MIDDLE SOUP CREEK PROJECT

Final Environmental Impact Statement

February 1997

Prepared by the Montana Department of Natural Resources and Conservation

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
NORTHWESTERN LAND OFFICE
SWAN RIVER STATE FOREST

MIDDLE SOUP CREEK PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT

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CHAPTER I

INTRODUCTION

INTRODUCTION

The Montana Department of Natural Resources and Conservation (DNRC), Swan River State Forest (SRSF), proposes the Middle Soup Creek Project. The purpose of the project is to generate revenue for the Montana School Trust from project area lands. The project area is located approximately seven miles southeast of Swan Lake, Montana, in Sections 21 and 28, and in portions of Sections 9, 16, 22, 27 and 33, T24N-R17W (Figure 1.1). The 2,591 acres within the project area are owned by the State of Montana and held in trust by DNRC. Timber sale and conservation lease opportunities resulting from the project would be advertised in May or June, 1997. Timber sale activities would run for approximately two consecutive years. A conservation lease would be valid for twenty years.

I. PURPOSE

A. School Trust Mandate

The lands involved in this project are held by the State of Montana in trust for the support of public schools (Enabling Act 1889). The Board of Land Commissioners and DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for public schools (Montana Code Annotated 1995b). The Board and DNRC have a broad discretion as to the best way to satisfy this legal mandate, subject to applicable state and federal law.

For the lands involved in this project, DNRC is evaluating timber management or a conservation lease as ways to best satisfy this legal mandate.

FIGURE 1.1 MIDDLE SOUP VICINITY AREA

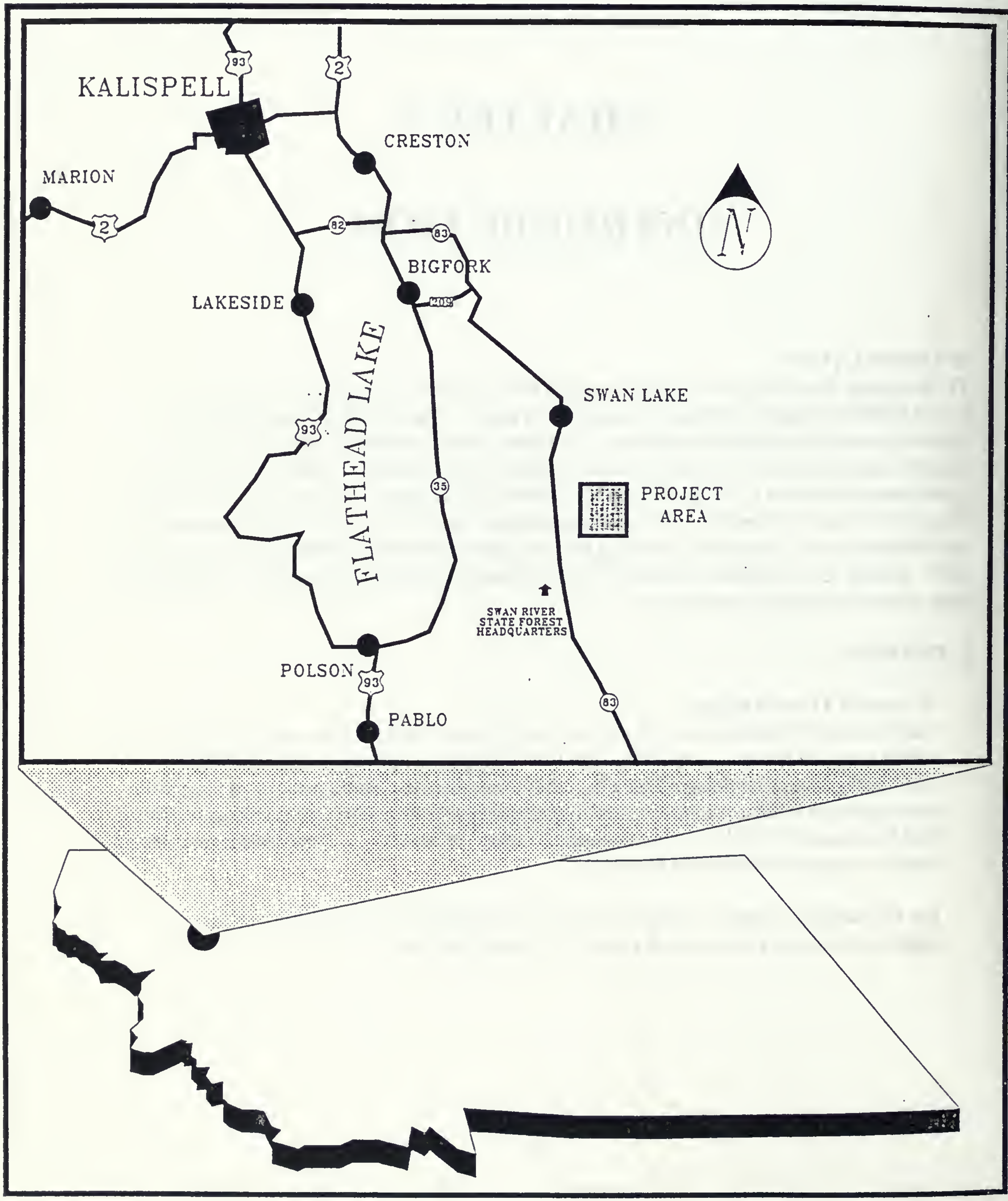

Figure 1.1

B. Proposals

In keeping with the "School Trust Mandate", the objective of the Middle Soup Creek Project is to generate the largest, reasonable monetary return to the school trust in both the short term and the long term by (a) selling approximately six million board feet of timber on the project area lands or (b) selling a twenty-year conservation lease for the lands.

1. Timber sale

The following considerations influenced the selection of the project area, the size of the project area, and the amount of timber to be sold:

1. Efficiently generating revenue as required by the Montana Constitution (Enabling Act 1889)

2. Harvesting approximately 6 MMBF of timber while maintaining the natural resource thresholds identified and recommended by resource specialists that were consulted (Resource specialists are listed in "Preparers and Contributors.")

3. Treating forest stands classified as "high risk," "low risk," and "overstory removal" in the SRSF Stand Level Inventory (Montana Dept. of State Lands 1991-1994)

4. Containing the project area within one grizzly bear management subunit (US Fish and Wildlife Service 1993)

5. Limiting the number of watersheds affected to the Soup Creek and Cilly Creek drainages

2. Conservation lease

As a separate option from harvesting timber, DNRC proposes to generate revenue by selling a conservation lease for the project area lands. The lease would preserve and protect timber and other vegetation from harvest, within the project area, for twenty years. Appendix C contains a copy of the conservation lease.

A bid for a conservation lease must compare favorably to the highest timber sale bid. If one of the action alternatives is selected, bids for a timber sale representing the selected action alternative and a conservation lease would be accepted. Conservation lease bids would be compared to the highest timber sale bid using the method that is detailed in Chapter IV, "Economic Analysis." Whichever option would generate the most revenue for the school trust over the long term would be implemented.

The environmental effects of a conservation lease would be the same as the effects of the no-action alternative for the 20 years the lease would be in effect. No timber harvests would be proposed over the term of the lease.

C. Decision Making

This EIS will provide the basis for deciding what (if any) actions will be taken on the project area lands. The "decision maker" will select one of the four alternatives outlined in this EIS. The decision maker will consider which alternative would generate the largest, reasonable, short- and long-term monetary return to the school trust. He will also consider how individual effects of the project would collectively impact the long-term health of the ecosystem, long-term timber productivity, and future economic opportunities.

If an action alternative is selected, the Board of Land Commissioners must approve the selected alternative before bids can be accepted.

II. DEVELOPING RESOURCE CONCERNS

A. Scoping

Comments from organizations, federal and state agencies, DNRC specialists, and the public defined the scope of this EIS (Table 1.1). DNRC solicited participation in the Middle Soup Creek Project by advertising in newspapers and distributing a project proposal to interested individuals, landowners, organizations, industries, and agencies on September 19, 1994. DNRC accepted comments on the proposal for 30 days. Field reviews were held with representatives of Friends of the Wild Swan to clarify their concerns. A draft EIS was made available for public review in September, 1996. DNRC accepted comments concerning the draft EIS for 45 days. A public hearing was held October 8, 1996 to receive public comments concerning the draft EIS. The final EIS was issued in February, 1997.

The project proposal mailing list is located in Appendix A. Public scoping comments are located in Project Files 303 to 307.

B. Interdisciplinary Team

An interdisciplinary (ID) team consisting of eight resource specialists considered all scoping comments (ID team members are listed in Appendix B). The ID team identified resource concerns that the project may impact. The resource concerns were identified and categorized based on the comments, the expertise of the ID team members, and their knowledge of the project area. The concerns were divided into three categories: major resource concerns, other resource concerns, and concerns not further analyzed. The concerns in the categories received varying degrees of analysis.

Table 1.1 *Public Participation*

Date	Scoping
September 1994	The project proposal was mailed to interested individuals, owners of adjacent land, special interest groups, private industry, and federal and state agencies (Appendix A). Paid advertisements were sent to local papers (Appendix A). A 30-day comment period began.
October 1994	Comments on the proposal were received from two landowners, Friends of the Wild Swan, the MFWP, DNRC land managers, and the ID team.
Date	**Ongoing Public Involvement**
March 1995	DNRC project leaders held a meeting with concerned citizens.
May 1995	DNRC project leaders conducted a field reconnaissance with concerned citizens.
July 1995	DNRC project leaders conducted a second field reconnaissance with concerned citizens.
Date	**Formal Public Review**
September 1996	Draft EIS issued for public review and comment. A public hearing will be held. The comment period will be 45 days long.
February 1997	Final EIS available for public review.
February 1997	The finding issued.

III. MAJOR RESOURCE CONCERNS

The major resource concerns: ecosystem sustainability, old-growth preservation, and timber productivity were identified by the public during scoping. Each required in-depth analysis and ultimately led to the development of action alternatives (introduced in Chapter II). Each major resource concern has been resolved through at least one action alternative. The major resource concerns are briefly described below and explored in greater depth in chapters II, III, and IV.

A. Ecosystem Sustainability

Timber harvesting may reduce the total area of forest, alter the overall ecological characteristics of forested stands in the project area, and reduce the structural and compositional diversities of stands required to maintain natural ecosystem functions.

Timber harvesting may further fragment existing stands in the project area, increasing edge effects and raising forest fragmentation beyond acceptable levels for the maintenance of natural biological diversity.

B. Old-Growth Preservation

Timber harvesting may significantly alter the character of old-growth stands within the project area and impact the connectivity of those stands with old-growth stands adjacent to the project area.

Past timber harvesting activities in the Soup Creek and Cilly Creek watersheds may have degraded old growth and its unique qualities to the point that additional timber harvesting in old-growth stands may be unacceptable.

Timber harvesting will ruin the opportunity to use existing old-growth stands as "outdoor classrooms" where the ecological uniqueness of old-growth forests can be studied.

C. Timber Productivity

Mitigation resolving nontimber resource concerns may over-compromise timber productivity and the potential of timber production to support school trusts in both the short term and the long term.

