would establish new Limited Public Access Areas in the landscapes where they do not already exist. Alternatives 4 and 5 would establish no new Limited Public Access Areas.

Restoration of Native Plant Communities
The restoration and maintenance of native plant communities will benefit the culture of the Tribes. Alternative 1 has the highest levels of restoration and maintenance associated with it, followed by Alternatives 2 and 3, respectively. Alternatives 4 and 5 do not seek to restore native plant communities.

Silvicultural Systems
Silvicultural systems that result in a forest that appears and functions in a natural way are the most desirable from a cultural resources perspective. When listed in the order of their ability to emulate natural disturbance regimes and therefore produce more natural forest structures, Alternative 1 comes first, followed by Alternatives 2 and 3, respectively. Alternatives 4 and 5 would not simulate pre-European disturbance regimes.

Intermediate Entries

The use of herbicides and chemical fertilizers in the forest is of major concern. Alternatives 5 and 1 would not use chemicals during intermediate entries. Alternative 2 would include the restricted use of herbicides and fertilizers, and Alternatives 3 and 4 would use them as standard silvicultural tools during intermediate entries.

Figure 4-94. We assume that the rejuvenation and maintenance of Tribal culture depends on the restoration and preservation of native plant and animal communities.

Grazing

Grazing at higher elevations or in culturally sensitive areas has significant adverse impacts on cultural resource uses. Alternative 1 would reduce cattle impacts the most, followed by Alternatives 2, 3, 5, and 4.

Fisheries Restoration

Restoring native cutthroat trout and bull trout populations is a high priority from a cultural resource perspective. Alternative 1 envisions the most fish restoration work, followed by Alternative 2.

Assumptions

The rejuvenation and maintenance of Tribal culture depends on the restoration and preservation of native plant and animal communities, particularly within the forest.

Effects on Tribal Culture

Roads

Many cultural activities that take place in roaded portions of the forest now depend on roads. For instance, roads enable elders and families with children or disabled individuals to access areas that would otherwise be difficult or impossible to reach. Roads also make it possible for people who work full time to reach places that otherwise would be too remote. But too many roads can conflict with cultural activities. Vehicle noise and dust can be a problem, and roads often allow visitors to unintentionally interfere with or invade the privacy of Tribal members engaged in traditional practices. Roads in the wrong places can provide easy public access to sensitive cultural sites the Tribes would like to protect. In addition, too many roads can reduce habitat security for wildlife and thereby reduce hunting opportunities for Tribal members. Sediment-laden runoff from roads can degrade fish habitat in streams and lakes, and even threaten native fish species like bull trout and westslope cutthroat trout, species culturally important to the Tribes.

Figure 4-95 shows the proposed reductions in road miles in areas that are currently roaded under each alternative. Road closures will have a net benefit on cultural resources and forest-based cultural activities as long as appropriate cultural access is maintained. Under Alternatives 1, 2, and 3, a comprehensive, Reservation-wide forest transportation plan would be completed and implemented. Such a plan would minimize the cultural impacts of road closures and new road construction.

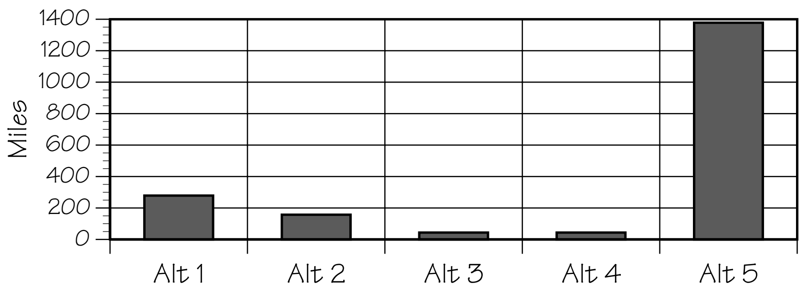


Figure 4-95. Proposed reductions in road miles in areas that are currently roaded under each alternative.

Under all the alternatives except Alternative 5, some new roading would occur in areas that are currently roaded. The miles of new road that would be constructed in these unroaded areas under each alternative are shown in figure 4-96. New roading can have significant negative impacts on cultural resources by directly impacting cultural sites, by reducing the naturalness of areas, by lowering hunting opportunities through reductions in habitat security, and by degrading fisheries through increases in stream sediments. A comprehensive transportation plan such as that proposed under Alternatives 1, 2, and 3 could help to minimize these impacts.

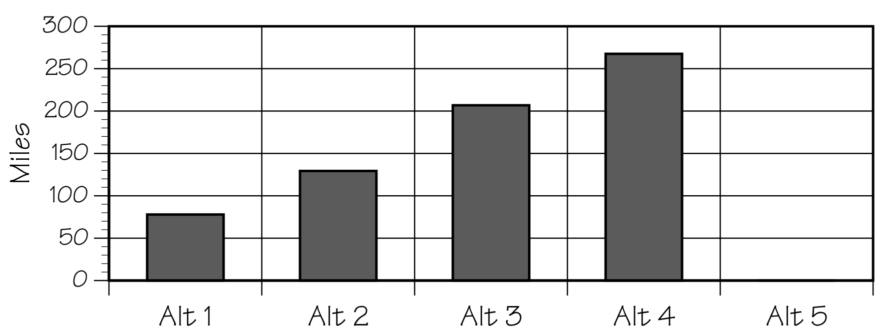


Figure 4-96. Miles of new road that would be constructed in unroaded areas under each alternative.

Roadless and Wilderness Areas

Maintaining the roadless status of some of the existing roadless areas and protecting other lands as wilderness will benefit the cultural resources of the Tribes. The cultural value of these natural areas to the Tribes is perhaps best expressed in the words of Clarence Woodcock, former director of the Flathead Culture Committee, when he spoke about the need to designate the Mission Mountains as a wilderness area.

> The Mission Mountains have served as a guide, passage way, fortification, and vision-seeking grounds, as well as a place to gather medicinal herbs, roots, and a place to hunt for food for the Pend d'Oreille and Salish Indians since they have lived at the foothills of the Missions.

> Pete Beaverhead, a tribal elder, before he died, once said that he would go up into the mountains for weeks at a time and then would be afraid to come back down because "it was so clear up there. The air made your breathing easy. I didn't want to come back down because I knew the air down below would be bad. It was the stink from the roads and the other things the white man has made."
>
> Our elders have many stories to tell about experiences in the mountains. They have become for us, the descendants of Indians, sacred grounds. Grounds that should not be disturbed or marred. We realize the importance of these mountains to our elders, to ourselves, and for the perpetuation of our Indian culture because of these stories. They are lands where our people walked and lived. Lands and landmarks carved through the minds of our ancestors through coyote stories and actual experiences. Lands, landmarks, trees, mountain tops, crevices that we should look up to with respect.

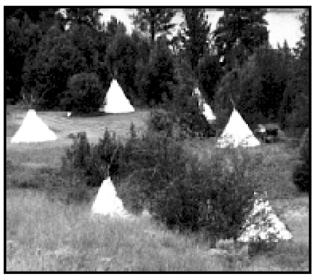


Figure 4-97. Designating Limited Public Access Areas—portions of the forest in which access or types of use is reserved for Tribal members—is considered essential to the cultural well being of the Tribes.

Alternative 1 would prohibit roading on 68,245 acres in ten existing roadless areas. Helicopter logging would be allowed in all but two of these areas. Alternative 1 would also designate 29,814 acres in two areas as Tribal wilderness and add another 8,377 acres to the existing Mission Mountains Tribal Wilderness. Alternative 2 would prohibit roading on 33,118 acres in eight existing roadless areas and designate 22,416 acres in two areas as Tribal wilderness. It would also add 4,553 acres to the existing Mission Mountains Tribal Wilderness. None of the other alternatives would designate either roadless or wilderness areas.

Limited Public Access Areas

Designating Limited Public Access Areas—portions of the forest in which access or types of use is reserved for Tribal members—is considered essential to the cultural well being of the Tribes. The history of the Tribes is a history of people and place; the two elements are inseparable. Rejuvenating and maintaining the culture requires creating a strong cultural environment, an environment that includes pristine places where Tribal cultural activities can be practiced in solitude. Limited Public Access Areas will provide opportunities for solitude. They will reduce conflicts with other visitors who sometimes unintentionally invade the privacy of individuals engaged in traditional practices. They will also restrict public access to some vulnerable cultural sites that the Tribes would like to protect. Alternatives 1, 2, and 3 would establish new Limited Public Access Areas in the landscapes where they do not already exist. Alternatives 4 and 5 would establish no new Limited Public Access Areas. These areas are listed in table 4-54 (see also Appendix N).

Vegetation

Restoration

The restoration and maintenance of native plant communities will benefit the culture of the Tribes. Because the role that fire once played in the forest has been reduced, plant communities that once played an important role in Tribal culture have declined. The grasslands and woodlands that border the forest are examples, as are parklike stands of large ponderosa pine and high-elevation forests of whitebark pine. Salish and Kootenai people once harvested food and medicines from these areas and hunted and camped in them. Now, because of fire exclusion, past silvicultural practices, grazing activities, and noxious weed infestations these ecosystems support different plant and animal communities. Many have become dense with timber.

Alternative 1 would use prescribed fire and harvest to restore 16,912 acres, while Alternative 2 would reclaim 8,653 acres. The other alternatives would not attempt to restore grassland or woodland acres. Under Alternative 1, grazing would be managed to maintain or improve existing forest grassland types with an emphasis on enhancing native plant communities, specifically the Palouse Prairie and intermountain grassland types. Alternative 2 would seek to improve or maintain the diversity of existing grassland ecosystems, while Alternative 3 would favor introduced species over native. Alternatives 4 and 5 would simply maintain the current mix of native grasslands and desirable introduced species.

Because of fire exclusion, past silvicultural practices, grazing activities, and noxious weed infestations, plant communities that once played an important role in Tribal culture have declined. The grasslands and woodlands that border the forest are examples, so are parklike stands of large ponderosa pine and high-elevation forests of whitebark pine.

Parklike stands of old growth ponderosa pine were probably among the most common campsites for the Salish and Kootenai before Europeans arrived in this area. Among the three restoration alternatives, Alternative 1 has the highest desired condition ranges for parklike stands of old growth ponderosa pine in both the Nonlethal and Mixed Fire Regimes. It is followed by Alternatives 2 and 3 respectively. Alternatives 4 and 5 do not have desired condition ranges because they are not ecosystem-management-based alternatives. The vegetation model projects a different ranking of the alternatives. According to the vegetation model, in the Nonlethal Fire Regime, Alternatives 5 and 3 would produce the most parklike stands. Alternatives 1, 2, and 4 would rank third, fourth, and fifth, respectively. In the Mixed Fire Regime, the ranking, according to the vegetation model, would be 1, 5, 2, 3, and 4. These changes would occur over the long term.

Maintaining the biological diversity of the Reservation is vital to Tribal culture. When a species disappears, cultural practices are often threatened. For example, the Kootenai find it difficult to make canoes anymore because western white pine, the species traditionally used, has almost disappeared from the Reservation.

Another species, whitebark pine is a very important tree species to the Tribes because it provided food for Indian people and for a large number of animals—as many as forty species. Whitebark pine nuts are one of the grizzly bear's most important foods in the Northern Rockies. But whitebark pine has declined dramatically over the last fifty years because of fire exclusion policies and because of an introduced disease called whitepine blister rust.

Alternative 1 incudes the most aggressive whitebark pine restoration efforts. Managers would map the extent of the species, reintroduce periodic fires into whitebark pine habitats, cooperate in the development of a whitebark pine blister rust program and a first-generation, disease-resistant whitebark pine seed source for out-planting. Under Alternative 2, managers would do only the mapping and reintroduction of fire. Under Alternative 3 managers would only reintroduce fire. Alternatives 4 and 5 would take no steps to restore whitebark pine.

Restoring riparian zones is important from a cultural resources perspective because many food and medicine plants grow in riparian areas. Riparian zones also provide valuable wildlife habitat, especially for birds. The alternatives vary in the level of restoration that would be conducted (as measured and defined by the MRA inventory process) as well as in the percentage that would have their species diversity restored. Alternative 1 ranks highest in riparian restoration. Alternatives 2, 3, and 4 have similar restoration objectives, although under Alternative 4, mangers would have fewer tools at their disposal. It is likely that this limited array of tools would hinder management's ability to meet the riparian area objective. Alternative 5 would seek to reduce livestock impacts in sensitive riparian zones. That, and the reduction in total road miles expected to occur under this alternative, would improve riparian conditions.

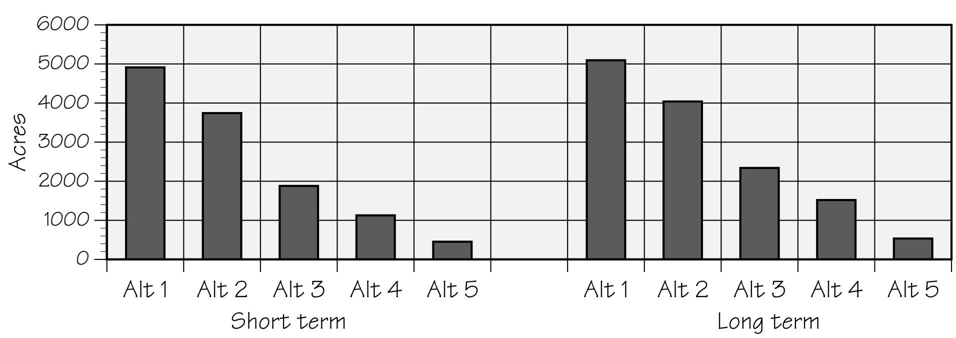
Silvicultural Systems Emphasized

Silvicultural systems that result in a forest that appears and functions in a natural way are the most desirable from a cultural resources perspective. The silvicultural prescriptions used in Alternatives 1, 2, and 3 would mimic natural disturbance regimes; that is, the timing, size, and pattern of disturbance would be more consistent with the pre-European period, and the forest structures and communities that result over the long term would be similar to those that would have been encountered before the days of fire suppression and logging. When listed in the order of their ability to emulate natural disturbance regimes and therefore produce more natural forest structures, Alternative 1 comes first, followed by Alternatives 2 and 3, respectively. Alternatives 4 and 5 would not simulate pre-European disturbance regimes.

Silvicultural prescriptions used by Alternatives 1, 2, and 3 would meet Scenic Integrity Level (SIL) objectives through the use of natural cutting unit patterns, green-tree retention, seed-tree cuts, shelterwood cuts, and the blending of clearcuts with other prescriptions. Over the long term, these steps would improve the scenic quality of the Reservation's forested landscapes and help to make timber harvesting more acceptable from a cultural perspective. The forest structures that would result from the implementation of Alternative 4 would appear and function much like the existing available forest, portions of which are considered by many to be unnatural in appearance. Alternative 5 is a salvage only alternative, but salvage harvests would meet SIL objectives.

Before Europeans arrived in this area, the Tribes made extensive use of fire to manage forests. Underburns and other types of prescribed fires are therefore generally considered beneficial from a cultural perspective, as long as vulnerable cultural sites are protected. Figure 4-98 shows the acres receiving prescribed fire treatments under each alternative.

Figure 4-98. Acres that would receive prescribed fire treatments under each alternative



Intermediate Entries

From a cultural resources perspective the use of herbicides and chemical fertilizers in the forest is of major concern. Chemicals can contaminate food and medicine plants with toxins and kill or harm sensitive plants and animals. Alternatives 5 and 1 would not use chemicals during intermediate entries. Alternative 2 would include the restricted use of herbicides and fertilizers. Under Alternative 3, herbicides, fertilizers would be emphasized more, and under Alternative 4 chemicals would remain standard tools used in site preparation during intermediate entries.

Set-asides for Indian Loggers and Post and Pole Production

Small-scale logging and post and pole cutting have become an important part of contemporary Tribal culture on the Flathead Reservation. Therefore maximizing the Tribes' small business set-aside for Indian loggers (without increasing the overall harvest volume) and ensuring adequate and sustainable post and pole production is important. Figure 4-99 shows how the alternative differ with respect to the Indian-logger-small-business set-aside.

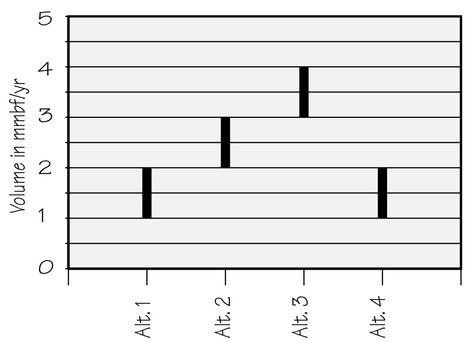


Figure 4-99. The volume of timber that would be set aside Indian loggers. Alternative 5 is not included because volumes can not predicted year to year in a salvage only situation.

Alternative 5 does not set aside a specific volume of timber because timber harvesting would be limited to salvage operations after natural disturbances such as fire. Alternative 5 would require almost all harvesting to be accomplished through small Tribal businesses. The only exception would be very large fires with salvage volumes exceeding Indian logger capabilities.

Post and poling would be maximized Alternative 4, although it would be unregulated and not necessarily sustainable. Under all of the other alternatives, post and poling would be regulated; opportunities over the short term would be greatest under Alternatives 2, 3, and 5. Over the long term, opportunities under Alternative 5 would decline substantially because road access would drop over time.

Grazing

Grazing at higher elevations or in culturally sensitive areas has significant adverse impacts on cultural resource uses. Overgrazing on any site is also of major concern. Alternative 1 would reduce grazing impacts on uplands and in riparian areas the most, followed by Alter-

Restoring native cutthroat trout and bull trout populations is a high priority from the stand point of protecting cultural resources.

natives 2 and 3. All three of these alternatives would address the chief concerns expressed by traditional or cultural users of the forest. Alternative 4 would result in little change from current management. Alternative 5 would result in little change over the short term, but reductions in road density expected to occur under Alternative 5 over the long term would improve range and riparian area health.

Fisheries Restoration

Restoring native cutthroat trout and bull trout populations is a high priority from the stand point of protecting cultural resources. The Salish and Kootenai people have fished for these species for countless generations. The alternatives vary in the amount of fish restoration work that would be conducted for these species. Alternative 1 envisions the most fish restoration work, followed by Alternative 2. The fisheries restoration objectives of the remaining three alternatives do not differ from each other.

Economic and Socio-Economic

Introduction

During the scoping period, issues and concerns were identified about the future of forest management on the Reservation. Among the concerns that related to socio-economic concerns were (1) the perception that income from the forest resource was inadequate, (2) that Tribal member employment in forest-related activities was insufficient, and (3) that the cause of the poor employment situation was the lack of local forest industries and a failure to use the resource for its "highest and best use."

Figure 4-100. Logging revenues are an important source of income to the Tribes.

Summary of Key Effects

Economic Return and Employment

Short term economic returns are highest from Alternative 4, followed by Alternatives 2, 3, 1, and 5, respectively.

Tribal Forestry staffing would remain about the same for Alternatives 1 through 4, at about 96 people. Internal shifts in staff would occur depending on alternative. Alternative 5 would reduce forestry staffing to about 37 people, 33 of whom would be fire fighters.

Total employment, both direct and induced, would be about 490 for Alternative 4, 400 for Alternative 2, 370 for Alternative 3, 330 for Alternative 1, and 200 for Alternative 5.

Over the first thirty-year period, Alternative 4 would produce the most income and jobs, followed in order by Alternatives 2, 3, 1, and 5. Over the long term (through 2089), Alternative 4 is predicted to produce the most income and jobs, followed in order by Alternatives 3, 2, 1, and 5.

Economic Costs

Road closures through obliteration would not have a significant effect on any alternative except Alternative 5, where it would reduce revenues by about 9%.

The increased costs of reintroducing fire to the ecosystem combined with predicted road closures would reduce Tribal income by about 4.2% for Alternative 1, 3% for Alternative 2, 2.8% for Alternative 3, 0.7% for Alternative 4, and 16.9% for Alternative 5.

The effects on Indian loggers will differ among alternatives. Each promotes Indian logging. Although Indian logging consistently returns less income to the Tribes, it is socially desirable.

Indian Logging

Indian logging would be promoted in each alternative through the use of harvest set-asides. Alternative 1 would reserve one to two million board feet per year for Indian loggers, Alternative 2 would reserve two to three million board feet, Alternative 3 three to four million board feet, and Alternative 4 one to two million board feet. Under Alternative 5 almost all logging (about three million board feet per year) would be done by Indian loggers. The exception would be very large salvage operations, which would happen only intermittently. Income from Indian logging to the Tribes would continue to lag behind non-Tribal logging.

Recreation

Recreation income to the Tribes is likely to decline under Alternatives 1, 2, and 3 as Limited Public Access Areas are established in all landscapes.

Assumptions

Calculation of present net values or other discounting methods would not improve one's ability to compare alternatives. The application of discount rates would behave as constants because the timing of benefits and costs are likely to be very similar under each alternative.

Special forest products (SFPs) are independent of the alternatives. For example, mushroom collection is just as likely to occur under Alternative 1 as Alternative 4. The amount of mushroom collection would be determined by the market. Alternative 5 may be an exception since many traditional woods workers would be displaced and might increase their production of SFPs, but there is no way to estimate those effects.

The effects on Indian loggers will differ among alternatives. All of the alternatives promote Indian logging. Although Indian logging consistently returns less income to the Tribes, it is socially desirable.

Ecosystem management, the philosophy underlying Alternatives 1, 2, and 3, is more expensive to implement than past management approaches because more planning, reconnaissance, and care in logging and post-logging treatments is necessary.

Limitations

Lack of data is the greatest limitation to economic analysis. Data is lacking for recreation-use days and values, post and pole harvest, special forest product harvest, and so on.

The board foot harvest outputs from the vegetation model are not precise and there is no way to estimate their variance. As a result they can be used only to rank alternatives. For example, although the vegetation model predicts just over 18 million board feet of harvest for Alternative 2, that does not mean that an 18-million-board-foot harvest would occur each year of the period, and there is no way to know if the confidence level around that figure is 10%, 20%, or more.

The dollar values generated by multiplying model harvest outputs by stumpage value can be used only to rank or compare alternatives. It is impossible to say that the figures are accurate within some percent range.

Stumpage in the future cannot be estimated accurately. There are too many noneconomic variables that affect future timber values. Estimates are little more than speculation.

Effects

Economic Returns 1980 through 1997

The economic returns from the forest resource over the last 17 years is complex. Stumpage income to the Tribes is the most significant contribution to the Tribal budget from the forest resource. Over the 17-year period, about 374 million board feet of timber was sold for nearly $64 million. The volumes and values received have fluctuated over the years depending on markets, availability of timber, Federal regulations and so on. But on average, about 20.7 million board feet were cut and about $3.5 million was received annually.

Figure 4-101. Over the last 17 years, on average about 20.7 million board feet per year were cut. That volume yielded roughly $3.5 million annually.

The Tribes also received income from the sale of permits to Tribal loggers. Over the 17-year period, these permits resulted in the harvesting of about 50 million board feet of timber and an income of about $2.8 million. Another significant product from the forest is found in free-use permits. The Tribes do not receive income from this harvest, but individual Tribal members receive the value and use the wood to build homes and structures. This has resulted in the harvest of about 89 million board feet over the 17-year period with an estimated value of about $3 million. In recent years a cordwood market has developed and resulted in the harvest of an estimated 3.5 million board feet with a value to the Tribes of about $100,000.

Christmas trees also provide income to Tribal members but not to the Tribes. From 1980 to 1989, the last year records were kept, 375,000 bales of Christmas trees were cut with an estimated value to Tribal members of about $475,000 or about $53,000 per year. The Christmas tree market has declined markedly over the past eight years, and probably no more than about 3,000 to 5,000 bales were sold to off-reservation buyers in 1997, generating about $20,000 to $35,000.

One factor that will reduce economic returns is the projected stumpage prices for the next ten years. The stumpage values used in the comparisons of alternatives are based on 1997 stumpage. In each of the ten years for the short-term assessment (1999-2008), it is projected that stumpage, exclusive of inflation, will decline 1.04% per year.[1] While this is not a large projected decline, it does indicate that the ever rising stumpage prices of the last few years—14.2% per year since 1991—are likely to end. This means that the decline in stumpage rates will result in even lower economic returns in the short term. It should be noted that this 1.04% decline in stumpage may be insignificant in comparison to the accuracy of the vegetation model. It is unlikely that the model predictions of volume harvested are within 2% of the actual. In fact, the market supply and demand fluctuation will most assuredly mask such a small decline in stumpage.

[1] "The 1993 RPA Timber Assessment Update," U.S.D.A. Forest Service, Rocky Mountain forest and Range Experiment Station, Fort Collins, CO, 80526, General Technical Report RM-GTR-259, page 36.

Economic Returns by Alternative

Economic returns for alternatives are based on projections of volume made by the vegetation model for the short term (30 years) and the long term (90 years). The volume of harvest was further divided into ponderosa pine greater than 20" dbh and other species. This was done to reflect the higher value that ponderosa pine receives. The following table shows the projected volumes and species by alternative and time period.

Figure 4-102. Alternatives 1 and 2, which focus on nurturing stands like the one above, would have annual harvests of 14.9 and 18.1 million board feet, respectively.

	Short Term			Long Term		
	mmfb/yr	Ponderosa Pine > 20"	Other spp	mmfb/yr	Ponderosa Pine > 20"	Other spp
Alt 1	14.9	0.7	14.2	16.9	1.8	15.1
Alt 2	18.1	0.7	17.4	19.0	1.9	17.0
Alt 3	16.6	0.7	15.9	20.5	2.2	18.3
Alt 4	22.6	1.0	21.5	23.6	2.6	21.0
Alt 5	3.0	0.4	2.6	3.0	0.6	2.4

Notes: This table includes volume from woodland and sod restoration treatments, and the species production is based on percentages averaged for the short and long terms.

Projected Short Term Economic Returns from Harvest by Alternative

Alternative 1

For Alternative 1, the model predicts an annual harvest of 700 thousand board feet of ponderosa pine and 14.2 million board feet of other species for the first thirty-year period. Applying the stumpage rates for 1997 ($340.64 for ponderosa pine and $257.23 for other species) results in a Tribal harvest income of $3,645,000. This includes one to two million board feet set aside for Indian loggers in small sales and paid permits. (The stumpage values used for Indian loggers is 36% of the contract stumpage. This is the average value of Indian stumpage versus non-Indian stumpage for the period 1988 through 1997.)

The stumpage paid to the Tribes is only part of the economic return to the Tribal and non-Tribal community. There are both direct contributions to the local economy for wood-products-associated businesses (woods workers, etc.) and indirect contributions to the community at large from the economic activity of the forest industry (the money spent by workers within the industry and so on). The direct return is calculated at $350,170 per million board feet harvested. The indirect and induced return to the local economy is calculated at $437,713 per million board feet. The total direct and indirect return from harvest is then $787,883 per million board feet.[2]

This alternative predicts an annual harvest of 14.9 million board feet. This would generate about $12,000,000 in direct and indirect economic returns to the local economy. This is in addition to the stumpage paid to the Tribes.

[2] "Employment and Labor Income Response Coefficients," Intermountain Research Station, USDA Forest Service, Missoula, MT, 1993, pages 1-3.

Alternative 2

For Alternative 2, the model predicts an annual harvest of 700 thousand board feet of ponderosa pine and 17.4 million board feet of other species for the first thirty-year period. Applying the stumpage rates for 1997 ($340.64 for ponderosa pine and $257.23 for other species) results in a Tribal harvest income of $4,300,000. This includes two to three million board feet set aside for Indian loggers in small sales and paid permits.

This alternative predicts an annual harvest of 18.1 million board feet. This would generate about $14,000,000 in direct and indirect economic returns to the local economy. This is in addition to the stumpage paid to the Tribes.

Road closures through obliteration would not have a significant effect on any alternative except Alternative 5, where it would reduce revenues by about 5%.

Alternative 3

For Alternative 3, the model predicts an annual harvest of 700 thousand board feet of ponderosa pine and 15.9 million board feet of other species for the first thirty-year period. Applying the stumpage rates for 1997 ($340.64 for ponderosa pine and $257.23 for other species) results in a Tribal harvest income of $3,744,000. This includes three to four million board feet set aside for Indian loggers in small sales and paid permits.

This alternative predicts an annual harvest of 16.6 million board feet. This would generate about $13,000,000 in direct and indirect economic returns to the local economy. This is in addition to the stumpage paid to the Tribes.

Alternative 4

For Alternative 4, the model predicts an annual harvest of 1.0 million board feet of ponderosa pine and 21.5 million board feet of other species for the first thirty-year period. Applying the stumpage rates for 1997 ($340.64 for ponderosa pine and $257.23 for other species) results in a Tribal harvest income of $3,645,000. This includes one to two million board feet set aside for Indian loggers in small sales and paid permits.

This alternative predicts an annual harvest of 22.6 million board feet. This would generate about $17,000,000 in direct and indirect economic returns to the local economy. This is in addition to the stumpage paid to the Tribes.

Alternative 5

For Alternative 5, the model predicts and annual harvest of 400 thousand board feet of ponderosa pine and 2.6 million board feet of other species for the first thirty-year period. In most years the entire harvest would be done by Tribal loggers (the exception would be very large salvage operations that would occur only intermittently). The value of Tribal logger stumpage for the period 1988 through 1997 was 36% of the Non-Indian logger stumpage. Applying this reduced stumpage to the annual harvest for this alternative results in a harvest income of $289,000.

This alternative predicts an annual harvest of 3 million board feet. This would generate about $2,400,000 in direct and indirect economic returns to the local economy, in addition to the stumpage paid to the Tribes.

Effects of Road Closures and Burning on Income

Road Closures

Alternatives 1, 2, and 3 will result in road abandonment and obliteration designed to reduce road densities. The miles of road abandoned will vary by alternative. Alternative 1 will result in more roads obliterated as well as more roads recontoured to restore the natural slope. This would be more expensive than the methods used under Alternatives 2 and 3 where road ripping or gating would be more common than recontouring. Alternative 5 would require the removal of culverts before roads are no longer maintained. This is to minimize the likelihood of catastrophic failures and the deposition of large amounts of sediment in the creeks and rivers following the abandonment of maintenance.

The following table was generated using GIS analysis and shows the miles of roads to be obliterated by alternative.

Table 4-57. Estimated miles of road that would be obliterated under each alternative.

Miles of Roads to be Obliterated

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Total Miles	279	157	44	0	1378
Numbers of Culverts to Remove	608	342	96	0	824
Miles of Recontouring	50	20	0	0	0

The costs of road obliteration will vary based on numerous factors including steepness, rockiness, vegetation, proximity to streams, etc. It is estimated that the average cost of obliteration is $1,500 per mile. This includes scarification, culvert removal, waterbars and revegetation. It is estimated that recontouring will cost $3,200 per mile and that pulling culverts without any other action will cost $600 per mile.[3]

Applying these costs to the estimated miles in the above table results in total costs of $578,500 for Alternative 1, $299,500 for Alternative 2, $66,000 for Alternative 3, $0 for Alternative 4, and $826,800 for Alternative 5. These are total rather than annual costs and if spread over the thirty-year short-term period, they would be rather insignificant compared to total annual stumpage income. On an annual basis, Alternative 1 would cost about $19,000, Alternative 2 about $10,000, Alternative 3 about $2,200, and Alternative 5 about $27,000.

Timber harvest receipts will decline in order to pay for these closures. The costs of obliteration will be reflected in reduced stumpage values. Under Alternative 5, there will be very few timber harvests; the cost of removing culverts would amount to about 9% of annual harvest receipts. Under Alternatives 1, 2 and 3, obliteration would be 0.5%, 0.2%, and 0.06% of revenues, respectively.

[3] Estimates are based on the range of costs listed in "Cost Estimating Guides for Road Construction", Table T-3 "Obliteration of Temporary Roads," page (02/98)-123, U.S.D.A. Forest Service, Northern Region, Engineering, Jan. 1998. $1,500 for obliteration and culvert removal is the midpoint for the range listed for moderate terrain. $3,200 for recontouring is the average of midpoints for gentle and moderate to steep slopes. The estimate for pulling culverts and not doing anything else as would be the case for Alternative 5 is $600 per mile.

Increased Burning

One of the main elements of ecosystem management is the reintroduction of fire into the forest ecosystem. Increasing the amount of burning will result in increased costs.

Acres of pile burning, broadcast burning, grass and woodland burning, and burning to achieve parklike stands were estimated. The acres and the costs associated with this type of burning are found in Appendix P.

In the short term, over the next 30 years, Alternative 1 would have annual burning costs of about $134,000. Alternative 2 would have annual costs about $123,000. Alternative 3 would have costs of about $103,000 annually, Alternative 4 $40,000, and Alternative 5 would have costs of about $22,000 per year.

Over the long term, Alternative 1 would have annual costs of about $75,000. Alternative 2 would have annual costs of about $67,000. For Alternative 3 costs would be about $42,000, for Alternative 4 about $15,000, and for Alternative 5 about $5,000.

These are significant costs and would be seen in reduced stumpage income or increased operating costs to the Tribes.

Combined Effects of Road Closures and Reintroduction of Fire

Probably the two most significant elements of the ecosystem management alternatives with respect to economics are the road closures and reintroduction of fire. Taken together, they are a reasonable approximation of the additional costs of ecosystem management over traditional management.

Combining road closures and fire reintroduction for Alternative 1 results in an annual cost of about $153,000. For Alternative 2 the cost would be about $133,000, for Alternative 3 it would be $103,000, for Alternative 4 about $40,000, and for Alternative 5 about $49,000.

Indian versus Non-Indian Harvest

An issue that arose during the scoping process was a concern that inadequate numbers of Tribal members were benefitting from the timber harvest. The need for more sales to Indian loggers was noted.

Historically, records have been kept comparing the values received and volumes harvested by Indian loggers and non-Indian loggers. Figure 4-103 shows the difference in stumpage between the two groups. It indicates that stumpage from Indian logger sales has historically been less than non-Indian sales. For the past ten years, stumpage payments by Indian loggers has averaged only 36% of non-Indian. As a matter of policy the Tribes have made efforts to

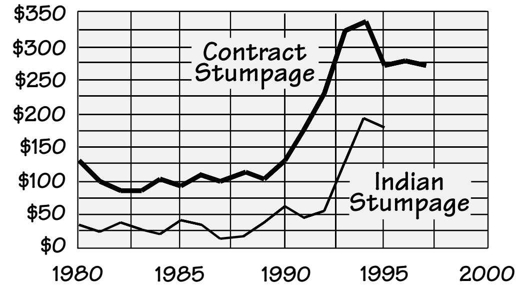


Figure 4-103. This graph shows the difference that has existed between contract and Indian stumpage since 1980.

insure that Indian loggers receive sales. However, this effort has cost the Tribes income. In effect, the Tribes have been subsidizing the Indian loggers. It may or may not be correct to say that an increase in Indian logger sales would result in an increased subsidy and concomitant loss of income to the Tribes. Perhaps more sales to Indian loggers would increase the numbers of Indian loggers bidding on sales and increase the stumpage bids to those that would be offered by non-Indian loggers. The Tribes may, as a matter of policy, prefer that the difference in stumpage go to the Indian loggers rather than the to Tribal coffers.

Projected Short-term Employment by Alternative

There are several types of employment that result from the timber harvest. Between 85 and 105 Tribal government employees are needed to conduct Forestry Department business. The activities range from sale preparation and administration to fire management. The following table shows the staff and organization and the estimated numbers of employees by alternative. Alternative 4 represents the present Forestry Department Staff.

Table 4-58. The anticipated staffing and organizational framework for each alternative

Short-term Employment

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Admin.	4	5	5	5	2
Sale Admin.	4	6	7	7	1
Scaling	1	2	2	2	0
Projects	13	17	17	17	1**
Plans	5	6	6	6	0**
For. Dev.	13	14	15	15	0**
Fire	18 + 35*	15 + 28*	13 +28*	13 +28*	5 + 28*
GIS	3	3	3	3	0
Totals	96	96	96	96	37

A second source of employment is the direct employment by the logging industry. In contract sales to non-Indian loggers, 25% of the crew are required to be Tribal members. Indian logger sales usually have a much larger number of Tribal workers. There are no data available that accurately estimate the number of total workers who are Tribal. The University of Montana Bureau of Business and Economic Research has developed multipliers that estimate the total number of workers per million board feet harvested. A factor or 11.03 per million board feet harvested can be used to calculate direct employment. A factor of 22.17 per million board feet harvested can be used to estimate indirect and induced employment. Combining the two results in a factor of 33.20 for the entire economy.

The effects on employment by alternative follow.

Alternative 1

The vegetation model predicts a contract harvest of 14.9 million board feet for Alternative 1. About 96 Tribal Forestry employees would be needed to generate this harvest. Direct forest-products-related employment from this harvest level would be about 164 people. It is estimated that about 90 of those workers would be Tribal members.[4] The indirect and induced employment based on a combined contract harvest plus permit, lodgepole pine, etc. of 14.9 million board feet would be about 330 people.

Alternative 2

The vegetation model predicts a contract harvest of 18.1 million board feet for Alternative 2. About 96 Tribal Forestry employees would be needed to generate this harvest. Direct forest-products-related employment from this harvest level would be about 200 people. It is estimated that about 100 of those workers would be Tribal members.[5] The indirect and induced employment based on a combined contract harvest plus permit, lodgepole pine, etc. of 18.1 million board feet would be about 400 people.

Alternative 3

The vegetation model predicts a contract harvest of 16.6 million board feet for Alternative 3. About 96 Tribal Forestry employees would be needed to generate this harvest. Direct forest-products-related employment from this harvest level would be about 183 people. It is estimated that about 95 of those workers would be Tribal members. The indirect and induced employment based on a combined contract harvest plus permit, lodgepole pine, etc. of 16.6 million board feet would be about 370 people.

Alternative 4

The vegetation model predicts a contract harvest of 22.0 million board feet for Alternative 4. About 96 Tribal Forestry employees would be needed to generate this harvest. Direct forest-products-related employment from this harvest level would be about 240 people. It is estimated that about 110 of those workers would be Tribal members. The indirect and induced employment based on a combined contract harvest plus permit, lodgepole pine, etc. of 22.5 million board feet would be about 490 people.

Alternative 5

The vegetation model predicts a contract harvest of 3.0 million board feet for Alternative 5. About 37 Tribal Forestry employees would be needed to generate this harvest, mostly to provide fire protection. Direct forest-products-related employment from this harvest level would be about 35 people. It is estimated that about 60 Tribal members would be forced to harvest post, poles, cordwood, etc. by the reduced contract harvest, generating about a 6-million-board-foot harvest. The indirect and induced employment based on a combined contract harvest plus permit, lodgepole pine, etc. of 9 million board feet would be about 200 people.

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[4] Estimate is based on 25% employment in contract harvest plus 50 Tribal workers on Indian only harvest. Fifty is estimated employment based on 4.5 million board feet of lodgepole pine, cordwood, etc. Indirect and induced employment is million board feet times 22.17 (From Bureau of Business and Economic Research).

[5] See footnote number 1, this section.

Other Economic Returns

The values and employment associated with timber harvest were used to generate the data above. However, there are other resources in the forest that produce income, and the revenue from these, too, will vary by alternative.

Grazing

Grazing permits are let by the Tribes, and a substantial portion of those leases are in forested areas. The prices for these leases are set by the Tribes and do not reflect market values. Presently, the appraised value for grazing leases is $6 per animal unit month (AUM) and the value received is $1.50 per AUM. This is similar to the way the Bureau of Land Management and Forest Service operate. Based on the present stocking rate of about 19,500 AUMs, the Tribes receive about $45,000 per year in grazing leases.

The economic impacts of grazing on forest land is dependent on the number of AUMs applied to the land. The number of AUMs is called the stocking rate. It is not within the scope of this analysis to predict how any of the alternatives would affect stocking rates, and so it is not possible to give a quantitative assessment of economic impacts. Instead, the economic impacts are qualitatively ranked relative to each other in the following matrix (table 4-59)

Table 4-59. The relative economic impacts on grazing by alternative. A minus (-) symbol indicates a negative impact and a zero, no change. Two minus signs indicates a stronger negative impact.

Grazing Economic Effects

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Effect on Grazing Income	--	-	-	0	--

Recreation

One direct source of income to the Tribes comes from the sale of recreation permits to non-Tribal members. These permit sales generate between $200,000 and $300,000 each year. The value of a recreation day for a Tribal member is probably less than it is for a nonmember because of the Tribal member's proximity to the resource.

Because no data are available for the value of recreation days on the Reservation forest, the economic impacts for recreation are qualitatively ranked in the following matrix (table 4-60).

Table 4-60. The relative economic impacts on recreation by alternative. A minus (-) symbol indicates a negative impact and a zero, no change. Two minus signs indicates a stronger negative impact.

Recreation Economic Effects

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Effect on Recreation Income	--	-	-	0	-

It is likely that Alternatives 1, 2, and 3 will result in less Tribal income from recreation because each of these alternatives has a provision for creating Limited Public Access Areas. These areas could be set aside for the exclusive use of Tribal members and may result in a reduction of the purchase of recreation permits, the main source of recreation income to the Tribes. This financial loss may be offset by an improvement in the quality of recreation and cultural experiences by Tribal members in these areas.

Long-Term Effects

Economic

For the purposes of the impact assessment, the long term is defined as the period 2010 through 2089. The vegetation model has generated volume predictions based on the biological potential and the constraints placed upon the forest during that time. These predictions are for six of the eleven ten-year periods.

The annual harvest increases in each alternative except Alternative 5, which remains steady at 3 million board feet.

The annual harvest by alternative for the entire period is plotted on the graph that follows (fig. 4-104). The plots maintain their relative differences except the Alternative 3 line. Around year 2040, the harvest from Timber Emphasis overtakes the Alternative 2 line and continues to produce more timber throughout the period.

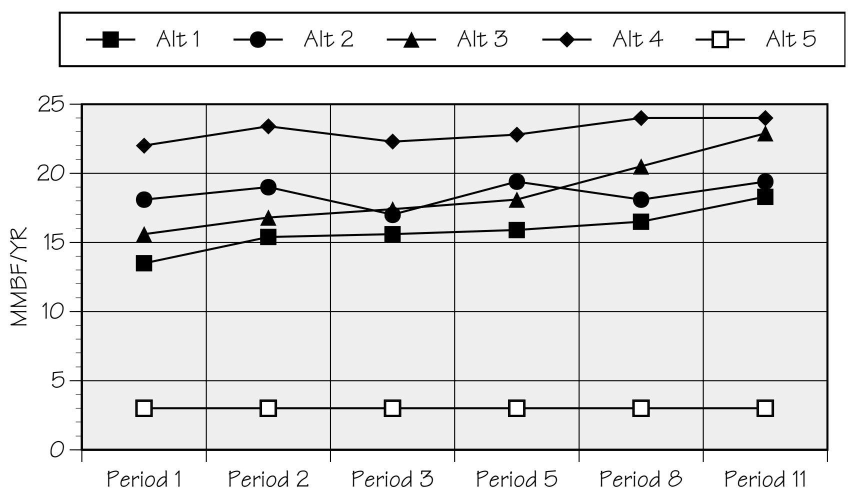

Figure 4-104. Predicted harvest volumes by alternative from period 1 through period 11. Each period represents 10 years.

Applying stumpage values to timber over a ninety-year period is even more speculative than over the ten-year period used for the short-term analysis. The RPA ventures a guess at future stumpage values. Those predictions cover ten-year periods through 2040. From 2010 through 2020, RPA predicts an annual 3% increase in stumpage. For 2020 through 2030 it predicts a 0.5% decline, and for 2030 through 2040 it predicts a 0.3% increase. Accuracy, of course decreases with time. These rises and falls in the stumpage value are probably insignificant and easily masked or altered by events we cannot predict. The increase in harvest volume predicted by the vegetation model is far more significant and probably more realistic.

The following table (table 4-61) shows the harvest increases by alternative through 2089. This is useful in distinguishing between alternatives over the long term.

Table 4-61. Harvest increases by alternative through the year 2089

Timber Harvest by Alternative in 2009 and 2089

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
2009 Harvest (MM)	15.6	17.0	17.4	22.3	3.0
2089 Harvest (MM)	18.3	19.4	22.9	24.0	3.0
Percent Change	+17.3%	+14.1%	+31.6%	+7.6%	0

Another way to look at these data is to consider the increase in harvest as a return on investment. The stumpage values for each alternative will be the same at any point in time so the real difference between alternatives is the change in harvest volume over the period.

Employment

As with economic effects, predicting the future of employment from harvest is tenuous at best. It is likely that fewer people will be needed to harvest timber in the future because of increased mechanization. This would mean that the 11.03 coefficient would probably go down. Indirect and induced effects would also decline but not in proportion to direct effects. More precise speculation about the long term effects of each alternative on employment is beyond the capabilities of this analysis.

Other Forest Resources

The long term future for recreation is likely to grow. This has been the case in the last decades and is likely to continue. Whether the Tribes will accommodate the increased demand or restrict recreation to reduce adverse impacts to the recreation resource is unknown. From an income standpoint, recreation revenues is a minor factor. From an employment standpoint, recreation jobs could become an important segment of the economy.

The long-term future for grazing is unclear, but likely to decrease on forested areas because of ecosystem management concerns.

Communication and Education

Introduction

During the scoping process two issues relating to communication and education were identified: (1) there is a lack of communication between programs, agencies, and the public, and this has led to poor management priorities; and (2) there is a need for more education to promote understanding between Tribal programs, other agencies and the public. The ID Team developed objectives for all of the alternatives that seek to improve communication and education among agencies, programs, and the public.

Every alternative has objectives designed to improve communication between the public and the Departments of Forestry and Natural Resources and to enhance education about forest management.

Effects

All Alternatives

Every alternative has objectives designed to improve communication between the public and the Departments of Forestry and Natural Resources and to enhance education about forest management. These include: (1) making annual presentations; (2) participating in intertribal youth practicums, science fairs, and career days; (3) holding summer field trips; (4) writing feature articles for local newspapers; and (5) promoting "Project Learning Tree" at local schools. Management priorities should improve as the Tribal Departments of Forestry and Natural Resources increase their understanding of public needs through the above interactions. Similarly, the public's satisfaction should improve as they understand more about the social, biological, and economic factors affecting management decisions.

Communication between the Departments of Forestry and Natural Resources and other Tribal programs should improve by developing common fiscal-year goals, holding annual field trips, and creating a joint home page to display public information and feature articles. These programs should help to build an *esprit de corps* among programs. In so doing, they will foster win-win solutions to management problems and ownership in resource management achievements. They should help to reduce conflicts and lead to more efficient and effective program operations.

The alternatives also include objectives to send trainers and presenters to local, regional, and national training programs. Tribal programs and the resource management professions in general should benefit from this exchange.

Another objective is to develop and implement a comprehensive education action plan on fire's role and fire use in pre-contact ecosystems. The decision maker's and the public's understanding of fire should improve under this program. The acceptance of fire as a management tool should also improve. Management priorities should be easier to organize when the public understands fire's role in forested ecosystems.

Communication with other agencies should improve as Tribal managers attend annual coordination meetings with Federal, state, county, and rural cooperators. These meetings could lead to cooperative undertakings that build partnerships in resource management and increase understanding and acceptance of each other's mission.

Alternatives 1, 2, 3, and 4

These alternatives have objectives to develop interpretive trails at Boulder and Swartz Lake and to install of “Points of Interest” at Valley Creek and Saddle Mountain. These improvements should enhance the public’s knowledge of resource management and provide more opportunities to learn about ecological factors affecting resource management. They will also be a way for the Tribes’ to point out resource management achievements.

These alternatives also have an objective to develop and fill a public information officer position. This individual would develop and maintain programs to educate the public, other agencies, and young people about Tribal program goals, activities, and key resource management events. Opportunities to listen to the public would increase, and the public’s level of satisfaction should improve through an effective public information program.

Chapter Five
NEPA Considerations

Contents

NEPA Considerations

The Relationship of Short-term Uses of the Environment and Maintenance of Long-term Productivity

Alternative 1

Short-term impacts associated with Alternative 1 would include vegetation loss, soil disturbances, and stream sedimentation associated with restoration activities, timber harvesting, salvage operations and anticipated new road construction.

Long-term losses in forest productivity resulting from the construction of 78 miles of new roads would be more than offset by the retirement of 279 miles of existing roads. There will also be long-term losses in forest productivity resulting from the restoration of 9,542 acres of grasslands. That impact would be offset by gains in forage for wildlife and livestock. Some losses in hiding cover are expected in the Nonlethal Fire Regime as stands are thinned and understory cover is reduced.

Alternative 2

Short-term impacts would include vegetation loss, soil disturbances, and stream sedimentation associated with restoration activities, timber harvesting, salvage operations, and anticipated new road construction.

Long-term losses in forest productivity resulting from the construction of 129 miles of new roads would be offset by the retirement of 157 miles of existing roads. Long-term losses in forest productivity could be expected from the restoration of 8,244 acres of grasslands. However, these impacts would be offset by gains in forage for wildlife and livestock. Some long-term losses in wildlife diversity are expected to result from continued competition between big game and livestock on winter ranges.

Alternative 3

Short-term impacts would include vegetation loss, soil disturbances, and stream sedimentation associated with timber harvesting, salvage operations, and anticipated new road construction.

Long-term losses in forest productivity would result from the construction of 207 miles of new roads. These losses would be offset somewhat by the retirement of 44 miles of existing roads. Long-term losses in wildlife diversity are expected to occur within riparian and wetland areas as a result of competition between big game and livestock. This alternative is expected to result in further degradation of stream substrate condition, which could lower the production of aquatic insects and reduce the hatching and emergence success of fish. Under Alternative 3, aquatic biotic potential is expected to decrease, which could jeopardize the continued viability of some fish populations.

Alternative 4

Short-term impacts would include vegetation loss, soil disturbances, and stream sedimentation associated with timber harvesting, salvage operations, and anticipated new road construction.

Long-term losses in forest productivity would result from the construction of 268 miles of new roads. Long-term losses in wildlife diversity are expected to occur within riparian and wetland areas as a result of competition between big game and livestock. This alternative is expected to result in further degradation of stream substrate condition, which could lower the production of aquatic insects and reduce the hatching and emergence success of fish. Under Alternative 4, aquatic biotic potential is expected to decrease and could jeopardize the continued viability of some fish populations.

Alternative 5

Short-term impacts would include vegetation loss, soil disturbances, and stream sedimentation associated with salvage operations. Long-term impacts include losses in early-seral and forage habitat that could reduce the productivity of wildlife species such as deer and elk that require forest openings. Long-term losses in wildlife diversity are expected to occur within riparian and wetland areas as a result of competition between big game and livestock.

Significant Irreversible and Irretrievable Impacts

Irreversible impacts apply primarily to the effects on nonrenewable resources like minerals and cultural resources. Irretrievable impacts apply to the loss of production, harvest, or use of natural resources for one or more years.

Alternatives 1 and 2

Implementation of either of these two alternatives would not result in the loss of nonrenewable resources. Both alternatives would have minimal irreversible impacts. Neither is expected to have irretrievable impacts.

Alternative 3

The implementation of this alternative would not result in the loss of nonrenewable resources and would therefore have minimal irreversible impacts.

Irretrievable impacts would include the long-term loss of forest production on 395 acres resulting from the construction of 163 miles of new roads. Other irretrievable impacts include the degradation of stream substrate conditions, which could lower the productivity of aquatic insects and reduce the hatching and emergence success of fish and the loss of aquatic biotic potential, which could jeopardize the continued viability of some fish populations.

Alternative 4

This alternative would not result in the loss of nonrenewable resources and would therefore have minimal irreversible impacts.

Irretrievable impacts would include the long-term loss of forest production on 650 acres resulting from the construction of 268 miles of new roads. Other irretrievable impacts include the degradation of stream substrate conditions, which could lower the productivity of aquatic insects and reduce the hatching and emergence success of fish and the loss of aquatic biotic potential, which could jeopardize the continued viability of some fish populations.

Alternative 5

This alternative would not result in the loss of nonrenewable resources and would therefore have minimal irreversible impacts. Irretrievable impacts would include the long-term loss of early-seral and forage habitat. Significant increases in this type of habitat would likely occur only after catastrophic fire events.

Cumulative Impacts

Cumulative impacts are defined as the impact on the environment resulting "from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions."

Alternatives 1 and 2

The use of fire as a management tool will increase, and consequently both alternatives will substantially increase smoke emissions and will therefore contribute to increases in nutrient loads in water bodies like Flathead Lake. It can be assumed that airborne particulates from prescribed fire sources will affect air quality in areas off the Reservation. Conversely, particulates from fires occurring outside the Reservation will impact local air quality, although the timing and extent of these impacts can not be determined very far in advance. Soil disturbances resulting from restoration activities within and adjacent to the forest will increase opportunities for the spread of weeds. Old ponderosa pine, western larch, and spruce will increase, and there will be more parklike stands in the Nonlethal and Mixed Fire Regimes. These increases will be associated with a decrease in the dense Douglas-fir and grand fir stands that have resulted from the absence of fire. Residential developments within and adjacent to forest lands will reduce habitat for forest wildlife species. In certain areas, such as along the shore of Flathead Lake or at the base of the Mission Range, these impacts are potentially significant for the grizzly bear. The widening of Highway 93 through the Evaro area will add to forest fragmentation and negatively impact the movement of wildlife between the Reservation Divide area and the Mission and Rattlesnake Ranges. Under Alternative 2, some long-term losses in wildlife diversity are expected to result from continued competition between big game and livestock on winter ranges. Alternatives 1, 2, and 3 would implement a trail-use fee system for the use of designated snowmobile tails and cross country ski trails within the North Missions Landscape. The fees would be used for the maintenance of these trails.

Alternatives 3 and 4

Airborne particulates from prescribed fire sources will affect air quality in areas beyond the Reservation's boundary, and particulates from fires occurring outside the Reservation will impact local air quality, although the timing and extent of these impacts can not be determined at this time. Mature ponderosa pine and western larch will increase. Managers will emphasize harvesting, thinning, and reforestation over prescribed fire. Residential developments within and adjacent to forest lands will reduce habitat for forest wildlife species. In certain areas, such as along the shore of Flathead Lake or at the base of the Mission Range, these impacts are potentially significant for the grizzly bear. The widening of Highway 93 through the Evaro area will add to forest fragmentation and negatively impact the movement of wildlife between the Reservation Divide area and the Mission and Rattlesnake Ranges. Competition between big game and livestock in riparian and wetland areas will decrease wildlife diversity. Higher road densities in the forest will impact big game and grizzly bear security. Cumulative impacts to stream condition will continue from road construction, removal, and inevitable washouts. Over the long term, cumulative impacts should stabilize because of improvements in road condition, but they will stabilize a level higher than current condition because of the increase total road miles.

Alternative 5

Old stands of all species will increase under Alternative 5. Douglas-fir, grand fir, and alpine fir will continue to increase in all landscapes. There will be a net loss of early-seral forage habitat, which will force species like the grizzly bear onto adjacent non-forested areas that are vulnerable to residential development. Under these circumstances, grizzly bears would be expected to suffer a relatively high mortality rate. The widening of Highway 93 through the Evaro area will negatively impact the movement of wildlife between the Reservation Divide area and the Mission and Rattlesnake Ranges. Competition between big game and livestock in riparian and wetland areas will decrease wildlife diversity. Cumulative impacts to stream condition will continue primarily from the inevitable road washouts. Over the long term, cumulative impacts should stabilize and then decline due to the reduction in total road miles.

Unavoidable Significant Adverse Impacts Resulting from Project Implementation

Unavoidable adverse impacts are those that occur after implementation of all mitigation measures.

Alternatives 1 and 2

Impacts from livestock grazing in riparian and wetland areas will decrease wildlife diversity.

Unavoidable adverse impacts include those associated with the roading of currently unroaded areas (approximately 80 miles of roads would be built in unroaded areas under Alternative 1, and 129 miles would be built under Alternative 2). New road construction results in increased sediment delivery to streams and increased efficiency of runoff, which causes more "flashy flow" responses to rainfall and snowmelt.

Unavoidable adverse impacts also include sediment resulting from the removal of stream crossings, which is part of the process of road removal. It is nearly impossible to remove road fill and culverts without introducing some sediment to streams. Stream crossing removals will be scheduled for late summer when flows are at a minimum and the risk of sediment being released into the stream is at a minimum. The amount of sediment released will be directly related to the number of crossings removed. Alternative 1 and 2 will have the greatest number of culverts removed and therefore will have the greatest near-term impact in the form of sediment released. However, these two alternatives will have the least long-term impact because of the removal of the high-risk earth fills within the stream channels.

Alternative 3

Unavoidable adverse impacts would include the long-term loss of forest production on 395 acres resulting from the construction of 163 miles of new roads; the degradation of stream substrate conditions and the loss of aquatic biotic potential. The list also includes losses in big game and grizzly bear security from high road densities and decreases in wildlife diversity resulting from impacts associated with livestock grazing in riparian and wetland areas.

Unavoidable adverse impacts include impacts associated with the roading of currently unroaded areas (approximately 206 miles of roads would be built in unroaded areas under Alternative 3). New road construction results in increased sediment delivery to streams and increased efficiency of runoff, which causes more "flashy flow" responses to rainfall and snowmelt.

Unavoidable adverse impacts also include sediment resulting from the removal of stream crossings, which is part of the process of road removal.

Alternative 4

Unavoidable adverse impacts would include the long-term loss of forest production on 650 acres resulting from the construction of 268 miles of new roads.; the degradation of stream substrate conditions and the loss of aquatic biotic potential. The list also includes losses in big game and grizzly bear security from high road densities and decreases in wildlife diversity resulting from impacts associated with livestock grazing in riparian and wetland areas.

Unavoidable adverse impacts also include impacts associated with the roading of currently unroaded areas (approximately 268 miles of roads would be built in unroaded areas under Alternative 4). New road construction results in increased sediment delivery to streams and increased efficiency of runoff, which causes more "flashy flow" responses to rainfall and snowmelt.

Unavoidable adverse impacts also include sediment resulting from the removal of stream crossings, which is part of the process of road removal.

Alternative 5

Unavoidable adverse impacts would include the long-term loss of early-seral and forage habitat and decreases in wildlife diversity resulting from impacts associated with livestock grazing in riparian and wetland areas. Unavoidable adverse impacts also include sediment resulting from the removal of stream crossings, which is part of the process of road removal.

Mitigation Measures to be Employed

Mitigation includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (e) compensating for the impact by replacing or providing substitute resources or environments.

This EIS is nonspatial, so it is difficult to discuss mitigation measures in a spatially specific way. It should be emphasized, however, that Alternatives 1, 2, and 3 are all restoration-oriented; that is, they have, as one of their primary goals, the restoration of a more natural environment. They would accomplish this by mitigating the impacts associated with logging, grazing, and other human uses of the forest. It should also be noted that the final Forest Management Plan will include a comprehensive set of *management standards*, the majority of which are mitigation oriented.

Alternatives 1 and 2

Both of these alternatives are strongly restoration oriented, that is they seek to restore altered forest environments to a more natural condition. Both mitigate the impacts associated with logging activities by emphasizing restoration. Both emphasize structural goals over economic returns (timber revenues are a by product of restoration activities). Both also attempt to mitigate the impacts associated with logging by reducing open and closed road densities, increasing old growth, reestablishing a more natural role for fire, improving 100 % of the road segments that are degrading water quality, increasing the emphasis placed on the protection of scenic qualities, actively restoring the scenery of areas adversely impacted by past logging practices, protecting roadless areas, designating new wilderness areas, and adding to existing wilderness areas. Both attempt to minimize the impacts associated with grazing by improving grazing practices and rehabilitating riparian areas impacted by past grazing practices.

Alternative 3

While this alternative would use an ecosystem management approach to restore pre-European forest structures, restoration efforts would be balanced against the need to maximize income and employment and reduce harmful forest insect infestations and diseases. It would seek to mitigate the impacts associated with logging activities by designing timber sales to meet more natural structural goals. Alternative 3 attempts to mitigate the impacts associated with logging by reducing open and closed road densities, increasing old growth, reestablishing a more natural role for fire, improving 70% of the road segments that are degrading water quality, increasing the emphasis placed on the protection of scenic qualities, and actively restoring the scenery of areas adversely impacted by past logging practices. Alternative 3 would also attempt to minimize the impacts associated with grazing by improving grazing practices and rehabilitating riparian areas impacted by past grazing practices. However, the magnitude of all these mitigation measures would be less than would occur Alternatives 1 and 2.

Alternative 4

Alternative 4 would focus on maximizing the yield of forest products from the available forest base. Mitigation measures would include improving the condition of forest range lands, decreasing open road densities slightly, leaving security areas of at least 3,000 acres adjacent to all logging units on big game summer ranges, improving 50% of the road segments degrading water quality, and minimizing the visual impact of timber harvesting activities.

Alternative 5

The goal of this alternative is to allow natural processes other than fire to control the future direction of the forest. Mitigation measures would include limiting forest management activities to salvaging dead and dying timber after fires, wind storms, or insect and disease outbreaks; decreasing road densities to about half their current levels; reducing grazing opportunities; and conducing modest restoration work in riparian zones.

Chapter Six
Consultation, Coordination, and List of Commentors on the DEIS

Contents

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Francis Auld	Tribal Preservation Office Confederated Salish and Kootenai Tribes	Kootenai Culture
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US Forest Service
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Persons, Agencies, and Organizations Commenting on the DEIS

The following persons, agencies, and organizations submitted written comments on the DEIS. The comment period began on Monday, March 1, 1999 and ended on May 2, 1999. Several comments were received subsequent to the May 2nd deadline but were accepted into the record. Both Tribal and non-Tribal members were invited to comment. One public meeting was held on April 21 at the Mission Valley Power building in Pablo, Montana. About 100 people attended. At the end of the comment period, 104 letters or comment forms had been received from the individuals, agencies, and organizations listed below.

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Chapter Seven
Comments and Responses

Contents

Public Comments on the DEIS and ID Team Responses

The following pages present written comments on the DEIS and the Interdisciplinary Team's responses to those comments. Comments are summarized and grouped by topic. To avoid duplication, similar comments made by several individuals have been combined and are answered only once. In some cases, the response to a comment is shown only as "comment noted." This means either that we acknowledge the comment and no response is needed or that the comment is the opinion of the commenter and a response is not appropriate. A list of the individuals or agencies commenting is included in Appendix A. Copies of the actual written comments received are available for viewing at the CSKT Tribal Forestry Office in Ronan, Montana, and at the office of Bud Moran, Superintendent of the Flathead Agency, Bureau of Indian Affairs, CSKT Tribal Complex, Pablo, Montana. The list of persons, agencies, and organizations commenting is presented in Chapter 6.

Vegetation

Comment 1

Be flexible with your precontact condition goals. It is not reasonable to go all the way back to precontact conditions.

Response

We agree. The ID Team realizes that the world has changed substantially since precontact times. We now have thousands of miles of forest roads, dams, and utility corridors. We have hundreds of homes within the forest or at its margin. We have threatened and endangered species for which there are specific federal guidelines limiting management options. The public has strong attitudes about prescribed and natural fires, clearcutting, and other forest practices. Also, the Tribes depend on revenue from timber. Hence, it would not be possible, even it were desirable, to return completely to precontact forest conditions. Instead, the three ecosystem management alternatives focus on the restoring historic forest structures to varying degrees consistent with human needs and values of the present-day world. As we stated in the Draft Forest Management Plan:

> *The ecosystem management actions proposed—a combination of timber harvest, pre-commercial and commercial thinning, and prescribed fire—are designed to restore the forest—not all the way back to its precontact condition, but to move it in a more ecologically sustainable direction, one that more closely resembles the precontact. In the words of foresters Edward Monnig and James Byler, The "ecosystem approach is complicated by changes in our forests since the early settlement days and by an inability to fully define pre-European conditions and processes. The changes in our forests over the past century and the current societal demands on our forests*

make duplication of the pre-European condition a virtual impossibility—even in areas reserved from commodity production. The quest for healthy sustainable forests will require numerous approximations and continual monitoring of effects." In the end, the best we can do is to strive to maintain and mimic important ecosystem processes in order to arrest some of the more detrimental trends. Besides providing the disturbances needed to maintain a healthy forest, the ecosystem management approach will also maintain timber revenues and jobs for Tribal members.

Comment 2

Tree stocking standards should be five years instead of the proposed ten.

Response

The five-year regeneration period that has become nearly an industry standard comes from US Forest Service guidelines mandated by Congress. There is no particular biological basis to this standard. It is a one-size-fits-all concept. Some sites revegetate quickly, and others take considerably longer. Attempts to hurry the process become expensive in terms of intense site preparation and artificial reforestation. The ten-year regeneration period recognizes this fact, and allows leeway to accommodate natural restocking processes for the Modified Restoration Alternative. This of course does not mean that rapid reforestation is not welcome. Note that a five-year period was specified for the Commodities alternative (Alternative 3).

Comment 3

I like the salvage only part of Alternative 5, but realize it is not economically feasible. Could it be used in some of the areas and not others under the other alternatives as a kind of compromise?

Response:

The other alternatives (other than Alternative 5, the Custodial Alternative) do not include salvage as the major harvest prescription because that would not be compatible with the underlying philosophy of those alternatives. Alternatives 1, 2, and 3 are based on ecosystem management principles, and Alternative 4 is based on traditional silvicultural principles.

Under the first three alternatives, a variety of silvicultural tools are necessary to reverse the trend toward forest densification and climax species composition; a salvage only policy would prevent the Tribes from meeting their vegetative objectives under these alternatives. Alternative 3 and Alternative 4 both emphasize commodity production; salvage only would fail to meet the economic and vegetative objectives of these alternatives.

Alternatives 1, 2, and 3 seek to balance economic, cultural, social, and ecological concerns on the available commercial forest base. The commercial forest base is less than one-half of the total forest acreage of the Reservation.

Comment 4

We urge the Tribes to carefully evaluate all proposed clearcutting to mitigate the potential adverse impacts on hydrology and wildlife.

Response

The Tribes do carefully evaluate each instance of proposed clearcutting. In addition to the forest-wide programmatic evaluation occurring in this EIS, evaluations occur at the project level during the NEPA-planning phase of each timber sale. An interdisciplinary team, which includes wildlife and water specialists, must concur with the final harvest plan. Further, clearcutting is the choice of last resort when even-aged treatments are required. The use of seed trees, shelterwoods or green-tree retention in what would otherwise be a clearcut is always carefully considered.

Comment 5

We urge the Tribes to include commitments in the forest plan to design timber harvest units to retain all or most western larch, Douglas-fir and ponderosa pine trees over 14" in diameter.

Response

The forest plan will specify vegetative structural goals. The specific goals will depend on the alternative ultimately chosen. Under any one of the first three alternatives, for example, vegetative structural goals will be based in large part upon precontact forest conditions. Before European-American settlement, the forests of the Reservation encompassed a range of tree sizes, tree species, and stocking densities—from very open stands with a few small trees, to very dense stands with large trees of many species. The exact conditions depended on the site and its history of disturbances, such as fire. So under any one of these three alternatives, it would not be possible to leave all trees greater than 14 inches and still meet structural goals. In addition, there are concerns about forest health and vigor that would require some stands of larger trees to be harvested. Still, each ecosystem-based alternative provides for the maintenance, where feasible, of existing large trees and the recruitment and development of large trees consistent with the historical range of variability.

Comment 6

Ecosystem management and the proposed alternative will result in forests that are not as healthy and less productive while generating far less revenue than current management direction. Annual growth will far exceed the annual harvest and significant overstocking and mortality will occur because of insect and disease and the likelihood of catastrophic fire. Forest health and productivity and the revenue lost need to be given more emphasis in your EIS.

Response

A primary objective of the ecosystem management alternatives in the DEIS is to achieve long-term forest health, which differs somewhat from stand and tree-level health. It is assumed that this is achieved when all the primary structures and processes are present in the right amounts, based upon the historical range of variability. Maximizing revenue is not the primary goal of these alternatives. Rather the primary goal is to meet forest structure and health objectives; any revenue generated is considered secondary and a by-product of restoration.

At the implementation level, practitioners will have the latitude to prioritize the treatment of disease-ridden or stagnant stands after first meeting structural goals. Managers will also use fire aggressively in conjunction with silvicultural treatments and salvage to help keep fuels within historic ranges.

While the DEIS alternatives were based upon complex modeling techniques, 754 Continuous Inventory Plots (CFI) were used to calibrate the models. As models are only simplified facsimiles of reality, it is recognized that monitoring is a critical part of this plan and must be ongoing. If future analysis shows that vegetation goals are not being met, mid-course corrections will be made.

Comment 7

Page 44 shows a much greater growth than harvest. We suggest an alternative that makes greater use of jobs to improve forest health. It seems very wasteful to burn this additional growth. Less emphasis should be put on fire.

Response

The table on page 44 to which you refer shows historical *allowable cuts* versus *actual harvests* for several periods, and yes, historically the average harvest level has been less than growth. It should be emphasized that the figures in Table 2-1 are based on different acreages and different computational procedures than the current alternatives in the EIS.

The current proposal uses an acreage base of approximately 225,000 acres and harvest level computations based on meeting structural goals, rather than maximizing harvest levels. Traditional harvest levels were calculated using procedures that reduced disease-infested stands quickly and cut growth. The new procedures, with their emphasis on structure, do not liquidate diseased stands as rapidly. Instead, they seek to first develop the array of forest structures determined to be necessary for long-term sustainability. Growth does exceed harvest, but all of that "excess" growth would not be burned. Fire, however, will remain a critical tool necessary to accomplish ecosystem management goals.

Comment 8

Will the agency and Forestry Department address the unregulated harvest of small forest products? Too little analysis on page 47 of this complex and significant issue. On page 321 you say it would be regulated under other alternatives but you do not say how. It has not occurred under the interim phase of the draft plan. How do you propose to regulate post and pole harvesting?

Response

It is not within the scope of the EIS to discuss detailed plans for handling unregulated harvest or the enforcement of existing ordinances. However, the various alternatives do provide for qualitative and quantitative controls over all types of harvest, including unregulated harvest. The plan specifies a structural target, by fire regime, and a volume-to-be-harvested target. These targets are implemented at the project level. All measurable harvest is considered in the annual allowable harvest, and openings or changes in forest structure caused by unregulated harvest are accounted for. This accounting affects the budget of acres that can be treated in each analysis area when a large timber sale is proposed.

Comment 9

Please explain how log control (from landing to mill) would be addressed. CEQ says the proposed action must consider all actions related to the proposed action…Log accountability should be addressed in this document.

Response

Log control measures are implementation procedures detailed in agency operations plans, logging plans, timber sale contracts and other policy statements. Such discussions are beyond the scope of this document, and were not identified as an issue during public scoping.

Comment 10

The idea of temporary even-aged harvest is a farce.

Response

We disagree. The temporary even-aged management system, also called uneven-aged restoration, will play a key role in restoring historic forest structures on the Reservation.

Comment 11

Page 51: The ecological terminology used is outdated and old thinking…You use both habitat typing and another classification interchangeably. One is goal directed, the other is focused on dynamics. Please be consistent.

Response

We disagree. There has been no decline in the acceptability of vegetative classification systems such as habitat typing (personal communication with Robert Pfister, 7/27/99). The habitat type system is merely a classification of late successional communities. Armed with knowledge of a habitat type, a description of the current condition, and a fundamental understanding of secondary succession, one is able to suggest likely developmental pathways of forest vegetation given various disturbances. It was this fundamental process that was used to model alternatives for the forest plan.

The concept of habitat types provides a perfect compliment to and adds rationale to later work by Oliver, who describes more fully the mechanisms of stand change. In fact, Oliver’s work acknowledges the fundamental contribution of late seral classification by Daubenmire and others. In his discussion of the stages of stand development, Oliver notes a similarity with those recognized by Daubenmire (Oliver and Larson, 1990).

Habitat types provide a practical way for professionals to communicate about site potential in terms of tree growth, tree species composition, and shrub, grass, and forb composition. The concept is useful in describing fire ecology principles (Fischer and Bradley, 1987) and is currently being used to apply coarse filter assessments to broad ecosystems (Haufler et al, 1996)

Yes, habitat types represent older thinking, but sound, relevant thinking. Please see the following professional papers for more information:

Fischer, W. C. and A. F. Bradley. 1987. Fire Ecology of Western Montana Forest Habitat Types. Intermountain Research Station, General Technical Report INT-223. 95 pp.

Haufler, J. B., C. A. Mehl, and G. J. Roloff. 1996. Using a coarse-filter approach with species assessment for ecosystem management. Wildlife Society Bulletin 24 (2). pp. 200-208

Oliver, C. D. and B. C. Larson. 1990. Forest Stand Dynamics, Biological Resource Management: A series of primers on the conservation and exploitation of natural and cultivated ecosystems. Wayne M. Getz, Series editor, Univeristy of California, Berkley. 467 pp.

Comment 12

Clearcutting is undesirable as a cutting method. Harvesting should be limited to the use of selective harvesting systems.

Response

Of all the silvicultural tools available to managers, clearcutting, when designed correctly and used in combination with prescribed fire, comes the closest to mimicking stand replacement fires. Given the constraints posed by the increasing number of homes in and adjacent to the forest and unnaturally high levels of fuels resulting from decades of fire exclusion, clearcutting is a necessary tool for managers attempting to restore historic vegetative structures.

Under Alternatives 1, 2, and 3, clearcuts would look very different than they have in the past. Managers would use natural cutting unit patterns, green tree retention, seedtree cuts, shelterwood cuts, and the blending of clearcuts with other prescriptions to make these man-made openings appear much more natural than in the past. In addition, those areas that have been heavily impacted by geometrically shaped clearcuts will be visually rehabilitated.

Comment 13

Minimize air pollution by retaining roads so Tribal members can reduce fuel by harvesting timber, thinning, and getting firewood.

Response

Alternatives 1, 2, 3, and 4 do allow for the retention of adequate road systems and do, to varying degrees, depend in part on mechanical treatments to reduce fuels. In addition, current polices encourage the use of wood material in harvest areas. Typically, the burning of piles is delayed if there is a reasonable chance that they will be utilized by Tribal members. However, given the size of the forest, and the quantity of material involved, Tribal members can use only a small percentage of the total material available. Please see also the response to comment number 48.

Comment 14

The vegetation analysis used the Upper Columbia River Basin Draft EIS to supplement the analysis. Did other resource specialists review this document and determine if they could use any parts of the analysis?

Response

Yes. Most of the ID Team members reviewed the Upper Columbia River Basin Draft EIS and evaluated how useful the information was to the work they were doing on the Draft EIS. The vegetation section, however, relies more on that document than any of the other sections in the DEIS.

Comment 15

I question the need to restore to Pre-European conditions. I fear high timber harvest with helicopter logging and high elevation burns would open up a whole new set of problems like weed invasion, major habitat changes for existing wildlife communities. I favor selective logging bug killed timber in a bit-by-bit fashion.

Response

Comment noted. Alternative 5 is a salvage-only Alternative.

Comment 16

Plan what is best for the future not what was best during precontact times.

Response

We agree, and the three ecosystem management alternatives do attempt to plan what is best for the future. Ecosystem management is not an attempt to set the clock back. Rather it seeks to improve the resiliency of the forest by staying within the range of historic forest structures.

An important premise of all three ecosystem management alternatives is this: In order to manage for diverse and sustainable forest ecosystems, we need to maintain and restore the natural processes and functions under which our ecosystems evolved. These are the conditions to which our plants and animals are best adapted. Where it is not possible to restore natural processes, managers need to provide conditions within and across landscapes that mimic those processes. Alternatives 1, 2, and 3 all attempt to do this in a way that is consistent with the human needs and values of the present and future world. See also response number 1.

Comment 17

I do not believe any of the alternatives will restore the Reservation. We would all have to leave to accomplish that. A more realistic goal would be to balance the needs of the current population and conserve and improve the ecosystem in a cooperative plan with all residents of the Reservation.

Response

We agree that none of the alternatives will or ever could fully restore precontact forest conditions, nor would it be desirable to do so. However, we do believe that Alternatives 1, 2, and 3 will move vegetative structures significantly closer to what they were during the precontact period, and that should improve the health and sustainability of the forest. Alternatives 1, 2, and 3 attempt to balance the needs of the current population and conserve and improve the ecosystem. See also response number 1.

Comment 18

If you want to return to pre-European conditions then you must ban all motor vehicles from the forest.

Response

In this context, the term restoration refers to the restoration of vegetative structures. It would not be economically feasible or socially desirable to ban motor vehicles from the forest. See also response number 1.

Comment 19

Why is the Modified Restoration alternative (Alternative 2) more vegetatively aggressive than the Restoration Emphasizing Commodities alternative (Alternative 3)?

Response

More acres are harvested under Alternative 2. Alternative 2 calls for a higher level of restoration than Alternative 3 does. The additional acres come from treatments designed to restore sod, woodlands, and parklands. For example, Alternative 2 treats areas that were historically sod or grass but that are now occupied by trees, a consequence of fire exclusion. These areas, which have not been managed intensively in the past, would not be treated at all under Alternative 3. If they were excluded from Alternative 2, Alternative 3 would rank higher in terms of acres harvested. Refer to Table 4-4 on page 197 of the DEIS. Please note that Alternative 3 exceeds the annual yields of all the restoration alternatives over the long term.

Comment 20

In Chapter 5, Unavoidable Significant Adverse Impacts, Alternatives 1 and 2 should have a discussion related to the impact of harvesting 18.1 mmbf of timber per year.

Response

There will be impacts associated with the harvesting of timber under all five of the alternatives. These impacts are described in the Environmental Consequences chapter (Chapter 4) of the DEIS. The section that you refer to in Chapter 5 addresses only unavoidable significant adverse impacts, which are defined as impacts that occur after the implementation of all mitigation measures. We believe that this section adequately addresses significant adverse impacts that would occur from the harvesting proposed. Under both Alternatives 1 and 2, timber harvest is a by product of restoration efforts. In other words, the objective of harvesting trees is to achieve vegetative structural goals in order to restore the health and sustainability of the forest. It is also important to keep in mind that under both of these alternatives (and under the other three), the Tribes would be harvesting roughly a third of the volume that the forest grows each year.

Comment 21

We recommend that the Tribes include an objective indicating that herbicides, pesticides, and other toxicants and chemicals would be used in a safe manner that allows protection and maintenance of water quality standards, assures protection of ecological integrity, and avoids public health and safety problems.

Response

We agree, and we have included such an objective. In the past, the Tribal Forestry program has not used pesticides in the forest, and it has no plans to do so in the future. The Forestry Program has used herbicides but only on a very limited (spot application) basis. Restricted herbicides are not used. The Tribes' Division of Lands does apply herbicides on range and agricultural lands and occasionally on forest roads to control weeds, and an environmental assessment has been written to cover this action.

Comment 22

The following issues were not addressed adequately in the EIS or draft plan: unregulated harvesting, lack of old growth, reduced scenic quality due to clearcuts, and decreased public satisfaction with how the forest is managed.

Response

For a response to the concern about unregulated harvest, please see the response to comment number 8.

We disagree that the EIS has not adequately addressed the issue of old growth. Old growth is addressed in terms of seral clusters and cluster groups. Please see page 225 to 226 of the DEIS for a summary of how the alternatives will affect the different types of old growth on the Reservation.

We also disagree that the EIS has not adequately addressed the issues of reduced scenic quality due to clearcuts and public satisfaction with how the forest is managed. We believe these two issues are closely related. Many of the objectives in the DEIS are designed to improve the scenic quality of clearcuts and public satisfaction. For example, harvesting activities under Alternatives 1, 2, and 3 will meet scenic integrity levels through the use of natural cutting unit patterns, green tree retention, seedtree cuts, shelterwood cuts, and the blending of clearcuts with other prescriptions. These measures should make clearcuts and other even-aged treatments appear much more natural than in the past. Those areas that have been heavily impacted in the past by geometrically shaped clearcuts will be visually rehabilitated. Over the long term, all of these steps should improve the scenic quality of the forest and should help to improve public satisfaction with how the forest is being managed.

Comment 23

Your statement defining a disturbance on page 20 as something that causes significant change is misleading. Many small (cumulative) disturbances that may be unnoticed by humans, yet over time have significant effects on the forest ecosystem.

Response

You are correct. Many small disturbances can add up to be significant. We have changed this part of the EIS.

Comment 24

Does 20% or 50% salvage refer to volume or trees per acre?

Response

The percentages given in the EIS for the amount of salvage that would occur under each of the alternatives refer to volume.

Comment 25

The harvest in Alternative 1 seems dramatic and drastic. An average should continue to have high years and low years and to cut a huge proportion each year means no turning back.

Response

We disagree with your assertion that the harvest proposed under Alternative 1 is dramatic and drastic. The objective under Alternative 1 would be to harvest an estimated 14.9 million board feet of timber each year for the first thirty years of the forest plan. For comparison purposes, over the last 17 years, the Tribes harvested an average of about 20.7 million board feet of timber per year, which is considerably less than the growth over the same period. So under Alternative 1, the volume of timber harvested by the Tribes would drop 5.8 million board feet a year. Alternatives 2, 3, and 4 would all harvest higher volumes than Alternative 1, but all of the alternatives would harvest roughly a third or less of the growth that is occurring on the forest. These volumes are estimates and represent a ten-year average; the actual amount harvested each year would go up and down depending on market conditions and other factors.

Comment 26

The DEIS does not clearly explain how the proposed timber harvest levels for the various alternatives were determined. Can proposed harvest levels be more specifically disaggregated into individual regions within the Reservation to provide a clearer understanding of site-specific impacts of forest plan goals and objectives?

Response

Pages 188 to 194 and 360 to 366 of the DEIS explain in some detail how the proposed timber harvest levels for the various alternatives were determined. Both explanations were written so they could be understood by the public, so they may not be as technical as some professionals would like. For a more technical description, please contact the CSKT Tribal Forestry Department.

The vegetation modeling did divide the Reservation into landscapes. Vegetation output and associated harvest volumes were estimated for each landscape. For the most part, this landscape-level vegetation output (which took the form of seral cluster distributions) was used by the ID Team to assess the environmental consequences of each alternative. The team used harvest volumes to assess economic impacts. Harvest volumes, however, are not the best way of assessing impacts on other resources.

Comment 27

Pages 6 and 50: Clearcutting does not mimic natural process. This is simply a fallacy.