IV. OTHER RESOURCE CONCERNS

Other resource concerns required varying degrees of (and often in-depth) analysis. They are resolved by the project design or by mitigation measures. The following other resource concerns are described here: grizzly bear, elk, white-tailed deer, gray wolf, sensitive animal species, cavity-dependent wildlife, water quality, fisheries, air quality, soil, noxious weeds, and aesthetics.

A. Grizzly Bear

Previous land management activities may have negatively impacted the grizzly bear population in and around the project area. Past road building has facilitated use of the area by people which can increase bear mortality and displace bears from biologically suitable habitats. Exclusion of bears from the project area could further isolate grizzly bears in the Mission Mountains, increasing their likelihood of extirpation.

B. Elk and White-Tailed Deer

Timber harvesting may affect elk and white-tailed deer populations both positively and negatively. Tree removal may reduce availability of hiding and thermal cover but increase forage availability. Road construction and improvement may improve hunter access, reducing security. Negative impacts on elk and white-tailed deer populations may affect the local economy through reductions in wildlife-related recreation.

C. Gray Wolf

Wolves are not known to presently inhabit the Swan Valley. Wolves are, however, increasing in number and distribution in western Montana (US Fish and Wildlife Service 1995b). The similarity of the Swan Valley to areas in northwest Montana recently colonized by wolves suggests that it could support wolves. Increased human activity may increase the chances of human-caused wolf mortality.

D. Sensitive Animal Species

Timber harvesting activities may adversely impact wildlife species that are closely associated with old growth and/or that are particularly sensitive or vulnerable to human disturbance.

E. Cavity-Dependent Animal Species

Timber harvesting activities may impact species that use snags and decayed trees for nesting, roosting, feeding, and shelter. In the 1970's and 1980's salvage harvesting was conducted in the project area. The salvage harvesting may have compromised habitat for cavity-dependent species, and this project may further reduce habitat quality.

F. Water Quality

Timber harvesting activities may impact water quality. Specifically, water yields and sedimentation may increase. The quality of water in the immediate area and downstream may be affected. Where water quality was impacted, fisheries would most likely be impacted.

G. Fisheries
Timber harvesting activities may impact westslope cutthroat trout and bull trout populations if water quality is affected.

H. Air Quality
Air quality may be degraded when logging slash is burned after timber harvesting.

I. Soil
Timber harvesting activities may result in soil rutting, compaction, and displacement. Site productivity may be reduced.

J. Noxious Weeds
Timber harvesting activities and increased motorized traffic resulting from the project may promote the invasion and establishment of noxious weeds.

K. Aesthetics
The project area may provide aesthetic enjoyment to the recreating public. Timber harvesting activities may alter the color, texture, shape, contrast, and feeling of the existing landscape. The impacts of the project on aesthetics may be amplified if the timber harvesting activities were visible from the well-traveled Soup Creek and Cilly Creek roads.

V. CONCERNS NOT FURTHER ANALYZED
The following concerns were given careful consideration before the ID team decided not to further analyze: Scenic Highway 83, Soup Creek Campground, cultural resources, bald eagle, peregrine falcon, special status plants, and some sensitive animal species. These concerns are either unlikely to be impacted by the Middle Soup Creek Project, or current laws and regulations already address them.

A. Scenic Highway 83

1. Concern
Timber harvesting activities may degrade the scenic quality of Highway 83 which is important to the residents of Swan Valley and others who drive on Highway 83.

2. Reason not to further analyze
The visual effects of timber harvesting activities would not be seen from Highway 83. The project area is located 1.5 air miles east of Highway 83, and it has a low topographic setting on the Swan Valley floor (Figure 1.1).

B. Soup Creek Campground

1. Concern

Timber harvesting may impact the recreational availability of Soup Creek Campground which is located within the project area .

2. Reason not to further analyze

Project activities would not impact the Soup Creek Campground, but some short-term reduction in campground use may occur. Project activities are not planned within view of the campground and no restrictions or closures will be implemented because of the project; however, noise and traffic associated with project activities may temporarily discourage campground use. Log landings may be temporarily visible from the campground.

C. Cultural Resources

1. Concern

Timber harvesting activities may degrade a trail passing through the project area from the Swan River to the South Fork of the Flathead River. The trail was identified from a 1915 General Land Office map by the DNRC Archeologist. The trail may have been used by Native Americans and thus may be culturally important.

2. Reason not to further analyze

The trail could not be located on the ground. The Flathead Culture Committee of the Salish and Kootenai Tribes are unaware of any culturally important concerns in the project area. If additional field reconnaissance identified the trail or other cultural resources, mitigation measures would be implemented (Appendix D).

D. Threatened and Endangered Animal Species

1. Bald eagle

a. concern

Timber harvesting activities may affect habitat and behavior of bald eagles that nest in or near the project area. The bald eagle is classified as threatened, and is protected under the Endangered Species Act.

b. reason not to further analyze

Strategies to protect the bald eagle are outlined in the Pacific States Bald Eagle Recovery Plan (US Fish and Wildlife Service 1986) and the Montana Bald Eagle Management Plan (Montana Bald Eagle Working Group 1994). Management direction involves identifying and protecting nesting. feeding, perching, roosting, and wintering/migration areas (US Fish and Wildlife Service 1986, Montana Bald Eagle Working Group 1994).

There is an eagle nest within six miles of the project area boundary on Swan Lake. The project area is outside the recommended home-range management area of a 2.5-mile radius around the nest. The closest documented eagle roost site was over two miles from of the project area boundary (McClelland 1995). The project area is also outside potential unoccupied nesting habitat along the Swan River. Bald eagles are not known to winter in the project area, and timber harvesting will not affect migration behavior.

Management objectives for foraging habitat involve the regulation of poisons and chemicals, maintenance of water quality and populations of prey species, and elimination of electrocution hazards in foraging habitat (US Fish and Wildlife Service 1986, Montana Bald Eagle Working Group 1994). No poisons or electrocution hazards would be introduced into the area as a result of the proposed action (and none exist there now). The herbicides picloram and 2,4-D would be used to control noxious weeds along roads. Neither herbicide bioaccumulates and neither should pose a threat to bald eagles if applied at recommended doses. Potential bald eagle foraging habitat in the project area includes small ponds and streams that support fish populations, and marshes and meadows that support rodents. Project activities are not being considered in small ponds, streams, meadows, or marshes, and the bald eagle prey base would not be impacted. For these reasons, bald eagles should not be affected and this concern will be dropped from further analysis.

2. **American peregrine falcon**

a. concern

Timber harvesting activities may affect habitat and behavior of peregrine falcons nesting in or near the project area. The peregrine falcon is classified as endangered in Montana, and is protected under the Endangered Species Act.

b. reason not to further analyze

Strategies to protect and recover populations are outlined in the American Peregrine Falcon Recovery Plan (US Fish and Wildlife Service 1984). One pair of peregrine falcons has been observed in the Swan Valley during the nesting season in recent years, in 1993. The pair is thought to nest approximately 16 miles northwest of the project area, although nesting has not been confirmed. No other peregrine falcons are suspected to nest in the Swan Valley (Warren 1995).

Peregrine falcons may travel up to 18 miles from the nest in search of prey. Peregrine falcons feed almost exclusively on birds, preferably ducks, shorebirds and songbirds. Hunting habitats include river bottoms, lakes, meadows. marshes, agricultural croplands, and coniferous forests. Some marshy areas exist in the project area. These are marginal feeding sites, however, because they are isolated from suitable nesting sites and surrounded by heavy timber. No timber harvesting would take place in these marshy areas and potential hunting habitats would not be affected.

Timber harvesting is not likely to affect peregrine falcon nesting sites. Peregrine falcons typically nest on cliff ledges, rock outcrops, or talus slopes. Preferred nest sites overlook meadows and riparian habitat. Rocky outcrops or talus slopes exist in three locations within a few miles of the project area. These areas and approximate distances from the project area boundaries are as follows: Goat Creek Canyon, 2 miles south; Soup Creek Canyon, 1 mile east; and South Lost Creek, 1 mile north. The rocky outcrops or talus slopes in all these areas are surrounded by heavy timber, and are snow covered late into the peregrine falcon breeding season, making them less than desirable nesting sites. In addition, because peregrine falcons exhibit nest site fidelity and do not readily colonize new areas, these areas are not likely to be colonized by peregrine falcons.

Peregrines falcons have been sighted in the Swan Valley during spring and fall migration. Timber harvesting would not impede migratory movements and mortality risk would not increase due to proposed management actions. Because project activities would not have an effect on nesting or foraging habitat, and would not disrupt migratory movements, this concern would be dismissed from further environmental analysis.

E. Sensitive Animal Species not Further Analyzed

1. Concern

Timber harvesting activities may impact the following sensitive animal species that occur near SRSF on Flathead National Forest (FNF): common loon, boreal owl, flammulated owl, harlequin duck, and bog lemming. These species are dismissed for one or more of the following reasons: (a) they are not old-growth associated, (b) they are not particularly sensitive to human disturbance, © they are not cavity-dependent, (d) the project area does not meet their habitat requirements, or (e) clearly, timber harvesting activities would not impact them. Specific reasons for dismissal are given below.

2. Reason not to further analyze

a. common loon

Loon nests are placed immediately adjacent to water. Nesting territory is highly variable, but is about 40 acres. No loon nests have been found in the project area (Montana Natural Heritage Program), and the closest loon nests are along the Swan River (Skarr 1989). Management for loon habitat is not required in areas that have not documented loon nesting (Skarr 1989), and this concern will be dismissed from further analysis.

b. boreal owl

Boreal owls inhabit mature to old-growth spruce-fir forests at elevations of 4200 to 8000 feet on the FNF. Elevations in the project area range from about 3360 to 3800 feet. This is lower than the elevation range preferred for breeding, although they may feed in this elevation range. Major prey items are mice, voles and shrews, preferentially in spruce-fir forest of pole size or greater trees. Boreal owls often feed at forest edges and in previously harvested areas. They are apparently not sensitive to human disturbance when feeding (Reichel 1995). For these reasons, boreal owls should not be affected by the project.

c. flammulated owl

Flammulated owls typically nest in mature to old-growth ponderosa pine or ponderosa pine/Douglas-fir forests. Nest stands have moderate canopy closure (30-50%) and an open understory, allowing the birds to maneuver and catch insects. The flammulated owl should not be affected by the action because no stands are being considered for harvest that meet the above description.

d. harlequin duck

Harlequin ducks use swift, clean, clear streams with cobble to boulder substrate on second to fifth order streams. Extensive surveys for harlequin ducks have been conducted in the Swan Valley, and none have been found. The project area is far from any known populations, and the probability of recolonization of this area by harlequin ducks is very small (Reich 1995). For these reasons, the project will not affect harlequin ducks.

F. Special Status Plants

1. Concern

Timber harvesting activities may impact two sensitive plant species, green-keeled cottonsedge (*Eriophorum viridicarinatum*) and small yellow lady's-slipper (*Cypripedium calceolus* var. *parviflorum*), that occur within the project area (Montana Natural Heritage

Program). Both plants occur on a very wet, marshy site in the SW ¼ of Section 21, T24N, R17W.