Response

We agree that clearcutting does not exactly replicate all of the complex ecological processes that occur as a consequence of wildfires. However, carefully planned clearcutting used in combination with prescribed fire (broadcast burning) does mimic certain aspects of stand-replacing fires, particularly when it comes to the kinds of structure the two disturbances create and the scale of the disturbances. Both a clearcut and a stand-replacing fire are infrequent, intense, and potentially large disturbances that leave behind young, open-canopied stands of early seral species (referred to as Cluster A in the DEIS). While stand replacement fires might leave 30% of the trees standing, a clearcut as proposed under the ecosystem management alternatives presented in the DEIS might leave 5 to 15% of the trees standing. Still, both a clearcut and a stand-replacing fire result in the removal of most of the biomass from the site, and both can help restore the mosaic of vegetative structures that were present during the precontact period. Both can increase biological diversity, improve the availability of plant species palatable to ungulates, help to reestablish a natural species mix, and reduce the potential for much larger and more intense wildfires that can seriously damage resources. Fires help to recycle important plant nutrients, but recent research is showing that a good proportion of those same nutrients can be returned to the soil after logging if the needles and fine branches (where most of the nutrients are located) are left on site for a year before broadcast burning. Even-aged treatments, which include clearcutting, are often the only treatments that can mimic stand replacing fires. Mimic in this context does not mean exactly duplicate.

For a variety of economic and social reasons, the Tribes have chosen to include alternatives that would replace uncontrolled and sometimes catastrophic natural events with harvesting and prescribed fire. Harvesting and prescribed fire can be planned and controlled, and while wildfire alone might restore historic vegetative structures, it threatens human life and property and significantly reduces revenue to the Tribes.

In short, in order to meet the purpose and need statement and the goals relating to social and economic needs, the Tribes have chosen to include alternatives that would harvest timber using even-aged treatments (shelterwood, seedtree and clearcut), treatments that to a large extent mimic stand replacing fires.

Comment 28

What is the management guideline when cluster A, including clearcuts, for a landscape is greater than the RMV? Do we disregard the RMV and create more of that particular cluster in the name of long-term goals?

Response

The objective of each of the ecosystem management alternatives is to attain a certain desired condition that falls within the Recommended Management Variability or RMV. At the project level, an ID Team may on occasion exceed the desired condition in the short term for forest health reasons or to achieve broader structural goals, but only if the attainment of the long-term desired condition is not compromised.

Comment 29

On page 16 there is a seriously inaccurate statement. Clustered Lady's Slipper is a forest plant that does indeed occur in Reservation's forests. Since this species is being considered for listing, the FMP needs to recognize its presence and plan for its continuation.

Response

You are correct that clustered Lady's-slipper *(Cypripedium fasciculatum*) does occur in open coniferous forests. We were wrong, however, in stating that the species is being considered for listing by the U. S. Fish and Wildlife Service (USFWS). In fact, it has no special status with the agency. We have changed this part of the EIS. The other species mentioned, Spalding's catchfly or campion

(*Silene spaldingii*) is proposed for listing as Threatened or Endangered by the USFWS. It is found in wheatgrass-fescue grasslands in the valley and foothill zones and is threatened by livestock grazing and agricultural and residential development.

Comment 30

The Affected Environment section mentions the importance of native plants on page 18 and again on pages 70-72. Alternatives describe "space" for Tribal members and briefly mention that the Tribal ethnobotanist will be consulted on sales, but we see no overt plan for protecting and improving culturally important plant species' populations. It seems possible that under Alternatives 1 and 2 some culturally important species may recover, but the DEIS includes no analysis of recovery and protection of these plants.

Response

To respond to your concern we paraphrase a section from the Tribes draft forest plan:

> There are different philosophical approaches to forest management. Strategies that focus on individual or groups of species are considered biologically centered, while those that focus on landscape patterns are termed ecosystem centered. Another choice of approach has to do with the level of refinement or detail. Managers can operate using a fine-filter approach or a coarse-filter approach (or some combination of the two). Strategies designed to address the needs of individual, at-risk species are called fine filter, while those that seek to retain the overall vegetative mosaic are termed coarse filter.
>
> The traditional approach to forest management has been a species-focused or biologically centered approach. Emphasis has been on Federally threatened and endangered species, culturally sensitive species, and game animals. These species have been used as management indicators, and have often been used to represent the habitat needs of large groups of other species. The use of individual indicator species to represent the habitat needs of others is inconsistent with the concept that each plant or animal has individual habitat needs. Today, biologically centered approaches use a combination of coarse-filter and fine-filter methods. Large reserves, such as Tribal conservation areas, provide protection for entire communities (a coarse-filter strategy), while fine-filter strategies protect individual species at risk (such as grizzly bears and bald eagles). The threatened, endangered, and sensitive species programs at the Tribal and Federal levels are generally regarded as appropriate fine-filter conservation efforts.
>
> The focus of the biocentric approach has changed over time from a small number of key species, to groups of related species, to entire communities of organisms. This approach has not yet been used for developing strategies for conserving the full range of biological diversity, which would involve

examining the habitat and biological needs for the full range of organisms within all the communities. Such an endeavor would be tremendously complex, costly, and impracticable at any sort of extensive scale. It is, for example, beyond the scope of this EIS to evaluate the specific status of each of the hundreds of culturally important plant species found within the forests of the Reservation. It would be even more impractical to determine how to protect and improve the status of each of those species. There are other problems as well. For example, the biocentric approach can ignore potentially important interactions between communities. Assuming communities are stable, predictable entities, it focuses on dominant species that may not represent the needs of others that are less abundant or conspicuous, and it ignores the influence our society has had on disturbance regimes.

Alternatives 1, 2, and 3 take a different approach to conserving biological diversity. They use the coarse-filter, ecosystem-centered approach, which looks beyond single species. Their focus is on providing components, structures, and processes that mimic natural ecosystems, thereby providing habitat for a greater range of biological organisms within each ecosystem. These alternatives assume that if the habitat or structure is present in the right proportions, the plants and animals will occupy it. Because landscapes are dynamic, the ecosystem approach attempts to mimic the expected variation that would be produced by natural disturbances and, in fact, is a more practicable approach to conserving biological diversity given the complexity and dynamic nature of ecosystems. Its theoretical weakness is that it may not recognize the needs of critical species. So these alternatives would also continue our use of biologically centered, fine-filter approaches for individual threatened and endangered species. We hope to accomplish this through the ID Team process on each timber sale, the appropriate use of biological assessments on specific projects, and the careful monitoring of impacts associated with forest management and other human activities in the forest. It is our hope that the two approaches—coarse-filtered, ecosystem-centered and fine-filtered, biologically centered—will complement one another and protect culturally important plant species.

Fire and Fuels Management

Comment 31

We do not like all the smoke that will come with increased prescribe burning, and we have suffered health problems as a result of the past prescribed fires.

Response

The public has strong feelings about possible public health impacts associated with smoke emission produced from prescribed burn activities. It is also true that several EIS alternatives will increase total emissions from prescribed burning (see page 235 of the DEIS). The Division of Fire works hard to ensure that all Tribal, State, and Federal air quality standards are met or exceeded. Flathead Agency is also a charter member of the Montana Airshed Group and as a cooperator, conducts all burn activities under a formal burn permit during the restricted fall burn season.

Comment 32 Harvesting needs to be done to reduce fuel loading.

Response We agree; Alternatives 1, 2, 3, and 4 use harvesting alone or harvesting in combination with prescribed fire to remove forest products and reduce fuels.

Comment 33 Prescribed fires in the Missions could get out of hand and sterilize soils, or cause runoff and watershed damage because of the fuel build up.

Response We agree that all prescribed fires have a risk of escaping control lines and causing unwanted environmental damage. We also agree that most areas in the Missions Mountains have a serious fuels buildup that could, under the right conditions, result in severe fires.

Risk and uncertainty relating to prescribed fire activities must be assessed on a project-by-project basis and evaluated on the basis of whether the benefits out weigh the risks. Sound risk management and careful planning are the foundation for all fire management activities. To ensure that fires do not escape, all prescribed fire projects are conducted under a carefully prepared “burn plan” that assesses risks and provides prescribed weather, fuel moisture, air quality, and safety parameters.

Burn plans are required for each fire ignited by managers. They must be prepared by qualified personnel and approved by the fire management officer and agency superintendent prior to their implementation. Each plan will follow specific agency direction and must include critical elements described in the Bureau of Indian Affairs' prescribed fire manuals. Planned ignitions are only conducted within the prescribed limit of the burn plan as required by Federal and Tribal policy.

Comment 34 Pile burning damages soils and does not mimic any natural process. I would prefer to see more broadcast burning.

Response We agree. In some cases, pile burning does damage soils and in all cases does not mimic any natural process. Broadcast burning is the preferred treatment over pile burning under the Preferred Alternative in the DEIS. Alternative 2 and several of the other alternatives (1, 3, and 5) do reduce annual planned pile burn acres by substantial margins (Chapter 4, table 4.8). Pile burning will still be used as a slash disposal method after selection harvest or in visual rehabilitation areas where retention of leave trees is the primary consideration, in high risk situations that would preclude the use of broadcast burning (i.e., in wildland/urban intermix areas, on sensitive soils, and adjacent to tribal cultural/religious sites), following road construction activities, and in timber stands where mechanical harvesting is the primary harvest method.

Comment 35

The amount of burning in Alternative 1 seems drastic. Pre-European burning was for hunting, but did this include the high elevations too? Where are these high areas that will be burned? And what are we mimicking with fire there? Why not let lightning take its own course in these areas.

Response

We disagree that the amount of burning in Alternative 1 is drastic. Relative to the other alternatives, the acres proposed to receive prescribed burn treatments under Alternative 1 are high because the use of fire is emphasized more under that alternative.

Pre-European burning by Native Americans was conducted for a number of reasons, all of which are well documented in the literature. The fires Indian people started were primarily in low elevation areas, but their fires spread to upper elevations during extreme fire-weather conditions, because there were no efforts to control or suppress wildfires at the time.

The high elevation burns noted in the DEIS are planned for the Lethal (or stand-replacement) Fire Regime. They would primarily occur in the Southwest, Jocko, West, and North Missions Landscapes at elevations above 5,000 feet elevation as follow-up slash disposal treatments after timber harvesting. Prescribed fire in the Lethal Fire Regime will be mimicking historical lightning-caused, stand-replacement wildfires that produced small to large "patches" of younger aged timber and mature to old-growth timber stands. Fire was the primary disturbance factor that provided diversity and ecological plant succession in these forests.

Alternatives 1, 2, and 3 propose to use prescribed fire in the Timberline Fire Regime to regenerate high elevation grasses, brush, and whitebark pine. These changes will benefit many sensitive wildlife species. The prescribed fires would occur at upper elevations in the Mission Mountain Wilderness, Jocko Primitive Area, and the proposed Ninemile Roadless Area and would take two forms: (1) light underburns, and (2) widely scattered, more intense stand-replacement fires. These fires will also reduce the unnaturally high accumulation of fuels that could produce severe and intense fires and damage resources.

In addition, the Mission Mountain Tribal Wilderness Fire Plan and the Flathead Agency Fire Plan may allow for the management of naturally occurring wildfires under a "confine or contain" management strategy. These fires would occur in some high elevation areas (such as the Mission Wilderness, proposed Ninemile Roadless Area, and Jocko Primitive Area) and possibly on Flathead River islands within the Reservation. The purpose of allowing these fires to burn would be benefit wildlife and other resources.

Comment 36 If Alternative 5 lets natural process take their own path, why would fire suppression policies remain in place?

Response Wildfires would need to be controlled for at least two reasons: (1) throughout much of the forest, the quantity of fuel has increased above historic levels and (2) there are now hundreds of homes within the forest or at its margin. Allowing fires to burn without first treating the fuels with mechanical methods would threaten forest soils and plants and animals, as well as human health, safety, and property. That level of risk is unacceptable.

Comment 37 Burning should be stopped. It does nothing but pollute the air.

Response Comment noted. Please see the responses to comment numbers 38 and 48.

Comment 38 We recommend the Tribes incorporate the use of techniques that minimize emissions from fire and the adverse impacts of smoke on public health and the environment.

Response Your recommendation is noted. The Flathead Agency rigidly adheres to smoke management principles that are designed to minimize emissions from fire and adverse impacts on air quality and public health. Our prescribed burn bosses are all trained in smoke management techniques and smoke emissions and dispersion modeling. Special projects are analyzed using the PUFFX model for dispersion and FOFEM for emissions modeling.

All project burn plans prescribe appropriate smoke dispersion conditions in order to transport smoke away from sensitive receptor sites and scenic viewsheds. They identify appropriate atmospheric conditions and the appropriate season for burning. They also specify fuel/duff moistures to reduce smoldering fires, project timing to avoid nighttime smoke impacts, and they can limit the amount of acres burned or even suspend the burn operation if smoke dispersion conditions are unacceptable. An agency smoke management plan and stringent air quality monitoring procedures will be developed when the EIS is final. The Division of Fire works hard to ensure that all Tribal, State, and federal air quality standards are met or exceeded. Flathead Agency is also a charter member of the Montana Airshed Group and as a cooperator, conducts all burn activities under a formal burn permit during the restricted fall burn season.

Comment 39

We recommend low intensity fires in specific planned locations be spread out over time so that some vegetative cover becomes reestablished before runoff periods in order to protect water quality.

Response

Your recommendation is noted. Although the DEIS does not describe in spatial terms proposed prescribed burn activities, it is a basic principle of fuels management strategies to "spread out" planned underburn activities over various project areas and over time. Also, very seldom do prescribed fires burn every acre of a project area. The reestablishment of vegetative cover to mitigate stream sedimentation and nutrient transport to surface waters during runoff periods is a primary consideration and is addressed during project development.

Comment 40

We suggest that there are circumstances where mechanical treatments are more appropriate than prescribed burning to address fuel accumulation.

Response

We agree, and under all of the alternatives mechanical treatments will be used wherever they are most appropriate.

Comment 41

We recommend the effect of prescribed burning on the potential stimulation of noxious weeds be evaluated during site-specific project analysis.

Response

Your recommendation is noted. The effects of prescribed burning on the potential stimulation of noxious weeds has been and will continue to be fully evaluated in programmatic and timber sale Environmental Assessments and in site-specific burn plans for prescribed burn projects.

Comment 42

We recommend that if smoke from prescribed fires is expected at night, potentially affected residents would be warned of high particulate levels and objectionable odors. Alerting residents should be part of the smoke management plan.

Response

Your recommendation is noted. Flathead agency provides notification of planned projects to local dispatch offices, county sheriff departments, and the local newspapers and radio stations on the day of burns. Notice of the location and extent of planned seasonal burn activities are also provided to local newspapers in the spring and fall. Whenever possible, notification is made to individual homeowners, especially when burns are in close proximity to their property. The Division of Fire also promotes feature newspaper articles about the use of fire and the reasons agency prescribed burn treatments are conducted.

Comment 43

For slash burning which may smolder longer than one day, will there be any requirement to limit its proximity to residences since evening meteorological conditions may concentrate pollutants near the ground level.

Response

Yes. Burn projects in close proximity to residences are routinely limited to reduce impacts from residual smoke. In some cases, pile treatments are prescribed over broadcast burning to allow for burning under the possible cover of snow, which allows for greater wind speeds and a complete transport of smoke emissions. A decision not to harvest a particular stand of timber or not to burn is also made in some cases. Although only a limited number of underburn or broadcast burn projects are conducted in these areas, they are all conducted under very rigid smoke dispersion and transport parameters.

Comment 44

We recommend the Air Quality—Existing Condition section include a windrose so local residents will have an indication as to their potential to be impacted by emission from the prescribed burns in their area.

Response

Including an air quality windrose for local residents is an excellent recommendation, and we have developed the appropriate materials for inclusion in the FEIS.

Comment 45

The terms broadcast burn, pile burn, underburn, and Nonlethal Fire Regime should be defined in the glossary.

Response

You are right, and we have included the definitions of these words in the glossary.

Comment 46

We encourage you to develop a monitoring plan to help you establish quantitative and qualitative understandings of the impacts to air quality.

Response

Although the DEIS did not include a detailed monitoring plan, the draft Forest Management Plan did, and the Final Forest Management Plan will. Please see also the response to comment number 160.

Comment 47

Forestry should be taking steps to make sure that wildfires are not a big part of our future. I know fires are part of our culture, but if we can prevent them to a certain extent we should.

Response

We agree, and all of the alternatives would seek to minimize the damage done by unwanted wildfires through a combination of suppression actions, mechanical treatments, prescribed fires, and fire control activities designed to reduce fuels and fire hazards.

Comment 48

I am opposed to prescribed burning and slash burning because of the pollution it causes. Waste products from logging could be salvaged for firewood or chipped for commercial sale. I hope prescribed burning and slash burning will be used as sparingly as possible.

Response

Your opposition to prescribed burning is noted. Slash treatments on many harvest units and roadside dozer piles are typically delayed for one or two years to provide wood-gathering opportunities for tribal members. The locations of these firewood gathering opportunities are provided annually in the Charkoosta News. Tribal forestry routinely pursues markets for pulpwood and chip utilization. However, this market is limited. Procedures that would provide for the skidding of firewood materials from harvest units down to roads (for tribal member access) is an objective under the Interim Forest Management Plan.

Comment 49

Increases in prescribed burning will decrease air quality. What guidelines for burning will minimize the impacts on health, visibility, water quality, and scenic quality? Will the effects of prescribed burning compromise the current Class I Airshed designation?

Response

Your concerns about possible decreases in air quality from increased prescribed burning are noted. In the air quality section of Chapter 2 of the DEIS (on page 89) there is a narrative describing air quality on the Reservation during the precontact period and the present. It can be argued that present-day air quality during the summer months has probably improved substantially over that of the precontact period even with the advent of prescribed fire. A short summary of guidelines to minimize smoke emission impacts (on health, visibility, and scenic quality) is also provided in Chapter 2 and in the fuel and air quality section of Chapter 4 (on page 230). Water quality guidelines are provided under Flathead Agency BMPs. Other air quality guidelines are provided through prescribed fire manuals, smoke management training materials, and through Tribal, State, and Federal standards.

Grazing

Comment 50

The Tribes need more control over livestock. Poorly controlled stock grazing has destroyed valuable land in places. The forest management plan should address low elevation grass and riparian areas, not just forest lands.

Response: Uncontrolled or poorly managed livestock grazing *can* damage forest resources. The Grazing Objectives common to all alternatives (on page 118 of the Draft EIS) improve grazing management through comprehensive grazing-land inventories, the establishment of permanent monitoring sites, the application of Best Management Practices, improvements such as off-stream watering points, and the development of range-unit grazing plans.

The purpose and need of the Forest Management plan is to provide long-term direction for the Tribes' forest resources. Low elevation areas outside of the forest are beyond the scope of the plan. All of the alternatives in the DEIS include grazing objectives for riparian forest areas.

Comment 51 The most recent range inventory is 18 years old and as such is severely outdated and should not be used in the context that it is. The actual range condition is poor to very poor. AUMs need to be recalculated with modern-day means, and the $1.50 per AUM also needs to be explained. Why is the Tribe accepting such a slow price for their valuable land base? The amount raised doesn't pay the cost of management. Cost should be same as private land grazing for all alternatives.

Response The most recent grazing land inventory *is* outdated but it is the best data available. The Grazing Objectives common to all alternatives (on page 118 of the Draft EIS) include an objective to conduct grazing land inventories that will use standard inventory techniques. These inventories will be used as baseline information to establish stocking rates. It would be inappropriate for us to make Reservation-wide generalizations about the condition of grazing lands until the new inventory is completed.

The fee per AUM is set by the Tribal Council in a process separate from that of the Forest Management Plan. It is beyond the scope of the EIS.

Comment 52 Please define "fair or better" condition.

Response The term "fair or better" condition is used by the USDA Natural Resources and Conservation Service and refers to range condition. The agency and its predecessor, the Soil Conservation Service, have used it to denote that 26 percent or more of the present vegetation (by weight) is climax vegetation. The designation is comparable to an ecological condition of at least mid-seral stage. We have added this term and others used in the classification system to the EIS in the section entitled *Glossary*.

Comment 53

If you allow ranchers a key to various gates to allow access to cattle, don't you have to allow wood cutters a key, and berry pickers, and hunters, etc. Why lock it at all if that's the case?

Response

Decisions about who has access through locked gates are made by the Tribal Council on a case-by-case basis. Access is generally given if the need can be justified. Range permittees have paid for a permit for use of an entire range unit. The permit includes the right of access in order to manage livestock. However, a permittee is resticted to the season of use of the permit and to the activites specified in the permit. A permittee may not use his or her permitted access to hunt or gather, for example.

Comment 54

The miles of cross and boundary fence proposed are unrealistic. Number of water developments is unrealistic.

Response

No miles of cross fence or boundary fence, and no number of water developments are proposed in the DEIS. Cross fences, boundary fences, and stockwater developments are some of the tools used to meet range condition and riparian area objectives, but the DEIS, which is nonspatial, does not specify the actual miles of fence or number of water developments needed. Instead it sets objectives for the condition of the range.

Comment 55

One grazing objective should be to analyze 5 range units per year beginning with the most critical and prioritize the other 50 units.

Response

Thank you for your suggestion. The schedule for inventories will be determined through an administrative process and will depend on a number of factors including the availability of funding, personnel, and other resources.

Comment 56

The grazing section beginning on page 247 leads the reader to conclude that the only forage available is that which grows on the road bed or adjacent to the road. If this is the case, then the range unit needs to be deleted from use.

Response

You have misinterpreted that section of the DEIS. We are saying that road abandonment will result in a net loss of *access* to forage for livestock. We stand by this assumption.

Comment 57

"Off-site water…" and "efforts to drive cattle…" is dispersion. Currently, most range units have no requirements for dispersion. Cross fencing, off-site water developments, requirements for dispersion, and moving the cattle to different locations when proper utilization has been reached would alleviate the problems.

Response Comment noted.

Weeds

Comment 58 Weeds should be controlled with most aggressive methods available.

Response The Tribes and the Bureau of Indian Affairs completed an integrated noxious weed management plan in 1992 and the associated environmental assessment in January, 1993. The plan implements a program to manage noxious weeds on Indian-owned lands of the Flathead Indian Reservation using an integrated approach that combines species-specific directives, control objectives based on weed infestation size or location, special management zones that modify treatment techniques and policies, and planing units based on watershed or logical boundaries. The plan allows flexibility in selecting treatment methods and incorporates many mitigation measures to reduce potential impacts.

Comment 59 Why not aggressively manage all weed infestations instead of 80% or some other percent? I realize there are budget limits, but the way this reads we will only manage 80 acres out of 100.

Response Weed management is constrained by a number of concerns, which include budgetary limits, the protection of sensitive plant species, and the protection of sensitive areas. Alternative 1 seeks to use an ecosystem-management approach to aggressively restore, to the extent possible, pre-European forest conditions. Under this alternative, weed management would focus on improving biodiversity and enhancing native species. The estimate of infested areas treated is therefore greatest for this alternative. The estimate for Alternatives 2, 3, and 4 is reduced because the level of vegetation management under those alternatives is less than it is under Alternative 1. Under Alternative 5, weed management would focus on main roads only, which is consistent with the underlying philosophy of that alternative.

Comment 60 After burning how will you deal with the weeds?

Response Methods of weed-management planning and control will not differ from those specified in the Integrated Noxious Weed Management Plan. Please see also the response to comment number 41.

Comment 61 What does "aggressively manage noxious weeds" actually mean?

Response "Aggressively manage noxious weeds" means that the methods, planning, and implementation of weed management will be done in accordance with the Tribes Integrated Noxious Weed Management Plan, as budgetary and other constraints allow. Please see also the response to comment number 59.

Wildlife

Comment 62 There is no discussion to develop a baseline for the existing condition of the effect on deer, elk, and moose populations due to the year around harvest of the male population segment and unlimited harvest quota.

Response Hunting regulations are beyond the scope of the Forest Management Plan. The harvest of big game is regulated by the Tribal Council with input from the Division of Fish, Wildlife, and Recreation. The Wildlife Management Program monitors big game populations through a periodic winter count to establish a baseline from which to manage big game populations. Recommendations on management are then made to the Tribal Council.

The reservation has areas that could undoubtedly support a larger big game population with management modifications such as road management or the reintroduction of fire. The ecosystem management alternatives in the DEIS require the reintroduction of fire to ecosystems. Although the reintroduction of fire will improve browse production in some areas, habitat effectiveness is seriously reduced due to the lack of effective road management.

Comment 63 How will the alternatives affect big game populations with relation to increasing open road densities in roadless areas? Populations in the nonlethal fire regime will be drastically affected. I would suggest leaving a 50- to 100-foot uncut buffer to lower the affects of hunting.

Response During project planning, a road management plan is developed. This plan is incorporated into the timber sale, and the road closures are implemented after the timber has been harvested. The use of a special treatment zone along open roads to limit viewing distance has been considered and will continue to be considered in future timber sales.

Comment 64 Consider bow hunting only to maintain culture.

Response Limiting hunting to bow hunting is a regulatory issue that is beyond the scope of the EIS. Please see the response to comment number 62.

Comment 65 There is no mention of the use of fire for restoration of big game winter range.

Response This section of the FMP has been rewritten to reflect the significance of the use of fire for big game winter range restoration.

Comment 66 Page 272 states "those clearcuts would have limited habitat potential for elk, mule deer, or ruffed grouse." This is an oversimplification.

Response This section of the DEIS has been rewritten.

Comment 67 Habitat fragmentation is buried in the more specific analysis of wildlife habitat (thermal cover, hiding cover, snags, etc.). Fragmentation of habitat is a critical issue in decision-making, and should be identified as such in the Executive Summary.

Response The Executive Summary has been rewritten to include a discussion of fragmentation.

Comment 68 Page 55 mentions lynx as a sensitive species, but the EIS does not describe how the forest management plan will address the fact that the Flathead Reservation has one of the few remaining viable lynx populations (National Wildlife Federation estimates there are about 700 lynx in the lower 48). In addition, the Reservation harbors a population of wolverine, which may be even rarer. So little is known about the habitat needs of these species that we believe any management practice that might impact them must be considered beyond the homogenized approach of Appendix I. Studies by Bill Ruediger (USFS Northern Region) and others show that there is a strong correlation between road density and population health of these reclusive predators.

Response Lynx are addressed in project plans and associated Biological Assessments, which are reviewed by the U. S. Fish & Wildlife Service. Lynx management is also considered in any transportation planning and road management activities that might improve access into otherwise inaccessible lynx habitat. The Flathead Indian Reservation is different than the rest of the State of Montana in that no lynx harvest is permitted, and there are very few tribal trappers who might accidentally trap lynx. Draft guidelines for the management of lynx have recently been published, and the Tribes are currently reviewing these guidelines for application on the Reservation.

Wolverines have been observed in the Mission Mountains, but not elsewhere on the Flathead Indian Reservation. Remote sensing cameras, track surveys, and aerial detection is being used for detection of predators throughout the reservation. In over 2,000 nights of detection, hundreds of miles of track surveys, and untold hours of aerial surveys, wolverines have not been detected in any other area. During the planning and evaluation process, we only consider wolverine to the extent that they may be present in other areas. The maintenance of traditional food sources should benefit wolverine if they are present but have not been detected.

We are not aware of any research on lynx published by Bill Reudiger. We have reviewed studies by Hornocker, Copeland, and other wildlife researchers, and continue to review new information as it becomes available.

Comment 69

Page 56-58 and Appendix F discuss the causes and concerns of habitat fragmentation but does not include Highway 93 & 200 and increased development as issues.

Response

The Wildlife Management Program is constantly evaluating potential fragmentation issues throughout the reservation and will address these issues with cumulative impacts in mind.

The impacts of major highways and increased development on forest fragmentation are beyond the scope of the EIS. The Forest Management Plan is directed at the 456,520 acres of forested land on the Reservation. Please see also the response to comment number 169.

Comment 70

Wildlife corridors are not addressed in the main body of the EIS, nor are they mentioned in any of the alternatives. Wildlife corridor maintenance and enhancement should be an important aspect of the Tribes' Forest Management Plan. They should be identified and addressed at the Reservation-wide scale. Currently wildlife corridors are being viewed on too small a scale—like trying to understand a freeway by looking at a three-mile stretch of it.

Response

During the interdisciplinary team meetings for the preparation of this Forest Management Plan, wildlife corridors were discussed at length. Some of the areas proposed as roadless areas were designated to protect wildlife corridors. Wildlife corridors are also evaluated through project planning and the associated Biological Assessments. A cumulative effects analysis is also done in conjunction with project plans.

Comment 71

In this section it says Ferry and McDonald Basins are managed for elk conservation. The word managed is being used too loosely here. This area has a hunting restriction but there is very little management occurring for the sake of elk. The same is true for the sheep management area. Both areas have severe grazing and weed problems.

Response

Ferry and McDonald Basins are areas where elk management is being practiced. The elk harvest in Ferry Basin was closed for many years. Depredation problems with adjacent land owners resulted in the Tribes issuing permits to harvest elk in the area. Elk numbers have been reduced from previous levels, and depredation has decreased.

The objective is to sustain a healthy population of elk, balanced to fit the available habitat. Current activities and the impact of the activities on the Ferry Basin elk herd are closely monitored.

The timber sale in Ferry Basin was designed for elk habitat improvement. Grazing practices have been changed in recent years to provide forage for elk. Fences have also been constructed to keep cattle from removing excessive amounts of forage. Although there are still some grazing and weed problems in portions of this area, overall conditions have improved considerably. Plans are in place to further improve grazing management and weed management.

Water and Fish

Comment 72

There is a lack of discussion and assessment of existing water quality, aquatic health, wetlands, and fisheries for Reservation waterbodies.

Response

One intent of the EIS is to provide a programmatic backdrop to guide the management of forestland on the Reservation. The programmatic nature of the EIS and the large and diverse acreage base it covers precludes the inclusion of detailed hydrologic information. However, detailed hydrologic information *is* directly incorporated into project-level planning activities (see, for example, the Draft Valley Creek Environmental Assessment, CSKT in preparation) and forms an important component of the alternative-development process in project-level activities.

We have also expanded the affected environment section of the DEIS in response to your concerns and described current monitoring efforts. We have also added a map of cutthroat trout and bull trout distribution to the fisheries section.

Comment 73 We recommend that maps showing waterbodies be included in the FEIS.

Response We have included a map showing Reservation forest waterbodies.

Comment 74 The DEIS does not identify impaired waters on the Reservation, nor does it clearly explain how impaired waters will be addressed in the Forest Management Plan.

Response Impaired waters are identified as waters that do not support or only partially support designated beneficial uses as identified in the CSKT Surface Water Quality Standards and Antidegradation Policy (CSKT 1995).

At present, the Tribes have not adopted a list of impaired waters, although in June of 1999 they submitted a list of impaired waters in their Draft Nonpoint Source Assessment (Makepeace 1999) to EPA, Region 8 offices for review and approval.

Comment 75 We recommend that improved disclosure of hydrological and aquatic effects of the forest management alternatives be provided.

Response We have expanded this part of the EIS.

Comment 76 Flathead Lake is listed as water quality limited by Montana Department of Environmental Quality (MDEQ). The Confederated Salish and Kootenai Tribes consider it threatened. Flathead Lake will need to have a Total Maximum Daily Load (TMDL) developed. We recommend that the Tribes & BIA work with the MDEQ on TMDL requirements in relation to proposed Tribal forest management activities in the Lake drainage. Tribal forest management activities need to be consistent with Lake TMDL. We also suggest that water quality monitoring to determine forest project impacts upon Flathead Lake be incorporated into the aquatics/hydrologic monitoring program.

Response The Flathead Lake TMDL is a nutrient TMDL. The CSKT participated in the technical development of the Flathead Lake TMDL effort and completed technical work with EPA funding related to the Lake TMDL (Makepeace and Mladenich 1996).

The TMDL work products, and previous work completed primarily by the University of Montana, Yellow Bay Biological Station identify three general nutrient load inputs to Flathead Lake—the upper Flathead River, the Swan River, and direct precipitation inputs (for a summary see Flathead Basin Commission, 1996). For nitrogen, approximately 90 percent of the load is derived from the upper Flathead, and the remaining load (approximately 10%) is split between the Swan drainage and direct precipitation. For phosphorus, approximately 20 percent of the load is derived from direct precipitation inputs, approximately 5 percent of the load is derived from the Swan drainage, and approximately 75 percent is derived from the upper Flathead River. For both nitrogen and phosphorus the majority of the load is derived from the upper Flathead Basin.

Potential nutrient inputs from CSKT forest management activities include direct precipitation inputs from managed and unmanaged ignitions (fires) and inputs from tributary streams.

Total suspended particulates will increase with proposed activities in Alternatives 1, 2, and 3. "The Flathead Fire Management Agency follows smoke management guidelines that only permit prescribed fire during weather and fuel moisture guidelines that are most favorable for the dispersion of smoke (DEIS, page 229)." By applying these guidelines, it is anticipated that there will not be a significant increase in direct precipitation load to the lake from proposed activities.

Perennial streams which are directly tributary to Flathead Lake, and which may be influenced by the Tribes' proposed forestry activities, include the south part of Dayton Creek on the west side of Flathead Lake and a number of smaller tributaries on the east side of Flathead Lake.

Dayton Creek is recognized as a nutrient contributor to Flathead Lake, however much of the nutrient load is related to agricultural uses (Ducharme et al. 1998). The Tribes and the Montana Fish, Wildlife, and Parks have a significant effort underway to restore water quality and aquatic habitat in Dayton Creek (see Ducharme et al. 1998). This effort should lead to improvement in tributary water quality, and there is a monitoring effort to track water quality and aquatic habitat trends.

Tributaries on the east side of the lake are characterized as small perennial streams which are generally deeply incised in bedrock or continental glacial material. Harvest and road building has been limited adjacent to perennial segments of the streams due to the steep slope of the topography. Consequently there are significant buffers adjacent to perennial stream segments. Data suggest that nutrient export to streams is limited if large riparian buffers are maintained (for a summary discussion see Salminen and Beschta 1991). This premise is supported by CSKT water quality data (CSKT 1997).

As project-level activities are proposed in contributing areas to Flathead Lake, potential increases in nutrient loads will be evaluated and incorporated into environmental assessments.

Comment 77

We consider water quality/aquatics monitoring to be a necessary and crucial element in identifying and understanding the consequences of forest management actions. We believe a monitoring plan should be identified in NEPA documents. We would like to see clear aquatics/water quality monitoring goals and objectives identified and described in the FEIS. (See item 4 of EPA appended comments for detail.)

Response

Please see the response to comment number 160. We have expanded the Water section in the Affected Environment Chapter to include a description of the Tribes' current water monitoring efforts.

Comment 78

Is it possible to prohibit fishing in streams by Tribal and non-Tribal people if bull trout are threatened? Consider catch and release only for a time to restore the fish population.

Response

Fishing regulations are beyond the scope of the Forest Management Plan. Fishing is regulated by the Tribal Council, with input from the Division of Fish, Wildlife, and Recreation (FWRC).

It is not only possible to prohibit fishing, it is present policy. The CSKT, in the 1980s were one of the first agencies to prohibit the harvest of bull trout. In 1993 the Tribes closed two critical bull trout spawning streams to all angling by nonmembers to prevent incidental mortality by anglers, including those not targeting bull trout. Tribal members are also prohibited from fishing those streams during the bull trout spawning period. The Flathead and Jocko Rivers have had catch and release restrictions since the 1980s

Comment 79

I find it hard to believe that out of 61 watersheds only 23 were moderately degraded and only 2 were highly degraded. The Middle and South Forks of the Jocko have been severely degraded through historical logging and road building as reflected by the lack of woody debris in both channels which leads to lower channel complexity within the local reach and downstream. The model misses the key feature of large woody debris. A good surrogate for this would be the percent of stream that contain roads within 100 feet (tree potential height) associated with the number of stream crossings.

Response

The model used in this EIS serves as a "course filter" to predict watershed condition and to impose limits on potentially detrimental activities. It also serves as a guide for minimizing the negative effects of management activities. It does this by providing a method of accounting for the cumulative level of activities within drainages that typically result in watershed degradation.

The model results did not have a high degree of correlation with key watershed parameters that have been measured in the field, which supports the your subjective assessment that more than two watersheds are severely degraded. We will continue to refine the model and improve the correlation of its predictions with measured parameters. However, the low correlation will not affect management decisions, because its value as an accounting tool is for gross-level planning. The issue of the level of degradation is subjective and to defend the number of drainages predicted by the model as highly degraded would not be a useful exercise. Instead we will seek to improve conditions in all drainages, not just those in a "moderate" or 'highly" degraded condition.

It is a valid point that large woody debris (LWD) was not included in the model. This important component of habitat and stream dynamics is not easily modeled. Fortunately though, there has been minimal logging of the riparian zone in the past. The percent of streams within 100 feet of roads may be a weak surrogate for the presence of LWD, but is probably not precise enough to be of any utility in planning. Nonetheless the number of miles of riparian roads is already factored into the model to indicate sediment delivery and riparian condition, and so it should not be factored in twice. A surrogate with even more resolution, but still of limited value, is the presence and intensity of grazing within a stream corridor. Future monitoring objectives include riparian inventories of all streams within the Reservation. Those data will accurately measure LWD recruitment potential.

Comment 80

The watershed model is too liberal in its measurement of sediment. I feel that 300 feet is more appropriate based on Belt, O'Laughlin, and Merrill (1992). Belt et al. also states that channelized sediment flow can move distances of thousands of feet. Therefore riparian buffers are not effective in stopping sediment flow in the channelized form. And how do utility corridors fit into this?

Response

We agree that sediment is often transported through riparian buffers for distances of greater than 100 feet. The use of "roads within 100 feet of streams" as a parameter in the model is not intended to refute that fact. Instead, that parameter was chosen because it has a fairly direct and potentially measurable impact on streams. If 300 feet were used, as the commenter suggests, the resolution in the model would go down because the likelihood of roads at distances greater than 100 feet from streams delivering sediment overland declines very rapidly with each additional increment of distance. Additionally, within the Reservation the geology is typically stable, and the climate rarely generates rain-on-snow events. Therefore, catastrophic mass-waste events that typically transport overland to distances exceeding 100 feet are more rare than in many other landscapes.

Utility corridors were not included in the watershed model. It is true that the road and vegetation changes brought by utility corridors have negative impacts.

The impact of these corridors is considered constant, that impact is not subject to change over management cycles, and it occurs in known locations. Therefore it is not conducive for inclusion in the watershed model, which addresses manageable impacts on a broad scale.

Comment 81

The description of stream sediment using 4.75 mm needs to be clarified more in relation to the range of 9.0 to 40.0%. What is considered the threshold of sediment value for the use of 4.75 mm? For example the use of 6.4 mm is negatively associated with values over 30%. This section also needs to break down the existing sediment level to the associated management levels. In other words, do highly managed areas correlate with streams that have high or elevated amounts of sediment?

Response

The method of substrate measurement used is the standard McNeil core approach (McNeil 1969). Particles were sifted through 12 sieves ranging in size from 76 mm to 75 um. A 6.4 mm sieve was not used. Comparisons to other research that relates survival to the percent smaller than 6.4 mm is possible by extrapolating sieving results between 4.75 mm and 9.5 mm sieves. With this method we can still use the same threshold level of 30% less than 6.4 mm, which is so commonly referred to in the literature.

Comment 82

Why don't all the alternatives propose to restore bull trout. Alternatives 3, 4, and 5 cannot be selected because they don't meet the Endangered Species Act (ESA) in regards to bull trout listing (they will only maintain existing populations but do not plan to recover as mandated by the ESA). Also what is the definition of the word "restore," when you say restore bull trout to x number of drainages?

Response

The Endangered Species Act (ESA) does not require that an agency restore all listed species. It does require consultation with U. S. Fish and Wildlife Service for all actions that may affect a listed species. It also requires that the agency carry out programs for the conservation of the listed species. The Tribes strive to conserve all existing bull trout populations, and that goal is possible with each alternative. Further, the Tribes would like to restore native species (bull trout included) to all drainages where it is feasible. We expressed that goal to varying degrees in each alternative. In this context, the word "restore" is a much more active process than just conservation. Forest management may play only a supportive, rather than a driving role in restoration. Removal or modification of migration barriers and removal of exotic species may be the most important steps in restoration. For example, restoration may require placing barriers at the mouths of streams. These barriers would be passable to bull trout but not brook trout.

Brook trout would then be eliminated from the system by poisoning, and bull trout would be reintroduced. Best forest management practices (BMPs) within those drainages would be necessary to provide optimal habitat conditions, but forest management is rarely the limiting factor controlling the presence of native species.

Comment 83

How will the alternatives affect large woody debris (LWD) loading? Since the Tribes do harvest timber from riparian areas, I would assume LWD would be negatively affected, which would negatively affect channel complexity and fish habitat and stream temperatures.

Response

The alternatives are indistinguishable in the near-term when it comes to LWD recruitment. They do not differ in the amount of harvest that would occur in riparian areas. The plan did not predict any harvest from riparian areas under any of the alternatives. While riparian harvest is not wholly precluded in the plan, it is very unlikely that it would occur given the Tribal policy that no harvest in riparian areas is allowed if the harvest would reduce tree densities to below levels defined as "old growth". It is also unlikely that an interdisciplinary team would allow timber harvesting in riparian areas.

It is more probable that grazing on the Reservation will impact riparian condition and associated LWD recruitment. The alternatives differ with respect to their grazing objectives. Based on proposed changes in grazing management, all of the alternatives should result in increased LWD recruitment (relative to the No Action Alternative). The changes include fencing riparian areas, reducing the season of use in riparian areas, and reducing stocking levels. The likelihood of increased LWD recruitment over the long-term would be highest under Alternatives 1 and 2 and lowest under Alternatives 3, 4, and 5.