Water howellia (*Howellia aquatillis*), a threatened aquatic plant, occurs in the Swan Valley (its closest occurrence to the project area is just to the north of the confluence of the Swan River and Cilly Creek), although it has not been found in SRSF (Montana Natural Heritage Program).

2. Reason not to further analyze

There is little potential that timber harvesting would affect green-keeled cottonsedge, small yellow lady's-slipper, or water howellia. Both green-keeled cottonsedge and small yellow lady's-slipper occur on a very wet, marshy site. No water howellia has been found within the project area, but water howellia also occurs on wet sites. Project activities would not take place on wetland sites (Shelly et. al. 1995, Project File 601). Protection for wetland sites would be provided through Best Management Practices 1991 and the Streamside Management Zone Law 1991 (Logan 1991, Montana Dept. of State Lands 1991).

VI. OTHER ENVIRONMENTAL REVIEWS RELATING TO THE PROJECT

A. Middle Soup Environmental Assessment

1. History

The Middle Soup Environmental Assessment (EA) proposed to sell approximately three million board feet of timber. It evaluated the consequences of three action alternatives and one no-action alternative, and it was completed in February, 1993. As a result of decisions that were based on the EA, the Middle Soup Creek Timber Sale was awarded to Champion International Corporation in November, 1993. By the end of that year, Champion International Corporation had constructed five temporary spur roads (totaling 0.5 mile), completed various other road maintenance projects, and removed seventy-four thousand board feet of right-of-way timber. In January, 1994, the Friends of the Wild Swan applied to the Montana Eleventh Judicial District Court for a preliminary injunction against the Department of State Lands and Champion International Corporation. In February, 1994, the court granted Friends of the Wild Swan the preliminary injunction. DNRC then withdrew the EA and the timber sale.

2. Relevance to this EIS

The scope of this Environmental Impact Statement (EIS) is influenced, and the content supplemented, by The Middle Soup EA. Roads that were constructed under the Middle Soup Timber Sale are included in the road density figures in this EIS.

B. The Swan Valley Grizzly Bear Conservation Agreement

Beginning in December 1994, DNRC participated in the development of the Swan Valley Grizzly Bear Conservation Agreement (SCA) with the U.S. Fish and Wildlife Service, Flathead National Forest, and Plum Creek Company, L.P. The SCA seeks to cooperatively manage grizzly bear habitat in the Swan Valley where intermingled ownership patterns and differing land management objectives complicate habitat management for a species as wide-ranging as the grizzly bear. The U.S. Fish and Wildlife Service evaluated the SCA in an environmental assessment and found that implementing the management guidelines in the agreement would not negatively impact grizzly bears (US Fish and Wildlife Service 1995c).

The Middle Soup Creek Project Area is within the conservation area delineated in the SCA. Since the grizzly bear analyses for this project were completed before the SCA was evaluated, they follow the previously used methods (which are still used for the Northern Continental Divide Ecosystem Grizzly Bear Recovery Area outside of the conservation area). Future analyses in the SCA Conservation Area will follow the SCA. An "SCA checklist" was compiled to evaluate compliance of all alternatives with the SCA and is included in the project file.

C. South Fork Lost Creek EIS

The SRSF is preparing an EIS for the South Fork Lost Creek Timber Sale. The South Fork Lost Creek Project Area is located approximately four air-miles northeast of the Middle Soup Creek Project Area. The project areas do not overlap.

The Middle Soup Creek Project EIS and the South Fork Lost Creek EIS share the same cumulative effects analysis areas for grizzly bear and air quality concerns. For both projects management activities would be guided by the SCA. The threshold for cumulative effects established by the SCA would not be exceeded. Guidelines and thresholds established by the SCA would likely preclude cumulative effects for both projects from jeopardizing survival and recovery of the grizzly bear population within the Northern Continental Divide Ecosystem Grizzly Bear Recovery Area (US Fish and Wildlife Service 1995c, US Fish and Wildlife Service 1995d, US Fish and Wildlife Service 1995e, Montana Dept. of Natural Resources and Conservation 1995b). Air quality cumulative effects would not exceed the limits defined by the Montana Cooperative Smoke Management Plan (State of Montana Cooperative Smoke Management Plan 1988).

The analysis areas for elk, white-tailed deer, and gray wolves overlap slightly. Five percent, or 290 acres, of the Middle Soup Creek Project analysis area for elk, white-tailed deer, and gray wolves overlaps with the South Fork Lost Creek Timber Sale's analysis area for these species. Since no treatments would be applied by either project within the area of overlap, and the area of overlap represents only five percent of the Middle Soup Creek Project analysis area, cumulative effects would be minimal. The South Fork Lost Creek EIS will contain an assessment of potential cumulative effects, including the effects of the Middle Soup Creek Project.

D. State Forest Land Management Plan

In June 1996, DNRC began a phased-in implementation of the State Forest Land Management Plan (Plan). The Plan established the agency's philosophy for the management of forested state trust lands. This project was begun prior to the adoption of the Plan. However, reasonable attempts have been made to incorporate the philosophy and standards of the Plan in this project.

SRSF harvest goals are established by the Northwest Land Office under guidance of the annual sustained yield statute (Montana Code Annotated 1995c). Forest Management activities to meet harvest goals are guided by the SFLMP.

Notice to readers:

The Montana Department of Natural Resources and Conservation issued the Middle Soup Creek Draft Environmental Impact Statement (DEIS) for public review and comment in September, 1996. Some changes were made to the DEIS as a result of public comments and they are incorporated in the Final EIS. The following is a summary of those changes:

Terms defined in the glossary are highlighted the first time they appear in the document. This was done to help the reader more clearly understand technical terms used in this document.

Changes were made in the wording of the conservation lease (see Appendix C) to clarify the specific purpose of the conservation lease. That is: To preserve and protect timber and vegetation within the project area from harvest for the next twenty years. Wording in Chapter I (FEIS page I-3) describing the lease was also changed to clarify the same point.

Chapter III, elk habitat (FEIS page III-28): It was clarified that it was assumed that standards for elk habitat are also adequate for mule deer.

Chapter III, water quality (FEIS page III-38): It was clarified that none of the streams within the Middle Soup Creek Project Area are identified as "threatened" or "impaired" under the Federal Clean Water Act, and are therefore not listed under section 303(d).

The cumulative effects discussions in Chapter IV are further elaborated upon and segregated for clarification.

Chapter IV, old growth versus post-old growth: It was clarified that post-old growth still meets the definition of old growth found in the glossary with some important attribute differences. A definition of post-old growth was added to the glossary to highlight those attribute differences.

Chapter IV, cavity-dependent species (FEIS page IV-50): It was incorrectly stated that, for Alternative B, structural enhancement harvesting would be applied to 897 acres when it is actually applied to 832.7 acres.

Chapter IV, economic analysis (FEIS page IV-75): The estimated dollar value for a 20-year conservation lease mistakenly included forest improvement costs. The figures in Table 4.15 were changed to reflect this difference.

CHAPTER II

ALTERNATIVES

INTRODUCTION

Chapter II describes the development of three "action alternatives," and a "no-action alternative." The action alternatives represent three different strategies for generating revenue to meet the project objectives. In addition to describing the alternatives, this chapter describes silvicultural treatments, the alternative development process, and mitigation measures that are common to all the action alternatives.

I. SILVICULTURAL TREATMENTS

The three action alternatives employ combinations of four different silvicultural treatments. The silvicultural treatments proposed for the Middle Soup Creek Project have been designed to simulate many effects of various fire intensities that historically occurred. They are intended to promote natural levels of structural and compositional diversity.

The following treatments are described below: light-reserve, regeneration harvesting; moderate-reserve, regeneration harvesting; heavy-reserve, regeneration harvesting; and structural enhancement. How each alternative would employ these various treatment is described in section III, "Alternatives."

A. Light-Reserve, Regeneration Harvesting

1. Harvesting

Light-reserve, regeneration harvesting would simulate many of the effects of a high-intensity, stand-replacing fire. Such a fire would greatly alter the structure and composition of overstory and understory vegetation. Light-reserve treatment would remove most of the overstory and understory vegetation within cutting units. Hiding and thermal cover would not be retained; however, the following important stand components would be reserved when available:

1. Approximately two large trees per acre having an average diameter around 22 inches. Preferred reserve trees would include western larch (*Larix occidentalis*), Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*)--tree species that have a high resistance to fire and wind. Reserve trees would provide for structural diversity and future snag recruitment. Light-reserve treatment would only be applied to stands that do not contain sufficient numbers of quality seed trees, but reserved trees would represent the healthiest trees available. They would have intact crowns, but they may not always meet seed tree quality. Reserved trees should not be likely to spread disease.

2. Small, scattered clumps of healthy, residual understory.

3. Approximately two live trees per acre, having broken boles, that would not be likely to spread disease.

4. Dead, standing trees that do not qualify as hazards under OSHA regulations (Logging Operations [Final Rules] 1995).

5. Fifteen to twenty tons per acre of large, down, woody material.

Retention of these stand components would depend on their presence, health, and vigor. Stand components would be reserved in a manner consistent with vegetation patterns and land contours; that is, they would be reserved in various, naturally-occurring shapes and sizes. The residual stand would average 10 square feet in basal area per acre and have 11 percent crown cover.

2. Residue disposal and site preparation

Reducing the fire hazard created by logging residue would be accomplished by excavator-piling and hand-burning residue.

To prepare the site for regeneration, mineral soil would be exposed on thirty to forty percent of the site. This scarification would be accomplished using an excavator-piler. The soil would be scarified over the entire site in randomly-spaced patches varying in size.

3. Regeneration

The prepared site would favor the establishment of shade-intolerant species. Favoring the establishment of shade-intolerant species would contribute to structural and compositional diversity by promoting the long-term presence of many species having varying degrees of shade tolerance.

Regeneration would establish primarily from adjacent stands. Natural regeneration would be supplemented by interplanting western white pine (*Pinus monticola*) that is resistant to white pine blister rust, a major cause of western white pine mortality on the SRSF. Interplanting rust-resistant western white pine would promote its continued presence in the project area.

B. Moderate-Reserve, Regeneration Harvesting

1. Harvesting

Moderate-reserve, regeneration harvesting would simulate the effects of a moderate-intensity, stand-replacing fire. Such a fire would greatly alter the structure and composition of both overstory and understory vegetation. Moderate-reserve treatment within cutting units. Hiding and thermal cover would not be retained; however, the following important stand components would be reserved when available:

1. Approximately six large (at least 20 inches dbh), healthy, seed trees per acre having straight boles and good crown development. Preferred reserve tree species would include western larch, Douglas-fir, and ponderosa pine. Depending on availability, reserved trees would be scattered at random or reserved in groups.

2. Small, scattered clumps of healthy understory.

3. Approximately two live trees per acre having broken boles that would not be likely to spread disease.

4. Dead, standing trees that do not qualify as hazards under OSHA regulations (Logging Operations [Final Rules] 1995).

5. Fifteen to twenty tons per acre of large, down, woody material.

As with light-reserve treatment, the retention of these stand components would depend on their presence, health, and vigor. Stand components would be reserved in various, naturally-occurring shapes and sizes. The residual stand receiving moderate-reserve treatment would average 21 square feet of basal area and have approximately 18 percent crown cover.

2. Residue disposal and site preparation

As with light-reserve treatment, residue disposal would be accomplished by excavator-piling and hand-burning residue.

To prepare the site for regeneration, mineral soil would be exposed on thirty to forty percent of the site. This scarification would be accomplished using the excavator-piler. The soil would be scarified over the entire site in randomly-spaced patches varying in size.

3. Regeneration

The prepared site would favor the establishment of shade-intolerant species. Favoring the establishment of shade-intolerant species would promote long-term structural and compositional diversity. Regeneration would establish by seed from reserve trees and adjacent stands. As with light-reserve treatment, natural regeneration would be supplemented by interplanting rust-resistant, western white pine.

C. Heavy-Reserve, Regeneration Harvesting

1. Harvesting

Heavy-reserve, regeneration harvesting would simulate the effects of a ground fire having varying intensity. Such a fire would alter stand density and species composition of overstory and understory vegetation. Heavy-reserve treatment would remove 20 to 70 percent of the overstory trees in a cutting unit, depending on the existing stand density. Currently the basal area of mature stands in the project area ranges from 100 to 240 square feet per acre; heavy-reserve treatment would reduce basal area to approximately 80 square feet. Trees would be removed singly, in groups, or in stringers not larger than one-half acre. Shade-intolerant species would be favored; however, some of all existing species would be reserved. Live trees with broken boles and dead standing trees that do not qualify as hazards under OSHA regulations (Logging Operations [Final Rules] 1995), would be reserved. Fifteen to twenty tons of large, down, woody material would also be reserved. The basal area reduction would maintain an average crown cover of approximately 70 percent. Hiding and thermal cover would be retained.

2. Residue disposal and site preparation

As with light- and moderate-reserve treatments, residue disposal would be accomplished by excavator-piling and hand-burning logging residue.

To prepare the site for regeneration, mineral soil would be exposed on twenty to thirty percent of the site. This scarification would be accomplished using the excavator-piler. Where patches, groups, or stringers of trees were removed, the soil would be scarified in randomly-spaced patches varying in size.

3. Regeneration

The prepared site would promote establishment of both shade-tolerant and shade-intolerant species thus promoting long-term structural and compositional diversity. Regeneration would establish by seed from the residual overstory. Natural regeneration would be supplemented by interplanting rust-resistant western white pine.

D. Structural Enhancement

1. Thinning

Structural enhancement would simulate the effect of multiple, scattered, low-intensity ground fires. Such fires would alter stand density and species composition primarily in the lower canopy layer. Understory vegetation would be lightly disturbed. Structural enhancement would reduce the basal area of stands by approximately ten percent. One-half-acre patches would be selectively thinned intermittently throughout the stand. Patches would be selected where shade-tolerant species are encroaching on shade-intolerant species. To further simulate the effects of low-intensity ground fire, thinning within patches would favor the removal of shade-tolerant trees having thin bark and crowns low to the ground. Some shade-intolerant species would also be removed to improve spacing and extend the presence of other healthy, shade-intolerant dominant and codominant trees. Live trees with broken boles, large down woody material, and dead, standing trees that do not qualify as hazards under OSHA regulations would be reserved.

2. Residue disposal and site preparation

Logging residue would be hand-lopped and scattered. Because structural enhancement is not a regeneration treatment, site preparation would not be required.

3. Regeneration

Regeneration would not be promoted by this treatment. Structural enhancement would reduce competition from encroaching shade-tolerant species and extend the presence of large, shade-intolerant trees thereby maintaining species diversity.

II. DEVELOPMENT OF ACTION ALTERNATIVES

A. Purpose of Action Alternatives

Action alternatives were developed to meet project objectives by addressing the resource concerns identified in Chapter 1. Because resolving some concerns created conflicts with resolving others, mitigation measures were developed. Mitigation measures were placed in groups, and the groups provided a framework for developing action alternatives.

Alternatives must be realistic and technologically available, and they must logically relate to the project proposal. A "no-action" alternative provides the baseline for comparing the environmental consequences of other alternatives. The no-action alternative is considered a viable alternative (Montana Codes Annotated 1995a).

B. Developing Action Alternatives for the Middle Soup Creek Project

The action alternatives for the Middle Soup Creek Project were developed to resolve the three major resource concerns: ecosystem sustainability, old-growth preservation, and timber productivity. The other resource concerns described in Chapter I are resolved through mitigation measures.

III. ALTERNATIVES

This section describes the no-action alternative, and proposed harvesting, logging methods, and mitigation measures that are specific to each action alternative. Mitigation measures that are common to all of the action alternatives are outlined in Appendix D.

None of the alternatives would require any new road construction because 5 spur roads totaling 0.53 mile were already constructed under the Middle Soup Timber Sale before it was withdrawn.

A. Alternative A

Alternative A is the no-action alternative. If Alternative A were selected, no timber harvesting would occur as a result of this project. Land management activities could be proposed and undertaken in the future following the appropriate level of MEPA review. In the event a conservation lease is issued, timber harvests would not be proposed over the term of the lease (20 years). Figure 2.1 shows the project area as it would continue to exist under Alternative A.

B. Alternative B:

1. Summary

a. ecosystem sustainability

Alternative B focuses on the major resource concern of ecosystem sustainability. Alternative B would promote the integrity of ecosystem functions within the project area by employing a combination of three strategies: conserving mature forest, reducing forest fragmentation, and maintaining structural complexity and diversity in the project area.

(1) conserving mature forest

Mature forest would be conserved to perpetuate an environment upon which many species depend. Mature forest corridors would be retained to allow sensitive, mature forest-dependent species to move between core areas of mature forest. Large, contiguous, and relatively intact polygons of forest characterized by mature forest attributes would be maintained.

Timber would be harvested using the structural enhancement silvicultural method within mature forest core and corridors. This method is designed to minimize alteration to stand character and function within corridors, old growth, or mature forest core.

1. Mature forest interior core areas: Core areas are defined herein as contiguous stands of mature forest that maintain a core of 50 hectares (123.5 acres) or greater after being buffered from adjacent immature stands by a 100 meter strip of mature forest.

MIDDLE SOUP EIS

FIGURE 2.1 ALTERNATIVE A PROJECT AREA

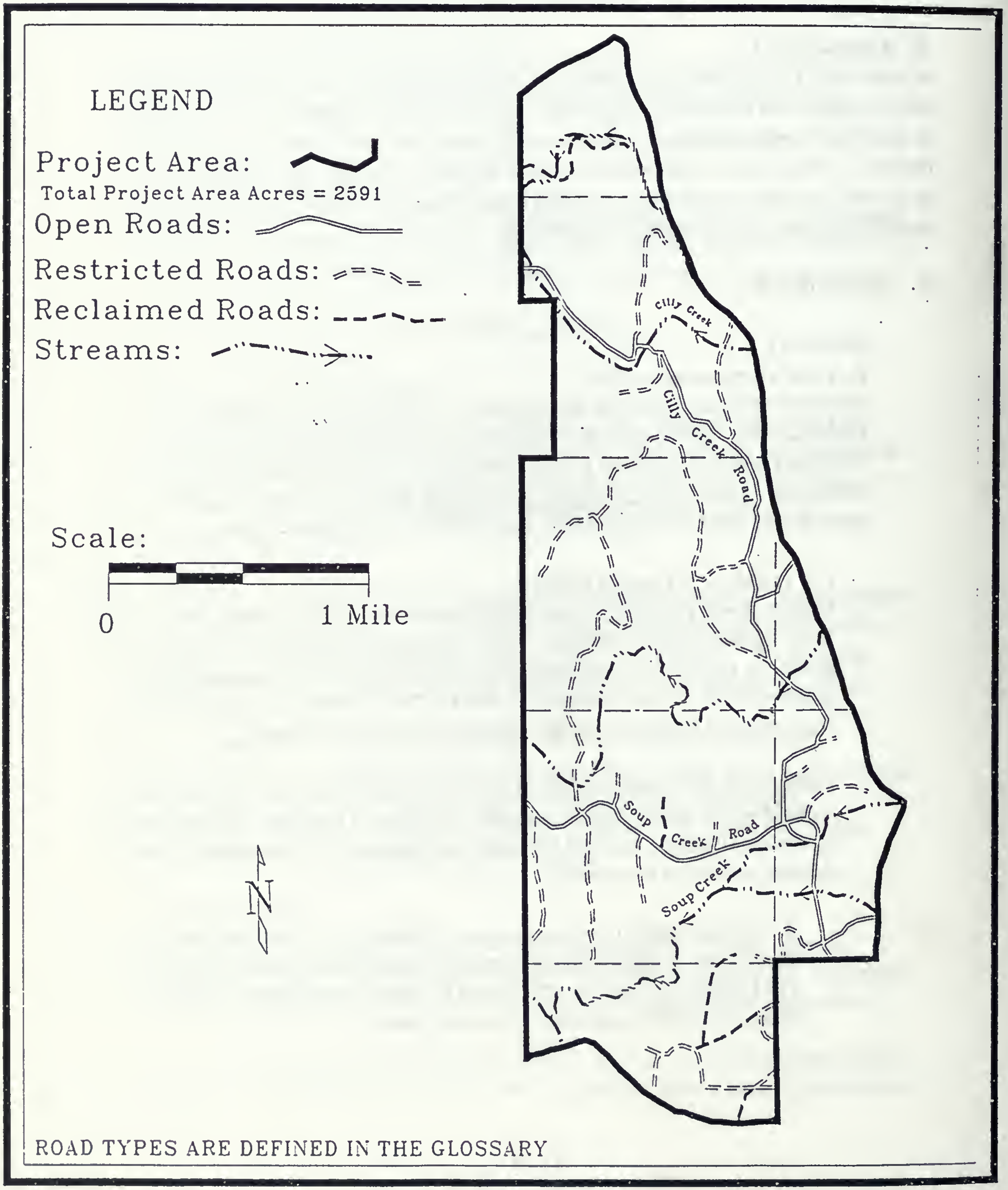

Figure 2.1

2. Mature forest corridors: Mature forest corridors are defined herein as contiguous forested areas that are at least 100 meters (327 feet) in width, have at least 40 percent canopy closure, and connect isolated stands of mature forest.

(2) reducing habitat fragmentation
Harvesting methods would promote multistoried, mixed-age transitions to soften sharp edges on existing forest patches. Corridors would be retained, and isolated patches of timber would be harvested to reduce fragmentation and produce a forest that would more closely mimic a forest subjected to natural processes.

(3) maintaining structural complexity and diversity within stands
Since the 1940's, active fire suppression has led to increased dominance of shade-tolerant species and increased stand densities throughout the Swan Valley. Some dense stands would be thinned to promote more historical, savannah-like conditions thus improving the structural integrity of stands. Encroaching shade-tolerant species would be harvested to promote long-term, compositional diversity in stands.

b. old growth preservation
Alternative B would not strive to maintain old-growth stands within the project area as they now exist. Harvesting would occur in these stands to maintain or enhance certain old growth characteristics (reduced fragmentation and edge, maintenance of historic structure etc.).

c. timber productivity
Harvesting intended to reduce fragmentation would use regeneration silvicultural systems that would restore stands to the full or good-to-fair vigor class. The majority of the harvesting focuses on improving vigor and persistence of large old shade-intolerant species and not designed to restore overall stand vigor.