Comment 84

Why is there no discussion of water/fish impacts in the cumulative impacts section in Chapter 5?

Response

We have expanded this part of the EIS in response to your concern.

Comment 85

In Chapter 5, Unavoidable Significant Adverse Impacts, Alternatives 1 and 2 should have a discussion related to continued grazing impacts on fisheries and the impact of obliteration of roads and associated pulling of stream crossings.

Response

Grazing will continue under all of the alternatives. Grazing practices will be modified the most under Alternatives 1 and 2 and least under Alternatives 4 and 5.

Alternatives 1, 2, and 3 also have an objective to restore riparian function. Where grazing still occurs in riparian areas, it will be possible to achieve "proper functioning condition" although that condition will not duplicate the precontact condition.

Alternatives 1, 2, and 3 also include provisions for road removal. Road removal has some unavoidable impacts associated with it (the primary impact is the release of sediment during the removal of road fills from stream channels). These activities will be performed during low flow periods to minimize impacts. These short-term impacts are acceptable given the greater long-term gains that come from removing the roads.

Comment 86 Why not have 100% of water pollution sources removed in all alternatives?

Response Reduction of 100% of all pollution sources is an expensive proposition that also brings diminishing returns with the reduction of the smallest and possibly most difficult sources. The alternatives represent a range of commitment to removing pollution and protecting aquatic resources (Alternative 1 would remove one-hundred percent, Alternative 2 eighty percent, and Alternatives 3, 4, and 5 seventy percent). The difference in water quality between the reduction of 100% and 80% of identified sources is assumed to be too small to measure, and therefore an 80% reduction is acceptable (although not as desirable as a 100% reduction).

Comment 87 Please append the BMPs to the FEIS.

Response This is a good suggestion. We have appended the BMPs to the FEIS.

Comment 88 We encourage the Tribes to develop an inspection process to identify existing road conditions that cause or contribute to nonpoint source pollution and stream impairment.

Response An informal procedure is currently in place. It utilizes the pre-sale planning process and interdisciplinary team expertise to identify road problems. A formal plan designed to identify and eliminate existing and potential road problems will be developed as a component of the Forest Management Plan and the Transportation Plan.

Comment 89 The DEIS does not describe methods by which the Tribe will identify sensitive (erosive) soils or land types.

Response Forested watersheds on the Reservation are entirely underlain by Belt Supergroup rocks. These materials are generally very stable, non-erosive, and not prone to earthflows or landslides. There are however, a number of weathering horizons, or Quaternary unconsolidated materials, that locally mantle Belt supergroup rocks. None of these mantles is characterized as highly erosive or overly prone to earthflows or landslides, but their potential to generate sediment is greater than that for Belt rocks. These materials are mapped on the USDA Natural Resources Conservation Service Parent Materials Map, which accompanies the Soils Surveys for Lake, Sanders, Missoula, and Flathead counties—the counties located within the exterior boundaries of the Reservation.

In summary, potentially erosive materials on the Reservation include:

- Volcanic ash caps or volcanic ash modified soils (denoted as andic soils in soil survey reports). These occur in higher elevation, first order basins across the Reservation.
- Continental glacial deposits, which occur exclusively along the east shore of Flathead Lake below an elevation of 4,500 feet.
- Alpine glacial deposits occur in some first order basins across the Reservation.
- Tertiary unconsolidated to partly consolidated sediments occur in the Evaro area and in isolated locations across the Reservation.
- Insitu weathered regolith derived from Wallace formation carbonate rocks. These occur on top of the north Mission Range and in pockets in Valley Creek and the upper Jocko watershed.

In all project environmental analyses, these landtypes are identified and silvicultural prescriptions located on these materials are evaluated for their erosion potential.

Comment 90 An objective of the preferred alternative is to improve the condition of 80% of the road segments that are severely degrading stream channels. Why not set 100% as the objective? We recommend 100%.

Response We agree. We have changed the objective in the Preferred Alternative to reflect your concern.

Comment 91 We recommend an objective be added to restore and maintain the chemical, physical, and biological integrity of Reservation streams and to assure compliance with applicable standards and maintenance of beneficial uses of Tribal waters.

Response This is a good suggestion. We have added this objective in the Preferred Alternative to reflect your concern.

Recreation and Scenery

Comment 92 I am concerned with the proposed Limited Public Access Areas (LPAAs). There are better ways to solve the problem. Deal directly with the causes of overcrowding or abuse. Find other ways to reduce conflict between members and nonmembers.

Response Alternatives 1, 2, and 3 simply reserve the right for the Confederated Salish and Kootenai Tribes (CSKT), as a private landowner, to restrict future public use on certain parcels of its lands. The specific areas that would be set aside as LPAAs and the actual restrictions that would be placed on public use in those areas are yet to be determined. Once the Tribes have developed a specific proposal outlining the restrictions and the LPAAs they want, the public will have an opportunity to comment on the proposal during the annual Tribal Ordinance 44D fishing, hunting, and recreation regulation-setting process.

Comment 93 Don't close Arlee hill to hang gliding.

Response Unless specifically authorized by the Tribes, the use of hang-gliders or para-gliders on Tribal lands is prohibited. Such use has been unlawful since March 1, 1993. The forest plan will not affect this regulation.

Comment 94 I am opposed to the proposed LPAAs. Don't restrict use based on race.

Response We disagree with your assertion that use would be restricted on the basis of race. The establishment of LPAAs will be based upon the needs of the landowner (in this case the members of Confederated Salish and Kootenai Tribes) and a variety of concerns—environmental, cultural, subsistence, economic, and recreational.

Generally when a landowner or a group of landowners choose to restrict, condition, or prohibit use of their land by the general public it is not considered a racial issue. Rather it is considered a basic landowner right. An example of an existing LPAA is the South Fork of the Jocko Primitive Area. Certain non-Tribal members still have recreational access to and use of the area if they meet and follow the parameters set forth for the site. Please see also the response to comment number 92.

Comment 95 I am a Tribal Member concerned about not being able to recreate in some of my favorite places with nonmember family members.

Response The specific restrictions that would be placed on nonmembers in LPAAs have not been determined. In the South Fork of the Jocko Primitive Area, an existing LPAA, nonmembers who are members of the immediate family of a Tribal member may visit the area as long as they are accompanied by the Tribal member. Then may not hunt or fish, however. Please see also the response to comment number 92.

Comment 96 Consider temporary closures that would allow Tribal members to conduct their activities during certain periods and still allow nonmembers access at other times.

Response There will be an opportunity to suggest alternatives to the LPAAs during the annual Tribal Ordinance 44D fishing, hunting, and recreation regulation-setting process. At that time the Tribes will have a more specific proposal as to which areas they want to designate as LPAAs and the specific restrictions that would apply within those areas. Please see the responses to comment numbers 92 and 94.

Comment 97 I am a nonmember concerned about Tribal members not being able to recreate with nonmember family members

Response Please see the responses to comment numbers 92 and 95.

Comment 98 If there are going to be LPAAs (we don’t support any) make it the Grizzly Bear Conservation Zone

Response Please see the response to comment number 92.

Comment 99 The DEIS does not address the fact that Proposed LPAAs have BIA roads. These roads would have to be designated Tribal roads if access is limited to Tribal members, and the roads would need to be maintained with Tribal funds.

Response Although most backcountry or forest roads on Tribally owned lands are Tribal roads (approximately 2,580 miles), there are other forest roads on Tribal lands identified as BIA maintenance roads or BIA system roads (approximately 360 miles). Nine percent of those 360 miles have a BIA right-of-way established. Some of the proposed LPAAs do have BIA system roads within their boundaries.

If roadway closures are identified as a restriction for a particular area and a BIA road is located within the area, that specific roadway and the proposed restriction will be evaluated for implementation under 25 CFR, Part 170, which governs BIA road restrictions or removal from the BIA system roads program. Tribal roads that are classified as a BIA system roads qualify for very limited Federal maintenance funding. If they are removed from the BIA system, the Tribes would use Tribal funding for maintenance activities. Please see also the response to comment number 92.

Comment 100 As an alternative to the LPAAs, post conservation officers at the main access points to check for permits.

Response Please see the response to comment number 96.

Comment 101 Don't close roads west of Hot Springs.

Response Please see the response to comment number 92.

Comment 102 If non-Tribal people are causing damage or problems, their use should be restricted, otherwise use other forms of control appropriate to the problem.

Response Please see the response to comment number 96.

Comment 103 Close Tribal lands to commercial use by non-Tribal spouses of tribal members.

Response The issue of the commercial use of Tribal land by non-Tribal spouses of tribal members is beyond the scope of the Forest Management Plan and EIS. That use is regulated by the Tribal Council through a separate process.

Comment 104 Inherent in the State-Tribal Fish and Wildlife Agreement is the expectation by non-Tribal members that there will be reasonable access to and use of Reservation fisheries and bird hunting resources. We support the continued use of Tribal lands for bird hunting and fishing by licensed nonmembers. All revenues from nonmember bird hunting and fishing permits go to the Tribes to be earmarked for fish and wildlife programs. It is our interpretation that this should include reasonable access to Tribal lands since funds for the management of fish and wildlife resources are partially paid by nonmember users and one of the purposes of the fishing and bird hunting agreement is to enable use of all lands within the Reservation by nonmembers.

Response

The Tribal-State Cooperative Agreement for Bird Hunting and Fishing on the Flathead Reservation is beyond the scope of the DEIS. The agreement, however, does not prohibit landowners from restricting public access or activities on their lands. The primary purpose of the agreement is to simplify regulations and licensing requirements and to provide a framework for the State and the Tribes to co-manage fish and gamebird resources of the Reservation. The agreement does not enable, entitle, or mandate recreational use of all lands within the Reservation by non-Tribal members, Tribal members, or any other persons.

Comment 105

If areas are closed for Indian spiritual ceremonies, why do Indians need to do this in the Mission Mountains, aren't there other places they can do these things?

Response

Wildlands or wilderness areas have always been very important to the peoples of the Confederated Salish & Kootenai Tribes for perpetuation of culture and traditional practices. However, after the Allotment Act, settlement and development congested the once natural and primitive lands of the Flathead Reservation. Many sacred cultural sites were destroyed. The only wild and untamed areas which remained away from so called "civilization" were in the mountains. The mountains is where the bridge linking the past and present worlds can be found.

For the Tribes, the primitive and wilderness areas provide hunting grounds and fishing waters, a sanctuary for cultural practices, recreation opportunities, scenic amenities, a place for educational scientific study, and the economic benefits of various natural resources. The goal of the Mission Mountains Tribal Wilderness Area is simply this, to preserve quiet and untamed areas for cultural and spiritual use.

Comment 106

Closed areas have BIA roads in them. BIA roads are open roads and the Tribes would need to allow the general public to use them.

Response

Please see the response to comment number 99.

Comment 107

How will closures be enforced? And what will the punishment be for trespass? How much will it cost to enforce the closures?

Response

LPAA restrictions will be enforced the same way as current recreation regulations are today—through education, law enforcement officers, and court judgements.

The administrative costs of implementing any new regulations pertaining to the proposed areas are negligible because all of the proposed LPAAs already receive law enforcement patrols for recreation regulation compliance.

Comment 108

In Chapter 5, Unavoidable Significant Adverse Impacts, Alternatives 1 and 2 should have a discussion related to the significant impacts on social attitudes within the Reservation that would result from limiting access.

Response

We disagree. The Tribes currently have two LPAAs. We see no unavoidable significant adverse impacts on social attitudes resulting from the establishment of these areas.

Comment 109

Why weren't the proposed limits on access more fully explained, described, or defined in the EIS? What activities will be restricted? Where are the data, the tables, and the graphs that delineate the reasons for the proposed restrictions in each area? Other resource areas had much more detail? Clarification is needed in order for people to understand the intent and specifics of the closures and restrictions.

Response

Please see the response to comment number 92.

Comment 110

Define certain types of non-tribal use or access for each landscape. Define time periods for each restriction. Are there to be exceptions to the non-Tribal public like nonmember spouses?

Response

Please see the response to comment number 92.

Comment 111

The Limited Public Access Areas should not have been part of the DEIS.

Response

We disagree. The Forest Management Plan and its EIS are appropriate places to plan for current and future recreational, cultural, and subsistence uses on the Tribal forest lands of the Reservation.

Comment 112

It is not clear how closures come into law and whether the Tribal Council can overrule these closures or make new ones without regard to the EIS.

Response

Please see the response to comment number 92.

Comment 113

It is not clear if the Lower Flathead River will remain open to boaters and fishermen. It is also not clear if one or all three of the areas in Mission Wilderness will become LPAAs.

Response

The LPAA identified within the Salish Landscape is the Tribal land located adjacent to the east bank of the Flathead River between Buffalo Bridge and Sloans Bridge. The LPAA would not restrict use occurring on the river itself, so boaters on the river would not be affected.

As for the Missions Landscape, Alternatives 1, 2, and 3 propose that *one* of the three areas listed in Table 3-10 be designated an LPAA. It should be noted that one of those areas (the Grizzly Bear Conservation Zone) is already an LPAA, although, under Alternatives 1, 2, and 3 the boundary of this area would change slightly.

Comment 114

Reconsider closures west of Camas Prairie, Hot Springs, and Lonepine. Many use the roads in this area to access USFS land to cut firewood, hunt, move cattle, maintain fences, and get away from it all. Please leave Garden Creek, Sunrise Springs, etc. open.

Response

Please see the response to comment number 92.

Comment 115

Won't closing some drainages impact others more because of the shifting of use to open areas?

Response

This topic is discussed briefly on page 306 of the DEIS. It is likely that creating LPAAs will result in the shifting of some nonmember recreational use. Exactly how much use would shift depends on the type of restrictions that are adopted for a given LPAA. Until a proposal with specific restrictions is developed, there is no way to analyze or predict the extent of the shifting that would occur.

Comment 116

I am opposed to the closures and I think that the closures will hurt the Tribes politically.

Response

Comment noted.

Comment 117

Please clarify the language to say that limited public access area restrictions do not pertain to landowners (such as the state of Montana) that have legitimate rights of access.

Response Please see the response to comment number 92.

Comment 118 Don't close the Southwest Landscape because it will require the Forest Service to reconstruct the Reservation Divide trail.

Response Please see the response to comment number 92.

Comment 119 I want to see the total closure of all our (Tribal) lands to nonmembers.

Response Comment noted. Please see the response to comment number 92.

Comment 120 If you close 30% of the Reservation you should reduce my recreation permit fee.

Response Comment noted. Please see the response to comment number 92.

Comment 121 In Camas Prairie the Cottonwood and Rainbow Lake roads are county roads and important to local travel and commerce by all citizens, Tribal and non-Tribal.

Response Comment noted. Please see the response to comment number 92.

Comment 122 The Flathead Indian Irrigation Project needs access to McGinnis Creek, Alder Creek-Thompson Peak and Mill Creek-Little Bitterroot irrigation structures. The Niarada to Hubbert Dam Road is very important to local loggers and ranchers. Sanders and Flathead counties maintain this road to Highway 2.

Response Comment noted. Please see the response to comment number 92.

Comment 123 LPAAs should have all roads closed too. "Culture" should require no vehicles.

Response Comment noted.

Comment 124 I support the Tribes establishment of LPAAs.

Response Comment noted.

Comment 125 I would be more than willing to participate in a trail-use fee system.

Response Comment noted.

Comment 126 Would the tail-use fee system be for all users or only nonmembers? How would it be enforced, who would enforce it, and how much will it cost the tribes to enforce it?

Response A trail fee system for cross-country skiing, mountain biking, or snowmobiling would only apply to designated trails within the North Missions Landscape and would target nonmember groups and individuals that utilize the area. Tribal members (the landowners) could be targeted, too, if their use of the area is significant. Managers would utilize the regulation and enforcement tools of Ordinance 44D to implement the fee system. The goal of the fee system would be to have users pay for development, maintenance, and enforcement of the proposed trails in the North Missions Landscape and any future additions to it.

Comment 127 Computer simulations used for visual analysis do not show the access roads. More open canopies will expose long lengths of road across the landscape. I would like to see more discussion and rationale as to why we do not propose more helicopter logging in these highly visible areas with more road obliterations.

Response All the Reservation forested landscapes were analyzed to identify highly visible areas based upon slope and visibility from various viewpoints. The analysis provides recommendations for harvest methods based upon visible roadcuts, clearcuts, etc.

Comment 128 Where are you planning on adding snowmobile runs and how will this improve natural sanctuary and peace?

Response Snowmobile use will be redirected from other parts of the Reservation to the North Missions Landscape. Snowmobile trails in this area will be improved where they already exist. Other areas of the Reservation will benefit if snowmobile use is concentrated in one area.

Comment 129 Clearcuts proposed to be rehabilitated are older cuts. How can we justify clearing away more trees to make it look better? We need to plant trees (instead of cutting more) so the scars are not so visible.

Response By removing straight lines and other techniques, existing clearcuts can be made to look more like natural openings, which will improve the scenic quality of areas heavily impacted in the past by geometrically shaped clearcuts.

Comment 130 I feel horses are a problem in many backcountry areas.

Response Comment noted.

Comment 131 Will scenic turnouts on Highway 93 be coordinated with Montana Department of Transportation?

Response Your concern is beyond the scope of the EIS.

Comment 132 The statement on page 299 about assuming that the public will be more accepting of openings and clearcutting is questionable.

Response The statement was, "We assume the public will become more accepting of natural-appearing forest openings as their understanding of the role of fire in forests increases and as their knowledge of pre-European forest conditions grows." We stand by this statement.

Comment 133 There should be more stringent restrictions on ORV use.

Response Currently ORV use is prohibited. This is the most stringent restriction possible (other than banning ATVs and 4x4 vehicles from Tribal roadways).

Comment 134 Leave the road to the snow cabin in the Hellroaring drainage open until it closes naturally.

Response It has already closed naturally to cars and pickups.

Comment 135 We are disturbed by soil damage being done by cars, trucks, 4-wheelers, and especially motorbikes to the river corridor around Buffalo Bridge. Could the use of vehicles be limited, roads be marked, or could the area be made wilderness where travel would be limited to foot, horseback, and possibly bicycles?

Response Please see the response to comment number 133.

Roadless Areas and Wilderness

Comment 136 Change all proposed wilderness and roadless areas except Courville Creek and Swartz Lake to special set asides. Leave management options in these areas wide open for things such as helicopter logging. Some areas have existing roads and those roads should be left open.

Response Comment noted.

Comment 137 The Preferred Alternative does not protect enough unroaded land.

Response The Preferred Alternative designates 26,969 acres of new wilderness and 33,118 acres of permanent roadless areas (refer to pages 293 and 297).

All existing roadless acres and areas with extremely low road densities were evaluated for classification as roadless, wilderness, semi-primitive non-motorized and semi-primitive motorized areas (these classifications provide various degrees of roadless-area protection).

Comment 138 Alternative 2 gives more financial return than Alternative 1, so why limit acreage that will return to wilderness?

Response Please see the response to comment number 137.

Comment 139 When you say "areas would be protected as wilderness," is this true wilderness? What are the restrictions on use?

Response Management plans, policies, and regulations for the areas identified to be protected as Tribal wilderness areas would be adopted within 4 years of official designation. Any restrictions that would apply in these areas would be determined during that planning process.

Culture

Comment 140 We have enough areas to practice our culture. Why are we proposing to close more areas to nonmembers? Not many Tribal members even get off the road to use unroaded areas.

Response We disagree. Various surveys conducted in the past show that a significant number of Tribal members would like more LPAAs. We do not have data on the actual number of Tribal members that use unroaded areas, but our own informal observations suggest that the number is significant.

Comment 141 Culture statements do not belong in an EIS. It reduces the importance of cultural purposes and statements to the same level as a vegetable.

Response Comment noted.

Transportation

Comment 142 Reduce road densities.

Response There are two types of road density discussed in the DEIS. Open road densities refer to the miles of open road per square mile. Total road densities refer to the miles of all roads (open and closed) per square mile.

Four of the five alternatives *do* reduce total road densities. Total road densities were calculated based on the total managed land base, and therefore it included lands not currently roaded. To estimate total road density at a point in the future after all managed lands have been roaded requires that future road density, which is based on predicted spacing of new roads, be calculated with adjustments in spacing to currently roaded lands. Alternative 1 reduces total road densities on currently roaded lands by 10%, and on the future fully roaded condition by 14%. Alternative 2 reduces total road densities on currently roaded lands by 6%, and on the future fully roaded condition by 7%. Alternative 3 reduces total road densities on currently roaded lands by 2%, and on the future fully roaded condition by 3%. Alternative 4 does not change existing total road densities. Alternative 5 proposes no new roads and proposes a reduction of 50% in existing roads.

In response to your comment we have reduced the *open* road density of the preferred alternative.

Comment 143

The EIS is not specific on treatment of existing roads. I think improvements on existing roads should be halted and restricted to just keeping the roads serviceable.

Response

Improvements on roads are necessary for several reasons. Road maintenance is necessary to simply ensure that the road achieves its purpose of vehicular access and protects that investment. In addition, extreme impacts on the aquatic system can result from a lack of road maintenance. Culverts and drainage structures, for example, must be continually maintained to reduce the chance of failure. When a culvert or drainage structure fails, large amounts of sediment can enter a stream.

Comment 144

Does the figure of 2,930 miles of forest roads within the Reservation include roads created by post and pole cutters or those created by road hunters (for example the ridge roads in Ferry Basin)?

Response

The figure 2,930 miles of road refers to system roads. It does not include many of the roads pioneered by post and pole cutters.

Comment 145

Why are stream crossings being designed for the 50-year event (under existing road policies and guidelines) when other agencies are designing for a 100-year event?

Response

We agree that stream crossings should be designed for a 100-year event, and although the summary of Best Management Practices does say that stream crossings will be designed for 50-year peak discharges, future culvert replacement and all new installations will be designed for the 100-year event. When BMPs are revised and updated they will reflect this change.

Comment 146

Are there any special mitigation measures for the maintenance of roads that parallel within 300 feet of any active stream channel. Mitigation in the form of sediment buffering devices (silt fence, straw bales, or slash filter windrow) should occur with road blading or other ground-disturbing maintenance activities.

Response

There have not been special mitigation measures for maintenance of roads that parallel streams. Slash filter windrows have been employed on new construction. This same tool will be employed on future road blading projects and incorporated into the BMPs when they are revised and updated.

Comment 147

In Chapter 5, Unavoidable Significant Adverse Impacts, Alternatives 1 and 2 should have a discussion related to the building of new roads in roaded and unroaded areas and of the obliteration of roads with the associated pulling of stream crossings.

Response

We have added to our discussion of Unavoidable Significant Adverse Impacts Resulting from Project Implementation.

New road construction results in increased sediment delivery to streams and increased efficiency of runoff, which causes more "flashy flow" responses to rainfall and snowmelt. The impacts of new road construction will be directly proportional to the amount of new construction, which varies by alternative.

Removal of stream crossings is a critical part of the process of road removal. It is nearly impossible to remove road fill and culverts without introducing some sediment to streams. The process used will be scheduled for late summer when flows are at a minimum and the risk of sediment being released into the stream is at a minimum. The amount of sediment released will vary by alternative and will be directly related to the number of crossings removed. The alternative with the greatest number of culverts removed will have the greatest near-term impact in the form of sediment released, although it will have the least long-term impact because of the removal of the high-risk earth fills within the stream channels.

Comment 148

If roadways were closed in forest areas and around lakes and rivers, there would be no adverse impact on the land

Response

It is true that roads nearest to waterbodies transport on average the greatest amount of sediment into those waterbodies. In the absence of mass-waste events, most sediment delivery occurs at stream crossings, and roads necessarily cross streams. Road closures have very little influence on the negative effect of roads. Closures do little to reduce sediment delivery to streams or to reduce runoff-efficiency increases caused by roads. To reduce those impacts, roads must be completely removed or designed and maintained with the maximum amount of mitigation measures.

Comment 149

We recommend that the FEIS describe the Tribes inspection and enforcement program with respect to road closures and restrictions to motorized access.

Response

We refer you to pages 82 to 88 of the DEIS which includes descriptions of existing road classification, inventory and condition, densities, policies and guidelines, effects on scenery, maintenance, and management (including guidelines for closed and abandoned roads). The FEIS is not the appropriate place for a description of the Tribes law enforcement program.

Comment 150 Roads need to stay open so rural fire departments can put fires out quickly.

Response Roads important for fire suppression purposes have been identified in a separate planning process and will remain open for fire suppression purposes.

Socio-Economic

Comment 151 The preferred alternative will hurt the reservation economy and companies like Stoltze.

Response We disagree. Alternative 2, the Preferred Alternative is predicted to produce a Tribal harvest income of about $4.3 million to the Tribes every year and generate about $14 million annually in direct and indirect economic returns to the local economy. For comparison, over the last 17 years, the Tribal harvest income averaged about $3.5 million a year. Alternative 2 is also expected to produce direct employment for about 200 people and indirect employment for about 400 people.

Comment 152 Your proposed alternative does not evaluate the impacts on Tribal members who live on the outer edges of the Reservation (Niarada, Lonepine, Hot Springs, Camas Prairie, Perma, and Dixon).

Response All of the communities on the Reservation were treated the same. Statistical data was used that reflected all counties or portions of counties within the Reservation boundaries. The concern about the loss of six saw mills, declining logging, and low cattle prices are the result of economic factors that preceded the DEIS and its alternatives.

It should also be noted that the Forest Management Plan EIS is not an economic development plan. The primary focus of the plan is ecosystem management, which emphasizes forest structure, composition, and health. The resulting economic impacts are considered secondary. Finally, the economic impacts on jobs was treated uniformly over the affected area. Predicted employment estimates were based on boardfoot harvest for each alternative. It is assumed that over time, the distribution of that employment will reflect distribution of the forested areas.

Comment 153

(1) Socio-economic concerns are not addressed at all in the Affected Environment Section, yet there are many questions which may impact the choice of alternatives. (2) What are the Tribal-member employment goals related to the Forest Management Plan? (3) What job markets are growing outside of forestry and ranching on the Reservation? (4) Will diversification of the job market lessen the pressure on forest and range resources? (5) Are these other jobs desirable to Tribal members, or do the Tribes recognize continued forest and range-based livelihoods as important to its economic character?

Response

We have, in response to the first sentence of your comment, supplemented this section of the DEIS.

The Tribal member employment goals are basically related to the harvest of sawlogs, post and poles, and cordwood. Each alternative includes an estimate of the portion of the harvest that will be set aside for Tribal members only. The economic impacts of the alternatives are based on the volumes of timber cut, using formulas from the University of Montana, Bureau of Business and Economic Research. The rationale for this is that ecosystem management treats economic returns and employment as ancillary or secondary benefits of treatment. The primary goal is a return to pre-settlement forest structures and conditions rather than the creation of income or employment;

Job markets outside forestry and ranching were not considered because of the very fact that they are outside forestry. This is a forest management plan, not a general assessment of the economics within the Reservation;

Whether or not job diversification would lessen the pressure on forest and range resources is speculation. There are no local quantitative data available that would indicate that demand for wood products would lessen with job diversification. It is our opinion that demand for wood products will not lessen and that there will be a continued demand for woods workers. There may be fewer people willing to do woods work because other jobs are available. That would tend to increase wages in the wood products sector;

The Tribes do recognize that continued forest and range-based livelihoods are important to their socioeconomic character. This is evidenced by the set asides for Tribal loggers and the attention paid to range management in forested areas. It is not known, nor is it quantifiable, whether the other jobs that may arise because of diversification will be desirable to Tribal members. One would suspect that these jobs would be desirable and that an unknown number of people would move out of the wood products and range-based jobs. However, if the demand for range and wood products is stable, other workers would almost certainly replace the vacated jobs.

NEPA Process

Comment 154

Are the 29 comments received during scoping sufficient to determine issues and concerns for an action such as this? CEQ requires agencies to make diligent efforts to involve the public in the NEPA process by providing public notice.

Response

From the beginning, the Tribal Council considered public participation crucial to the development of a Tribal forest management plan. During the scoping phase of the Environmental Impact Statement (EIS) process, which extended from January 30 through March 29, 1996, the Tribes worked hard to solicit public participation. As stated in the DEIS, the Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on January 30, 1996. The NOI announced that scoping meetings would held at five locations on the Reservation: Arlee, St. Ignatius, Elmo, Hot Springs, and Pablo. Notifications of these meetings were also published in the Missoulian on February 7 and 9, 1996; in the Charkoosta News on February 9 and 16; and in the Sanders County Ledger on February 15, 1996. In addition to these formal announcements, a number of informational articles on various aspects of the proposed action appeared in the Charkoosta prior to the scoping meetings. The Draft Flathead Indian Reservation Forest Management Plan (FMP), which is the proposed action, was available for viewing at public libraries in Hot Springs, Ronan, Polson, and the Salish and Kootenai College, Montana, and to anyone who requested a copy.

At each of the five scoping meetings, members of the public were asked to sign-in and were given a comment form and an Executive Summary of the FMP. Several maps showing the forest, the status of forest vegetation, and other natural resource information were placed around the room for review and discussion. Resource specialists fielded all questions, and all verbal comments were recorded on flip charts. These and all the written comments that were submitted were then added to the official record. In addition to the comments received during the scoping meetings, the ID Team solicited comments from the Ad Hoc group of Tribal members appointed by the Tribal Council. That group represented a cross section of Tribal members interested in forest management issues. The Ad Hoc group played a major part in shaping both the draft plan and the alternatives in the DEIS. Representatives from the ID Team also made presentations to and invited comments from the Elders of both the Salish and Kootenai Culture Committees and the Tribal Council.

Comment 155

The proposal [proposed action] was made too early in the process; it appears the EIS is simply a post hoc justification for a decision already made. The preparation of the EIS should be timed so that the final statement may be completed in time to be included in any recommendation or report on the proposal.

Response

While it is true the DEIS was released approximately three years after release of the draft forest plan or proposed action, that delay does not mean that the DEIS is simply a "justification for a decision already made." When the final EIS is completed, the alternative that is selected will become the basis for a final forest management plan.

The primary reason for the delay was the complexity of the modeling necessary to predict the consequences of each alternative on the Reservation's forests. The model developed by the ID Team over that three year period sought to achieve a target seral cluster distribution over a 120-year time period and involved tens of thousands of data points.

Comment 156

Is the agency making a good faith effort in soliciting public comment and are comments being seriously considered? The clearcutting issue has been dismissed. This is a very serious issue for many tribal elders. How could you dismiss it by attempting to justify it as a valid silvicultural tool? Could the same objective be met with a different silvicultural tool?

Response

For the answer to your first question, please see the response to comment number 154.

We disagree with your assertion that the 'clearcut issue' has been dismissed. Clearcutting has been a topic of discussion at most if not all of the meetings held on the draft forest plan and DEIS, including those with the Elders and Ad Hoc Committees. The ID Team has also discussed the issue at length with the Tribal Council. The Final EIS will reflect these discussions and the input received.

Of all the silvicultural tools available to managers, clearcutting, when designed correctly and used in combination with prescribed fire or mechanical site preparation, comes the closest to mimicking stand replacement fires. Given the constraints posed by the increasing number of homes in and adjacent to the forest and unnaturally high levels of fuels resulting from decades of fire exclusion, clearcutting is a necessary tool for managers attempting to restore historic vegetative structures.

Miscellaneous

Comment 157

On page 449, the DEIS refers to Ordinance 61-B. This ordinance has been renamed and renumbered to: *Forest Products Harvesting Ordinance* # 61-C.

Response You are right, and we have corrected the appropriate parts of the EIS.

Comment 158 The role of the Forest Service and Tribe and how they interact is not clear.

Response The U.S. Forest Service does not play a role in the management of Tribal lands. The Tribes do cooperate with the Forest Service on issues of mutual concern (such as fire suppression, forest pest monitoring, fire science applications, cumulative effects analysis, and recreation management) just as they do with other government agencies.

Comment 159 Many plans begin with a good idea, work for 10-15 years, then no longer seem to address the problem and are abandoned. What guarantees do we have that the same will not be true here?

Response The DEIS is not a plan, but rather an analysis of the environmental impacts that can be expected from the implementation of a plan and various alternatives to it. One of the goals of the Tribal Council is to establish an adaptive management and monitoring process. Adaptive management means managers will monitor the implementation of the forest plan's objectives to ensure that they are in fact being met and that projects are being implemented as planned and are effective in achieving the desired condition. The results of our monitoring efforts will be used to adjust forest management activities and to ensure that objectives and long range goals are being met. It is our hope that by using this adaptive management strategy, managers will be able to keep the plan current and relevant.

Comment 160 The DEIS includes little information regarding the proposed Tribal monitoring program to evaluate management actions relative to proposed goals and objectives. We recommend that additional information on the proposed forest management plan monitoring program and the Tribes' adaptive management system be provided in the FEIS.

Response The Tribes consider a thoughtful and thorough monitoring program to be one of the most important elements of any forest management plan, and although the DEIS did not include a monitoring plan, the Draft Forest Management Plan did and the Final Forest Management Plan will. (The monitoring plan in the Draft Forest Plan is available for public review.) We believe it is premature to develop a monitoring plan in the DEIS because the objectives (proposed activities) of the various alternatives are so different. Once an alternative is selected and the Record of Decision issued, the Final Forest Management Plan will be completed, and it will include a detailed monitoring plan.

Comment 161	I do not see much reality in these projections other than a selfish pillage for the sake of a few.
Response	We disagree. Depending on the alternative selected, total employment, both direct and induced, would range from about 490 to 200. Direct and indirect economic returns generated from the stumpage that would be cut ranges from \$2.4 to \$17 million. This revenue will help to support many important Tribal programs and will benefit the local economy. Most important, the plan would result in many nonmonetary benefits for other resources such as vegetation, wildlife, recreation, livestock grazing, fisheries, and culture.
Comment 162	Some of the goals on page 4 contradict each other: explain how we can strengthen Tribal sovereignty and self sufficiency and work cooperatively with adjacent landowners.
Response	We disagree. The two goals are not contradictory. Indeed, self sufficiency assures that the Tribes *can* work cooperatively with adjacent land owners as opposed to relying on the Federal government to represent the Tribes' interests. It can also be argued that working with adjacent landowners can improve Tribal self sufficiency. The Tribes work cooperatively with the U. S. Forest Service on fire management activities, for example. That cooperation improves the Tribes ability to manage its own lands. It therefore strengthens Tribal sovereignty and self sufficiency. The same could be said about the Tribes’ cooperation with neighboring landowners on issues such as weed control, recreation management, fisheries, wildlife, and so on.
Comment 163	What Tribal values are you describing here? How can you protect these values if you do not have an idea of what they are.
Response	The Tribal values that we are referring to can be inferred from relevant resolutions, ordinances, plans, and other documents that have been approved by the Tribal Council or the Tribal membership.
Comment 164	In the goals section, “good forest management” is a motherhood statement; this needs to be more definitive. What does this actually mean?

Response The statement could be interpreted as a "motherhood statement". However, we interpret it to mean sustainable forest management. The basic premise is: ecosystems that have evolved over extended time periods present the best chance for sustainability; management designed to maintain or restore key components, structures, and processes is generally the most likely to sustain ecosystem integrity and productivity. There is one important caveat, however. There are often times when, for social, cultural, economic, or even ecological reasons, this approach will not be possible. The world has changed substantially since precontact times. Fully restoring some components of an ecosystem over relatively short time-frames could threaten some sensitive species or jeopardize other resources. So prudent management, in our judgement, requires us to seek a balanced approach that takes into consideration human needs and the needs of species that may be in jeopardy.

Comment 165 Another goal should be to monitor the implementation of the plan to see if the prescribed activities are meeting the goals.

Response While the Tribes did not include monitoring as a goal, adaptive management and monitoring is part of the Purpose and Need Statement in the DEIS and is referenced in several other places in the document. In addition, the Final Forest Management Plan will include a detailed monitoring plan just as the Draft Forest Management Plan did.

Comment 166 In the purpose and need statement, what does "balanced forest ecosystem" mean?

Response By "a balanced forest ecosystem" we mean an ecosystem that falls within its historic range of variability. In short, a balanced forest ecosystem means that:

- fuels—including forest floor duff, dead woody material, and dense conifer thickets—are at levels much closer to what they were during the precontact period so that the risk of large, severe, uncontrollable wildfires is reduced;
- insect infestations and outbreaks of disease are at levels similar to what they were during the precontact period;
- natural reproduction of shade-intolerant conifers—species such as larch and ponderosa pine—are at levels closer to what they were during the precontact period;
- biodiversity of the forest is similar to what it was during precontact times, and the invasion of exotic species (noxious weeds) is significantly reduced.

Comment 167 There is no consideration of displacement impacts in the study's analysis of grazing, logging, and recreation. As an example: one displacement effect of the return to previous forest conditions may be the loss of dense forest habitat for wolverines, lynx and fishers.

Response The ID Team did consider displacement impacts associated with grazing, logging, and recreation. With respect to grazing and logging, none of the alternatives contains spatially specific proposals, and so it is not possible to predict displacement impacts associated with these activities with any specificity. However, our best broad-level prediction is that displacement impacts associated with these two activities will be minimal under all five alternatives. With respect to recreation, some of the proposed management activities are spatial (construction of a cross-country ski trail in the North Missions Landscape, for example). But again, we do not anticipate significant displacement impacts associated with anything that is proposed. The DEIS does predict that the Limited Public Access Areas (LPAAs) proposed under Alternatives 1, 2, and 3 would tend to concentrate nonmember use in areas where use is unrestricted and may therefore result in lower quality recreational experiences for some nonmembers. But the DEIS presents a range of options for the designation of LPAAs, and until the Tribal Council decides exactly which areas will receive that designation and what uses will be restricted, it is not possible to determine the significance of the impacts.

The team's analysis also considered impacts on the three species of forest carnivores mentioned. We addressed the impacts on these species—wolverine, lynx, and fisher—on the basis of three parameters: down woody debris, large snag density, and old growth. To do this, we compared output from the vegetation model to the RMVs. We believe, based on this analysis, that the basic premise of this part of your comment is false. By returning to precontact forest structures we should improve forest habitat conditions for the species mentioned. Our analysis shows that all of the alternatives will increase, to varying degrees, both down woody debris and large snag density. The old growth analysis is more complex because it involves predicting the future of three major cluster groups in three fire regimes over both the short and long-term periods. The analysis is summarized on pages 225 and 226 of the DEIS.

Comment 168 The focus of the impacts is entirely on the forest, and does not look at the Reservation as a whole. What are the indirect impacts of the FMP? There is no organized review of this crucial area.

Response We disagree. While the focus of the effects of the DEIS is on the forest (which is appropriate for an EIS on a forest management plan), the DEIS does address reasonably foreseeable impacts on resources beyond the forest. For example, the DEIS considers the Reservation-wide impacts of the alternatives on Tribal culture, economic and socio-economic conditions, scenery, and air and water quality.

Comment 169

Why are cumulative impacts separated from other reviews of environmental consequences? The coverage on page 340 is brief and incomplete. For example, the following have not been adequately considered: (a) Highway development (93 and 200): increased volume and speed can impact the goals to improve wildlife habitat, maintain ranching productivity, balance air quality concerns, etc. (b) Population growth in the valley: increased subdivision, especially near forested areas will affect water quality and quantity, soil stability, toxic substances, air quality, etc.

Response

NEPA requires cumulative impacts to be addressed, but it allows for some flexibility in the format (40 CFR 1502.10). We chose to follow-up our analysis of environmental consequences (Chapter 4) with a summary of key NEPA concerns (Chapter 5) because we thought that distilling out this information into a separate chapter would make for a clearer presentation. Chapter 5 does address, albeit briefly, some of the relevant and foreseeable cumulative impacts associated with the widening of Highway 93 and with residential developments within and adjacent to forest lands. But we feel it is beyond the scope of this EIS (which is for a forest management plan governing uses on Tribal forest lands on the Reservation) to conduct an in-depth analysis of the various impacts associated with the expansion of Highways 93 and 200 and growth in the Mission Valley. Exactly how the highway might be expanded is yet to be determined, and growth in the valley is, in the absence of a county land use plan, somewhat unpredictable in terms of the types of developments that might occur and where they might occur. Our analysis of the impacts of how these non-forest activities will affect Tribal forest lands must therefore be limited to some rather general, qualitative statements.

Comment 170

Why don’t timber, wildlife, water, soils, and other resources have “Objectives Common to All Alternatives?”

Response

The resources that you mention—timber, wildlife, water, soils, etc.—have numerous objectives, but those objectives are specific to each of the alternatives. None is common to all of the alternatives. So rather than including them in the section entitled “Objectives Common to All Alternatives” they are listed in the section titled “Objectives by Alternative.”

Comment 171

If the intent is to return to early times, then all people would have to leave this valley.

Response

Alternatives 1, 2, and 3 are ecosystem management alternatives that would, to varying degrees, move vegetative structures closer precontact conditions. It would not be possible, even it were desirable, to return completely to precontact forest conditions. Instead, the three ecosystem management alternatives focus only on restoring historic vegetative structures and only to the extent that is consistent with human needs and values of the present-day world. See also response number 1.

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Appendicies

Appendix A

Fire Management Response Strategy Classifications

Under Alternatives 1, 2, and 3, fire management will designate areas where a modified suppression response strategy will provide for fire protection or allow fire for resource benefit. Actions that allow fire for resource benefit will be covered by an agency fire plan that will include goals, objectives, and specific weather and fuel moisture prescriptions.

Fire Management Response Strategy Classifications

Designated Areas	Suppression Response Actions
Mission Mountains Tribal Wilderness	Allow prescribed natural fires. Utilize delayed response, confine or contain when appropriate and within a prescription. Full suppression dependent on fire season conditions.
Flathead River Islands	Allow prescribed natural fires. Utilize delayed response, confine or contain when appropriate and within a prescription. Full suppression dependent on fire season conditions.
Jocko Primitive Area	Allow delayed response, confine or contain when appropriate and within a prescription. Full suppression dependent on fire season conditions.
Roadless Areas	Allow delayed response, confine or contain when appropriate and within a prescription. Full suppression dependent on fire season conditions.
Lozeau Primitive Area	Allow post-season delayed response, confine or contain when appropriate and within a prescription. Full suppression dependent on fire season conditions.
Salish and Southwest Landscapes	Allow pre- and post-season delayed response, confine or contain when fire does not threaten non-tribal resources and is within a prescription. Full suppression dependent on fire season conditions.
Forest above 4,000'	Allow post-season delayed response, confine or contain when fire does not threaten non-tribal resources and is within a prescription. Full suppression dependent on fire season conditions.
Forest below 4,000'	Full suppression
Residential Intermix	Full suppression

Appendix B

The SARA Model and Prescriptions

Procedures for Development of the SARA Model

The SARA model is a set of computer programs developed by the University of California at Berkley. It is the primary model used by the ID Team to predict future forest structures based on different management scenarios. SARA stands for Spreadsheet Assisted Resource Analysis.

Yield Table development

A managed yield table approach was used as the basis for this Plan, as opposed to conventional yield tables such as empirical or normal yield tables.

Modeling

Tables were constructed using the Forest Vegetation Simulator (FVS). Twenty seven stand structural classes subdivided by 3 fire regimes were projected for 120 years under a no-treat, even-aged, uneven-aged, and prescribed underburn prescription. These 81 combinations were constructed from a sort of 754 Continuous Forest Inventory (CFI) plots on the Reservation. Plots common to a sort were projected individually, and then key attributes such as seral class, volumes and tree numbers were aggregated using a custom designed program.

Previous 10 year growth derived from the most recent CFI re-inventory provided local adjustments to growth parameters for existing stands. New stands, such as occurred after a regeneration harvest were projected using coefficients also derived from the CFI system, but using a different procedure described in an Agency paper titled "Deriving Managed Yield Tables" (Becker, 1993).

FVS projections included the Mistletoe and regeneration extensions, but could not model root rots and episodic events like bark beetles.

Prescriptions

The following prescriptions were applied:

Prescription	Fire Regimes Applied
Let existing stand grow, harvest at a later date when merchantable.	Mixed and Lethal
Let grow and begin uneven-aged management in the future when stand becomes merchantable.	Nonlethal and Mixed
No treatment	All fire regimes
Let grow until stand gets of merchantable size, then begin periodic underburn treatments.	All fire regimes
Do an even-aged treatment now (period 1).	Mixed and Lethal
Let stand grow, initiate even-aged treatment beginning next 10-year period.	Mixed and Lethal
Let stand grow, initiate even-aged treatment beginning after 20 years (period 3).	Mixed and Lethal

Prescriptions (cont.)

Prescription	Fire Regimes Applied
Let stand grow, initiate even-aged treatment beginning after 40 years (period 5).	Mixed and Lethal
Let stand grow, initiate even-aged treatment beginning after 70 years (period 8).	Mixed and Lethal
Even-age harvest now (period 1) to address forest health issues, then let stand grow to a point where uneven-aged harvests can begin.	Nonlethal and Mixed
Let stands grow to 10 years, then begin even-age harvests (period 2), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Let stand grow 20 years, then begin uneven-aged harvests (period 3), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Let stand grow 40 years, then begin uneven-aged harvests (period 5), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Let stand grow 70 years, then begin uneven-aged harvests (period 8), let each new stand grow until of a size such that uneven-age harvests can begin.	Nonlethal and Mixed
Individual tree selection	Nonlethal and Mixed
Underburn every 10 years	Nonlethal and Mixed
No treatment	All fire regimes

Even-aged clearcutting, generalized sequence:

Year	Event
0	Final or regeneration harvest, leaving 5-10 trees in each cutting unit for seed, aesthetics, etc.
1	Plant a mixture of species, and also allow natural seedlings to become established
15-25	Precommercial thinning, if trees get too thick
45-100	Commercial thinning (1-3), as needed to maintain a reasonably healthy stand.
120	Final harvest (again)

Since prescription A was applied to young stands, the treatments generally began with pre-commercial or commercial thinning and ended with a final harvest in 120 years. Mature stands received a final harvest immediately as the above table indicates (Rx = G, R, S, T, U).

Uneven-aged or selection

Periodic harvests were made on a 20 year average interval. Seventy-five to 175 trees per acre, from seedlings to large trees, were left after each harvest. Two to three very large trees per acre, up to 30 inches in diameter, were always left. After each harvest, natural regeneration was simulated to fill in voids in the stand.

Conversion to selection management

These prescriptions were designed to remedy serious forest health problems. An even-aged harvest is completed along with planting and thinning as indicated above. When the stand becomes merchantable, harvests were designed to develop an uneven-aged structure through individual tree selection.

No treatment

These stands receive no silvicultural treatments.

Underburn treatment

This treatment is designed to simulate the frequent natural fires that occurred in the lower elevation pine stands of the Reservation. Tree mortality rates based on species, size and slope are derived from fuels models used to predict fire behavior. One Underburn was simulated for each 10 year period.

Acreage compilations

Current conditions

Data developed from satellite imagery by the Wildlife Spatial Analysis Lab, dated August, 1990, and commonly called 'GAP' data provided the basis of spatial analysis. This data was in the form of a Geographical Information Systems (GIS) theme, and was developed for the purpose of creating a statewide vegetation classification.

GAP data was used in conjunction with local timber type maps to complete landscape acreage estimates for the four digit seral class calls. GAP data provided estimates of size and density, while type maps gave indication of species and structure.

This GAP data had several deficiencies: It could not distinguish some diameter class breaks, and did not recognize some seral classes. As a result, diameters were lumped between 10.1 and 20.0 inches, and small, dense stands were not recognized; their acreage were assumed distributed into adjacent seral stages, but their location could not be determined.

Overlays of GIS themes produced a file that assigned acres for any combination of the following: landscape (6), fire regime (4) (nonlethal, mixed, stand replacing or encroached), seral class (27), availability class (available, restricted, unavailable), and management strata (temporary even-aged, permanent even-aged, uneven-aged). Spreadsheet analysis was used to sum acres for the above combinations, and prepare constraint files for linear modeling. Actual prescriptions were assigned to the appropriate combinations of the above acreage.

Seral classes: Current conditions

All possible permutations of a four digit seral classes proved too many to effectively model. These were collapsed into fewer classes based on occurrence and similarities of probable effects, growth, and succession.

Pre-contact conditions

Pre-contact conditions were estimated by applying stand replacing (clear cut) or nonlethal fire regimes to existing representative CFI plots over a 100-200 year period so as to allow these stands to 'stabilize' as they moved away from the effects of the last 80 years of management. The 'mix' and range of seral structures was then observed and served to estimate pre-contact conditions and reference variability.

Fire regime treatments were applied using the Forest Vegetation Simulator.

Pre-contact distributions of structure became the basis for determining desired future goals, as modified by existing constraints.

Structural analysis of vegetation

Each structural or seral class has a good, indifferent or negative effect on such things as mistletoe levels, interior avian diversity or fire severity. Team members rated each seral class's effect for parameters within their area of expertise with a simple of rating of one to five. This allowed an objective analysis of the effects of a changing forest on the parameters of interest.

When seral classes proved to be too numerous to assess, they were lumped into clusters, with the same analysis done at the cluster level.

Seral classes were aggregated into clusters according to two rules: 1. For a given parameter, the aggregated classes had to have the same or similar ratings, and 2. All pertinent resource areas had to agree that the first requirement was met for them.

Seral classes were retained in the model as the basic ecological modeling unit, and must be retained for future modeling of successional pathways. Clusters were too broad to accomplish such tasks.

Desired future goals were defined as a target range of seral clusters for each fire regime. These ranges relied heavily upon estimates of pre-contact ranges, but were modified to accommodate current conditions and resource expectations.

Search for optimal solutions

The linear program C-WHIZ (Ketron management science, 1994) was the optimizer used. Key components of such a model are *objective functions*, *activities*, and *constraints*. Rationale and procedures can be found in Davis and Johnson, (1987).

Objective functions are mathematical statements of a goal. The goal for the Proposed plan was to meet target seral stage (cluster) acreages by the year 2069, and was to be achieved by minimizing deviation of acreages about the target. A target was established for each fire regime but applied across all six landscapes.

To accomplish the stated task, the model chose from available preconstructed yield tables to approximate the established target. Yield tables were available that reflected 3 fire regimes, 16 possible prescriptions, and 27 seral classes for each landscape. Six different time periods were reported. These combinations provided many potential pathways or strategies, and the model selected a combination of treatments through time to best meet the target.

Activities are things that can be done (prescriptions) to accomplish the goal.

Constraints are things that limit the achievement of the goal. Constraints in the model included such items as acreages of various seral classes, both initially and at later dates and limits on where certain prescriptions could be applied.

Two feasible solutions were run for comparison. The solution that serves as the basis of this Proposed Action sought to achieve the target seral cluster distribution as closely as possible, while the other sought to maximize board foot harvest over the 120 year time period.

The model results did not adjust for any adjacency constraints which may further reduce the harvest volumes indicated.

Appendix C

Seral Cluster Groups as a Percent of Fire Regimes

Alternative 1

	Young, open canopy, seral species (A1)			Mature & old, open cano climax species (A2)			Young, moderate canopy climax species (B)			Young, moderate canopy, seral species (C & D)			Mature, moderate & closed canopy, seral species (F & G)			Old, moderate & closed canopy, seral species (J & K)			Mature & old, moderate & closed canopy, climax species (E, H, I & L)			
	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	
	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	TOTAL
Nonlethal Fire Regime									Acres in Strata =		49,456		Acres +Wood/		80,072							
Current Condition	5%	15%	19.6%	20%	40%	12.9%	0%	10%	4.9%	0%	15%	10.9%	10%	30%	23.6%	25%	80%	1.4%	0%	20%	26.8%	100%
Short term	5%	15%	22.3%	20%	40%	16.7%	0%	10%	3.2%	0%	15%	9.0%	10%	30%	24.1%	25%	80%	1.1%	0%	20%	23.5%	100%
Long term	5%	15%	12.1%	20%	40%	14.0%	0%	10%	0.1%	0%	15%	13.3%	10%	30%	24.2%	25%	80%	17.6%	0%	20%	18.8%	100%
Mixed Fire Regime									Acres in Strata =		114,647											
				Total A			"	"		"	"		"	"		"	"		"	"		
Current Condition				15%	25%	18.1%	5%	15%	3.3%	13%	27%	15.7%	24%	60%	28.3%	10%	20%	1.9%	0%	20%	32.7%	100%
Short term				15%	25%	20.7%	5%	15%	4.5%	13%	27%	16.8%	24%	60%	21.6%	10%	20%	8.9%	0%	20%	27.6%	100%
Long term				15%	25%	9.2%	5%	15%	1.0%	13%	27%	23.1%	24%	60%	37.9%	10%	20%	14.2%	0%	20%	14.5%	100%
Lethal Fire Regime									Acres in Strata =		191,818											
Current Condition				10%	30%	12.1%	0%	5%	6.4%	20%	40%	22.9%	24%	60%	27.3%	15%	100%	1.8%	27%	100%	29.5%	100%
Short term				10%	30%	10.6%	0%	5%	4.0%	20%	40%	30.0%	24%	60%	27.3%	15%	100%	1.8%	27%	100%	26.3%	100%
Long term				10%	30%	4.5%	0%	5%	0.1%	20%	40%	28.0%	24%	60%	29.8%	15%	100%	11.9%	27%	100%	25.8%	100%
									Total Acres:		355,921		w/ Wood/Sod :		386,537							

NOTES:
(1.) Existing condition applies to the year 1989, the year of the most current inventory. **(2.)** Short term applies to the modeling periods 1999 through 2009. The percentage is an average for these periods. **(3.)** Long term applies to the modeling periods 2010 through 2089. The percentage is an average for these periods. **(4.)** DC is the Desired Condition. The range is combined for all multiple clusters. **(5.)** Percentages reported in the Nonlethal Fire Regime include woodland and sod restoration acres. **(6.)** Acres applied to the existing condition are different among alternatives. This is due to GIS sliver polygons and other overlay reductions. The acres applied to Alternative 3 are the most complete set.

ALTERNATIVE 2

	Young, open canopy, seral species (A1)			Mature & old, open cano climax species (A2)			Young, moderate canopy climax species (B)			Young, moderate canopy, seral species (C & D)			Mature, moderate & closed canopy, seral species (F & G)			Old, moderate & closed canopy, seral species (J & K)			Mature & old, moderate & closed canopy, climax species (E, H, I & L)			
	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	
	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	TOTAL
Nonlethal Fire Regime									Acres in Strata =		58,450		Acres +Wood/		80,510							
Current Condition	10%	30%	18.9%	10%	30%	12.1%	0%	10%	4.7%	1%	15%	10.4%	10%	30%	22.4%	15%	55%	1.7%	0%	20%	30.0%	100%
Short term	10%	30%	17.9%	10%	30%	13.5%	0%	10%	2.7%	1%	15%	9.4%	10%	30%	32.5%	15%	55%	1.1%	0%	20%	22.8%	100%
Long term	10%	30%	9.3%	10%	30%	12.2%	0%	10%	0.2%	1%	15%	12.8%	10%	30%	22.8%	15%	55%	16.8%	0%	20%	25.9%	100%
Mixed Fire Regime									Acres in Strata =		114,924											
				Total A																		
Current Condition				0%	25%	18.1%	5%	15%	3.3%	13%	27%	15.6%	25%	56%	28.4%	5%	20%	2.0%	0%	20%	32.7%	100%
Short term				0%	25%	19.5%	5%	15%	3.9%	13%	27%	22.8%	25%	56%	21.4%	5%	20%	9.3%	0%	20%	23.0%	100%
Long term				0%	25%	8.5%	5%	15%	0.7%	13%	27%	26.4%	25%	56%	39.8%	5%	20%	12.3%	0%	20%	12.3%	100%
Lethal Fire Regime									Acres in Strata =		193,000											
Current Condition				10%	20%	12.1%	0%	5%	6.4%	20%	40%	22.8%	35%	50%	27.3%	10%	25%	2.0%	10%	30%	29.5%	100%
Short term				10%	20%	12.4%	0%	5%	4.2%	20%	40%	29.7%	35%	50%	27.3%	10%	25%	1.9%	10%	30%	24.4%	100%
Long term				10%	20%	4.5%	0%	5%	0.1%	20%	40%	29.0%	35%	50%	31.9%	10%	25%	13.5%	10%	30%	20.9%	100%
									Total Acres:		366,374		w/ Wood/Sod :		388,434							

ALTERNATIVE 3

	Young, open canopy, seral species (A1)			Mature & old, open cano climax species (A2)			Young, moderate canopy climax species (B)			Young, moderate canopy, seral species (C & D)			Mature, moderate & closed canopy, seral species (F & G)			Old, moderate & closed canopy, seral species (J & K)			Mature & old, moderate & closed canopy, climax species (E, H, I & L)			
	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	DC RANGE		Estimated	
	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	lower	upper	% of Tot	TOTAL
Nonlethal Fire Regime									Acres in Strata =		80,544		Acres +Wood/		80,544							
Current Condition	20%	30%	19.1%	20%	30%	10.0%	0%	10%	4.6%	1%	15%	10.6%	24%	64%	23.9%	22%	34%	1.7%	0%	20%	30.2%	100%
Short term	20%	30%	15.6%	20%	30%	11.0%	0%	10%	3.7%	1%	15%	14.6%	24%	64%	28.4%	22%	34%	2.0%	0%	20%	24.5%	100%
Long term	20%	30%	0.4%	20%	30%	2.9%	0%	10%	0.0%	1%	15%	21.1%	24%	64%	34.3%	22%	34%	21.1%	0%	20%	20.2%	100%
Mixed Fire Regime									Acres in Strata =		114,976											
				Total A																		
Current Condition				20%	30%	18.1%	5%	15%	3.3%	13%	27%	15.6%	37%	79%	28.3%	5%	20%	2.0%	0%	20%	32.7%	100%
Short term				20%	30%	19.3%	5%	15%	4.4%	13%	27%	21.3%	37%	79%	23.5%	5%	20%	8.3%	0%	20%	23.2%	100%
Long term				20%	30%	7.0%	5%	15%	0.5%	13%	27%	23.6%	37%	79%	42.2%	5%	20%	11.8%	0%	20%	14.8%	100%
Lethal Fire Regime									Acres in Strata =		193,009											
Current Condition				10%	30%	12.1%	0%	5%	6.4%	15%	35%	22.8%	20%	45%	27.3%	5%	20%	2.0%	15%	40%	29.5%	100%
Short term				10%	30%	9.7%	0%	5%	3.9%	15%	35%	30.0%	20%	45%	25.7%	5%	20%	2.0%	15%	40%	28.8%	100%
Long term				10%	30%	6.6%	0%	5%	0.1%	15%	35%	29.0%	20%	45%	28.9%	5%	20%	10.3%	15%	40%	25.2%	100%
									Total Acres:		388,529		w/ Wood/Sod :		388,529							

ALTERNATIVE 4

	Young, open canopy, seral species (A1)		Mature & old, open cano climax species (A2)		Young, moderate canopy climax species (B)		Young, moderate canopy, seral species (C & D)		Mature, moderate & closed canopy, seral species (F & G)		Old, moderate & closed canopy, seral species (J & K)		Mature & old, moderate & closed canopy, climax species (E, H, I & L)		
	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	
	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	TOTAL
Nonlethal Fire Regime						Acres in Strata =	80,544		Acres +Wood/	80,544					
Current Condition		19.1%		10.0%		4.6%		10.6%		23.9%		1.7%		30.2%	100%
Short term	NOT APPLICA	16.3%	NOT APPLICA	10.8%	NOT APPLICA	4.5%	NOT APPLICABLE	12.1%	NOT APPLICA	30.8%	NOT APPLICABI	2.5%	NOT APPLICA	23.2%	100%
Long term		0.4%		3.5%		0.7%		14.3%		43.9%		11.4%		25.8%	100%
Mixed Fire Regime						Acres in Strata =	114,976								
			Total A		" "		" "		" "		" "		" "		
Current Condition				18.1%		3.3%		15.6%		28.3%		2.0%		32.7%	100%
Short term			NOT APPLICA	16.3%	NOT APPLICA	3.1%	NOT APPLICABLE	24.8%	NOT APPLICA	21.0%	NOT APPLICABI	7.7%	NOT APPLICA	27.1%	100%
Long term				2.4%		0.3%		22.9%		41.9%		8.3%		24.0%	100%
Lethal Fire Regime						Acres in Strata =	193,009								
Current Condition				12.1%		6.4%		22.8%		27.3%		2.0%		29.5%	100%
Short term			NOT APPLICA	10.1%	NOT APPLICA	3.8%	NOT APPLICABLE	30.3%	NOT APPLICA	26.0%	NOT APPLICABI	2.0%	NOT APPLICA	27.8%	100%
Long term				2.8%		0.1%		27.7%		30.9%		10.7%		27.9%	100%
						Total Acres:	388,529		w/ Wood/Sod :	388,529					

ALTERNATIVE 5

	Young, open canopy, seral species (A1)		Mature & old, open cano climax species (A2)		Young, moderate canopy climax species (B)		Young, moderate canopy, seral species (C & D)		Mature, moderate & closed canopy, seral species (F & G)		Old, moderate & closed canopy, seral species (J & K)		Mature & old, moderate & closed canopy, climax species (E, H, I & L)		
	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	DC RANGE	Estimated	
	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	lower upper	% of Tot	TOTAL
Nonlethal Fire Regime						Acres in Strata =	80,544		Acres +Wood/	80,544					
Current Condition		19.1%		10.0%		4.6%		10.6%		23.9%		1.7%		30.2%	100%
Short term	NOT APPLICA	15.0%	NOT APPLICA	5.1%	NOT APPLICA	3.5%	NOT APPLICABLE	15.2%	NOT APPLICA	28.6%	NOT APPLICABI	1.7%	NOT APPLICA	30.9%	100%
Long term		0.2%		0.6%		0.1%		17.0%		25.7%		22.3%		34.2%	100%
Mixed Fire Regime						Acres in Strata =	114,976								
			Total A		" "		" "		" "		" "		" "		
Current Condition				18.1%		3.3%		15.6%		28.3%		2.0%		32.7%	100%
Short term			NOT APPLICA	7.2%	NOT APPLICA	3.2%	NOT APPLICABLE	26.8%	NOT APPLICA	21.5%	NOT APPLICABI	8.5%	NOT APPLICA	32.8%	100%
Long term				0.6%		0.6%		20.1%		30.1%		14.1%		34.5%	100%
Lethal Fire Regime						Acres in Strata =	193,009								
Current Condition				12.1%		6.4%		22.8%		27.3%		2.0%		29.5%	100%
Short term			NOT APPLICA	7.2%	NOT APPLICA	3.5%	NOT APPLICABLE	30.7%	NOT APPLICA	27.3%	NOT APPLICABI	1.9%	NOT APPLICA	29.4%	100%
Long term				1.2%		0.1%		24.8%		25.4%		13.9%		34.6%	100%
						Total Acres:	388,529		w/ Wood/Sod :	388,529					

NOTES:
(1.) Existing condition applies to the year 1989, the year of the most current inventory. **(2.)** Short term applies to the modeling periods 1999 through 2009. The percentage is an average for these periods. **(3.)** Long term applies to the modeling periods 2010 through 2089. The percentage is an average for these periods. **(4.)** DC is the Desired Condition. The range is combined for all multiple clusters. **(5.)** Percentages reported in the Nonlethal Fire Regime include woodland and sod restoration acres. **(6.)** Acres applied to the existing condition are different among alternatives. This is due to GIS sliver polygons and other overlay reductions. The acres applied to Alternative 3 are the most complete set.

Appendix D
Prescription Acres

Prescription Acres Treated Each Decade in Each Fire Regime By Short- and Long-term Periods

		Acres Treated Each Decade - Short & Long Term									
		Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Fire Regime	Prescription	short term	long term	short term	long term	short term	long term	short term	long term	short term	long term
Nonlethal	1UEA	1,491	1,491	3,697	3,697	8,374	8,374	26,927	26,927	4,246	4,246
	UEA	3,970	3,970	11,564	11,564	3,321	3,321	18,326	18,326	369	369
	TEA	373	676	700	625	2,772	527	4,706	387	231	140
	Sod Rst'n	10,845	9,542	6,458	7,615	0	0	0	0	0	0
	Woodland Rst'n	10,955	8,881	10,305	5,395	0	0	0	0	0	0
	Parkland Rst'n	4,271	2,237	4,472	2,190	0	0	0	0	0	0
Harvest Subtotal:		31,906	26,797	37,196	31,085	14,467	12,222	49,959	45,640	4,847	4,756
	1UB	4,397	4,397	3,534	3,534	4,173	4,173	25	25	304	304
	UB	11,499	11,499	8,048	8,048	1,845	1,845	16	16	19	19
Treatment Subtotal:		47,802	42,693	48,778	42,667	20,486	18,241	50,000	45,681	5,170	5,079
	1NT	13,923	13,923	14,249	14,249	25,028	25,028	10,623	10,623	33,024	33,024
	NT	6,978	6,978	9,637	9,637	24,741	24,741	7,024	7,024	40,627	40,627
Mixed	1UEA	5,307	5,307	5,397	5,397	6,590	6,590	11,154	11,154	2,955	2,955
	UEA	1,831	1,831	3,700	3,700	8,052	8,052	21,289	21,289	3,736	3,736
	TEA	1,963	574	1,458	1,221	2,024	976	4,356	315	203	22
	1PEA	5,249	5,249	6,005	6,005	5,002	5,002	777	777	91	91
	PEA	4,715	1,284	5,552	1,144	5,167	433	2,208	381	1,637	55
Harvest subtotal:		19,065	14,245	22,113	17,468	26,835	21,053	39,784	33,916	8,621	6,858
	1UB	14,891	14,891	5,836	5,836	5,553	5,553	36	36	425	425
	UB	10,243	10,243	3,466	3,466	5,372	5,372	45	45	16	16
Treatment Subtotal:		44,199	39,379	31,416	26,770	37,760	31,978	39,865	33,997	9,061	7,299
	1NT	13,872	13,872	22,078	22,078	22,201	22,201	27,378	27,378	35,875	35,875
	NT	26,500	26,500	26,122	26,122	27,949	27,949	28,340	28,340	65,665	65,665
Lethal	1UEA	3,414	3,414	2,257	2,257	2,465	2,465	6,780	6,780	0	0
	UEA	194	194	1,778	1,778	4,010	4,010	10,235	10,235	19	19
	1PEA	7,684	7,684	8,584	8,584	4,872	4,872	2,223	2,223	0	0
	PEA	4,000	1,501	5,945	1,114	4,498	2,743	2,407	1,466	607	54
Harvest subtotals:		15,293	12,794	18,564	13,733	15,846	14,090	21,646	20,705	626	72
	1NT	57,382	57,382	57,616	57,616	61,147	61,147	59,481	59,481	68,485	68,485
	NT	97,634	97,634	94,903	94,903	82,335	82,335	93,872	93,872	122,203	122,203
Total Harvest Acres:		66,264	53,836	77,874	62,286	57,148	47,365	111,388	100,260	14,093	11,687
Tortal Treatment Acres:		107,294	94,866	98,758	83,170	74,091	64,309	111,510	100,382	14,857	12,450
Total Even-aged Acres:		23,984	16,968	28,245	18,694	24,336	14,553	16,678	5,550	2,768	362

Notes: Abbreviations are: NT = No Treatment; UEA = Uneven-aged; TEA = Temporary Even-aged; PEA = Permanent Even-aged; UB = Under Burn. **(1.)** Zone 1 prescriptions are selected in period 1. All acres are treated as a single stand. **(2.)** Underburns acres are also selected in period one. Underburns occur when appropriate fuel loadings build up in time. **(3.)** The UEA prescription includes acres selected for treatment on a 10-year basis. Treatments do not occur each 10-year period. Treatments are more likely to once every 20 years. **(4.)** TEA and PEA are timing prescriptions. They occur on the acres identified during the period identified. **(5.)** Wood and Sod Rstr. refer to woodland and sod restoration treatment acres. **(6.)** "Total Even-aged Acres" are the total of all TEA, 1PEA & PEA acres in all fire regimes. **(7.)** "Total Treatment Acres" are the total of each "Treatment Subtotal" and the "Harvest Subtotal" in the Lethal Fire Regime.

Appendix E

Threatened, Endangered, and Sensitive Species

Wildlife Species with Protective Status and Species of Special Concern on the Flathead Indian Reservation.

SPECIES	USFWS (ESA)[1]	USFS[2]	MNHP[3]
COEUR D' ALENE SALAMANDER		SENSITIVE	G3/S2
TAILED FROG			G3/S3
COMMON LOON		SENSITIVE	G5/S3
AMERICAN WHITE PELICAN			G3/S2
BLACK-CROWNED NIGHT-HERON			G5/S3
WHITE-FACED IBIS	C2		G5/S2
TRUMPETER SWAN	C2	SENSITIVE	G4/S1
HARLEQUIN DUCK	C2	SENSITIVE	G5/S2
BALD EAGLE	LT	THREATENED	G3/S3
NORTHERN GOSHAWK	C2		G4/S4
FERRUGINOUS HAWK	C2	SENSITIVE	G4/S3
PEREGRINE FALCON	LE	ENDANGERED	G3/S1
COLUMBIAN SHARP-TAILED GROUSE	C2	SENSITIVE	G4/S1
BLACK-NECKED STILT			G5/S3
FRANKLIN' S GULL			G5/S3
CASPIAN TERN			G5/S3
COMMON TERN			G5/S3
FORSTER' S TERN			G5/S3
BLACK TERN	C2		G4/S3
YELLOW-BILLED CUCKOO			G5/S3
FLAMMULATED OWL		SENSITIVE	G4/S1
BURROWING OWL			G4/S3
GREAT GRAY OWL			G5/S3
BOREAL OWL		SENSITIVE	G5/S3
BLACK SWIFT			G4/S3
BLACK-BACKED WOODPECKER		SENSITIVE	G5/S3
LOGGERHEAD SHRIKE	C2		G4/S4
BAIRD' S SPARROW	C2		G3/S3

SPECIES	USFWS (ESA)[1]	USFS[2]	MNHP[3]
LE CONTE' S SPARROW			G4/S1
TOWNSEND' S BIG-EARED BAT		SENSITIVE	G4/S2
NORTHERN BOG LEMMING		SENSITIVE	G5/S2
GRAY WOLF	LE	ENDANGERED	G4/S1
GRIZZLY BEAR	LT	THREATENED	G4/S1
FISHER		SENSITIVE	G5/S2
WOLVERINE	C2	SENSITIVE	G4/S3
LYNX	C2	SENSITIVE	G5/S3
WOODLAND CARIBOU	C2	ENDANGERED	G5/SX

[1] U.S. Fish and Wildlife Service, Endangered Species Act classification: LE=endangered, LT=threatened, C1=Taxa for which the Service has on file sufficient information on biological vulnerability and threats to support proposals to list as threatened or endangered, C2=Taxa for which the Service has information indicating that proposing to list is possibly appropriate but for which conclusive data on biological vulnerability and threat currently are not available to support a proposal to list.
[2] List of threatened, endangered, and sensitive species for Northern Region (U.S. Forest Service manual 2670.22).
[3] Montana Natural Heritage Program: G=Range-wide, S=Montana, 1=Critically imperiled, 2=Imperiled, 3=Very rare and local or vulnerable to extinction, 4=Apparently secure, though rare in some parts of range, 5=Demonstrably secure, though possibly rare in some parts of range, X=Believed to be extinct.

Appendix F

Wildlife Fragmentation and Diversity

Descriptive Statistics for Forest Management-related Fragmentation

	N. Missions	Missions	Jocko	Southwest	West	Salish
Patch Size						
Mean Patch Perimeter (ft)	5472 (3982)	4242 (2349)	3464 (4163)	3966 (3077)	3579 (2457)	5190 (3874)
Mean Patch Area (ac)	35	17.4	17.4	16.4	17.1	29.9
Patch Shape						
Perimeter/Area Ratio	0.024 (0.017)	0.039 (0.055)	0.03 (0.052)	0.04 (0.059)	0.03 (0.014)	0.02 (0.008)
Diversity Index	1.45 (0.268)	1.51 (0.286)	1.35 (0.249)	1.55 (0.395)	1.31 (0.228)	1.37 (0.218)
Patch Abundance						
Percent of Landscape in Patches	16.7	0.82	12	3	10	4
Patch Density (per 100 ac.)	1.3	0.11	7.9	0.6	4.5	0.8
Patch Spacing						
Nearest-neighbor Distance	5039 (2298)	7346 (5859)	3392 (1943)	4797 (6611)	4150 (2753)	10328 (31860)
Patch Dispersion [1]	1.38	0.206	1.308	0.506	1.411	0.866

[1] <1=aggregation of patches; >1=uniform dispersion of patches

Appendix G
Grizzly Bear Management Situations

A. Management Situation 1

1. Population and habitat conditions. The area contains grizzly population centers (areas key to the survival of grizzly where seasonal or year-long grizzly activity, under natural, free-ranging conditions is common) and habitat components needed for the survival and recovery of the species or a segment of its population. The probability is very great that major activities or programs may affect (have direct or indirect relationships to the conservation and recovery of) the grizzly.

2. Management direction. Grizzly habitat maintenance and improvement and grizzly-human conflict minimization will receive the highest management priority. Management decisions will favor the needs of the grizzly bear when grizzly habitat and other land use values compete. Land uses which can affect grizzlies and/or their habitat will be made compatible with grizzly needs or such uses will be disallowed or eliminated. Grizzly-human conflicts will be resolved in favor of grizzlies unless the bear involved is determined to be a nuisance by tribal management criteria. Nuisance bears may be controlled through either relocation or removal but only if such control would result in a more natural free-ranging grizzly population and all reasonable measures have been taken to protect the bear and/or its habitat (including area closures and/or activity curtailments).

B. Management Situation 2

1. Population and habitat conditions. Current information indicates that the area lacks distinct population centers; highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present. Habitat resources in Management Situation 2 either are unnecessary for survival and recovery of the species, or the need has not yet been determined but habitat resources may be necessary. Certain management actions are necessary. The status of such areas is subject to review and change according to demonstrated grizzly population and habitat needs. Major activities may affect the conservation of the grizzly bear primarily in that they may contribute toward (a) human-caused bear mortalities or (b) long-term displacement where the zone of influence could affect habitat use in Management Situation 1.

2. Management direction. The grizzly bear is an important, but not the primary, use of the area. In some cases, habitat maintenance and improvement may be important management considerations. Minimization of grizzly-human conflict potential that could lead to human-caused mortalities is a high management priority. In this management situation, managers would accommodate demonstrated grizzly populations and/or grizzly habitat use in other land use activities if feasible, but not to the extent of exclusion of other uses. A feasible accommodation is one which is compatible with (does not make unobtainable) the major goals and/or objectives of other uses. Management will at least maintain those habitat conditions which resulted in the area being stratified Management Situation 2. When grizzly population

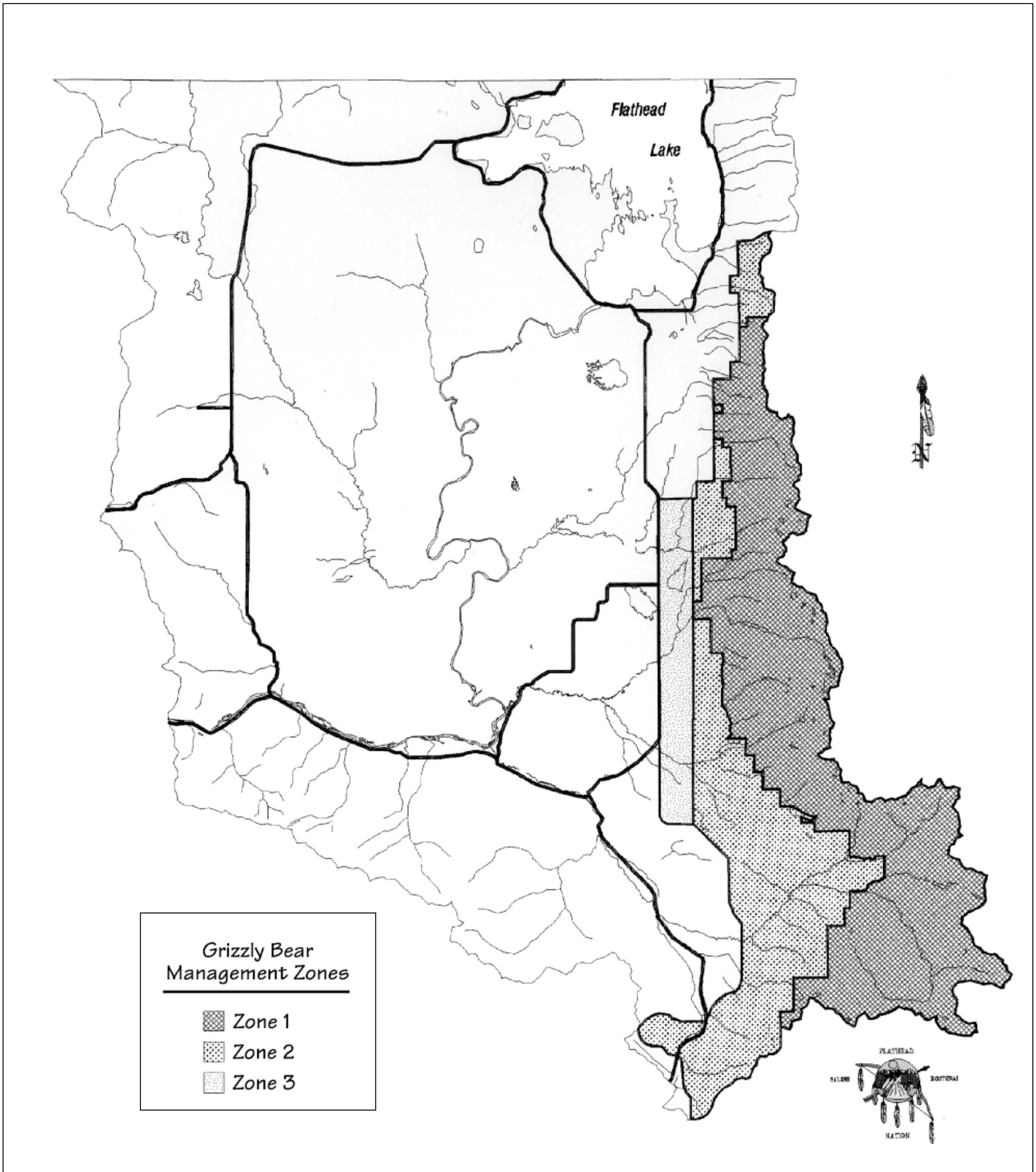
and/or grizzly habitat use and other land use needs are mutually exclusive, and other land use needs may prevail in management consideration. If grizzly population and/or habitat use represents demonstrated needs that are so great (necessary to the normal needs or survival of the species or a segment of its population) that they should prevail in management considerations, then the area should be reclassified under Management Situation 1. Managers would control nuisance grizzlies.

C. Management Situation 3

1. Population and habitat conditions. Grizzly presence is possible but infrequent. Developments, such as residences, subdivisions, campgrounds, or other high human use associated facilities, and human presence result in conditions which make grizzly presence untenable for humans and/or grizzlies. There is a moderate probability that major activities or programs may affect the species' conservation and recovery.

2. Management direction. Grizzly habitat maintenance and improvement are not management considerations. Grizzly-human conflict minimization is a high priority management consideration. Grizzly bear presence and factors contributing to their presence will be actively discouraged. For example, boneyards and unpicked fruit trees should be removed to prevent attracting bears to this area. Any grizzly involved in a grizzly-human conflict will be controlled. Any grizzly frequenting the area can be controlled by Tribal guidelines.