2. Methods
Under Alternative B, approximately 5.2 MMBF of timber would be harvested on 1006.2 acres. Moderate-reserve, regeneration harvesting would be applied to 44.3 of those 1006.2 acres (cutting units B1 and B2). Heavy-reserve, regeneration harvesting would be applied to cutting units B3 though B7 totaling 129.2 acres.

Structural enhancement would be applied to B8 through B18 totaling 832.7 acres. Figure 2.2 shows the location of the cutting units and the type of treatment each cutting unit would receive.

Conventional tractor-logging methods would be used. The tractor size would not exceed the equivalent of a JD 650C/D6D track-type tractor or a JD 540/518C rubber-tired skidder (machines that do not exceed nine feet in width and twenty feet in length). These limitations provide maneuverability that protects remaining trees and limits soil compaction.

3. Mitigation measures

Under Alternative B, the following activities would be accomplished: Motorized traffic on portions of the Upper Soup Creek Canyon and Cilly Ridge roads would be restricted (reducing open road density), potential sediment source sites would be mitigated, in-stream rehabilitation projects would be completed, existing roads would be maintained, and noxious weeds would be prevented and controlled.

C. Alternative C:

1. Summary

a. old-growth preservation

Alternative C focuses on the old-growth preservation major resource concern. Timber harvesting would not occur in old growth but would occur in one saw-timber stand and one multistoried stand.

Deferring timber harvesting within old-growth stands would allow all existing old growth to be used as an outdoor classroom. This alternative use of school trust lands might allow students to experience varying stages of natural forest succession in the absence of human disturbance. The economic value of this use was not estimated in the economic analysis in Chapter IV.

b. ecosystem sustainability

Alternative C would conserve mature forests and mature forest core. The Alternative does not strive to reduce fragmentation or increase structural complexity and diversity in the long-term within old-growth stands.

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FIGURE 2.2 ALTERNATIVE B CUTTING UNITS:

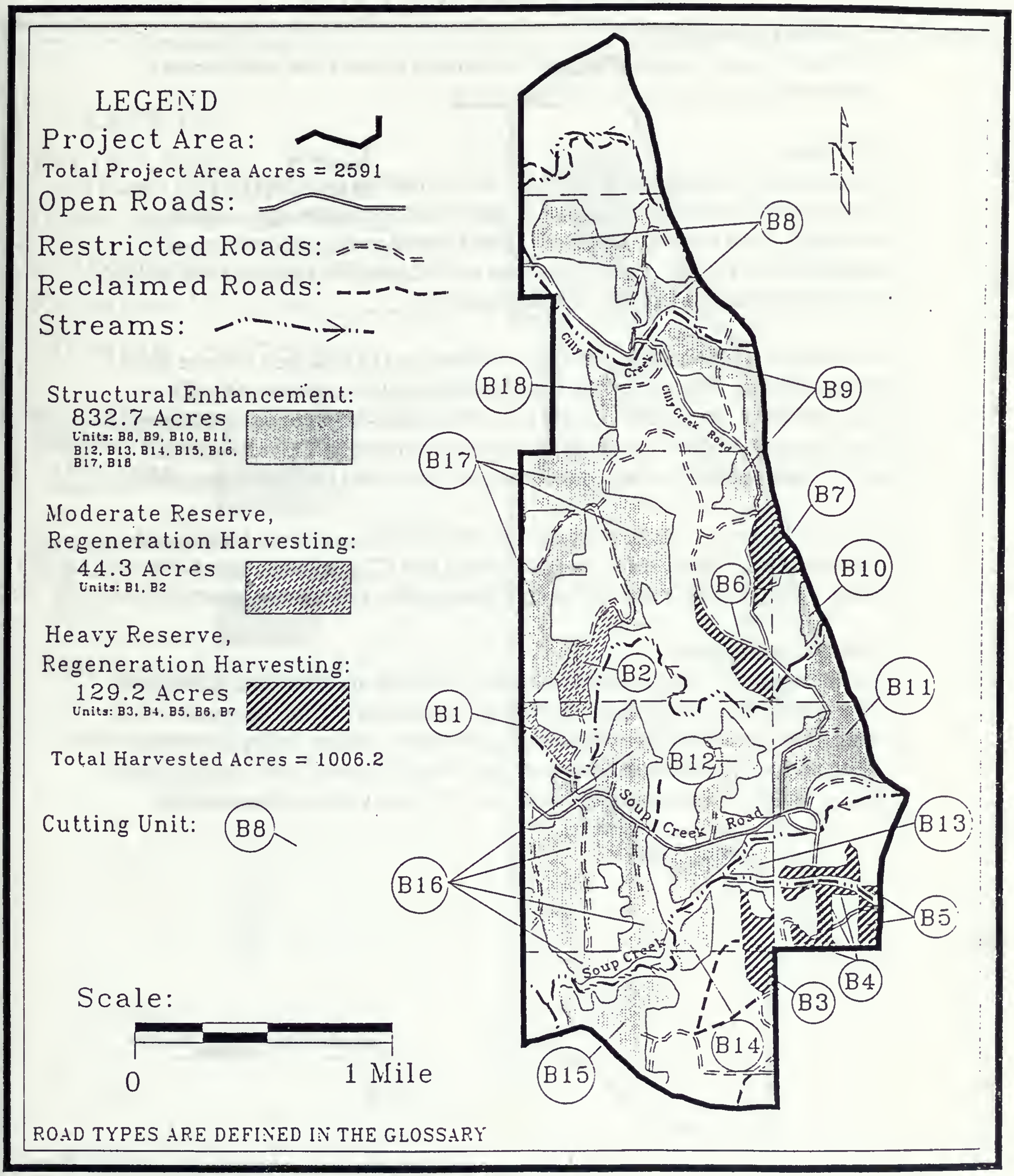

Figure 2.2

c. timber productivity
Harvesting would use regeneration silvicultural systems that would restore stands to the full or good-to-fair vigor class.

2. Methods

Approximately 150,000 board feet (150 MBF) would be harvested on 62.5 acres. The 49.6-acre, saw-timber stand would receive heavy-reserve, regeneration harvesting. The 12.9-acre, multistoried stand would receive moderate-reserve, regeneration harvesting. Figure 2.3 shows the location of the cutting units and the type of treatment each cutting unit would receive.

Conventional tractor-logging methods would be used to treat the 12.9-acre stand (cutting unit C1). The tractor size would not exceed the equivalent of a JD 650C/D6D track-type tractor or a JD 540/518C rubber-tired skidder (machines that do not exceed nine feet in width and twenty feet in length). These limitations provide maneuverability that protects remaining trees and limits soil compaction.

Helicopter logging would be conducted to treat the 49.6-acre stand (cutting unit C2) because the existing road accessing cutting unit C2 is not maintained due to wetland crossings, and a new road would compromise adjacent old growth.

3. Mitigation measures

Under Alternative C, the following activities would be accomplished: Motorized traffic on portions of the Upper Soup Creek Canyon and Cilly Ridge roads would be restricted (reducing open road density), potential sediment source sites would be mitigated, in-stream rehabilitation projects would be completed, existing roads would be maintained, and noxious weeds would be prevented and controlled.

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FIGURE 2.3 ALTERNATIVE C CUTTING UNITS

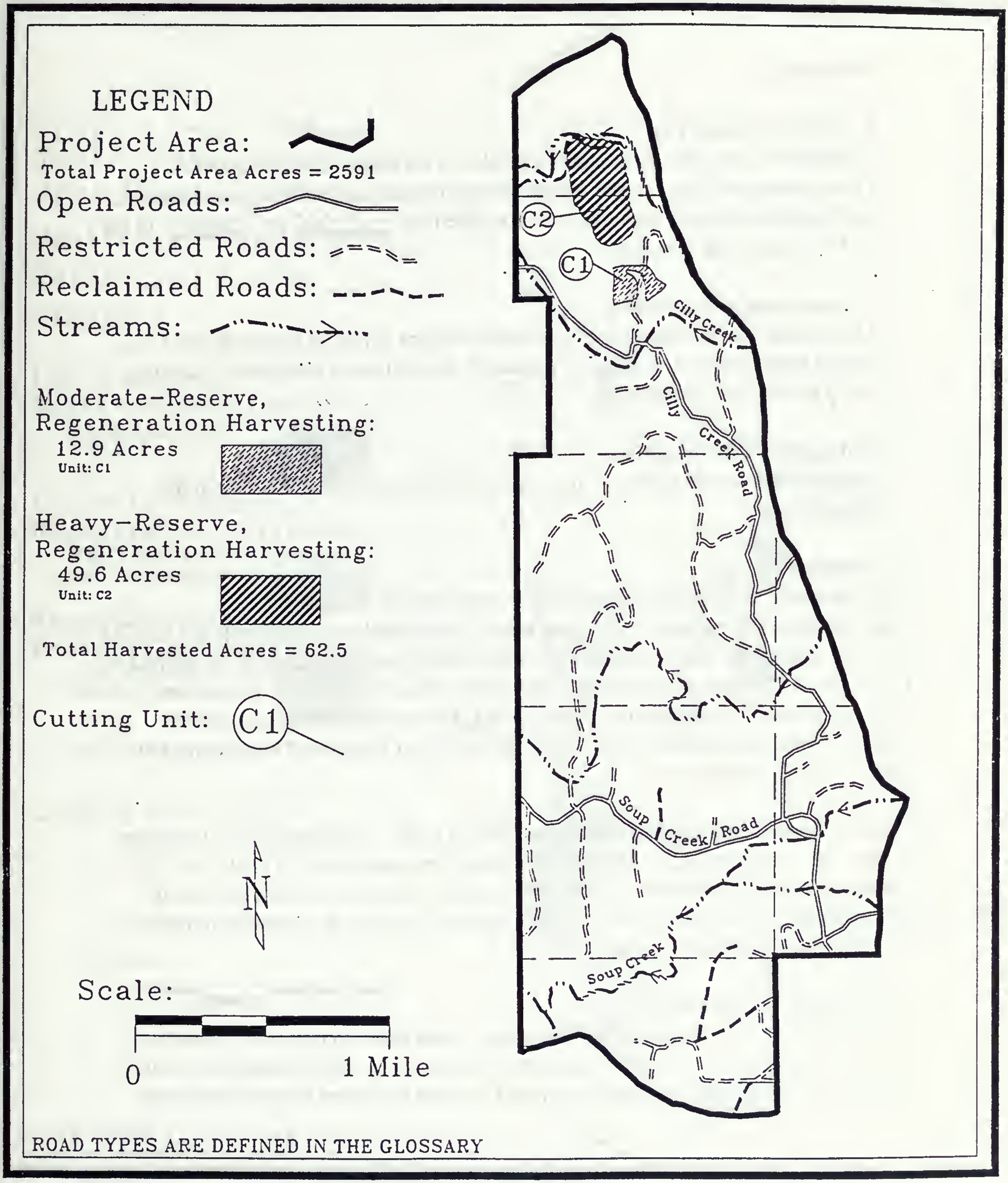

Figure 2.3

D. Alternative D:

1. Summary

a. timber productivity

Alternative D focuses on the timber productivity major resource concern. Treatments would be focused on optimizing timber productivity in old-growth, saw-timber, and multistoried stands identified as "high risk" or "low risk" in the SRSF Stand Level Inventory.

b. ecosystem sustainability

Alternative D would not strive to preserve mature forest or mature forest core, reduce fragmentation or increase structural diversity and complexity except along harvest unit boundaries.

c. old-growth preservation

Alternative D would not strive to preserve all old-growth stands within the project area.

2. Methods

Approximately 5.6 MMBF would be harvested on 323.7 acres.
Light-reserve, regeneration harvesting would be applied to cutting units D1 and D2 totaling 11.2 acres. Moderate-reserve, regeneration harvesting would be applied to cutting units D3 through D7 totaling 88.3 acres. Heavy-reserve, regeneration harvesting would be applied to cutting units D9 and D10 totaling 224.2 acres. Figure 2.4 shows the location of the cutting units and the type of treatment each cutting unit would receive.

Conventional tractor-logging methods would be used. The tractor size would not exceed the equivalent of a JD 650C/D6D track-type tractor or a JD 540/518C rubber-tired skidder (machines that do not exceed nine feet in width and twenty feet in length). These limitations provide maneuverability that protects remaining trees and limits soil compaction.

3. Mitigation measures

Under Alternative D, the following activities would be accomplished: Motorized traffic on portions of the Upper Soup Creek Canyon and Cilly Ridge roads would be restricted (reducing open road density), potential sediment source sites would

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FIGURE 2.4 ALTERNATIVE D CUTTING UNITS

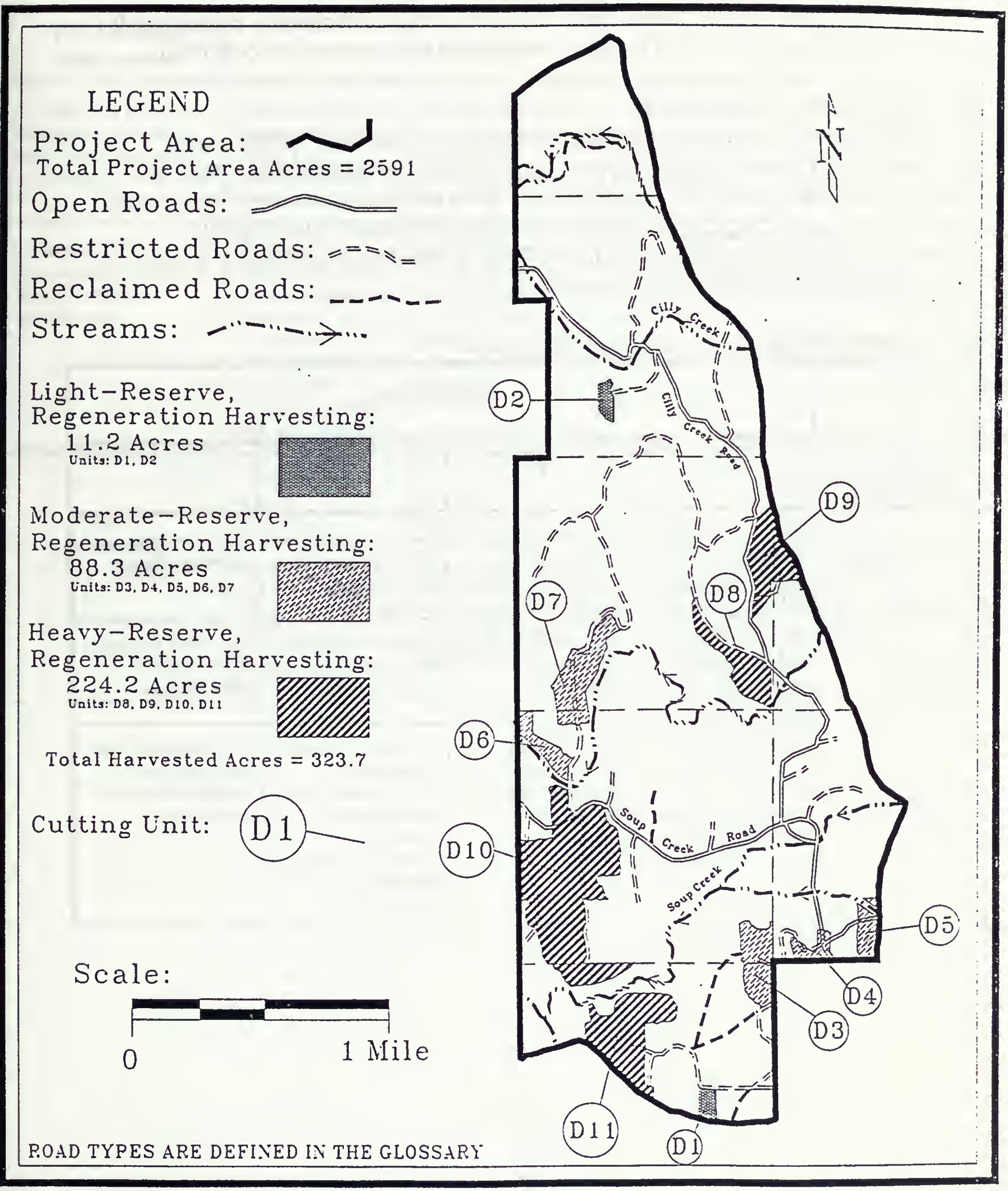


Figure 2.4

be mitigated, in-stream rehabilitation projects would be completed, existing roads would be maintained, and noxious weeds would be prevented and controlled.

IV. SUMMARY OF EFFECTS

The following table compares the alternatives by summarizing their environmental consequences. The table lists the major resource concerns in the left-hand column and compares the related effects for each alternative in the remaining columns. The scientific basis for the environmental effects summarized here is discussed in more detail in Chapter IV. Readers should refer to Chapter IV for a complete understanding of the terms, quantities, and statements presented here.

Table 2.1 *Summary of Effects* (continued on the following pages)

Resource Concerns	Alternatives			
Ecosystem Sustainability	**A**	**B**	**C**	**D**
1. Conserving mature forest	Short-term increase in mature forest; long-term decrease in mature forest.	Short-term decrease in mature forest; long-term increase in mature forest.	No change in mature forest in short term; long-term decrease in mature forest.	Short- and long-term decrease in mature forest.
2. Reducing habitat fragmentation	Short-term decrease in fragmentation; long-term increase in fragmentation.	Short- and long-term decrease in fragmentation.	Short-term and long term increase in fragmentation.	Short-term and long-term increase in fragmentation.
3. Maintaining structural complexity and diversity.	Short-term increase in structural complexity and diversity; long-term decrease in structural complexity and diversity.	Short-term and long-term increase in structural complexity and diversity.	No change in short-term diversity. Short-term and long-term decrease in structural complexity. Long-term decrease in diversity.	Short-term and long-term increase in structure complexity and diversity.

Old-Growth Preservation	A	B	C	D
1. Short- and long-term effects (% of existing old-growth acres in the project area).	100% of old growth preserved for short term; 71.4% preserved for long term.	88.3% of old growth preserved for short term; 81.9% preserved for long term.	100% of old growth preserved for short term; 71.4% preserved for long term.	77.6% of old growth preserved for short term; 55.3% preserved for long term.
2. General effects immediately post-harvest (% of existing old-growth acres).	No reduction in existing old growth in the watersheds or project area. 39.4% of Soup and Cilly Creek watersheds are in old growth. 50.5% of the project area is in old growth.	Old growth in Soup and Cilly Creek watersheds reduced by 2.6%. Old growth in the project area reduced by 11.7%	No reduction in existing old growth in the watersheds or project area.	Old growth in Soup and Cilly Creek watersheds reduced by 5.0%. Old growth in the project area reduced by 22.3%
Timber Productivity (% of project area)	14.2% having optimum productivity; 39.5% having positive productivity; 28.1% having zero productivity; 18.2% having negative productivity.	15.9% having optimum productivity; 39.3% having positive productivity; 37.8% having zero productivity; 7% having negative productivity.	14.7% having optimum productivity; 40.8% having positive productivity; 26.4% having zero productivity; 18.2% having negative productivity.	18% having optimum productivity; 40.2% having positive productivity; 26.8 percent having zero productivity; 15% having negative productivity.

Resource Concerns	Alternatives			
Grizzly Bear	**A**	**B**	**C**	**D**
1. Open Roads (% entire subunit > 1.0 mi/ mi^2)	Remain at 34%.	Reduced to 28%.	Reduced to 28%.	Reduced to 28%.
2. Open Roads (% DNRC acres > 1.0 mi/mi^2)	Remain at 43%.	Reduced to 34%.	Reduced to 34%.	Reduced to 34%.
3. Total Roads (% entire subunit > 2.0 mi/mi^2)	Remain at 43%.	Remain at 43%.	Remain at 43%.	Remain at 43%.
4. Total Roads (% DNRC acres > 2.0 mi/mi^2)	Remain at 52%.	Remain at 52%.	Remain at 52%.	Remain at 52%.
5. Security Habitat (entire subunit)	Remain at 38%.	Remain at 38%.	Remain at 38%.	Remain at 38%.
6. Security Habitat (DNRC acres)	Remain at 28 %.	Remain at 28 %.	Remain at 28 %.	Remain at 28 %.
7. Hiding Cover (entire subunit)	Remain at 79%.	Remain at 79%.	Remain at 79%.	Remain at 79%.
8. Hiding Cover (DNRC acres)	Remain at 91%.	Remain at 91%.	Remain at 91%.	Remain at 91%.
Elk	**A**	**B**	**C**	**D**
1. Open Roads	Remain at 1.2 miles per square mile.	Remain at 1.2 miles per square mile.	Remain at 1.2 miles per square mile.	Remain at 1.2 miles per square mile.
2. Hiding Cover	Remain at 90.9%.	Reduced to 90.1%.	Reduced to 90.7%.	Reduced to 89.2%.
3. Thermal Cover	Remain at 61.2%.	Reduced to 60.4%.	Reduced to 61.0%.	Reduced to 59.5%.
4. Forage Area	Remain at 26.2%.	Increased to 26.9%.	Increased to 26.4%.	Increased to 27.9%.
5. Security Area	Remain at 26.7%.	Remain at 26.7%.	Remain at 26.7%.	Remain at 26.7%.
6. Habitat Potential	Remain at 50%.	Remain at 50%.	Remain at 50%.	Remain at 50%.