Appendix G


Flathead
Lake
Grizzly Bear
Management Zones
Zone 1
Zone 2
Zone 3
FLATHEAD
SALISH
KOOTENAI
NATION

Appendix H
Wildlife Species and Associated Vegetation

Table 1. Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
REPTILES & AMPHIBIANS							
LONG-TOED SALAMANDER	*	*	*	*	*	*	*
COEUR D' ALENE SALAMANDER	*			*	*		
TAILED FROG	*			*	*		
WESTERN TOAD	*	*	*	*	*	*	
PACIFIC CHORUS FROG	*	*	*	*	*	*	
BULLFROG				*	*		
LEOPARD FROG				*	*		
SPOTTED FROG				*	*		
W. PAINTED TURTLE				*	*		
N. ALLIGATOR LIZARD	*	*	*		*		
WESTERN SKINK	*	*	*	*	*	*	
RUBBER BOA	*	*	*	*	*	*	
RACER		*	*		*	*	
BULL SNAKE		*	*	*		*	
W. TERRESTRIAL GARTER SNAKE	*	*	*	*	*	*	
COMMON GARTER SNAKE	*	*	*	*	*	*	
WESTERN RATTLESNAKE	*	*	*		*	*	
BIRDS							
COMMON LOON				*	*		
PIED-BILLED GREBE					*		
HORNED GREBE					*		
RED-NECKED GREBE					*		
EARED GREBE					*		
WESTERN GREBE					*		

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
WHITE PELICAN				*	*		
DOUBLE-CRESTED CORMORANT					*		
AMERICAN BITTERN					*		
GREAT BLUE HERON				*	*		
BLACK-CROWNED NIGHT HERON					*		
WHITE-FACED IBIS					*		
TUNDRA SWAN				*	*		
TRUMPETER SWAN					*		
GREATER WHITE-FRONTED GOOSE				*	*		
SNOW GOOSE					*		
ROSS= GOOSE					*		
CANADA GOOSE				*	*		
WOOD DUCK	*	*		*	*		
GREEN-WINGED TEAL				*	*		
MALLARD				*	*		
NORTHERN PINTAIL				*	*		
BLUE-WINGED TEAL				*	*		
CINNAMON TEAL				*	*		
NORTHERN SHOVELER				*	*		
GADWALL				*	*		
EURASIAN WIGEON					*		
AMERICAN WIGEON				*	*		
CANVASBACK				*	*		
REDHEAD				*	*		
RING-NECKED DUCK				*	*		
LESSER SCAUP				*	*		
HARLEQUIN DUCK				*			
COMMON GOLDENEYE	*	*		*	*		
BARROW'S GOLDENEYE	*			*	*		
BUFFLEHEAD		*		*	*		
HOODED MERGANSER	*			*	*		
COMMON MERGANSER	*			*	*		

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
RED-BREASTED MERGANSER	*			*	*		
RUDDY DUCK				*	*		
TURKEY VULTURE	*	*	*		*	*	
OSPREY				*	*		
BALD EAGLE				*	*		
NORTHERN HARRIER					*	*	
SHARP-SHINNED HAWK	*	*				*	
COOPER=S HAWK	*	*		*	*	*	
NORTHERN GOSHAWK	*						
SWAINSON'S HAWK		*				*	
RED-TAILED HAWK	*	*	*	*	*	*	
FERRUGINOUS HAWK					*	*	
ROUGH-LEGGED HAWK					*	*	*
GOLDEN EAGLE		*	*		*	*	*
AMERICAN KESTREL		*			*	*	
MERLIN		*			*	*	
PEREGRINE FALCON			*	*	*		*
GYRFALCON		*			*		*
PRAIRIE FALCON						*	
GRAY PARTRIDGE					*	*	
CHUKAR			*			*	
RING-NECKED PHEASANT			*	*	*	*	
SPRUCE GROUSE	*						
BLUE GROUSE	*	*	*				
WHITE-TAILED PTARMIGAN							*
RUFFED GROUSE	*		*	*			
COL. SHARP-TAILED GROUSE		*	*	*		*	
WILD TURKEY	*	*	*	*			
VIRGINIA RAIL					*		
YELLOW RAIL					*		

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
SORA					*		
AMERICAN COOT				*	*		
SANDHILL CRANE				*	*	*	
BLACK-BELLIED PLOVER					*	*	*
AMERICAN GOLDEN PLOVER					*	*	*
SEMIPALMATED PLOVER					*	*	*
KILLDEER					*	*	
BLACK-NECKED STILT				*	*	*	
AMERICAN AVOCET				*	*		
GREATER YELLOWLEGS				*	*		*
LESSER YELLOWLEGS					*	*	*
SOLITARY SANDPIPER				*	*	*	
WILLET					*	*	
SPOTTED SANDPIPER				*	*		
UPLAND SANDPIPER							*
LONG-BILLED CURLEW					*	*	
MARBLED GODWIT					*	*	
RUDDY TURNSTONE					*		*
SANDERLING					*		*
SEMIPALMATED SANDPIPER					*	*	*
WESTERN SANDPIPER					*		*
LEAST SANDPIPER					*	*	*
BAIRD=S SANDPIPER					*	*	*
PECTORAL SANDPIPER					*	*	*
STILT SANDPIPER					*		*
BUFF-BREASTED SANDPIPER					*	*	*
SHORT-BILLED DOWITCHER					*	*	
LONG-BILLED DOWITCHER					*	*	
COMMON SNIPE					*	*	
WILSON=S PHALAROPE					*	*	
RED-NECKED PHALAROPE					*		*
FRANKLIN' S GULL				*	*		
BONAPARTE' S GULL				*	*		

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
RING-BILLED GULL				*	*		
CALIFORNIA GULL				*	*		
HERRING GULL				*	*		
THAYER'S GULL				*	*		
GLAUCOUS GULL				*	*		
GLAUCOUS-WINGED GULL				*	*		
BLACK-LEGGED KITTIWAKE					*		
SABINE'S GULL				*	*		
CASPIAN TERN				*	*		
COMMON TERN				*	*		
FORSTER'S TERN				*	*		
BLACK TERN				*	*	*	
ROCK DOVE				*			
BAND-TAILED PIGEON		*			*	*	
MOURNING DOVE	*	*		*	*		
BLACK-BILLED CUCKOO	*	*	*	*	*		
YELLOW-BILLED CUCKOO	*	*	*	*	*		
BARN OWL		*			*	*	
FLAMMULATED OWL	*						
W. SCREECH-OWL	*	*		*	*		
GREAT HORNED OWL	*	*	*	*	*		
SNOWY OWL					*	*	*
N. HAWK-OWL		*	*		*		
N. PYGMY-OWL	*						
BURROWING OWL						*	
BARRED OWL	*			*			
GREAT GRAY OWL	*	*					
LONG-EARED OWL		*	*	*	*		
SHORT-EARED OWL		*			*	*	*
BOREAL OWL	*						

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
NORTHERN SAW-WHET OWL	*			*			
COMMON NIGHTHAWK		*			*	*	
COMMON POORWILL		*					
BLACK SWIFT				*			
VAUX' S SWIFT	*				*		
WHITE-THROATED SWIFT							
BLACK-CHINNED HUMMINGBIRD		*	*	*	*		
CALLIOPE HUMMINGBIRD		*	*	*	*		
RUFOUS HUMMINGBIRD	*	*	*	*	*		
BELTED KINGFISHER				*			
LEWIS' WOODPECKER		*		*			
RED-HEADED WOODPECKER		*			*		
RED-NAPED SAPSUCKER	*	*			*		
WILLIAMSON' S SAPSUCKER	*	*			*		
DOWNY WOODPECKER	*	*		*	*		
HAIRY WOODPECKER	*	*		*	*		
THREE-TOED WOODPECKER	*						
BLACK-BACKED WOODPECKER	*						
NORTHERN FLICKER	*	*		*	*		
PILEATED WOODPECKER	*			*			
OLIVE-SIDED FLYCATCHER	*	*			*		
WESTERN WOOD-PEWEE	*	*			*		
WILLOW FLYCATCHER			*	*	*		
LEAST FLYCATCHER			*	*	*		
HAMMOND' S FLYCATCHER	*	*					
DUSKY FLYCATCHER	*	*					
CORDILLERAN FLYCATCHER	*	*					
SAY' S PHOEBE						*	
WESTERN KINGBIRD		*			*	*	

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
EASTERN KINGBIRD		*		*	*	*	
HORNED LARK						*	*
TREE SWALLOW		*			*		
VIOLET-GREEN SWALLOW	*	*			*		
ROUGH-WINGED SWALLOW					*	*	
BANK SWALLOW					*	*	
CLIFF SWALLOW				*	*	*	
BARN SWALLOW				*	*	*	
GRAY JAY	*						
STELLER'S JAY	*			*			
CLARK'S NUTCRACKER	*	*					
BLACK-BILLED MAGPIE		*	*	*	*	*	
COMMON CROW		*	*	*	*	*	
COMMON RAVEN	*	*	*	*	*	*	*
BLACK-CAPPED CHICKADEE	*	*		*	*		
MOUNTAIN CHICKADEE	*	*		*			
BOREAL CHICKADEE	*				*		
CHESTNUT-BACKED CHICKADEE	*	*		*	*		
RED-BREASTED NUTHATCH	*	*					
WHITE-BREASTED NUTHATCH	*	*		*	*		
PYGMY NUTHATCH	*	*					
BROWN CREEPER	*	*		*			
ROCK WREN			*				
CANYON WREN							
HOUSE WREN		*	*	*	*		
WINTER WREN	*			*			
MARSH WREN					*		
DIPPER				*			
GOLDEN-CROWNED KINGLET	*	*					
RUBY-CROWNED KINGLET	*	*					
WESTERN BLUEBIRD		*				*	
MOUNTAIN BLUEBIRD		*	*			*	
TOWNSEND'S SOLITAIRE	*	*	*	*			

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
VEERY	*	*	*	*	*		
SWAINSON'S THRUSH	*	*	*	*	*		
HERMIT THRUSH	*	*	*	*	*		
AMERICAN ROBIN	*	*	*	*	*		
VARIED THRUSH	*	*	*	*	*		
GRAY CATBIRD			*	*	*		
SAGE THRASHER			*				
BROWN THRASHER		*	*	*	*		
WATER PIPIT					*	*	*
SPRAGUE'S PIPIT						*	
BOHEMIAN WAXWING	*	*	*	*	*		
CEDAR WAXWING	*	*	*	*	*		
NORTHERN SHRIKE			*		*	*	
LOGGERHEAD SHRIKE			*			*	
EUROPEAN STARLING		*	*	*	*	*	
CASSIN'S VIREO	*	*	*	*	*		
WARBLING VIREO	*	*			*		
RED-EYED VIREO	*		*	*	*		
TENNESSEE WARBLER		*			*		
ORANGE-CROWNED WARBLER	*	*	*	*	*		
NASHVILLE WARBLER		*	*	*	*		
YELLOW WARBLER			*	*	*		
AUDUBON'S WARBLER	*	*	*	*	*		
TOWNSEND'S WARBLER	*	*	*	*			
AMERICAN REDSTART	*	*	*	*	*		
NORTHERN WATERTHRUSH	*	*	*	*	*		
MACGILLIVRAY'S WARBLER	*	*	*	*	*		
COMMON YELLOWTHROAT			*	*	*		
WILSON'S WARBLER	*	*	*	*	*		
YELOW-BREASTED CHAT		*	*	*	*		

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
WESTERN TANAGER	*	*	*				
BLACK-HEADED GROSBEAK	*	*	*	*	*		
LAZULI BUNTING		*	*	*	*		
SPOTTED TOWHEE		*	*	*	*		
TREE SPARROW			*		*	*	
CHIPPING SPARROW		*			*	*	
CLAY-COLORED SPARROW		*	*		*	*	
BREWER'S SPARROW			*			*	
VESPER SPARROW						*	
LARK SPARROW		*				*	
LARK BUNTING			*			*	
SAVANNAH SPARROW						*	
GRASSHOPPER SPARROW						*	
FOX SPARROW		*	*	*	*		
SONG SPARROW			*	*	*		
LINCOLN'S SPARROW		*	*	*	*		
WHITE-THROATED SPARROW	*	*	*	*	*		
WHITE-CROWNED SPARROW		*	*	*	*		
OREGON JUNCO	*	*	*	*	*		
LAPLAND LONGSPUR						*	*
SNOW BUNTING					*	*	*
BOBOLINK					*	*	
RED-WINGED BLACKBIRD				*	*		
WESTERN MEADOWLARK						*	
YELLOW-HEADED BLACKBIRD					*		
RUSTY BLACKBIRD		*	*	*	*	*	
BREWER'S BLACKBIRD		*	*	*	*	*	
COMMON GRACKLE		*			*	*	
BROWN-HEADED COWBIRD	*	*	*	*	*	*	

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
BULLOCK'S ORIOLE		*	*	*	*		
BLACK ROSY FINCH			*			*	*
GRAY-CROWNED ROSY FINCH							*
CASSIN'S FINCH	*	*	*	*			
HOUSE FINCH		*	*	*		*	
RED CROSSBILL	*	*					
WHITE-WINGED CROSSBILL	*	*					
COMMON REDPOLL	*	*	*		*		*
HOARY REDPOLL		*			*	*	*
PINE SISKIN	*	*					
AMERICAN GOLDFINCH		*	*	*	*	*	
EVENING GROSBEAK	*	*					
HOUSE SPARROW							
MAMMALS							
MASKED SHREW	*	*	*	*	*	*	
VAGRANT SHREW	*	*	*	*	*	*	
WATER SHREW				*	*		
PYGMY SHREW	*		*	*	*	*	
LITTLE BROWN MYOTIS	*	*	*	*	*	*	
YUMA MYOTIS	*	*	*	*	*	*	
LONG-EARED MYOTIS	*	*	*		*	*	
LONG-LEGGED MYOTIS	*	*			*	*	
CALIFORNIA MYOTIS	*	*	*		*	*	
SILVER-HAIRED BAT	*			*	*		
BIG BROWN BAT	*	*	*			*	
HOARY BAT	*	*					
TOWNSEND'S BIG-EARED BAT	*	*					
PIKA							*
MOUNTAIN COTTONTAIL		*	*	*	*		
SNOWSHOE HARE	*		*	*			
WHITE-TAILED JACKRABBIT						*	
LEAST CHIPMUNK	*	*	*	*	*		*
YELLOW-PINE CHIPMUNK		*	*				

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
RED-TAILED CHIPMUNK	*						
YELLOW-BELLIED MARMOT						*	*
HOARY MARMOT							*
COLUMBIAN GROUND SQUIRREL		*	*		*	*	*
GOLDEN-MANTLED GROUND SQUIRREL		*	*				*
RED SQUIRREL	*						
NORTHERN FLYING SQUIRREL	*						
NORTHERN POCKET GOPHER		*	*		*	*	*
BEAVER				*	*		
DEER MOUSE	*	*	*	*	*	*	*
NORTHERN GRASSHOPPER MOUSE			*			*	
BUSHY-TAILED WOODRAT	*	*	*	*			*
SOUTHERN RED-BACKED VOLE	*		*		*		
HEATHER VOLE	*	*	*	*		*	*
MEADOW VOLE	*	*	*	*	*	*	
MONTANE VOLE					*	*	*
LONG-TAILED VOLE	*	*	*	*	*	*	*
WATER VOLE					*	*	*
MUSKRAT				*	*		
NORTHERN BOG LEMMING	*				*	*	
NORWAY RAT		*				*	
HOUSE MOUSE		*				*	
WESTERN JUMPING MOUSE					*	*	
PORCUPINE	*	*	*	*	*		
COYOTE	*	*	*	*	*	*	
GRAY WOLF	*	*	*	*	*	*	*
RED FOX	*	*	*	*	*	*	*
BLACK BEAR	*	*	*	*	*		
GRIZZLY BEAR	*	*	*	*	*	*	*
RACCOON	*	*	*	*	*		

Table 1 (cont.). Wildlife Species and Associated General Habitats of the Flathead Reservation

COMMON NAME	FOREST	WOODLAND	SHRUB	RIPARIAN	WETLAND	GRASSLAND	ALPINE
MARTEN	*				*		
FISHER	*				*		
SHORT-TAILED WEASEL	*	*	*	*	*		*
LONG-TAILED WEASEL	*	*	*	*	*	*	
MINK				*	*		
WOLVERINE	*	*	*				*
BADGER						*	
STRIPED SKUNK		*		*	*	*	
RIVER OTTER				*			
MOUNTAIN LION	*	*			*		
LYNX	*				*		
BOBCAT	*	*	*	*	*	*	
ELK	*	*	*	*		*	
MULE DEER	*	*	*			*	
WHITE-TAILED DEER	*	*	*	*	*	*	
MOOSE	*		*	*	*		
PRONGHORN			*			*	
BISON		*				*	
MOUNTAIN GOAT	*						*
BIGHORN SHEEP		*				*	*

Table 2. Forest Wildlife Species and Associated Cover Types

COMMON NAME	Ponderosa Pine	Douglas-fir	Grand Fir	Lodgepole Pine	Spruce-Fir	Cedar Hemlock	Mixed Conifer	Hardwood
Reptiles & amphibians								
Long-toed salamander	*	*	*	*	*	*	*	*
Coeur d' alene salamander		*	*	*	*	*	*	
Tailed frog		*	*	*	*	*	*	*
Western toad	*	*	*	*	*	*	*	*
Pacific chorus frog	*	*					*	*
N. Alligator lizard	*	*	*	*	*	*	*	*
Western skink	*	*						
Rubber boa	*	*	*	*	*	*	*	*
W. Terrestrial garter snake	*	*	*	*	*	*	*	*
Common garter snake	*	*	*	*	*	*	*	*
Bull snake	*							
Western rattlesnake	*							
Birds								
Wood duck	*	*					*	*
Common goldeneye	*	*	*	*	*	*	*	*
Barrow' s goldeneye	*	*	*	*	*	*	*	*
Bufflehead	*	*					*	*
Hooded merganser	*	*					*	*
Common merganser	*	*					*	*
Red-breasted merganser	*	*					*	*
Turkey vulture	*	*						*
Sharp-shinned hawk		*	*	*	*		*	*
Cooper' s hawk	*	*	*	*	*	*	*	*
Northern goshawk		*	*	*	*	*	*	*
Red-tailed hawk	*	*					*	*
Spruce grouse				*	*			
Blue grouse	*	*	*	*	*	*	*	*
Ruffed grouse		*	*		*		*	*
Col. Sharp-tailed grouse	*							*

Table 2 (cont.). Forest Wildlife Species and Associated Cover Types

COMMON NAME	Ponderosa Pine	Douglas-fir	Grand Fir	Lodgepole Pine	Spruce-Fir	Cedar Hemlock	Mixed Conifer	Hardwood
Wild turkey	*	*					*	*
Mourning dove	*							*
Black-billed cuckoo								*
Yellow-billed cuckoo								*
Flammulated owl	*	*					*	
W. Screech-owl	*							*
Great horned owl	*	*	*	*	*	*	*	*
N. Pygmy-owl	*	*	*	*	*	*	*	*
Barred owl		*	*		*	*	*	*
Great gray owl		*	*	*	*	*	*	
Long-eared owl	*	*						*
Boreal owl			*	*	*		*	
Northern saw-whet owl		*	*		*	*	*	*
Common nighthawk	*	*						
Common poorwill	*							
Vaux's swift	*	*					*	*
Black-chinned hummingbird	*							*
Calliope hummingbird								*
Rufous hummingbird	*	*	*	*	*	*	*	*
Lewis' woodpecker	*							*
Red-headed woodpecker	*							
Red-naped sapsucker								*
Williamson's sapsucker	*	*			*		*	*
Downy woodpecker	*	*					*	*
Hairy woodpecker	*	*	*	*	*	*	*	*
Three-toed woodpecker				*	*	*	*	
Black-backed woodpecker	*	*	*	*	*	*	*	*
Northern flicker	*	*					*	*
Pileated woodpecker	*	*	*	*	*	*	*	*
Olive-sided flycatcher		*	*	*	*		*	

Table 2 (cont.). Forest Wildlife Species and Associated Cover Types

COMMON NAME	Ponderosa Pine	Douglas-fir	Grand Fir	Lodgepole Pine	Spruce-Fir	Cedar Hemlock	Mixed Conifer	Hardwood
Western wood-pewee	*	*		*				
Hammond's flycatcher	*	*				*	*	
Dusky flycatcher	*	*					*	
Cordilleran flycatcher	*	*	*	*	*		*	*
Eastern kingbird								*
Tree swallow								*
Violet-green swallow	*	*					*	*
Gray jay		*	*	*	*		*	
Steller's jay					*			
Clark's nutcracker	*	*		*	*			
Black-billed magpie								*
Common crow	*	*						*
Common raven	*	*		*			*	
Black-capped chickadee							*	*
Mountain chickadee	*	*	*	*	*	*	*	*
Boreal chickadee					*			
Chestnut-backed chickadee						*	*	
Red-breasted nuthatch	*	*	*	*	*	*	*	*
White-breasted nuthatch	*					*		*
Pygmy nuthatch	*							
Brown creeper				*		*		
House wren								*
Winter wren					*	*		
Golden-crowned kinglet		*	*	*	*	*	*	*
Ruby-crowned kinglet	*	*	*	*	*		*	*
Western bluebird	*							
Mountain bluebird	*							
Townsend's solitaire	*	*	*	*	*	*	*	*
Veery								*

Table 2 (cont.). Forest Wildlife Species and Associated Cover Types

COMMON NAME	Ponderosa Pine	Douglas-fir	Grand Fir	Lodgepole Pine	Spruce-Fir	Cedar Hemlock	Mixed Conifer	Hardwood
Swainson's thrush	*	*	*	*	*	*	*	*
Hermit thrush	*	*	*	*	*	*	*	
American robin	*	*	*	*	*	*	*	*
Varied thrush					*	*	*	
Bohemian waxwing	*							*
Cedar waxwing								*
European starling								*
Cassin's vireo	*	*	*	*		*	*	*
Warbling vireo	*	*	*	*	*	*	*	*
Red-eyed vireo								*
Tennessee warbler					*	*	*	
Orange-crowned warbler	*	*					*	*
Nashville warbler						*		*
Audubon's warbler	*	*	*	*	*	*	*	*
Townsend's warbler		*	*	*	*	*	*	
American redstart								*
Northern waterthrush								*
Macgillivray's warbler	*	*	*	*	*	*	*	*
Wilson's warbler				*	*	*	*	
Yellow-breasted chat								*
Western tanager	*	*	*	*	*	*	*	*
Black-headed grosbeak								*
Lazuli bunting								*
Spotted towhee								*
Chipping sparrow	*	*		*			*	*
Fox sparrow					*			
White-crowned sparrow		*	*	*	*		*	
Oregon junco	*	*	*	*	*	*	*	*
Brewer's blackbird								*
Brown-headed cowbird	*	*					*	*

Table 2 (cont.). Forest Wildlife Species and Associated Cover Types

COMMON NAME	Ponderosa Pine	Douglas-fir	Grand Fir	Lodgepole Pine	Spruce-Fir	Cedar Hemlock	Mixed Conifer	Hardwood
Bullock's oriole								*
Cassin's finch	*	*			*	*	*	
Red crossbill	*	*	*	*	*	*	*	
White-winged crossbill				*	*	*		
Pine siskin	*	*	*	*	*	*	*	*
American goldfinch								*
Evening grosbeak	*	*	*		*	*	*	
Mammals								
Masked shrew		*	*		*	*	*	*
Vagrant shrew		*	*		*	*	*	*
Pygmy shrew	*	*					*	
Little brown myotis	*	*	*	*	*	*	*	*
Yuma myotis	*	*	*	*	*	*	*	*
Long-eared myotis	*	*					*	
Long-legged myotis	*	*	*	*	*	*	*	*
Silver-haired bat	*	*	*	*	*	*	*	*
Big brown bat	*	*	*	*	*	*	*	*
Hoary bat	*	*	*	*	*	*	*	*
Townsend's big-eared bat	*	*	*	*	*	*	*	*
Mountain cottontail	*	*					*	*
Snowshoe hare		*	*		*	*	*	*
Yellow-pine chipmunk	*	*	*	*			*	
Red-tailed chipmunk					*			
Columbian ground squirrel	*	*					*	
Golden-mantled ground squirrel	*	*			*		*	
Red squirrel	*	*	*	*	*	*	*	
Northern flying squirrel	*	*	*	*	*	*	*	
Northern pocket gopher	*							
Deer mouse	*	*	*	*	*	*	*	*
Bushy-tailed woodrat	*	*	*	*	*	*	*	

Table 2 (cont.). Forest Wildlife Species and Associated Cover Types

COMMON NAME	Ponderosa Pine	Douglas-fir	Grand Fir	Lodgepole Pine	Spruce-Fir	Cedar Hemlock	Mixed Conifer	Hardwood
Southern red-backed vole		*	*		*	*	*	*
Heather vole	*	*	*	*	*	*	*	
Long-tailed vole		*	*	*	*	*	*	*
Northern bog lemming					*			
Porcupine	*	*	*	*	*	*	*	*
Coyote	*	*	*	*	*	*	*	*
Gray wolf	*	*	*	*	*	*	*	*
Red fox	*	*					*	*
Black bear	*	*	*	*	*	*	*	*
Grizzly bear	*	*	*	*	*	*	*	*
Raccoon	*	*				*	*	*
Marten			*		*	*	*	
Fisher	*	*	*	*	*	*	*	*
Short-tailed weasel			*	*	*	*	*	
Long-tailed weasel	*	*					*	
Wolverine				*	*	*		
Striped skunk	*	*					*	*
Mountain lion	*	*	*	*	*	*	*	*
Lynx					*	*		
Bobcat	*	*	*	*	*	*	*	*
Elk	*	*	*	*	*	*	*	*
Mule deer	*	*					*	*
White-tailed deer	*	*	*	*	*	*	*	*
Moose			*		*	*	*	*

Table 3. Forest Wildlife Species and Associated Forest Successional Stages

Common name	Grass/ Forb	Seedling/ Sapling	Pole	Mature	Old Growth
Reptiles & amphibians					
Long-toed salamander	*	*	*	*	*
Coeur d' alene salamander			*	*	*
Tailed frog	*	*	*	*	*
Western toad	*	*	*	*	*
Pacific chorus frog	*	*	*	*	*
N. Alligator lizard	*	*	*	*	*
Western skink	*	*	*	*	*
Rubber boa	*	*	*	*	*
W. Terrestrial garter snake	*	*	*	*	*
Common garter snake	*	*	*	*	*
Bull snake	*	*	*	*	*
Western rattlesnake	*	*	*	*	*
Birds					
Wood duck				*	*
Common goldeneye				*	*
Barrow' s goldeneye				*	*
Bufflehead				*	*
Hooded merganser				*	*
Common merganser				*	*
Red-breasted merganser				*	*
Turkey vulture	*	*		*	*
Sharp-shinned hawk				*	*
Cooper' s hawk				*	*
Northern goshawk				*	*
Red-tailed hawk	*	*	*	*	*
Spruce grouse			*	*	*
Blue grouse	*			*	*
Ruffed grouse		*	*	*	
Col. Sharp-tailed grouse	*				

Table 3 (cont.). Forest Wildlife Species and Associated Forest Successional Stages

Common name	Grass/ Forb	Seedling/ Sapling	Pole	Mature	Old Growth
Wild turkey	*			*	*
Mourning dove	*			*	
Black-billed cuckoo			*	*	
Yellow-billed cuckoo		*	*	*	*
Flammulated owl					*
W. Screech-owl				*	*
Great horned owl				*	*
N. Pygmy-owl				*	*
Barred owl				*	*
Great gray owl				*	*
Long-eared owl			*	*	
Boreal owl				*	*
Northern saw-whet owl			*	*	*
Common nighthawk	*				
Common poorwill	*			*	
Vaux's swift				*	*
Black-chinned hummingbird		*	*	*	*
Calliope hummingbird	*	*	*	*	*
Rufous hummingbird		*	*	*	*
Lewis' woodpecker	*			*	*
Red-headed woodpecker	*			*	*
Red-naped sapsucker			*	*	*
Williamson's sapsucker			*	*	*
Downy woodpecker			*	*	*
Hairy woodpecker			*	*	*
Three-toed woodpecker			*	*	*
Black-backed woodpecker			*	*	*
Northern flicker				*	*
Pileated woodpecker				*	*
Olive-sided flycatcher				*	*

Table 3 (cont.). Forest Wildlife Species and Associated Forest Successional Stages

Common name	Grass/ Forb	Seedling/ Sapling	Pole	Mature	Old Growth
Western wood-pewee				*	*
Hammond's flycatcher				*	*
Dusky flycatcher		*	*	*	*
Cordilleran flycatcher		*	*	*	*
Eastern kingbird	*		*	*	
Tree swallow	*			*	
Violet-green swallow	*			*	
Gray jay			*	*	*
Steller's jay			*	*	*
Clark's nutcracker	*			*	*
Black-billed magpie	*				
Common crow	*			*	
Common raven	*	*	*	*	*
Black-capped chickadee		*	*	*	*
Mountain chickadee	*			*	*
Boreal chickadee				*	*
Chestnut-backed chickadee				*	*
Red-breasted nuthatch			*	*	*
White-breasted nuthatch			*	*	*
Pygmy nuthatch	*		*	*	*
Brown creeper				*	*
House wren			*	*	
Winter wren				*	*
Golden-crowned kinglet				*	*
Ruby-crowned kinglet				*	*
Western bluebird	*				
Mountain bluebird	*				
Townsend's solitaire	*			*	*
Veery		*	*	*	
Swainson's thrush				*	*

Table 3 (cont.). Forest Wildlife Species and Associated Forest Successional Stages

Common name	Grass/ Forb	Seedling/ Sapling	Pole	Mature	Old Growth
Hermit thrush				*	*
American robin	*	*	*	*	*
Varied thrush				*	*
Bohemian waxwing			*	*	*
Cedar waxwing			*	*	*
European starling	*				
Cassin's vireo			*	*	*
Warbling vireo		*	*	*	*
Red-eyed vireo		*	*	*	*
Tennessee warbler	*	*	*		
Orange-crowned warbler		*	*	*	*
Nashville warbler		*	*	*	*
Audubon's warbler			*	*	*
Townsend's warbler				*	*
American redstart		*	*	*	
Northern waterthrush		*	*		
Macgillivray's warbler		*			
Wilson's warbler		*			
Yellow-breasted chat		*	*		
Western tanager				*	*
Black-headed grosbeak		*	*	*	
Lazuli bunting		*			
Spotted towhee		*	*		
Chipping sparrow	*			*	
Fox sparrow		*	*	*	*
White-crowned sparrow		*	*		
Oregon junco	*		*	*	*
Brewer's blackbird	*		*		
Brown-headed cowbird	*	*	*		
Bullock's oriole				*	*

Table 3 (cont.). Forest Wildlife Species and Associated Forest Successional Stages

Common name	Grass/ Forb	Seedling/ Sapling	Pole	Mature	Old Growth
Cassin's finch				*	*
Red crossbill				*	*
White-winged crossbill				*	*
Pine siskin			*	*	*
American goldfinch	*				
Evening grosbeak				*	*
Mammals					
Masked shrew	*	*	*	*	*
Vagrant shrew	*	*	*	*	*
Pygmy shrew			*	*	*
Little brown myotis				*	*
Yuma myotis				*	*
Long-eared myotis				*	*
Long-legged myotis				*	*
Silver-haired bat				*	*
Big brown bat				*	*
Hoary bat				*	*
Townsend's big-eared bat				*	
Mountain cottontail		*	*	*	*
Snowshoe hare		*	*	*	*
Yellow-pine chipmunk		*	*	*	*
Red-tailed chipmunk			*	*	*
Columbian ground squirrel	*				
Golden-mantled ground squirrel	*				
Red squirrel			*	*	*
Northern flying squirrel				*	*
Northern pocket gopher	*				
Deer mouse	*	*	*	*	*
Bushy-tailed woodrat	*	*	*	*	*
Southern red-backed vole				*	*

Table 3 (cont.). Forest Wildlife Species and Associated Forest Successional Stages

Common name	Grass/ Forb	Seedling/ Sapling	Pole	Mature	Old Growth
Heather vole	*	*			
Long-tailed vole	*	*			
Porcupine			*	*	*
Coyote	*	*	*	*	*
Gray wolf	*	*	*	*	*
Red fox	*	*			
Black bear	*	*	*	*	*
Grizzly bear	*	*	*	*	*
Raccoon	*	*		*	*
Marten			*	*	*
Fisher			*	*	*
Short-tailed weasel			*	*	*
Long-tailed weasel	*	*	*	*	*
Wolverine	*	*	*	*	*
Striped skunk	*	*			
Mountain lion	*	*	*	*	*
Lynx	*	*	*	*	*
Bobcat	*	*	*	*	*
Elk	*	*	*	*	*
Mule deer	*	*		*	*
White-tailed deer	*	*	*	*	*
Moose	*	*	*	*	*

Table 4. Forest Wildlife Species and Associated Canopy Coverage Classes

Common name		0 - 39%	40 - 69%	> 70%
Reptiles & amphibians				
Long-toed salamander		*	*	*
Coeur d' alene salamander		*	*	*
Tailed frog		*	*	*
Western toad			*	*
Pacific chorus frog		*	*	*
N. Alligator lizard		*	*	*
Western skink		*	*	*
Rubber boa		*	*	*
W. Terrestrial garter snake		*	*	*
Common garter snake		*	*	*
Bull snake		*		
Western rattlesnake		*		
Birds				
Wood duck		*	*	*
Common goldeneye		*	*	*
Barrow' s goldeneye		*	*	*
Bufflehead		*	*	*
Hooded merganser		*	*	*
Common merganser		*	*	*
Red-breasted merganser		*	*	*
Turkey vulture		*	*	
Sharp-shinned hawk			*	*
Cooper' s hawk			*	*
Northern goshawk			*	*
Red-tailed hawk		*		
Spruce grouse			*	*
Blue grouse		*	*	
Ruffed grouse			*	*
Col. Sharp-tailed grouse		*		

Table 4. Forest Wildlife Species and Associated Canopy Coverage Classes (cont.)

Common name		0 - 39%	40 - 69%	> 70%
Wild turkey		*	*	*
Mourning dove		*	*	
Black-billed cuckoo		*		
Yellow-billed cuckoo		*		
Flammulated owl			*	
W. Screech-owl		*	*	
Great horned owl		*	*	*
N. Pygmy-owl		*	*	
Barred owl			*	*
Great gray owl			*	*
Long-eared owl		*	*	
Boreal owl			*	*
Northern saw-whet owl			*	*
Common nighthawk		*		
Common poorwill		*		
Vaux's swift		*		
Black-chinned hummingbird		*		
Calliope hummingbird		*	*	
Rufous hummingbird		*	*	
Lewis' woodpecker		*		
Red-headed woodpecker		*		
Red-naped sapsucker		*	*	
Williamson's sapsucker		*		
Downy woodpecker		*	*	
Hairy woodpecker		*	*	
Three-toed woodpecker		*	*	
Black-backed woodpecker		*	*	*
Northern flicker		*	*	
Pileated woodpecker				*
Olive-sided flycatcher				

Table 4. Forest Wildlife Species and Associated Canopy Coverage Classes (cont.)

Common name		0 - 39%	40 - 69%	> 70%
Western wood-pewee				
Hammond's flycatcher				
Dusky flycatcher		*	*	
Cordilleran flycatcher		*	*	
Eastern kingbird		*		
Tree swallow		*		
Violet-green swallow		*		
Gray jay				*
Steller's jay				*
Clark's nutcracker		*`	*	
Black-billed magpie				
Common crow		*		
Common raven		*	*	*
Black-capped chickadee		*	*	*
Mountain chickadee		*	*	
Chestnut-backed chickadee			*	*
Red-breasted nuthatch		*	*	
White-breasted nuthatch		*		
Pygmy nuthatch		*		
Brown creeper				*
House wren		*	*	
Winter wren				*
Golden-crowned kinglet			*	*
Ruby-crowned kinglet			*	*
Western bluebird		*		
Mountain bluebird		*		
Townsend's solitaire		*	*	*
Veery			*	*
Swainson's thrush			*	
Hermit thrush			*	*

Table 4. Forest Wildlife Species and Associated Canopy Coverage Classes (cont.)

Common name		0 - 39%	40 - 69%	> 70%
American robin		*	*	*
Varied thrush				*
Bohemian waxwing			*	
Cedar waxwing		*	*	
European starling		*		
Cassin's vireo			*	*
Warbling vireo		*	*	
Red-eyed vireo		*	*	
Orange-crowned warbler		*	*	
Nashville warbler			*	*
Audubon's warbler		*		
Townsend's warbler			*	*
American redstart		*	*	
Northern waterthrush			*	
Macgillivray's warbler		*	*	
Wilson's warbler		*	*	
Yellow-breasted chat		*		
Western tanager		*		
Black-headed grosbeak		*		
Lazuli bunting		*		
Spotted towhee		*		
Chipping sparrow		*		
Fox sparrow			*	*
Oregon junco		*		
Brown-headed cowbird		*		
Bullock's oriole		*		
Cassin's finch		*		
Red crossbill		*	*	
White-winged crossbill			*	*
Pine siskin		*	*	

Table 4. Forest Wildlife Species and Associated Canopy Coverage Classes (cont.)

Common name		0 - 39%	40 - 69%	> 70%
American goldfinch		*	*	
Evening grosbeak		*	*	*
Mammals				
Masked shrew		*	*	*
Vagrant shrew		*	*	*
Pygmy shrew		*		
Little brown myotis		*	*	*
Yuma myotis		*	*	*
Long-eared myotis		*	*	*
Long-legged myotis		*	*	*
Silver-haired bat		*	*	*
Big brown bat		*	*	*
Hoary bat		*	*	*
Townsend's big-eared bat		*	*	*
Mountain cottontail		*		
Snowshoe hare		*	*	
Yellow-pine chipmunk			*	*
Red-tailed chipmunk			*	*
Columbian ground squirrel		*		
Golden-mantled ground squirrel		*		
Red squirrel			*	*
Northern flying squirrel			*	*
Northern pocket gopher		*		
Deer mouse		*	*	*
Bushy-tailed woodrat		*	*	*
Southern red-backed vole			*	*
Heather vole		*		
Long-tailed vole		*		
Northern bog lemming		*		
Porcupine		*	*	*

Table 4. Forest Wildlife Species and Associated Canopy Coverage Classes (cont.)

Common name		0 - 39%	40 - 69%	> 70%
Coyote		*	*	*
Gray wolf		*	*	*
Red fox		*		
Black bear		*	*	*
Grizzly bear		*	*	*
Raccoon		*	*	*
Marten			*	*
Fisher			*	*
Short-tailed weasel		*	*	*
Long-tailed weasel		*	*	*
Wolverine		*	*	*
Striped skunk		*		
Mountain lion		*	*	
Lynx		*	*	*
Bobcat		*	*	*
Elk		*	*	*
Mule deer		*	*	
White-tailed deer		*	*	*
Moose		*	*	*

Appendix I

Effects of the Alternatives on Wildlife

Table 1. Effects of Alternatives on Forest Reptiles and Amphibians. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
W. Painted turtle	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
N. Alligator lizard	Habitat	4	3	4	5	4	4
	Population	5	4	4	5	5	5
	C.E.	5	4	4	5	5	5
Western skink	Habitat	4	3	4	5	5	5
	Population	5	4	5	5	5	5
	C.E.	5	4	5	5	5	5
Rubber boa	Habitat	3	3	3	4	4	3
	Population	3	3	3	4	4	3
	C.E.	3	3	3	4	4	3
Racer	Habitat	4	3	4	5	5	5
	Population	5	4	5	5	5	5
	C.E.	5	4	5	5	5	5
Bull snake	Habitat	3	2	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
W. Terrestrial garter snake	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Common garter snake	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Western rattlesnake	Habitat	4	3	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 1 (cont.). Effects of Alternatives on Forest Reptiles and Amphibians. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
W. Painted turtle	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
N. Alligator lizard	Habitat	4	3	4	5	4	4
	Population	5	4	4	5	5	5
	C.E.	5	4	4	5	5	5
Western skink	Habitat	4	3	4	5	5	5
	Population	5	4	5	5	5	5
	C.E.	5	4	5	5	5	5
Rubber boa	Habitat	3	3	3	4	4	3
	Population	3	3	3	4	4	3
	C.E.	3	3	3	4	4	3
Racer	Habitat	4	3	4	5	5	5
	Population	5	4	5	5	5	5
	C.E.	5	4	5	5	5	5
Bull snake	Habitat	3	2	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
W. Terrestrial garter snake	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Common garter snake	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Western rattlesnake	Habitat	4	3	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2. Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Wood duck	Habitat	4*	3	4	4	4	5
	Population	4	3	4	4	4	5
	C.E.	4	3	4	4	4	5
Harlequin duck	Habitat	4	4	4	4	4	4
	Population	5	4	5	5	5	5
	C.E.	5	4	5	5	5	5
Common goldeneye	Habitat	3	2	3	3	4	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Barrow's goldeneye	Habitat	4	4	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Bufflehead	Habitat	3	3	4	4	4	4
	Population	3	3	3	3	4	4
	C.E.	3	3	3	3	4	4
Hooded merganser	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
Common merganser	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Red-breasted merganser	Habitat	3	3	3	3	3	3
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Turkey vulture	Habitat	2	2	2	2	2	2
	Population	5	5	5	5	5	5
	C.E.	?	?	?	?	?	?

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.) Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.)