Resource Concerns	Alternatives			
White-Tailed Deer	**A**	**B**	**C**	**D**
1. Hiding Cover	Remain at 90.9%.	Reduced by 44.3 acres (less than 1%).	Reduced by 12.9 acres (less than 1%).	Reduced by 99.5 acres (1.7%).
2. Foraging Area	Remain at 26.2%.	Increased to 26.9%.	Increased to 26.4%.	Increased to 27.9%.
3. Thermal Cover	Remain at 61%.	Reduced to 60.4%.	Remain at 61%.	Reduced to 59.5%.
Cavity-Dependent Wildlife	Habitat quality would remain high.	Minimal negative impacts; Possible long-term benefits.	Some moderate negative impacts; Possible long-term benefits.	Some substantial negative impacts; Some moderate negative impacts.
Aesthetics	No change.	Visual resource reduced substantially on 44.3 acres; moderately on 129.2 acres; slightly on 832.7 acres.	Visual resource reduced substantially on 12.9 acres; moderately on 49.6 acres.	Visual resource reduced substantially on 99.5 acres; moderately on 224.2 acres.
Water Quality	**A**	**B**	**C**	**D**
1. Annual Runoff of Soup Creek Watershed	Remain at existing 1% increase over modeled natural conditions.	Remain at existing 1% increase over modeled natural conditions.	Remain at existing 1% increase over modeled natural conditions.	Remain at existing 1% increase over modeled natural conditions.
2. Annual Runoff of Cilly Creek Watershed	Remain at existing 3% increase.	Remain at existing 3% increase.	Remain at existing 3% increase.	Remain at existing 3% increase.
3. Annual Sediment of Soup Creek Watershed	Remain at 18% increase with zero accumulation.	Increase to 27% with zero accumulation.	Remain at 18% increase with zero accumulation.	Increase to 27% with zero accumulation.
4. Annual Sediment of Cilly Creek Watershed	Remain at 44% increase with zero accumulation.	Remain at 44% increase with zero accumulation.	Decreased to 35% over modeled natural conditions with zero accumulation.	Remain at 44% increase with zero accumulation.
5. Existing Erosion Sources	Erosion sources not mitigated.	Erosion sources inventoried and mitigated.	Erosion sources inventoried and mitigated.	Erosion sources inventoried and mitigated.
6. SMZ Cutting Units	No Harvest Activity	No Harvest Activity	No Harvest Activity	No Harvest Activity

Resource Concerns	Alternatives			
Fisheries	No change to fisheries from current condition. No additional habitat monitoring.	Low potential risk to fishery habitat and population. Continue monitoring fish habitat as recommended by MFWP.	Low potential risk to fishery habitat and population. Continue monitoring fish habitat as recommended by MFWP.	Low potential risk to fishery habitat and population. Continue monitoring fish habitat as recommended by MFWP.
Air Quality	No change to existing air quality.	Burning on 173.5 acres; Moderate decrease in air quality lasting a few days.	Burning on 62.5 acres; Slight decrease in air quality lasting a few days.	Burning on 323.7 acres; decrease in air quality lasting a few days.
Soils	**A**	**B**	**C**	**D**
1. Soil Erosion Potential	Existing erosion potential would remain unchanged.	Decreased erosion potential by implementing mitigation.	Decreased erosion potential by implementing mitigation.	Decreased erosion potential by implementing mitigation.
2. Soil Impacts: Displacement and Compaction	No change in existing compaction, 10-15% of the area in old skid trails and landings	Mitigation measures would limit impacts to less than 15% of the project area. Less than 23 acres severely impacted with skid trails and landings.	Mitigation measures would limit impacts to less than 15% of the project area. Less than 5 acres severely impacted with skid trails and landings.	Mitigation measures would limit impacts to less than 15% of the project area. Less than 23 acres severely impacted with skid trails and landings.
Noxious Weeds	No treatment, continued spread on roads.	Implement weed control and grass seeding.	Implement weed control and grass seeding.	Implement weed control and grass seeding.
Gray Wolves	**A**	**B**	**C**	**D**
Road Density (analysis area)	Remain at 1.2 miles/square mile.	Remain at 1.2 miles/square mile.	Remain at 1.2 miles/square mile.	Remain at 1.2 miles/square mile.

Treatment	Alternatives			
Road System	**A**	**B**	**C**	**D**
Road Construction	None	None	None	None
Road Closure	None	1.8 miles of Upper Soup Creek Canyon Road and 1.7 miles of Upper Cilly Ridge Road closed.	1.8 miles of Upper Soup Creek Canyon Road and 1.7 miles of Upper Cilly Ridge Road closed.	1.8 miles of Upper Soup Creek Canyon Road and 1.7 miles of Upper Cilly Ridge Road closed.
Road Maintenance	None	12 miles of ditch-pulling, surface-grading, culvert-cleaning and noxious weed control.	12 miles of ditch-pulling, surface-grading, culvert-cleaning and noxious weed control.	12 miles of ditch-pulling, surface-grading, culvert-cleaning and noxious weed control.
Logging Method	**A**	**B**	**C**	**D**
Tractor (acres)	None	1006.2	12.9	323.7
Helicopter (acres)	None	None	49.6	None
Harvest Method	**A**	**B**	**C**	**D**
Light-Reserve	None	None	None	11.2
Moderate-Reserve	None	44.3	12.9	88.3
Heavy-Reserve	None	129.2	49.6	224.2
Structural Enhancement	None	832.7	None	None
Brush Disposal	**A**	**B**	**C**	**D**
Excavator Pile and Burn (acres)	None	173.5	62.5	323.7
Lop and Scatter (acres)	None	832.7	None	None

Treatment	Alternatives			
Tree Regeneration	**A**	**B**	**C**	**D**
Interplant WWP at 200 trees/acre	None	44.3	12.9	99.5
Interplant WWP at 100 trees/acre	None	129.2	49.6	224.2
General Information	**A**	**B**	**C**	**D**
Total Acres Treated	None	1006.2	62.5	323.7
Total Volume (MBF)	None	5,177	150	5,631
Season of Harvest	None	Winter	Winter	Winter

V. PREFERRED ALTERNATIVE

Alternative B has been identified as the Preferred Alternative. Alternative B best meets the purpose of school trust land management and provides the most positive benefits with the least negative benefits. Specific rationale for identifying the Preferred Alternative included the following decision criteria: 1) State Forest Land Management Plan philosophy and Resource Management Standards and; 2) Project objectives. Economic criteria is an integral part of project objectives. Short and long term effects are an integral part of the State Forest Land Management Plan philosophy and Resource Management Standards. Personal and professional judgement is applied throughout application of the decision criteria.

A. Plan Philosophy and RMS

In June 1996, DNRC began a phased-in implementation of the State Forest Land Management (SFLMP). The SFLMP establishes DNRC's philosophy for the management of forested state trust lands. That philosophy provides that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. The SFLMP also defines Resource Management Standards (RMS) that promotes the SFLMP philosophy. Decision criteria for the preferred alternative includes the degree to which each alternative meets the SFLMP philosophy and RMS.

All of the "action alternatives comply fully with most of the RMS and with the SFLMP philosophy. Since the alternatives were developed prior to adoption of the SFLMP, some alternatives do not comply as effectively as others with RMS. RMS that all of the alternatives do not fully comply with are considered below and contribute to identifying the Preferred Alternative.

1. Biodiversity

RMS-3 - directs managing for the proportion and distribution of forest types and structures that were historically present within the landscape (SFLMP ROD 1996, page ROD-12). A primary focus of Alternative B is to begin restoring current forest conditions to historic conditions. Since this is not a primary focus of Alternatives A, C and D, Alternative B best meets that aspect of the SFLMP philosophy.

2. Sensitive species

RMS-1 - directs managing for site characteristics important to long-term persistence of sensitive species (SFLMP ROD 1996, page ROD-31). The course filter approach used to promote ecosystem sustainability includes analyzing three critical elements of the ecosystem: conserving mature forest; reducing habitat fragmentation; and maintaining structural complexity and diversity. Managing for these elements would contribute to long-term persistence of sensitive species.

Alternative A, in the short-term, would contribute to an increase in mature forest and structural complexity and a decrease in fragmentation. In the long-term, Alternative A would contribute to a decrease in mature forest and structural complexity and an increase in fragmentation. Alternative A would, therefore, contribute effectively to short-term persistence of sensitive species, but not as effectively in the long term.

Alternative B, in the short-term, would contribute to a decrease in mature forest and fragmentation and an increase in structural complexity. In the long-term, Alternative B would contribute to an increase in mature forest and structural complexity and a decrease in fragmentation. Alternative B would not provide for sensitive species, in the short term, as effectively as Alternative A. In the long term, Alternative B provides for sensitive species more effectively than Alternative A.

Alternatives C and D do not provide for conserving mature forest, reducing habitat fragmentation or maintaining structural complexity as effectively in the short term or the long term as Alternatives A and B. Since the focus of RMS-3 is on long-term persistence (SFLMP ROD 1996, page ROD-31), Alternative B best meets the course filter elements contributing to long-term persistence of sensitive species.

Further consideration to long-term persistence of sensitive species is supplemented by the fine filter analysis for the western big-eared bat, fisher, lynx, black-backed woodpecker and northern bog lemming (page IV-46).

No clear difference in effects on lynx and northern bog lemming habitat were identified between alternatives.

Effects of each alternative on western big-eared bat and black-backed woodpecker habitat is included in the analysis of affects on cavity nesting species (page IV-47). Habitat quality would remain high in Alternative A, minimal impacts in Alternative B, moderate impacts in Alternative C and Substantial impacts in Alternative D. Since there is little difference in impacts between Alternatives A and B, and Alternative B provides the best long-term effects under the course filter analysis, Alternative B appears preferable to Alternative A.

The fine filter analysis suggests any reduction in old growth may negatively impact fisher habitat (page IV-46). Alternative A and C do not reduce current old-growth amounts. Alternative B would reduce the amount of old growth in the project area from 50.5 percent to 38.8 percent. Alternative D would reduce the amount of old growth to 28.2 percent. Although Alternative A and C would have the least negative impact on fisher habitat, the amount of old growth that would remain in Alternative B and D would be within the range historically projected of 25 to 50 percent. Overall, the fine filter analysis indicates Alternative B best meets the Sensitive Species RMS-1.

3. Sensitive species

RMS-4 directs that habitat needs of sensitive species be met primarily through managing for the range of historically occurring conditions and by maintaining connecting corridors (SFLMP ROD 1996, page ROD-31).

The primary focus of Alternative B is to begin restoring historical conditions. This is not a primary focus of other alternatives. Alternative B, therefore, best meets this aspect of Sensitive Species RMS-4.

Maintenance of connecting corridors is strongly correlated to the analysis of spatial characteristics of forested patches. Alternative B is designed to minimize increasing fragmentation and/or loss of connectivity, and to ultimately reduce fragmentation and increase connectivity. Alternative D would contribute to sharp increases in fragmentation. Although Alternative A and C do not add to existing fragmentation, neither do they decrease fragmentation. Alternative B best meets the intent of Sensitive Species RMS-4.

B.. Project Objective
The objective of the Middle Soup Creek Project is to generate the largest, reasonable monetary return to the school trust in both the short term and long term by either selling approximately six million board feet of timber or selling a twenty-year conservation lease. Alternatives A and C are each projected to generate negative net revenue if harvested this year or if harvesting is deferred for twenty years. These alternatives do not meet the project objective and therefore are not considered further.

Alternative B is projected to generate approximately $1,045,572 of net revenue in the short term. Alternative D is projected to generate $1,215,776. Alternative D appears to provide $170,204 or approximately 14 percent greater advantage in short-term financial return. Since timber volumes, timber values and associated costs are all based on estimates, the actual difference in short-term return is not certain.