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Osprey	Habitat	3	2	3	4	3	2
	Population	3	3	3	4	3	3
	C.E.	3	3	3	4	4	3
Bald eagle	Habitat	4	3	4	4	4	4
	Population	4	3	4	4	4	4
	C.E.	4	4	4	4	4	4
Sharp-shinned hawk	Habitat	3	2	3	4	4	2
	Population	4	3	3	4	4	3
	C.E.	4	2	3	4	4	3
Cooper' s hawk	Habitat	3	2	3	4	4	2
	Population	4	3	3	4	4	3
	C.E.	4	2	3	4	4	3
Northern goshawk	Habitat	3	3	3	4	4	3
	Population	4	3	3	4	4	3
	C.E.	4	3	3	4	4	3
Red-tailed hawk	Habitat	2	3	2	2	2	4
	Population	3	3	2	2	2	4
	C.E.	3	3	3	3	3	3
Golden eagle	Habitat	4	3	4	4	4	5
	Population	4	3	4	4	4	4
	C.E.	4	4	4	4	4	5
American kestrel	Habitat	4	3	4	4	4	5
	Population	3	3	3	4	4	4
	C.E.	3	3	3	4	4	4
Merlin	Habitat	4	3	4	4	4	5
	Population	4	3	4	4	4	5
	C.E.	4	3	4	4	4	5

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Spruce grouse	Habitat	3	3	3	3	4	2
	Population	3	3	3	3	4	2
	C.E.	3	3	3	3	4	2
Blue grouse	Habitat	3	2	3	3	3	4
	Population	3	2	3	3	4	4
	C.E.	3	2	3	3	4	4
Ruffed grouse	Habitat	3	2	2	3	4	4
	Population	3	2	2	3	4	4
	C.E.	3	2	2	3	4	4
Flammulated owl	Habitat	5	3	4	5	5	5
	Population	5	3	4	5	5	5
	C.E.	5	3	4	5	5	5
W. Screech-owl	Habitat	4	3	3	5	5	4
	Population	4	4	4	5	5	4
	C.E.	4	3	4	5	5	4
Great horned owl	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
N. Hawk-owl	Habitat	4	3	4	4	4	4
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
N. Pygmy-owl	Habitat	3	3	3	4	4	3
	Population	3	3	3	4	4	3
	C.E.	3	3	3	4	4	3
Barred owl	Habitat	4	3	4	5	5	3
	Population	4	3	4	4	5	3
	C.E.	4	3	4	5	5	3

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Great gray owl	Habitat	4	3	4	5	5	4
	Population	5	4	4	5	5	5
	C.E.	5	4	4	5	5	5
Long-eared owl	Habitat	3	3	4	4	4	4
	Population	3	3	4	4	4	4
	C.E.	3	3	4	4	4	4
Boreal owl	Habitat	4	4	4	5	5	4
	Population	4	4	4	5	5	4
	C.E.	4	4	4	5	5	4
N. Saw-whet owl	Habitat	3	3	3	3	3	3
	Population	4	3	3	3	3	3
	C.E.	3	3	4	4	4	4
Common nighthawk	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
Common poorwill	Habitat	4	4	4	4	4	4
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
Mourning dove	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
Vaux's swift	Habitat	4	3	4	4	4	4
	Population	4	3	4	4	4	4
	C.E.	4	3	4	4	4	4
Calliope hummingbird	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Rufous hummingbird	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
Lewis' woodpecker	Habitat	4	3	3	4	4	4
	Population	4	3	3	4	4	4
	C.E.	4	3	3	4	4	4
Williamson's sapsucker	Habitat	4	3	4	4	4	3
	Population	4	3	4	4	4	3
	C.E.	4	3	4	4	4	3
Downy woodpecker	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Hairy woodpecker	Habitat	4	3	4	4	4	5
	Population	4	3	4	4	4	5
	C.E.	4	3	4	4	4	5
Three-toed woodpecker	Habitat	4	3	4	4	4	3
	Population	4	3	4	4	4	3
	C.E.	4	3	4	4	4	3
Black-backed woodpecker	Habitat	5	3	4	5	5	4
	Population	5	3	4	5	5	4
	C.E.	5	3	4	5	5	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Northern flicker	Habitat	3	2	3	3	3	4
	Population	2	2	3	2	3	4
	C.E.	2	2	3	2	3	4
Pileated woodpecker	Habitat	4	2	3	4	4	2
	Population	4	2	3	4	4	2
	C.E.	4	2	3	4	4	2
Olive-sided flycatcher	Habitat	3	3	3	3	4	4
	Population	3	3	3	3	4	4
	C.E.	3	3	3	3	4	4
W. Wood-pewee	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
Hammond' s flycatcher	Habitat	3	2	3	3	4	2
	Population	3	2	3	3	4	2
	C.E.	3	2	3	3	4	2
Dusky flycatcher	Habitat	2	2	2	2	2	4
	Population	2	2	2	2	2	4
	C.E.	2	2	2	2	2	4
Cordilleran flycatcher	Habitat	3	3	3	3	3	2
	Population	3	3	3	3	3	2
	C.E.	3	3	3	3	3	2
Eastern kingbird	Habitat	4	4	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Tree swallow	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Violet-green wallow	Habitat	3	3	3	3	3	4s
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
Gray jay	Habitat	3	3	3	3	3	2
	Population	3	3	3	3	3	2
	C.E.	3	3	3	3	3	2
Steller' s jay	Habitat	3	3	3	3	4	2
	Population	4	3	4	4	4	2
	C.E.	4	3	4	4	4	2
Clark' s nutcracker	Habitat	3	2	2	3	3	4
	Population	3	2	2	3	3	4
	C.E.	3	2	2	3	3	4
Common raven	Habitat	2	2	2	2	2	4
	Population	2	2	2	2	2	4
	C.E.	2	2	2	2	2	4
American crow	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
Black-capped chickadee	Habitat	2	1	2	2	2	3
	Population	1	1	1	1	1	2
	C.E.	1	1	1	1	1	2
Mountain chickadee	Habitat	2	1	2	2	2	3
	Population	1	1	1	1	1	2
	C.E.	1	1	1	1	1	2
Boreal chickadee	Habitat	3	3	3	3	4	3
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2. (cont.) Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Chestnut-backed chickadee	Habitat	4	3	4	4	4	3
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Red-breasted nuthatch	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
White-breasted nuthatch	Habitat	3	3	4	4	4	4
	Population	4	3	4	4	4	4
	C.E.	4	3	4	4	4	4
Pygmy nuthatch	Habitat	3	2	3	3	3	4
	Population	3	2	3	3	3	4
	C.E.	3	2	3	3	3	4
Brown creeper	Habitat	4	3	4	4	4	3
	Population	4	3	4	4	4	3
	C.E.	4	3	4	4	4	3
House wren	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
Winter wren	Habitat	4	3	4	4	4	3
	Population	4	3	4	4	4	3
	C.E.	4	3	4	4	4	3
Golden-crowned kinglet	Habitat	4	3	4	4	4	3
	Population	3	3	4	4	4	3
	C.E.	3	3	4	4	4	3
Ruby-crowned kinglet	Habitat	3	3	3	4	4	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Western bluebird	Habitat	4	2	3	4	4	4
	Population	4	3	3	4	4	4
	C.E.	4	3	3	4	4	4
Mountain bluebird	Habitat	4	3	3	4	4	4
	Population	3	2	3	3	3	4
	C.E.	3	2	3	3	3	4
Townsend's solitaire	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Veery	Habitat	4	2	3	4	4	4
	Population	4	2	3	4	4	4
	C.E.	4	2	3	4	4	4
Swainson's thrush	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Hermit thrush	Habitat	4	3	4	4	4	3
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
American robin	Habitat	2	2	2	2	2	3
	Population	2	2	2	2	2	3
	C.E.	2	2	2	2	2	3
Varied thrush	Habitat	3	3	3	3	3	2
	Population	3	2	3	2	3	2
	C.E.	3	2	3	2	3	2
Cedar waxwing	Habitat	4	3	4	3	3	4
	Population	3	2	3	2	3	4
	C.E.	3	2	3	2	3	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
European starling	Habitat	4	-	4	4	4	4
	Population	4	-	4	4	4	4
	C.E.	4	-	4	4	4	4
Cassin's vireo	Habitat	3	2	3	2	2	2
	Population	3	2	3	2	2	2
	C.E.	3	2	3	2	2	2
Red-eyed vireo	Habitat	5	3	5	4	4	4
	Population	5	3	5	4	4	4
	C.E.	5	3	5	4	4	4
Orange-crowned warbler	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
Nashville warbler	Habitat	4	3	4	3	4	3
	Population	4	3	4	3	4	3
	C.E.	4	3	4	3	4	3
Audubon's warbler	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Townsend's warbler	Habitat	3	2	3	2	3	2
	Population	3	2	3	2	3	2
	C.E.	3	2	3	2	3	2
American redstart	Habitat	5	2	3	2	4	4
	Population	5	2	4	3	4	4
	C.E.	5	2	4	3	4	4
Northern waterthrush	Habitat	5	2	3	2	4	4
	Population	5	2	4	3	4	4
	C.E.	5	2	4	3	4	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Macgillivray' s warbler	Habitat	2	3	2	3	2	3
	Population	2	3	2	3	2	3
	C.E.	2	3	2	3	2	3
Wilson' s warbler	Habitat	4	3	4	3	4	3
	Population	4	3	4	3	4	3
	C.E.	4	3	4	3	4	3
Yellow-breasted chat	Habitat	4	4	4	4	4	4
	Population	5	4	5	4	5	5
	C.E.	5	4	5	4	5	5
Western tanager	Habitat	2	3	2	3	2	3
	Population	2	3	2	3	2	3
	C.E.	2	3	2	3	2	3
Black-headed grosbeak	Habitat	4	3	4	3	4	4
	Population	4	3	4	3	4	4
	C.E.	4	3	4	3	4	4
Lazuli bunting	Habitat	4	3	4	4	4	4
	Population	4	3	4	4	4	4
	C.E.	4	3	4	4	4	4
Spotted towhee	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
Chipping sparrow	Habitat	2	2	2	2	2	3
	Population	3	2	3	2	3	3
	C.E.	3	2	3	2	3	3
Fox sparrow	Habitat	3	3	4	3	4	3
	Population	3	3	4	3	4	3
	C.E.	3	3	4	3	4	3

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 2 (cont.). Effects of Alternatives on Forest Birds. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
White-crowned sparrow	Habitat	4	4	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Oregon junco	Habitat	1	2	1	2	1	1
	Population	1	2	1	2	1	1
	C.E.	1	2	1	2	1	1
Brown-headed cowbird	Habitat	3	?	3	3	3	3
	Population	3	?	3	3	3	3
	C.E.	3	?	3	3	3	3
Cassin's finch	Habitat	3	3	3	3	3	4
	Population	3	3	3	3	3	4
	C.E.	3	3	3	3	3	4
Red crossbill	Habitat	2	2	2	2	2	3
	Population	2	2	2	2	2	3
	C.E.	2	2	2	2	2	3
White-winged crossbill	Habitat	3	3	3	3	3	3
	Population	4	?	4	4	4	4
	C.E.	4	?	4	4	4	4
Pine siskin	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
American goldfinch	Habitat	3	3	3	3	3	3
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Evening grosbeak	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 3. Effects of Alternatives on Forest Mammals. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Masked shrew	Habitat	2*	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Vagrant shrew	Habitat	4	3	3	3	4	4
	Population	3	3	3	3	3	3
	C.E.	4	3	3	3	4	4
Pygmy shrew	Habitat	5	5	5	5	5	5
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
Little brown myotis	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Yuma myotis	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Long-eared myotis	Habitat	4	4	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Long-legged myotis	Habitat	4	4	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Silver-haired bat	Habitat	2	2	2	3	3	3
	Population	2	2	2	3	3	3
	C.E.	2	2	2	3	3	3
Big brown bat	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 3 (cont.). Effects of Alternatives on Forest Mammals. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Hoary bat	Habitat	5	5	5	5	5	5
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
Townsend's big-eared bat	Habitat	4	4	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Mountain cottontail	Habitat	3	2	3	3	3	4
	Population	3	2	3	3	3	4
	C.E.	3	2	3	3	3	4
Snowshoe hare	Habitat	2	2	2	2	2	3
	Population	2	2	2	2	2	3
	C.E.	2	2	2	2	2	3
Yellow pine chipmunk	Habitat	2	2	2	2	2	3
	Population	2	2	2	2	2	3
	C.E.	2	2	2	2	2	3
Red-tailed chipmunk	Habitat	4	3	4	4	4	4
	Population	4	3	4	4	4	4
	C.E.	4	3	4	4	4	4
Columbian ground squirrel	Habitat	2	2	2	2	2	3
	Population	2	2	2	2	2	3
	C.E.	2	2	2	2	2	3
Golden-mantled ground squirrel	Habitat	4	4	4	4	4	4
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Red squirrel	Habitat	1	1	1	1	1	1
	Population	1	1	1	1	1	1
	C.E.	1	1	1	1	1	1

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 3 (cont.). Effects of Alternatives on Forest Mammals. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Northern Flying Squirrel	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
Northern Pocket Gopher	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Deer Mouse	Habitat	1	1	1	1	1	1
	Population	1	1	1	1	1	1
	C.E.	1	1	1	1	1	1
Bushy-tailed woodrat	Habitat	5	5	5	5	5	5
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
S. red-backed vole	Habitat	3	3	2	3	2	3
	Population	3	3	2	3	2	3
	C.E.	3	3	2	3	2	3
Heather vole	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Long-tailed vole	Habitat	5	5	5	5	5	5
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
Northern bog lemming	Habitat	5	5	5	5	5	5
	Population	?	?	?	?	?	?
	C.E.	?	?	?	?	?	?
Porcupine	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 3 (cont.). Effects of Alternatives on Forest Mammals. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Coyote	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Gray wolf	Habitat	2	2	2	2	2	2
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
Red fox	Habitat	2	2	2	2	3	2
	Population	2	2	2	2	3	2
	C.E.	2	2	2	2	3	2
Black bear	Habitat	2	2	2	2	3	2
	Population	2	2	2	2	3	2
	C.E.	2	2	2	2	3	2
Grizzly bear	Habitat	2	2	2	2	4	2
	Population	5	5	5	5	5	5
	C.E.	5	5	5	5	5	5
Raccoon	Habitat	3	3	3	3	3	3
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
Pine marten	Habitat	3	3	2	3	3	3
	Population	3	3	2	3	3	3
	C.E.	3	3	2	3	3	3
Fisher	Habitat	4	4	3	4	5	4
	Population	4	4	3	4	5	4
	C.E.	4	4	3	4	5	4
Short-tailed weasel	Habitat	2	2	2	2	3	2
	Population	2	2	2	2	3	2
	C.E.	2	2	2	2	3	2

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 3 (cont.). Effects of Alternatives on Forest Mammals. Effects are described for habitat, population, and cumulative effects (C.E.).

Species		Existing	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Long-tailed weasel	Habitat	2	2	2	2	2	2
	Population	2	2	2	2	2	2
	C.E.	2	2	2	2	2	2
Wolverine	Habitat	2	2	2	2	2	2
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Striped skunk	Habitat	2	2	2	2	3	2
	Population	2	2	2	2	3	2
	C.E.	2	2	2	2	3	2
Mountain lion	Habitat	2	2	2	2	3	2
	Population	3	3	3	3	3	3
	C.E.	3	3	3	3	3	3
Lynx	Habitat	3	3	3	3	4	3
	Population	4	4	4	4	4	4
	C.E.	4	4	4	4	4	4
Bobcat	Habitat	3	3	3	3	4	3
	Population	3	3	3	3	4	3
	C.E.	3	3	3	3	4	3
Elk	Habitat	3	3	2	2	4	3
	Population	3	3	2	2	4	3
	C.E.	3	3	2	2	4	3
Mule deer	Habitat	3	3	2	2	4	3
	Population	3	3	2	2	4	3
	C.E.	3	3	2	2	4	3
White-tailed deer	Habitat	2	2	3	3	3	2
	Population	2	2	3	3	3	2
	C.E.	2	2	3	3	3	2
Moose	Habitat	3	3	3	3	4	3
	Population	4	3	3	3	4	4
	C.E.	4	3	3	3	4	4

* 1=uniformly abundant 2=abundant with gaps 3=patchy 4=somewhat isolated 5=rare

Table 4. Forest Wildlife Species Requiring Snags and/or Dead and Down Woody Debris.

	Snags		Down and Dead	
Species	Feeding	Nesting/ Denning	Feeding	Nesting/ Denning
Long-toed salamander			*	*
Coeur d' alene salamander			*	*
Tailed frog			*	*
Pacific chorus frog			*	*
Spotted frog			*	*
Western toad			*	*
W. Painted turtle				*
N. Alligator lizard			*	*
Western skink			*	*
Rubber boa			*	*
Bull snake			*	*
Western rattlesnake			*	*
Common garter snake			*	*
W. Terrestrial garter snake			*	*
Wood duck		*		
Bufflehead		*		
Harlequin duck		*		*
Common goldeneye		*		
Barrow's goldeneye		*		
Hooded merganser		*		
Common merganser		*		*
Bald eagle		*		
Osprey		*		
Merlin		*		
American kestrel		*		
Spruce grouse				*
Blue grouse				*
Ruffed grouse				*

Table 4 (cont.). Forest Wildlife Species Requiring Snags and/or Dead and Down Woody Debris.

Species	Snags		Down and Dead	
	Feeding	Nesting/ Denning	Feeding	Nesting/ Denning
W. Screech-owl		*		
Flammulated owl		*		
Great horned owl		*		
Great gray owl		*		
Barred owl		*		
Saw-whet owl		*		
Boreal owl		*		
N. Pygmy-owl		*		
Vaux's swift		*		
Northern flicker	*	*	*	
Pileated woodpecker	*	*	*	
Red-headed woodpecker	*	*	*	
Lewis' woodpecker	*	*	*	
Downy woodpecker	*	*	*	
Hairy woodpecker	*	*	*	
Black-backed woodpecker	*	*	*	
Three-toed woodpecker	*	*	*	
Red-naped sapsucker	*	*		
Williamson's sapsucker	*	*	*	
Say's phoebe		*		
Western flycatcher		*		
Violet-green swallow		*		
Tree swallow		*		
Black-capped chickadee	*	*	*	
Mountain chickadee	*	*	*	
Boreal chickadee	*	*	*	
Chestnut-backed chickadee	*	*	*	
Red-breasted nuthatch	*	*		

Table 4 (cont.). Forest Wildlife Species Requiring Snags and/or Dead and Down Woody Debris.

Species	Snags		Down and Dead	
	Feeding	Nesting/ Denning	Feeding	Nesting/ Denning
White-breasted nuthatch	*	*	*	
Pygmy nuthatch	*	*	*	
Brown creeper	*	*		
House wren	*	*	*	
Golden-crowned kinglet	*			
Ruby-crowned kinglet	*			
Mountain bluebird		*		
Western bluebird		*		
Masked shrew				*
Vagrant shrew				*
Water shrew				*
Pygmy shrew				*
Long-eared myotis	*			
Little brown myotis	*			
Long-legged myotis	*			
Silver-haired bat	*			
Big brown bat		*		
Snowshoe hare				*
Mountain cottontail				*
Yellow pine chipmunk			*	*
Redtail chipmunk			*	*
Red squirrel		*		
N. Flying squirrel		*		
Deer mouse		*		*
Bushy-tailed woodrat				*
S. Red-backed vole				*
Heather vole				*
Montane vole				*
Meadow vole				*

Table 4 (cont.). Forest Wildlife Species Requiring Snags and/or Dead and Down Woody Debris.

Species	Snags		Down and Dead	
	Feeding	Nesting/ Denning	Feeding	Nesting/ Denning
Water vole				*
Long-tailed vole				*
Porcupine		*		
Coyote				*
Gray Wolf				*
Red Fox				*
Black bear	*	*	*	*
Grizzly bear	*		*	*
Racoon	*	*	*	*
Marten	*	*	*	*
Fisher	*	*	*	*
Shorttail weasel	*		*	*
Long-tailed weasel	*		*	*
Striped skunk			*	*
Lynx			*	*
Bobcat			*	*
Mountain lion				*

Appendix J

The Watershed Model

Evaluating Reservation Watersheds

The Watershed Model provides a means to evaluate human disturbances in a watershed, and to predict stream condition. Roads, stream crossings, livestock grazing, and clearcuts are the measures of human disturbance. The sensitivity of the watershed to these disturbance factors is determined by measures of slope (average percent slope) and erodibility (parent material), and stream type according to the Rosgen Classification (Rosgen 1994). This is a conceptual model, developed from published relationships between the agents of disturbance and the parameters of channel condition. The model is an accounting tool based on a numerical tabulation of values attributed to each of the factors of disturbance. Any weighting factors used in the model were based on professional judgement and are subject to further refinement. A total score of 100 is the highest possible and represents a drainage with no human disturbance and high natural resiliency. A threshold score of 40 was subjectively set as the point below which the combination of factors of disturbance and sensitivity would result in unacceptable degradation of stream channels, or violation of standards. Field verification is necessary to validate the assumptions concerning the relationship between watershed disturbance and channel degradation. The degree of accuracy of the model and the relative importance of each parameter within the model will be determined through regression analysis using measured field data.

The watershed model applies only to distinct drainages of intermediate size, usually second or third order. The size constraint is necessary to maintain the direct linkage between cause and effect. Only those drainages where land disturbances within the drainages could be expected to translate into changes in stream condition were included. Watersheds of very small size, (typically <1000 acres) were not included in the analysis. Watersheds of the Mission Mountain Buffer Zone were also not included since the area affected by management activities is only a narrow, low elevation band within each drainage. Sixty-six watersheds on the Reservation were analyzed. Boundaries of the watershed units follow watershed divides, with the downstream end determined either by junctions with other streams or by the lower extent of forest coverage.

The model is divided into four categories: sediment yield (45%), water yield (15%), riparian condition (15%), and stream sensitivity (25%).

Sediment yield is evaluated as a function of roads in a drainage. For simplification, the other sources of sediment are not included. Numerous studies have indicated that roads generate most of the total erosion from forest practices. For example, McCashion and Rice (1983) reported 17 times more erosion from roads than harvest areas. Roads alter watersheds by changing historic levels of sediment and runoff through soil disturbance and interception of the subsurface flow of water. The relationship between basin level roading and degradation of the stream channel has been confirmed through extensive research. For example, Cederholm (1982) demonstrated a positive relationship in 43 basins of Washington state between roading and the percent of fine sediments in stream beds. Decker and Clancy (1993) related total miles of roads in the drainages of the Bitterroot River to the distribution of native trout. The drainages with fewest road miles had the strongest remaining populations of bull trout.

The total number of stream crossings in a drainage is included to add refinement to the roading factor by quantifying the number of points that road-generated sediment is delivered directly into streams. Inclusion of roads within one hundred feet of a stream channel also adds refinement by giving additional weight to those road miles that have the greatest likelihood of delivering sediment to streams. The 100' distance was chosen after considering published research. Tennyson et al. (1981) reported that sediment from roads traveled a maximum of 150 feet through buffers, and Ketcheson and Megahan (1991) and Burroughs and King (1989) arrived at similar conclusions, that the probability of sediment movement below cross drains is less than 10 percent at distances of 200 feet or more.

These three factors quantifying road effects: total miles of road in the drainage, total stream crossings, and total miles of road within one hundred feet of stream channels, are summed to give a total road factor. That factor is weighted by dividing it by the total miles of stream channel within the drainage. Dividing by total stream miles has the effect of giving more weight to those miles of road that drain directly into streams, and incorporates a weighting factor that allows comparison between drainages. The summation of the road factor is modified by up to 30% according to an estimate of the erodibility. Erodibility is evaluated as a function of average slope and parent material within the drainage.

Increases in water yield above historic levels have the potential to change channel dimension and degrade fishery habitat. Changes in forest structure by clearcutting have been shown to increase water yield by reducing transpiration loss, increasing snow retention, and synchronizing snow melt (Harr 1979). The score is derived from the percent of the drainage in clearcut condition, then modified by a subjective evaluation of the hydrologic response based on infiltration rates characteristic of different geologic types.

Riparian condition is determined by use of the system established by the Montana Riparian Association which employs evaluations of vegetation cover and type and streambank stability. When such an evaluation has not been completed, the score is obtained based on a rating scale of AUM's per mile of stream.

Stream Sensitivity describes the relative tendency of stream channels to change shape or condition in response to changes in the watershed. The method used to identify stream sensitivity is the Rosgen stream classification system (Rosgen 1994) which employs physical stream measurements such as slope, substrate size, sinuosity, width, depth, and entrenchment. When any of these variables change, the stream channel must accommodate the change by some degree of adjustment in its dimension, profile and pattern. The rate and direction of channel adjustment is determined by the type and degree of change in the physical variables, and also by the stream type. Different stream types change, or adjust to differing degrees. A sensitive type changes quickly and drastically, while a resilient type adjusts very little in response to changes in the physical variables.

Scoring Watersheds with the Watershed Model

Watershed Model

Rating Value Score

Sediment Yield

Roads x **Erodibility**

[(TRM+SC+RRM)/TSM] [PS X PM] = x .45 =

#	Rank	%Slope	Rank	PM	Rank
0.00-1.00	100	0-29.9	1.00	AT	1.00
1.01-1.99	95	30-30.9	0.98	T	0.96
2.00-2.99	85	40-40.9	0.95	VCT	0.96
3.00-3.99	75	50-50.9	0.91	LR	0.96
4.00-4.99	60	60-60.9	0.88	VCP	0.92
5.00-5.99	50	>60.9	0.85	VCS	0.92
6.00-6.99	40			VCL	0.92
7.00-7.99	30			TV	0.88
8.00-8.99	20			CP	0.85
9.00-9.99	10			CMS	0.85
>10	0			CS	0.85
				LC	0.85

Water Yield

Vegetation Removal x Hydrologic Response x .15 =

PCC	Rank	Type	Rank
.05	100	CP	.10
.10	80	CS	.20
.15	60	VCP	.30
.20	40	CMS	.30
.25	20	VCS	.40
.30	0	LC	.50
		T	.60
		TV	.60
		VCL	.70
		VCT	1
		AT	1
		LR	1

Riparian Condition x .15 =

MRA Score	Rank	AUM's/SM	Rank
81-100	100	0	100
66-80	80	10	75
51-65	50	20	50
31-50	25	30	25
0-30	0	40	0

Stream sensitivity/resiliency x .25 =

Rosgen Type	Rank
A1, A2, B1, B2	100
B3, C1, C2,	80
B4, B5, B6	60
A6, C3	40
A3, C4, C5, C6	20
A4, A5	0

Watershed Condition

No Standards are exceeded:	Model Score = 60 - 100
Standards may be exceeded:	Model Score = 40 - 59
One or more Standards are exceeded:	Model Score = 0 - 39

Appendix K

Methods used to Predict Future Road Densities

The methods used to estimate future road densities under each of the alternatives are described below and in the tables that follow.

1. Determine average road spacing in fully roaded drainages across the reservation. This was accomplished using GIS to measure slope distances between roads at 18,039 locations. Results were partitioned into two different outputs to be used for different purposes: one that measured total road spacing and one that adjusted road spacing by excluding road intersections, ridges, and stream bottoms.

2. Develop the statistical relationship between total road spacing and road density. Total road spacing measurements were used for this determination because density determinations require the use of all existing road miles. The relationship is described as road destiny - 5.5056 Ln (road spacing) + 43.509.

3. Determine the acres available for harvest in each landscape for each alternative.

A) Determine acres of commercially available or restricted (SMZs) forest (non I/N ground) in each landscape.

B) Separate commercial acres into roaded (within 0.25 miles of an existing road), and unroaded (greater than 0.25 miles of an existing road) by alternative. These acreages differ by alternative because each alternative sets aside different acreages as permanent roadless areas.

C) Determine miles of road in commercial areas in each landscape.

D) Calculate road density for roaded areas (miles of road per square mile of roaded areas).

4. Determine the miles of road to be built in the remaining available unroaded lands. This prediction is based on a calculation of future road densities derived from the desired road spacing specific to each alternative and the regression equation that describes the mathematical relationship between road spacing and road density.

5. Determine the miles of road to be removed from the existing road network. This prediction is based on the percent reduction desired by each alternative and the difference between existing road densities and target road densities.

6. Determine future road densities by alternative by adding future road miles of road to be constructed in commercial unroaded area and target road miles in roaded areas divided by total commercial acres by alternative.

Table 1. Presently Roaded Landscape

Landscape	Existing Rd Miles	Existing Rd Density (miles/sq. mile)	Area (sq. miles)
Jocko	834.7	6.32	132.18
Missions	80.9	4.86	16.64
North Missions	202.5	5.88	34.48
Salish	545.2	6.97	78.16
Southwest	286.2	6.47	44.9
West	806.9	6.73	119.98
Total	2756.3		426.34

Table 2. Remaining Available Unroaded Area

Landscape	Alternative 1	Alternative 2	Alternative 3
Jocko	6.22	6.57	8.24
Missions	2.38	3.32	3.32
North Missions	1.65	2.7	7.67
Salish	2.23	2.83	3.24
Southwest	8.21	9.53	11.28
West	3.3	3.98	3.98
Total	23.99	28.93	37.73

Table 3. Future Roading in Unroaded Areas (miles)
Road density = -5.5056 Ln (road spacing) + 43.509

Landscape	Alt 1 1500'=3.25m/s	Alt 2 1200'=4.47m/s	Alt 3 1000'=5.48m/s	Alt 4 746'=7.09m/s	Alt 5
Jocko	20.2	29.4	45.2	58.4	0
Missions	7.8	14.8	18.2	23.5	0
North Missions	5.4	12.1	42.0	54.4	0
Salish	7.3	12.7	17.8	23.0	0
Southwest	26.7	42.6	61.8	80.0	0
West	10.7	17.8	21.8	28.2	0
Total	77.9	129.3	206.8	267.5	0

Table 4. Future Road Reductions in Currently Roaded Areas

Alternative 1: Reduction in road miles on 20% of landscape				
Landscape	**20% of area (sq. miles)**	**Miles at Existing Density**	**Miles at New Density**	**Miles Reduced**
Jocko	26.4	167.1	85.9	81.2
Missions	3.3	19.6	10.8	8.8
North Missions	6.9	40.5	22.4	18.1
Salish	15.6	109	50.7	58.3
Southwest	9	58.2	29.2	29
West	24	161/5	78	83.5
Total	85.2	555.9	277	278.9
Alternative 2: Reduction in road miles on 15% of landscape				
Landscape	**15% of area (sq. miles)**	**Miles at Existing Density**	**Miles at New Density**	**Miles Reduced**
Jocko	19.8	125.1	88.5	65.6
Missions	2.5	12.2	11.2	1
North Missions	5.2	30.6	23.2	7.4
Salish	11.7	81.5	52.3	29.2
Southwest	6.7	43.3	29.9	13.4
West	18	121.1	80.5	40.6
Total	63.9	413.8	285.6	157.2
Alternative 3: Reduction in road miles on 10% of landscape				
Landscape	**10% of area (sq. miles)**	**Miles at Existing Density**	**Miles at New Density**	**Miles Reduced**
Jocko	13.2	83.4	72.3	11.1
Missions	1.7	8.3	9.3	0
North Missions	3.4	20.0	18.6	1.4
Salish	7.8	54.4	42.7	11.7
Southwest	4.5	29.1	24.7	4.4
West	12	80.8	65.8	15
Total	42.6	276.0	233.4	43.7

Table 5. Predicted Future Road Density

Alternative #	Area	Total Rd Miles	Road Density
1	450.3	2555.4	5.67
2	455.3	2728.5	5.99
3	464.1	2919.4	6.29
4	464.1	3023.8	6.52
5	464.1	1378	2.97

Appendix L

List of BIA Main Haul Roads

BIA Main Haul Road Numbers
(Note: BIA roads may only include portions of a forest road)

BIA NO.	FORESTRY NO.
103	J- 1 000
106*	NONE
112	D- 1 000
114*	HS-3000, HS-3040, HS-4050, HS-4060
115	D-3000
122	H-2000, H-2200, H-3000, H-3500
123	V-1000, V-1200, V-3000, V-5000, V-5700, V-5701, V-5750, D-8100
124	V-4000
125*	M-5000
126*	M-3000
127	L-2000, L-2050
130	D-5000
132	HS-5000
133	HS-4000, HS-4020
134	C-4000, C-6000
142	C-2150, C-6000
145	P-2000, P-2400, P-2410
146*	W- 11 00, P-5200
148*	I-1060, I-1100, I-1110, I-1111, I-1120,
149*	I-1100, I-1350
150	C-2000, C-3000, C-3100, C-4150
157	D-8000, D-8500
164	C-1000, C-2000
165	1-1000
166	D-6000, D-6150, D-7000, D-7001
186	HS-2000, HS-2100
188	B-2000
202	L-1000, HS-1000
215	FB-1000, FB-3000, FB-4000
217	V-1000, V-1100
1012	P-5000
1015	W-1000
1021	L-3000, L-4000
1022	L-1000
1023	L-1000
1114	P-3000, P-3010, P-4000
1281	L-1000
1282	L-5000, L-5060, L-6200
1885*	B-2500

* BIA Roads not on the main haul system as identified by BIA Forestry (9/94).

Appendix M

Scenery Model and Viewpoints

Introduction

The Flathead Reservation was divided into 6 Landscapes following geographical boundaries (Jocko, Missions, North Missions, Salish Mountains, Southwest, and West) and further separated into similar subunits (see Figure 3). The following information describes the 6 Landscape's current scenery conditions. It should be noted that all landscapes and their respective subunits can be viewed from a major transportation corridor and/or community, which results in the highest sensitivity level rating of 1 for all landscapes. An example of this sensitivity level is shown from a recent study of Flathead Reservation highway travelers, which revealed that 92% of the out-of-state visitors considered scenery the most important attraction to this area (Christensen 1993).

Scenery Study Objectives

Scenery data, aside from a general inventory produced in the 1982-91 Flathead Indian Reservation Forest Management Plan Environmental Assessment (University of Montana 1984), is largely lacking for the Reservation landscape. Without a detailed inventory of the scenery resources, developing a new holistic forest management plan will be very difficult at best.

The scenery resource study was completed in four phases, with a critical path analysis flow chart and narrative task checklist to facilitate completion of the study.

Phase One consisted of the following tasks:

1. **Research best methodology for describing and classifying landscapes.**

2. **Compile existing data on scenery from Tribal, State and Federal land management agencies on the Reservation.**

3. **Review and identify critical viewpoints and viewsheds in the six landscapes.**

4. **Develop management standards recommended management variables for those standards and environmental indicators for monitoring activities.**

Phase Two of the study included the following tasks:

1. **Photograph viewsheds from identified viewpoints.**

2. **Classify the scenery of each landscape or by subunits of each landscape.**

3. **Write landscape specific narrative descriptions.**

4. Refine viewpoints and landscape boundaries.

Phase Three of the study included the following tasks:

1. Enter landscape and subunit boundaries into GIS computer program.

2. Attach unit narratives as an attribute file to each landscape on GIS.

3. Take representative photo of each of the six landscapes for display in the final plan.

Phase Four included the following tasks:

1. Describe desired future scenery structure in narrative.

2. Simulate rehabilitation of impacted viewshed with computer model (paint-brush and tin).

Materials and Methods

Methodologies of describing and classifying landscapes for setting scenery management objectives are varied. However, because the Tribal land base is primarily forested, the U.S. Forest Service landscape management program and it's Visual Management System (National Forest Landscape Management, Volume 1, 1973, and Volume 2, 1974) will be used for baseline research methods and terminology. This system works from analyzing three basic concepts of our visual reaction to the environment:

Visual reaction to the environment

1. Characteristic Landscape - Regardless of the size or segment of the landscape being viewed, it has an identifiable character.

2. Variety - Visual variety is desirable. Landscapes rich in variety are likely to be more appealing than ones tending toward monotony.

3. Deviations - Deviations from a characteristic landscape vary in their degree of contrast and can usually be designed to achieve visually acceptable variety.

These concepts were explored and weighted by inventorying the character type or scenic integrity level, the variety class and the sensitivity level of each landscape or subunit.

The first step was to determine representative viewpoints along major transportation routes, population centers, or recreation areas, which provided views of the forested areas in all six landscapes. A 35mm camera was used to photograph the views in color slide and print, and black and white print film for analysis and report production. Each viewpoint was documented on a 1:100,000 scale map for recording and GIS modeling purposes.

The photos and field knowledge were then used to determine the scenic integrity level (current landscape character viewed from that point in time), the variety class, and the sensitivity level of each landscape subunit.

The results of the survey data were used to determine the measurable standards or objectives for the visual management of Reservation lands. These objectives were keyed to the values of the survey and each describes a different degree of acceptable alteration of the natural landscape based upon the importance of the scenery.

Additionally, short-term management objectives will be implemented to either upgrade areas with existing visual impacts which do not meet the set objective for the area or to enhance landscapes having scenic potential.

Scenic Integrity Levels for the Existing Condition

Level	Definition
Unaltered (Very High)	Area viewed is intact with only minor deviations. Visual harmony is expressed at highest level.
Appears Unaltered (High)	Area viewed appears intact. Deviations are not evident because they repeat form, line, color, texture, and pattern common to landscape character.
Slightly Altered (Moderate)	Area viewed appears slightly fragmented. Noticeable deviations are subordinate to the landscape character. Visual harmony slightly reduced.
Moderately Altered (Low)	Area appears moderately fragemented. Deviations begin to dominate, but still borrow from attributes such as size, shape, edge effect, and pattern of natural openings.
Heavily Altered (Very Low)	Area appears extremely fragmented. Deviations extremely dominant and borrow little from landscape character. In need of rehabilitation. (Not to be used as management standard.)

Scenic Integrity Levels for the Desired Condition

Level	Definition
Distinctive	The following areas are distinctive: the Tribal Wilderness, everything above 6000' in the Jocko and Southwest landscapes, the River Corridor, and everything within three miles of the Flathead Lake shoreline.
Common	Everything not classifed as distinctive is considered common.
Very High	Visible from 3 or more viewpoints, slopes greater than 30%
High	Visible from 3 or more viewpoints, slopes less than 30%
Moderate	Visible from less than 3 viewpoints, slopes less than 30%
Low	Not visible

Viewpoints

The **North Missions Landscape** was analyzed from the following viewpoints (8):

NP001	Blue Bay Campground	
PN040	Elmo	
NM002	Finley Point	
NP003	Finley Point State Park	
	Highway 93	
MN005		Minesinger Trail Road intersection
NM058		Scenic turnout on Polson Hill
NPM004	Polson (KwaTaqNuk)	
PN039	Wild Horse Island	

The **Missions Landscape** was analyzed from the following viewpoints (16):

PM031	Bison Range	
NM002	Finley Point	
	Highway 93	
MN005		Minesinger Trail Road intersection
MP008		Scenic turnout near Beaverhead Lane
MJPS010		Post Creek Hill
JM022		Mission Mountains Scenic Turnout (Ravalli Hill)
NM058		Scenic turnout on Polson Hill
JM015	Jocko Flats (P500 & P1000 intersection)	
JM014	Jocko Prairie	
MJP012	Mission Dam Homesites	

PMJS009	Ninepipe Interpretive Site
MP006	Pablo
NPM004	Polson (KwaTaqNuk)
MP007	Ronan
MJP011	St. Ignatius
JM013	Twin Lakes

The **Jocko Landscape** was analyzed from the following viewpoints (15):

	Highway 93
MJPS010	Post Creek Hill
J016	Evaro at State Dept. Garage
J018	McClure Road on Evaro Hill
J019	Lumpry Road south of Arlee
J020	White Coyote Road
J021	Valley Creek Road
JM022	Ravalli Hill Scenic Turnout
JM015	Jocko Flats (P500 & P1000 intersection)
JM014	Jocko Prairie
J017	Joe's Smoke Ring on Evaro Hill
MJP012	Mission Dam Homesites
PMJS009	Ninepipe Interpretive Site
MJP011	St. Ignatius
JM013	Twin Lakes
J023	Vanderburg Campsite at Valley Creek

The **Southwest Landscape** was analyzed from the following viewpoints (15):

	Highway 93
MJPS010	Post Creek hill
	Highway #200
PS027	Gunderson Creek
WS054	Seepay Creek
	Highway #212
PS030	Appx. 1.75 miles north of Dixon Agency
	Highway #382
WSP052	Perma bridge
	Lower Flathead River
PS024	Magpie Spring Creek
PS025	West of Magpie Creek
PS026	McDonald Basin
PS028	Near Hoskins Landing
PS029	North of Dixon Agency
WS053	Near Painted Rocks

WS055		Below Burgess Lake
	Moiese Valley Road	
PS032		Corner near Foust Farm
PS033		Near Moiese Valley Canal crossing
PMJS009	Ninepipe Interpretive Site	

The **West Landscape** was analyzed from the following viewpoints (14):

WP049	Dog Lake cutoff road (up Camas Creek)	
	Highway #28	
PW043		Battle Butte School county road intersection
PW044		Curve north of Niarada
WP047		Highway 382 intersection
W048		Dog Lake
WP057		Garden Creek Road intersection
	Highway #200	
WS054		Seepay Creek
	Highway #382	
WP050		Dog Lake cutoff road (Camas Creek) intersection
WP051		Curve on south end of Camas Prairie straightaway
WSP052		Perma bridge
WP046	Hot Springs (1 mile east)	
WP045	Lone Pine Reservoir	
	Lower Flathead River	
WS053		Near Painted Rocks
WS055		Below Burgess Lake

The **Salish Mountains Landscape** was analyzed from the following viewpoints (41):

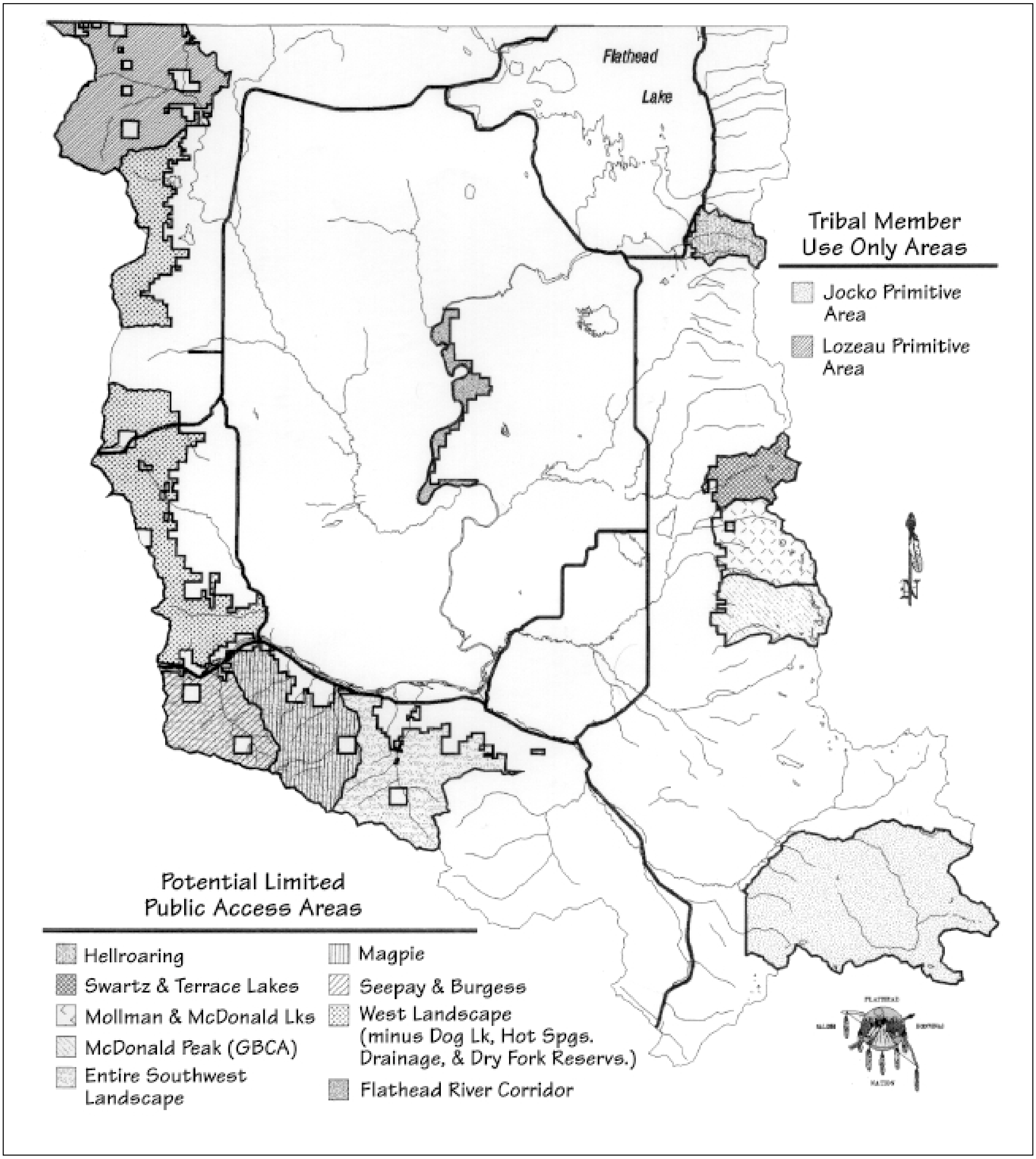
PM031	Bison Range	
NP001	Blue Bay Campground	
P038	Buffalo Bridge	
WP049	Dog Lake cutoff road (up Camas Creek)	
PN040	Elmo	
NP003	Finley Point State Park	
	Highway 28	
P041		Crest of the hill above Elmo
P042		Deep Draw
PW043		Battle Butte School county road intersection
PW044		Curve north of Niarada
WP047		Highway 382 intersection
WP057		Garden Creek Road intersection
	Highway 93	
MP008		Scenic turnout near Beaverhead Lane

MJPS010		Post Creek Hill
	Highway 200	
PS027		Gunderson Creek
	Highway 212	
PS030		Appx. 1.75 miles north of Dixon Agency
	Highway #382	
WP050		Dog Lake cutoff road (up Camas Creek) intersection
WP051		Curve on south end of Camas Prairie straightaway
WSP052		Perma bridge
WP046	Hot Springs (1 mile east)	
WP045	Lonepine Reservoir	
	Lower Flathead River	
PS024		Magpie Spring Creek
PS025		West of Magpie Creek
PS026		McDonald Basin
PS028		Near Hoskins Landing
PS029		North of Dixon Agency
P037		Goose Bend
P038		Buffalo Bridge
MJP012	Mission Dam Homesites	
	Moiese Valley Road	
PS032		Corner near Foust Farm
PS033		Near Moiese Valley Canal crossing
P034		North of Crow Creek crossing
PMJS009		Ninepipe Interpretive Site
MP006	Pablo	
NPM004	Polson (KwaTaqNuk)	
MP007	Ronan	
	Sloan Road	
P035		Crest of hill before drop to river north of Sloan’s Bridge
P036		Corner near Whiskey Trail Ranch
P056		Corner above Big Bend
MJP011	St. Ignatius	
PN039	Wild Horse Island	

Appendix N

Proposed Limited Public Access Areas

(Please refer to table 3-10 in main document for the options by landscape)



Appendix O

Diversified Recreational Opportunity Level (DROL) Classification

Definitions

The DROL system categorizes lands into the following five classifications for the purposes of recreation planning:

A. Primitive: Unmodified natural or natural appearing environment. No vegetative alterations.

B. Semi Primitive Non Motorized: Natural appearing environment. Vegetative alterations limited to sanitation salvage in units very small in size and number, widely dispersed and not evident.

C. Semi Primitive Motorized: Predominantly natural appearing environment. Vegetative alterations very small in size and number, widely dispersed and visually subordinate.

D. Roaded Natural: Most naturally appearing environment as viewed from sensitive roads and trails. Vegetative alterations done to maintain desired visual and recreational characteristics.

E. Roaded Modified: Substantially modified environment except for campsites. Roads, landings, slash and debris may be strongly dominant from within, yet remain subordinate from distant sensitive roads and highways.

F. Rural/Urban: Natural environment is culturally modified yet attractive (i.e. pastoral farmlands). Backdrop may range from alterations not obvious to dominant. Urbanized environment with dominant structures, traffic lights and paved streets. May have natural appearing backdrop. Recreation places may be city parks and large resorts. Vegetation in planted and maintained.

Appendix P

Socio-Economic Calculations

Table 1. Costs and acres associated with prescribed burn treatments

Alternative	Type	Short term acres	Costs	Long-term acres	Costs
Alternative 1	Pile and burn	6540	$58,860	16650	$149,850
	BCB	27630	$2,873,520	29520	$3,070,080
	Grass/woodland	62905	$251,620	219125	$876,500
	Parklike	55740	$836,100	176680	$2,650,200
	Total		$4,020,100		$6,746,630
	Annual Cost		**$134,003**		**$74,963**
Alternative 2	Pile and burn	8550	$76,950	23310	$209,790
	BCB	27720	$2,882,880	32940	$3,425,760
	Grass/wood	48880	$195,520	162405	$649,620
	Parklike	36010	$540,150	118135	$1,772,025
	Total		$3,695,500		$6,057,195
	Annual Cost		**$123,183**		**$67,302**
Alternative 3	Pile and burn	11970	$107,730	34920	$314,280
	BCB	24510	$2,549,040	21240	$2,208,960
	Grass/wood	14045	$56,180	42130	$168,520
	Parklike	25390	$380,850	70940	$1,064,100
	Total		$3,093,800		$3,755,860
	Annual Cost		**$103,127**		**$41,732**
Alternative 4	Pile and burn	29940	$269,460	75510	$679,590
	BCB	8790	$914,160	5400	$561,600
	Grass/wood	6845	$27,380	20530	$82,120
	Parklike	0	$0	0	$0
	Total		$1,211,000		$1,323,310
	Annual Cost		**$40,367**		**$14,703**
Alternative 5	Pile and burn	1890	$17,010	8820	$79,380
	BCB	5850	$608,400	1170	$121,680
	Grass/wood	6845	$27,380	20530	$82,120
	Parklike	1470	$22,050	10825	$162,375
	Total		$674,840		$445,555
	Annual Cost		**$22,495**		**$4,951**

Economic Returns by Alternative

Economic returns for alternatives are based on projections of volume made by the model for the short term (30 years) and the long term (90 years). The volume of harvest was further divided into yellow pine greater than 20" dbh and other species. This was done to reflect the higher value that yellow pine receives. The following table shows the projected volumes and species by alternative and time period.

Annual yield (mmbf/yr) by alternative and species

Alt	Short Term			Long Term		
	mmbf/yr	YP > 20	Other spp.	mmbf/yr	YP > 20	Other spp.
1	14.9	0.7	14.2	16.9	1.8	15.1
2	18.1	0.7	17.4	19.0	1.9	17.0
3	16.6	0.7	15.9	20.5	2.2	18.3
4	22.6	1.0	21.5	23.6	2.6	21.0
5	3.0	0.4	2.6	3.0	0.6	2.4

The volumes in the table are essentially allowable cuts. From these the Indian logger set asides must be subtracted. Set asides are:

Alternative	**Set aside**
1	1 -2 MM
2	2 -3 MM
3	3-4 MM
4	1 -2 MM
5	3 MMI will use the midpoint for calculations.

Alternative 1

700 M PP + 14.2 MM other = 14.9 MM
700M is 4.7% and 14.2MM is 95.3%
Set aside amounts:
1.5 MM x 4.7% = 70M YP
1.5MM x 94.3% = 1.4MM other

This leaves 630M YP for contracts and 12.8 MM other for contracts.

Contracts calc:

630M x $340.64	=	$ 214,603	
12.8MM x $257.23	=	$3,292,544	
Total	=	$3,507,147	

Indian Set aside calc:

70M x $340.64 x .36		=	$ 8,584
1.4MM x $257.23 x .36=		$129,644	
Total		=	$138,228

Summing Contracts with Indian set aside gives total stumpage for the alternative; $3,645,375 which is rounded to **$3.6 million**.

Alternative 2

700 M PP + 17.4 MM other = 18.1 MM
700M is 3.9% and 17.4 M is 96.1%
Set aside amounts:

2.5 MM x 3.9%	=	100M YP
2.5MM x 96.1%	=	2.4MM other

This leaves 600M YP for contracts and 15.0 MM other for contracts.

Contracts calc:

600M x $340.64	=	$ 204,384	
15.0 MM x $257.23	=	$3,858,450	
Total	=	$4,062,834	

Indian Set aside calc:

100M x $340.64 x .36	=	$ 12,263	
2.4MM x $257.23 x .36=		$222,247	
Total		=	$234,510

Summing Contracts with Indian set aside gives total stumpage for the alternative; $4,297,344 which is rounded to **$4.3 million**.

Alternative 3

700 M PP + 15.9MM other = 16.6 MM
700M is 4.2% and 15.9 M is 95.8%
Set aside amounts:

3.5 MM x 4.2%	=	150M YP
3.5MM x95.8%	=	3.35MM other

This leaves 550M YP for contracts and 12.55 MM other for contracts.
Contracts calc:

550M x $340.64	=	$ 187,352
12.55 MM x $257.23	=	$3,228,236
Total	=	$3,415,588

Indian Set aside calc:

150M x $340.64 x .36	=	$ 18,395
3.35MM x $257.23 x .36	=	$310,219
Total	=	$328,614

Summing Contracts with Indian set aside gives total stumpage for the alternative; $3,744,202 which is rounded to **$3.7 million**.

Alternative 4

1.0M PP + 21.5 MM other	=	22.5 MM

1.0M is 4.4% and 21.5 M is 95.6%
Set aside amounts:

1.5 MM x 4.4%	=	66M YP
1.5MM x 95.6%	=	1.43 MM other

This leaves 934 M YP for contracts and 20.1 MM other for contracts.

Contracts calc:

934M x $340.64	=	$ 318,158
20.1 MM x $257.23	=	$5,170,323
Total	=	$5,488,481

Indian Set aside calc:

66M x $340.64 x .36	=	$ 8,094
1.4MM x $257.23 x .36	=	$129,644
Total	=	$137,738

Summing Contracts with Indian set aside gives total stumpage for the alternative; $5,626,219 which is rounded to **$5.6 million**.

Alternative 5

The entire harvest is allocated to Indian loggers

400M YP + 2.6MM other	=	3.0 MM

400M x $340.64 x .36	=	$ 49,052
2.6MM x $257.23 x .36	=	$240,767
Total	=	$289,819 which is rounded to **$290,000**

Appendix Q

Applicable Laws and Tribal Ordinances

Tribal Ordinances and Federal Laws and policies considered in the drafting of this document include (but are not limited to) the following:

Federal Laws and Policies

National Indian Forest Resource Management Act

National Historic Preservation Act

Archaeological Resource Protection Act

Native American Graves Protection and Repatriation Act

American Indian Religious Freedom Act

Clean Water Act

Safe Drinking Water Act

Clean Air Act

Fish and Wildlife Coordination Act

Endangered Species Act

Resource Conservation and Recovery Act

National Environmental Policy Act

25 CFR (Code of Federal Regulations)

Reservation Class 1 Airshed Designation

Tribal Ordinances, Resolutions and Policies[1]

Ordinance 76A Tribal Water Planning Ordinance

Ordinance79A Mission Mountains Tribal Wilderness Guidelines and Policies

Ordinance 87A Aquatic Lands Conservation Ordinance

Ordinance 89B Water Quality Management Ordinance

Ordinance 45B Tribal Land Ordinance

Ordinance 78B Natural Resources Department Ordinance

Ordinance 44D Tribal Hunting and Fishing Conservation Ordinance

Ordinance 95 Cultural Resource Protection Ordinance

Ordinance 61B Tribal Timber Permit Policy and Regulations

Resolution 97-40 Resolution defining the Boundaries and Management Activities for the Lozeau Primitive Area

Lower Flathead River Corridor Management Plan

Grizzly Bear Management Plan

Mission Mountains Tribal Wilderness Management Plan

Wilderness Buffer Zone Management Plan

Mission Mountains Tribal Wilderness Fire Management Plan

Flathead Reservation Fuels Management Plan

Appendix Q

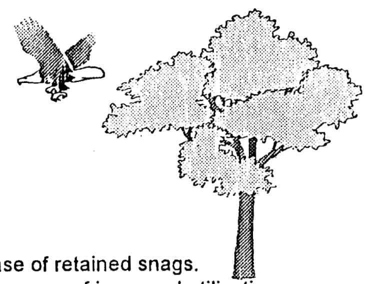
Tribal Fisheries Policy
Annual Fire Management Plan
Timber Use Policy Statement
Fisheries Management Plan of the Flathead Indian Reservation

1 This list is not inclusive. Amendments, though not listed, are included.

Appendix R

CSKT Snag Policy

SNAG RETENTION PRESCRIPTIONS
FLATHEAD INDIAN RESERVATION



Administrative Guidelines

1. Snags or culls should be randomly distributed rather than clumped.
2. Retention snags should be marked in leave-tree marked units.
3. Retention snags should NOT be marked in cut-tree marked units.
4. Timber sale contracts should use appropriate "clauses" to protect retention snags.
5. In harvest units scheduled for site prep. underburning, slash should be removed near the base of retained snags.
6. Retention snags needed to meet CS&KT tribal forest management policy will be left at the expense of improved utilization.
7. Do not mark hard snags for retention within 200 feet of a road unless they are below the road and lean downhill.
8. Retention tree/snags are not available to the purchaser or employees for commercial/free use.
9. The sale administrator must be familiar with the sale marking guides and the contract wording to avoid approving removal of retention trees/snags.
10. Retention snags which may be necesarry to remove for safety purposes should be personnally reviewed by the sale administrator before approval is given to cut. Felling should be avoided if possible.

Definitions & Desirable Characteristics

Hard Snag	Soft Snag
Sound or with soft heartwood	Obvious rot with firm wood present
Top present or broken	Broken top
Woodpecker holes	Same
NOT fire killed, case-hardened or pitched	Same
Vertical cracks, fissures	Same

Replacement Tree Characteristics

Live cull
Heart rot, conks, wounds, scars, broken top or branches
Dead areas within crown
Dead or broken top
Not excessively fire damaged (lower branches normal)

When available, select for retention:

Larger snags over smaller ones
Broken tops over intact tops
Diseased over healthy trees
Cull over merchantable
Live cull over dead merchantable
Larch over ponderosa over Douglas-fir over grand fir over all others
Trees with woodpecker activity over trees without
Snags with vertical, straight boles over leaning, curved boles

SNAG RETENTION NEEDS (per acre)

	HABITAT GROUP 1 & 2	3	4	5	6
Total Hard Snags					
(>10" DBH & 15' tall)	4	3	3 1/2	1 1/2	1 1/2
(>20" DBH & 40' tall)	1/10 ac.			0	0
Live Replacement					
(>20" DBH & 40' tall)	3/10 ac.			0	0
Total Soft Snags					
Total Dead & Down					
(>6" diam. & 8' long)	8-10 tons	10-15 tons	12-20 tons	10-12 tons	8-10 tons

GROUP 1 (Warm/Dry) HT Code	Phase	GROUP 2 (Mod. Warm/Dry) HT Code	Phase	GROUP 3 (Mod. Cool/Dry) HT Code	Phase	GROUP 4 (Moist) HT Code	Phase	GROUP 5 (Cool/Mod. Dry) HT Code	Phase	GROUP 6 (Cold/Mod. Dry) HT Code	Phase
130	PP/Agsp	250	DF/Vaca	280(270)	DF/Vagl	400 Series (spruce)		640	AF/Vaca	720	AF/Vagl
170	PP/Syal	260	DF/Phma	281(271)	DF/Vagl-Vagl			690	AF/Xete	730	AF/Vasc
210	DF/Agsp	261	DF/Phma-Phma	282(272)	DF/Vagl-Aruv	500 Series (grand fir, redcedar, hemlock)		691	AF/Xete-Vagl		
220	DF/Feid	262	DF/Phma-Caru	290	DF/Libo			692	AF/Xete-Vasc		
230	DF/Fesc	310	DF/Syal	292	DF/Libo-Caru			710	MH/Xete		
311	DF/Syal-Agsp	312	DF/Syal-Caru	320	DF/Caru						
321	DF/Caru-Agsp	313	DF/Syal-Syal	323	DF/Caru-Caru						
				330	DF/Cage						
				350	DF/Aruv						

Appendix S

CSKT Best Management Practices (BMPs)

**FORESTRY BEST MANAGEMENT PRACTICES,
CONFEDERATED SALISH AND KOOTENAI TRIBES 1-95.**

The following definitions and recommendations are a compilation of best management practices (BMP's) for activities on forested lands. These BMP's are a supplement to existing infrastructure, which includes the Tribal Aquatic Lands Conservation Ordinance (ALCO), the Tribal Water Quality Ordinance and the interdisciplinary approach employed to evaluate proposed timber sales. Many of the activities described below are subject to permitting and review through this existing infrastructure.

Additionally, these BMP's are not meant to supercede site specific recommendations. Specifically, as it relates to harvest within streamside management zones (SMZ's) or other sensitive areas, all harvest activity shall be evaluated with the appropriate resource professional.

1.0. DEFINITIONS:

1.1. Channel: A channel is a feature capable of confining and conducting flowing water. A channel has a bed with material influenced by flowing water. Bed materials generally include either silt, sand, gravel, bedrock, vegetation, debris or a combination of these materials. A channel has banks which are incised relative to immediately surrounding topography.

1.2. Dry Draws: Linear depressions in the surrounding topography which conduct flow on a sporadic basis, but not often enough to scour a definable channel. Dry draws often support plant species which favor higher soil moisture levels, but dry draws do not necessarily exhibit full riparian vegetative characteristics. Dry draws generally have higher soil moisture levels than surrounding topography and they may exhibit seasonal saturated soil conditions.

1.3. Hazardous Substance: A material which is by its nature toxic, dangerous to handle or dispose of, or a potential environmental contaminant. Hazardous substances include, among other potential substances, petroleum products, pesticides, herbicides, chemicals and biological wastes.

1.4. High Water Mark: The location on a stream bank or other body of water where the water level normally reaches during peak flow.

1.5. Other Body of Water: Other bodies of water include all aquatic-related resources exclusive of streams and wetlands. Examples include lakes, ponds, canals and drainage systems.

CSKT Best Management Practices (cont.)

1.0. DEFINITIONS cont'd:

1.6. Stream: Natural water course of perceptible extent with definite bed and banks which confine and conduct continuously or intermittently flowing water.

1.6.1. Class 1 Stream: A stream, or reach of stream, which maintains flow for at least six months of the year. Class 1 streams have a channel able to confine and conduct flowing water.

1.6.2. Class 2 Stream: A stream, or reach of stream, which maintains flow annually, but does not necessarily flow for six months of the year. Class 2 streams have a channel able to confine and conduct flowing water.

1.6.3. Class 3 Stream: A stream, or reach of stream, which may or may not flow on an annual basis, but which has a defined channel of perceptible extent which is capable of confining and conducting flowing water. Class 3 streams have width not more less than 3 feet, as measured from high water mark to high water mark.

1.7. Wetlands: These include, at a minimum, areas that remain wet long enough to support a prevalence of plants that are adapted to saturated soil conditions. Wetlands include, but are not limited to marshes, swamps, bogs, elk wallows, springs, seeps and riparian areas.

1.8. Streamside Management Zone: The SMZ is a zone of variable width located on both sides of a stream or surrounding a wetland or other body of water.

1.8.1. Class 1 Stream: The SMZ consists of a 100 foot buffer on both sides of a stream as measured from the high water mark of a stream.
* When a stream braids, or has multiple channels, a SMZ is measured from the high water mark of the outermost channels.
* When riparian vegetation extends beyond a 100 foot buffer, the SMZ width is extended 25 feet beyond the outside perimeter of the riparian vegetation.
* When wetlands, or other bodies of water, border or are within a SMZ, the SMZ width is extended 50 feet beyond the outside perimeter of a wetland or other body of water, or 25 feet beyond the perimeter of the riparian vegetation, whichever is greater.

1.8.2. Class 2 Stream: The SMZ consists of a 100 foot buffer on both sides of a stream as measured from the high water mark of a stream.
* When a stream braids, or has multiple channels, a SMZ is measured from the high water mark of the outermost channels.

CSKT Best Management Practices (cont.)

1.8.2. Class 2 Stream cont'd:

* When riparian vegetation extends beyond the 100 foot buffer, the SMZ width is extended 25 feet beyond the outside perimeter of the riparian vegetation.
* When wetlands, or other bodies of water, border or are within a SMZ, the SMZ width is extended 50 feet beyond the outside perimeter of a wetland or other body of water, or 25 feet beyond the perimeter of the riparian vegetation, whichever is greater.

1.8.3. Class 3 Stream: The SMZ consists of a 50 foot buffer on both sides of a stream as measured from the high water mark of a stream.

* When a stream braids, or has multiple channels, a SMZ is measured from the high water mark of the outermost channels.
* When riparian vegetation extends beyond the 50 foot buffer, the SMZ width is extended 25 feet beyond the outside perimeter of the riparian vegetation.
* When wetlands, or other bodies of water, border or are within a SMZ, the SMZ width is extended 50 feet beyond the outside perimeter of a wetland or other body of water, or 25 feet beyond the perimeter of the riparian vegetation,-whichever is greater.

1.8.4. Wetland or Other Bodies of Water: The SMZ consists of a 50 foot buffer around all sides of a wetland or other body of water. When riparian vegetation extends beyond the 50 foot buffer, the SMZ width is extended 25 feet beyond the outside perimeter of the riparian vegetation.

2.0. ROADS:

2.1. Planning and Location:

2.1.1: Minimize the number of roads constructed in a watershed through comprehensive road planning. Use existing roads where practical, unless use of such roads will cause or aggravate an erosion problem.

2.1.2: Locate roads to fit natural topography and avoid grades greater than 8%, drainage bottoms and topography where large cut slopes will be required.

2.1.3: Locate roads on stable soil and geologic materials. These include well drained soils and rock formations which dip into the slope.

* Avoid slumps and slide-prone areas which may be characterized by steep slopes, highly weathered bedrock, clay layers, concave slopes, hummocky topography and rock formations that dip parallel to the slope.
* Avoid wet areas, including saturated or unstable toe slopes, wetlands, other bodies of water and wet meadows.

CSKT Best Management Practices (cont.)

2.1. Planning and Location cont'd:

2.1.4: Locate roads outside of a SMZ when roads run parallel to stream channels.

2.1.5: Minimize the number of stream crossings and choose stable stream crossing sites perpendicular to stream channels.

2.1.6: Locate roads to provide access to log landing areas which will minimize soil disturbance.

2.1.7: Avoid placing roads in areas suspected to have shallow subsurface drainage which may be intercepted during road construction.

2.2. Design:

2.2.1: Design roads to balance cuts and fills or use full bench construction where stable fill construction material is not available.

2.2.2: Vary road grades to reduce concentrated flow in road drainage ditches, culverts and on fill slopes and road surfaces.

2.2.3: Design stream-crossings for passage of fish, minimum impact on water quality and passage of the 50 year peak discharge event.

2.3. Drainage from Road Surface:

2.3.1: Provide adequate drainage from the surface of all permanent and temporary roads by using out-sloped or crowned roads or rolling dips.

2.3.2: Space road drainage features so peak flow on a road surface or drainage ditch will not exceed the capacity of the individual drainage facilities.

2.3.3: Out-sloped roads are appropriate when fill slopes are stable, road drainage will not flow directly into stream channels and safety concerns can be met. Road surfaces should not be outsloped on slopes in excess of 35%.

2.3.4: Properly constructed rolling dips will drain concentrated runoff from a road surface. Construct rolling dips deep enough into the subgrade so traffic will not obliterate them.

CSKT Best Management Practices (cont.)

2.3. Drainage from Road Surface cont'd:

2.3.5: Skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to improve inlet efficiency. At minimum, use 18" culverts and 3' catch basins. Protect the upstream end of cross-drain culverts from plugging.

2.3.6: Install ditch relief culverts at the gradient of the original ground slope. Armour inlets and outlets with rock or other energy dissipators.

2.3.7: Cross drains, culverts, water bars, rolling dips and other drainage structures should not discharge onto erodible soils, unstable fill materials or into SMZ's where adequate sediment filtration will not occur.

2.4. Construction:

2.4.1: Keep slope stabilization, erosion control, and drainage work current with road construction activities.

2.4.2: Ensure that road drainage features are fully functional prior to seasonal runoff and ensure that road sections are not left in an unstable condition over winter.

2.4.3: Stabilize erodible, exposed soils by seeding or other suitable means prior to seasonal runoff.

2.4.4: At the toe of fill slopes within a SMZ, pile slash in a row parallel to a road. Limit the height, width and length of "slash filter windrows," so not to impede wildlife movement.

2.4.5: Reseed fill slopes.

2.4.6: Construct cut and fill slopes to avoid slope instability.

2.4.7: Never incorporate large woody debris into the fill portion of a road prism.

2.4.8: Minimize sediment production from borrow areas by designing for stable slopes, controlling drainage and reseeding.

2.5. Maintenance:

2.5.1: During advance maintenance work, reconstruct only to the extent necessary to provide adequate drainage and safety.

CSKT Best Management Practices (cont.)

2.5. Maintenance cont'd:

2.5.2: Avoid disturbing stable road surfaces.

2.5.3: Do not disturb roadside vegetation more than required to safely serve traffic needs.

2.5.4: Minimize road related activities when soils appear excessively wet.

2.5.5: Grade road surfaces only as often as necessary to maintain a stable running surface and to retain original drainage features.

2.5.6: Do not berm road material on either side of a road perimeter.

2.5.7: Maintain drainage features through periodic inspection and maintenance, including cleaning rolling dips and cross drains, repairing ditches and clearing debris from culverts.

2.5.8: Do not cut the toe of cut slopes, or remove established vegetation, when grading roads or cleaning ditches.

2.5.9: Provide breaks in a snow berm to allow for drainage during winter activities.

2.5.10: Haul excess road materials removed by maintenance operations to stable sites away from SMZ's.

2.6. Road Closure and Abandonment:

2.6.1: Stabilize cut and fill slopes, borrow areas and any other road-related feature.

2.6.2: Remove cross drainage and ditch relief culverts and provide for permanent runoff control on abandoned roads.

2.6.3: Reseed all road surfaces, cut and fill slopes, log decking areas and borrow areas.

2.6.4: When culverts and bridges are retained, provide for long term maintenance.

2.6.5: When culverts and bridges are removed, reconstruct stream crossing to a stable configuration.

CSKT Best Management Practices (cont.)

3.0. STREAM CROSSINGS:

3.1. General:

3.1.1: Locate stream crossings perpendicular to the main channel.

3.1.2: Adjust road grade to reduce the volume of water carried by road drainage structures toward stream crossings.

3.1.3: Direct road drainage away from streams and stream crossing sites.

3.1.4: Bridges are generally preferable to culverts and shall be installed in suitable sites.

3.1.5: For temporary crossings, consider improved drive through stream crossings (requires ALCO permit).

3.1.6: Minimize stream channel disturbances and potential sediment problems during installation of stream crossing structures.
* Do not place erodible material into stream channels.
* Remove stockpiled material from high water zones.
* Locate temporary construction bypass roads in locations which will have minimal disturbance.

3.1.7: Install culverts to conform to the natural bed and slope of stream channels.
* Place culverts slightly below normal stream grade to avoid culvert outfall barriers.
* Do not alter stream channels upstream from culverts, unless unavoidable.

3.1.8: Install culverts to prevent erosion of fill. Compact fill material to prevent seepage and potential failure.

3.1.9: Armour the inlet and outlet with rock or other suitable material.

3.1.10: Install culverts during low flow, when possible.

3.1.11: Use culverts with a minimum diameter of 18 inches for permanent stream crossings and cross drains.

CSKT Best Management Practices (cont.)

4.0. STREAMSIDE MANAGEMENT ZONE:

4.1. General Guidelines:

4.1.1: Avoid mechanical activities within SMZ's, aside from roads which cross streams or approved, temporary crossings.

4.1.2: Always directionally fell trees to the outside of a SMZ.

4.1.3: Do not broadcast burn in a SMZ.

4.1.4: When applying a treatment in a SMZ, minimize disturbance to the deciduous trees and shrubs.

4.1.5: Use whole tree skidding methods in a SMZ.

4.1.6: Silvicultural treatments in a SMZ should be done during frozen or dry weather conditions.

4.1.7: When operations will occur adjacent to a SMZ, clearly mark the SMZ boundary to avoid operation in a SMZ.

4.1.8: Do not handle, store, apply or dispose of hazardous or toxic materials in a SMZ.

4.1.9: To provide for woody debris recruitment, remove only trees in a SMZ which will not recruit to the stream.

4.2. Streams, Wetlands and Other Bodies of Water:

4.2.1: Silvicultural treatment in Class 1 through Class 3 streams shall be restricted to salvage operations when forest conditions exceed criteria outlined in the following table (taken from Interim Flathead Reservation Old Growth Characteristics).

4.2.2: Silvicultural treatment in Wetlands and Other Bodies of Water shall be restricted to salvage operations when forest conditions within a SMZ exceed criteria outlined in the following table (taken from Interim Flathead Reservation Old Growth Characteristics).

4.3. Dry Draws:

4.3.1: Apply harvest prescriptions which maintain at least 30 percent of total shrub and tree canopy cover in dry draws.

CSKT Best Management Practices (cont.)

GUIDELINES FOR SILVICULTURAL ACTIVITIES WITHIN STREAMSIDE MANAGEMENT ZONES.*
FLATHEAD INDIAN RESERVATION, MONTANA

OLD GROWTH TYPE	FOREST TYPE	HABITAT TYPE GROUPS	LARGE TREE AGE	TREES/AC > DBH	DBH VARIATION	BASAL AREA	SNAGS > 9"	DEAD/ BROKEN TOPS > 9"	% DECAY BY VOLUME > 9" DBH	AMOUNT DOWN WOODY > 9"	TREE CANOPY LAYERS
#1	PP, DF,L	A-1, B-1 A,B,C	170	8>21"	M	117 TO 239	6 0 TO 22	12 3 TO 23	5 0 TO 11	L TO M	MULTIPLE/ SINGLE
#2	DF, L, GF	C-1 C, D	170	8>21"	H	128 TO 220	7 2 TO 37	11 0 TO 21	5 2 TO 12	M	MULTIPLE
#3	LP	C-1, D-1, E-1, F-1, G-1, H-1 C, D, E, F	140	10> 13"	L	146 TO 212	19 0 TO 92	11 5 TO 22	6 2 TO 15	H	SINGLE
#4	AF, DF,GF, C, L	D-1, E-1, F-1, D, E, F	180	10> 21"	H	111 TO 302	15 2 TO 43	9 0 TO 19	9 1 TO 31	H	MULTIPLE
#5	AF, DF, GF, L	G-1, H-1 D, E, F	180	10>17"	M	107 TO 239	12 3 TO 36	9 1 TO 18	6 0 TO 12	H	MULTIPLE
#6	AF, WSL	I-1 G	180	10 > 13"	M	132 TO 204	25 5 TO 38	11 2 TO 31	10 2 TO 17	M	MULTIPLE
#7	LP	I-1 G	140	30 > 9"	L	139 TO 189	17 9 TO 22	8 TO.14	5 0 TO 11	H	SINGLE/ MULTIPLE
#8	AF, WSL NOT PRESENT	J-1	180	20 > 13"	M	174 TO 191	37 33 TO 40	12 10 TO 14	5 0 TO 8	M	SINGLE

PP = PONDEROSA PINE DF = DOUGLAS FIR L = WESTERN LARCH LP = LODGEPOLE PINE WSL = WHITEBARK, LIMBER PINE, SUBALPINE LARCH
AF = ALPINE FIR S = SPRUCE GF = GRAND FIR C = WESTERN RED CEDAR

* Table Adapted From "Interim Flathead Reservation Old Growth Characteristics," dated July, 1994

CSKT Best Management Practices (cont.)

4.3. Dry Draws cont'd:

4.3.2: Limit mechanically-disturbing activities to frozen and dry weather conditions.

4.3.3: Water bar and seed skid trails which run parallel to dry draws.

4.3.4: Avoid concentrations of slash which, when burned, will produce bare soils and inhibit normal revegetation of the site.

4.3.5: If, during saturated soil conditions, shallow subsurface drainage is intercepted and brought to the surface, restore the subsurface drainage pattern. If this fails, concentrate flow into stable drainage structures.

5.0. TIMBER HARVESTING:

5.1. Harvest Design:

5.1.1: Where feasible, avoid locating even-aged units directly adjacent to a SMZ. Try to apply selection harvest prescriptions.

5.1.2: Avoid planning even aged harvest units on opposite sides of a SMZ. Stagger units on opposite sides of a SMZ.

5.1.3: Design harvest units which minimize windthrow inside a SMZ.

5.1.4: Design and locate skid trails and skidding operations to minimize soil disturbance. Consider erosion potential and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes.

5.1.5: Avoid locating log decking and landing areas where skidding across drainage bottoms will be required.

5.2. Additional Harvesting Activities:

5.2.1: Tractor skid only when compaction, displacement and erosion will be minimal.

5.2.2: Do not skid with the blade down.

CSKT Best Management Practices (cont.)

5.2. Additional Harvesting Activities cont'd:

5.2.3: For each landing, skid trail, fire trail or borrow area provide a drainage system to control the dispersal of water and to prevent soil displacement.

5.2.4: Do not use switchback ("goback") skid trails.

5.2.5: When natural revegetation is inadequate to prevent soil displacement, apply seed and construct water bars or other structures on skid trails, landings, fire trails and borrow areas.

5.2.6: Drainage features should be installed or reconstructed on roads upon completion of seasonal operations. Roads should be re-seeded as needed and berms on road perimeters should be removed at this time.

5.2.7: Trees which impede proper road maintenance should be removed during harvest operations.

5.3. Slash Treatment and Site Preparation:

5.3.1: Use brush blades on dozers when piling slash.
* Avoid use of dozers with angle blades.
* Site preparation equipment producing irregular surfaces is preferred.

5.3.2: Scarify the soil only to the extent necessary to meet the reforestation objective of a site.

5.3.3: Carry out brush piling and scarification when soils are frozen or dry enough to minimize soil compaction or displacement.

5.3.4: Stabilize or reclaim landings and temporary roads upon completion of use.

5.3.5: Avoid heavy slash piling and burning in swales and dry draws.

6.0. WINTER LOGGING:

6.1. Harvest Planning:

6.1.1: Consider snow-road construction and winter harvesting when logging in sensitive areas including wet meadows, areas with high water tables, SMZ's, wetlands or other bodies of water.

CSKT Best Management Practices (cont.)

6.1. Harvest Planning cont'd:

6.1.2: Conduct winter logging operations when the ground is frozen or snow cover is adequate to minimize site disturbance. If conditions change and erosion hazard increases, suspend operations.

6.2. Road Construction and Harvesting Considerations:

6.2.1: During cold weather, plow snow cover off roadway to facilitate deep freezing of a road grade prior to hauling. During heavy snowfall, leave openings in snow berm large enough for wildlife passage.

6.2.2: Before logging, mark existing culvert locations. During and after logging, make sure that all culverts and drainage ditches are open and functional.

6.2.3: Construct snow roads of compacted snow for single-entry harvests and temporary roads in sensitive areas.

6.2.4: Designate, or mark, all stream courses prior to snowfall.

6.2.5: Do not use a stream channel as a roadway or skid trail except at designated crossings.

6.2.6: Avoid steep areas where skid trails may be subject to erosion the next spring. Return the following season and build erosion controls on any skid trails which have soil displacement.

7.0. HAZARDOUS SUBSTANCES:

7.1. General:

7.1.1: Know and comply with regulations governing the storage, handling, application and disposal of hazardous substances.

7.1.2: Do not transport, handle, store, load, apply or dispose of any hazardous substance or fertilizer in such a manner as to pollute water supplies or waterways or cause damage to land, humans, plants and animals.

7.1.3: Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification to appropriate Tribal staff.

CSKT Best Management Practices (cont.)

7.1. General cont'd:

7.1.4: Follow the label of a product in use at all times.

7.1.5: Apply chemicals during appropriate weather conditions and during the optimum time for control of a target pest or weed.

Appendix U

Windroses for the Flathead Indian Reservation

FLATHEAD AGENCY AIR QUALITY WIND ROSE ASSESSMENT

Introduction

An air quality assessment using wind rose modeling of local transport wind profiles was conducted in response to a comment received from the Environmental Protection Agency on the DEIS. The request was to supplement the Air Quality-Existing Conditions portion of the Flathead Agency Draft Environmental Impact Statement (DEIS), 1999 with wind roses for the Reservation. The purpose of the wind rose modeling was to identify prevailing local wind directions to assess possible air quality impacts on local residents and communities from emissions produced by wildfire occurrence or prescribed fire activities.

Graphs of dominant wind transport direction (frequency of direction that wind is coming from with associated wind speeds) were developed using the WRPLOT model, which is an interactive IBM PC program that generates wind rose plots for selected meteorological stations for user-specified date and time ranges. A wind rose depicts the frequency of occurrence of winds in each of 16 direction sectors and six wind speed classes for a given location, dates, and time periods. Also included is the percent frequency of calm wind conditions.

Wind rose graphs were created for the Flathead Reservation area using hourly weather data from the National Weather Service (NWS) stations in Missoula and Kalispell, Montana. Complete weather data for both weather stations where limited to the six year period of 1984 to 1989. Modeling produced custom graphs for a typical burn year (March through November); spring (March-June), summer (July and August), and fall (September through November) burn seasons; and for nighttime and daytime periods within the burn seasons.

WRPLOT graphs can provide a general assessment of air quality impact from wildfire and prescribed fire smoke transport by using the Missoula NWS data to represent conditions in the Mission Mountain, Jocko, and Southwest Landscapes and Kalispell NWS data for representation in the North Missions, Salish Mountains, and West Landscapes as defined in the Flathead Agency Draft EIS.

Limitations

In this case the usefulness of wind rose plots is limited, however, because the available weather data is located some distance from the area being assessed. Due to the influences of local terrain, the exposure of the NWS recording instruments, and the temporal variability of the wind, the wind rose graphs may not always be representative of true smoke transport for any given area. Interpretation of the graphical outputs should be used with caution.

Summary

A general assessment of the Missoula NWS data indicates that west to northwest winds prevail throughout the burn year (see the graph labeled misall24.eis) with a shift to the southeast during the fall months of September through November (graph misfal24.eis). The frequency of calm wind (which generally represents poor smoke dispersion and/or transport) is about 15% over the full burn year, but increases to over 30% over a typical fall season. The graph data indicates that the greatest potential for local, Flathead Reservation area air quality impacts (southerly winds, lower transport wind speeds to calm winds) could occur in the Mission Mountain and Jocko Landscapes during the fall burn season, particularly under nighttime conditions.

An assessment of the Kalispell NWS data indicates that southerly winds prevail throughout the burn year (graph kalall24.eis) with an increased northerly component during the summer and fall months of July through November (graphs kalsum24.eis and kalfal24.eis). The frequency of calm winds is about 20% over the full burn year with an increase to almost 27% during a typical fall season. The highest frequency of calm winds is about 34% during nighttime, fall season conditions. The graph data indicates that the greatest potential for local air quality impacts could occur during the summer and fall months from smoke produced in the northern portion of the Reservation. The table below shows the information covered by each plot (the file name is at the top of the plot). The plots themselves are shown on the pages that follow.

Landscapes	File Name	Weather Station	Burn Season	Time
North Missions, Salish Mountains, West	Kalall24.eis	Kalispell	March-Nov.	24 hours
	Kalalln.eis	Kalispell	March-Nov.	0001-1000
	Kalalld.eis	Kalispell	March-Nov.	1000-2400
	Kalspg24.eis	Kalispell	March-June	24 hours
	Kalspgn.eis	Kalispell	March-June	0001-1000
	Kalspgd.eis	Kalispell	March-June	1000-2400
	Kalsum24.eis	Kalispell	July-August	24 hours
	Kalsumn.eis	Kalispell	July-August	0001-1000
	Kalsumd.eis	Kalispell	July-August	1000-2400
	Kalfal24.eis	Kalispell	Sept.-Nov.	24 hours
	Kalfaln.eis	Kalispell	Sept.-Nov.	0001-1000
	Kalfald.eis	Kalispell	Sept.-Nov.	1000-2400
Missions Mountains, Southwest, Jocko	Misall24.eis	Missoula	March-Nov.	24 hours
	Misalln.eis	Missoula	March-Nov.	0001-1000
	Misalld.eis	Missoula	March-Nov.	1000-2400
	Misspg24.eis	Missoula	March-June	24 hours
	Misspgn.eis	Missoula	March-June	0001-1000
	Misspgd.eis	Missoula	March-June	1000-2400
	Missum24.eis	Missoula	July-August	24 hours
	Missumn.eis	Missoula	July-August	0001-1000
	Missumd.eis	Missoula	July-August	1000-2400
	Misfal24.eis	Missoula	Sept.-Nov.	24 hours
	Misfaln.eis	Missoula	Sept.-Nov.	0001-1000
	Misfald.eis	Missoula	Sept.-Nov.	1000-2400