Long-term potential return to the school trusts are related to future management flexibility to meet changes in demand and uses. Substantial future management flexibility would be retained on the 129.2 acres of heavy reserve harvesting and 832.7 acres of structural enhancement harvesting within Alternative B. Little flexibility would be retained on the 44.3 acres of moderate reserve harvesting within Alternative B. Alternative D would retain substantial flexibility on 224.2 acres of heavy reserve harvesting and provide little flexibility on 99.5 acres of light reserve and moderate reserve harvesting. Alternative B would therefore retain greater future management flexibility.

Long-term potential return to the school trusts are also related to differences in future timber productivity between alternatives. Alternative D would provide the greatest improvement to stand vigor within the stands to be treated. Alternative D would improve average stand vigor on the project area from 2.50 to 2.39 Alternative B would not provide as much improvement to stand vigor within stands treated. Alternative B would improve average stand vigor on the project area to 2.36. Alternative B would provide the largest improvement in future timber productivity by improving stand vigor on a larger number of stands.

A third important consideration in long-term potential return to school trusts is the health of the ecosystem. Conserving mature forest, reducing habitat fragmentation and maintaining structural complexity and diversity are considered important elements of a healthy ecosystem. As discussed above, Alternative B conserves mature forest most effectively in the long term, provides for the greatest reduction in existing fragmentation and provides short-term and long-term improvements in structural complexity. Alternative B most effectively restores and promotes characteristics of healthy ecosystem.

Since there is not a great deal of difference in short-term financial return between Alternative B and D and the amount of that difference may be related to estimated costs and returns, greater importance would be given to long-term potential return. Alternative B promotes greater potential long-term financial return and therefore best meets the project objective.

C. Effects on Other Resources

Application of mitigations common to all alternatives contributed to minimizing the difference in effects on some resources. Effects on other resources are considered and discussed below.

1. Grizzly bear

The major difference in effects are between the no-action Alternative A and action Alternatives B, C and D. Action Alternatives B, C and D would reduce the percent of area with greater than one mile of open road per square mile from thirty four percent to twenty eight percent.

2. Elk

Elk habitat potential would remains the same for all alternatives.

3. White-tailed deer

Little change would be effected on available thermal cover, hiding cover and forage areas. All alternatives would maintain proportions of these areas above recommended levels.

4. Water quality

The no-action alternative would not increase short-term sedimentation of Soup and Cilly Creek. The risk to long-term sedimentation may be increased by deferring replacement of stream crossings and road improvements. Alternatives B, C and D would each result in short-term increases in sedimentation but with a net reduction in long-term sedimentation. All of the action alternatives would comply with SMZ requirements and BMP recommendations.

Water yield increases are projected for each action alternative but are well below ECA thresholds for each watershed.

5. Fisheries

There would be low potential risk to fishery habitat from each of the action alternatives. The action alternatives provide for continued monitoring of fish habitat as recommended by MDFWP. The no-action alternative does not provide for continued monitoring.

6. Air Quality
The action alternatives would provide short-term decreases in air quality from burning. Smoke from burning would likely last several days.

7. Soils
Potential soil impacts would be greater on the action alternatives. Mitigation that would be applied to each action alternative would minimize potential soil impacts. These include the following: 1) Harvesting would be conducted in the winter on snow-covered, frozen soil; 2) Track-mounted excavators would be used to treat slash; 3) Excavator piling and soil scarification would be limited to less than 40 percent of the cutting units; 4) Skidding trails would be limited to no more than 20 percent of cutting units; and 5) Woody debris would be retained to promote long term soil stability and productivity.

8. Noxious Weeds
All action alternatives include specific measures to treat existing noxious weeds and prevent further encroachment. The no-action alternative does not treat existing noxious weeds.

9. Gray Wolves
Wolves are not known to currently inhabit the Swan Valley. Action alternatives should not reduce the existing deer and elk prey base. Planned reductions in open road density should reduce the risk of human-caused wolf mortality.

CHAPTER III

AFFECTED ENVIRONMENT

Environmental Characteristics, Analysis Areas, and Analysis Methods

INTRODUCTION

Chapter III provides the baseline for analyzing the environmental consequences of all the alternatives. In order to determine this baseline, the effects of past natural events (e.g. fire) and human activities (e.g. harvesting, fire suppression, etc.) were considered. In addition to describing the affected environmental characteristics that are important to the analysis of resource concerns, it delineates analysis areas, and explains analysis methods where appropriate.

I. VEGETATION

A. Historic Conditions in Forests of the Swan Valley

1. General conditions

The Swan River State Forest (SRSF) still contains some of the largest remaining tracts of undisturbed mature forest. These tracts are representative of the Swan Valley ecosystem before human exploitation began several decades ago. Although these forests are undisturbed in the sense that they have not had any quantity of timber removed, they are not entirely pristine. Active fire suppression began well before commercial exploitation in the Swan Valley so even unharvested forests are not natural in the sense that their structure and composition reflects the absence of natural disturbance for more than 50 years (Antos and Habek 1981, Freedman and Habeck 1984, Habeck 1988).

Since timber harvesting in the Swan Valley began in earnest during the 1960's, the total area of mature forest remaining has been reduced about twenty-one percent (Hart 1994, Fig. 1). More importantly, fragmentation of the remaining forest has increased more than two-fold, resulting in a large number of smaller, more uniformly sized timber patches with less core area (Hart, 1994).

Reduction of total mature forest area and increased fragmentation of remaining forest patches may threaten ecosystem integrity. Loss of effective old forest habitat may have caused some plant and animal communities to become sensitive, threatened, or endangered. Also, many less obvious species may be reduced to non-sustainable population densities. Reducing mature forests may reduce the effectiveness of the Swan Valley forest ecosystem to act as a corridor between the Mission and Swan Mountains. Ultimately, the shift in community balance from old forest to open. early successional communities may change the nature of the biotic communities compared with historic patterns.

2. Historic fire regimes

Historically, fire exercised an influential role over the characteristics of forested landscapes in the Swan Valley, as it did over most of forested western Montana. Fire regimes varied, depending on micro-site conditions, from infrequent, stand-replacing burns, through intermediate frequency, intermediate intensity burns, to frequent, thinning underburns. However, the latter type appears to have been restricted to the upper portion of the Swan River drainage, south of the SRSF.

Hart (1994:36) summarized the historical data as follows:

"...Although most of the burns...were of stand-replacement intensity, many less intense fires had also crept over wide areas. The upper [i.e., southern*] half of the Swan Valley had been extensively burned, and was blanketed by fallen trees. In this area, fires were moderate, thinning the forest. The lower* [i.e., northern] *Swan also was scarred by fires, but it had a great deal of older mixed forest; species typical of mesic sites were found in this region...".*

Antos and Habeck (1981), working mostly in the northern portion of the Swan Valley, emphasized the dominance of low-frequency, high-intensity fires (i.e., "stand-replacement fires") in determining stand patterns:

"During most summers, the occurrence of frequent rain makes intense fires unlikely; but in some years, dry summers set the stage for large crown fires. Most stands were initiated on large burns....an average frequency of replacement burns of between 100 and 200 years was characteristic...Stands over 300 years old do occur, and repeat burns less than 20 years apart have also occurred. In some forests initiated by replacement burns, ground fires have occurred after stand establishment, with variable effects on the overstory. Very wet sites such as stream bottoms and lower north slopes often experience partial burns when located within the perimeter of large replacement burns".(Antos and Habeck 1981:29)

Freedman and Habeck (1984), who worked primarily in drier forests south of the project area but as far north as Goat Creek in the SRSF, emphasized the role of rather more frequent burns in the southern portion of the Swan Valley, while agreeing with Antos and Habeck (1981) that fire frequency decreased with latitude:

"...wildfire was commonplace in the Swan Valley. Fire-scarred ponderosa pines, charcoal in the soil layers, and the occurrence of even-aged stands of lodgepole pine...attest to the past presence of fire; the relative scarcity of old-growth climax forests provides further insight into the influence of historic fire".(Freedman and Habeck 1984:24)

"Our fire history analysis indicates that the [lower elevation portions of the Swan Valley] *was burned frequently; in the drier southern half..the intervals were shorter than on the more moist northern part. Between 1758 and 1905 this portion of the range had fire-free intervals of about 30 years, and the presence of western larch and even-aged lodgepole pine suggests the fires here were of higher intensity..The remaining samples are from the southern end* [i.e., south of the Project Area] , *and these have a shorter interval of 17 years."*(Freedman and Habeck 1984: 27)

3. Historic abundance of older forest types

There exists no single, unambiguous way to estimate the historic amounts of older forests and/or old growth (in part because definitions of "old growth" are not consistent among investigators). However, we can provide an approximation based on the work of Losensky (1993), Lesica (1996), USDA Forest Service, Flathead National Forest (1992), and Hart (1994).

Losensky (1993) estimated percentages of area by age class in the year 1900, using adjustments to 1930's forest inventory information. He provided estimates broken down by forest cover types, and reported both by defined "climatic sections" as well as western Montana averages. His estimates for the western white pine and larch/Douglas fir cover types that are most typical of lower elevation areas within the SRSF indicates that roughly one-half of the forested area existed as mature and/or old growth (Table 3.1).

Table 3.1 ***Proportions of each forest cover type in various age-classes, both within the climatic section corresponding to the SRSF, and for western Montana averaged over all cover types (Losensky 1993).***

	Upper Flathead (Climatic Section 12)		Western Montana Average	
Age/size classes	western white pine	Douglas-fir western larch	western white pine	Douglas-fir western larch
Nonstocked	11.7	11.4	22.8	18.2
Seedling/sapling	9.7	18.8	23.2	19.1
Poles	1.2	5.6	3.8	5.9
Immature	6.4	9.8	6.8	7.3
Mature	51.0	17.8	22.5	18.2
Old Growth	21.8	36.6	20.8	31.3

Lesica (1996) took a different approach to estimating the proportions that would generally occur within age-class intervals, based on mean fire-free intervals. He found that negative-exponential distributions adequately fit observed frequencies for a number of forests. Using an assumed 150-year mean fire-free interval (i.e., interpolating from Antos and Habeck's [1981] "average frequency of replacement burns of between 100 and 200 years"), the distribution in Table 3.2 results, presented from oldest to youngest classes.

The Flathead National Forest (USDA Forest Service, Flathead National Forest 1992) used data from an 1898-99 survey of the area by H.B. Ayers to estimate the amount of mature forest existing at the turn of the century, concluding:

"The Swan Valley contained the highest proportion (9 percent) of the high-volume timber class (5-10 MBF/acre) of the areas surveyed on the Forest. About 40 percent of the area was occupied by mature and older forests." (USDA Forest Service, Flathead National Forest 1992:III-6)

Finally, Hart (1994:54), noting that considerable potential for bias existed in estimating proportions of "old growth" existing historically, estimated the proportion of 200+ year stands at just under 30% of the total Seeley-Swan landscape (including areas south of the SRSF) during the 1930's, or approximately 48% of forested stands in which age information had been recorded. Taken together, estimates of old-growth fraction in Swan Valley forests prior to active management vary from about 25 to 50 percent of the forested ecosystem.

Table 3.2. *Proportions by age-classes resulting from application of the negative exponential model, using an assumed stand-replacement interval of 150 years (Lesica 1996).*

Age Class	Proportion in Class	Cumulative Proportion
200+	26.4	26.4
181 - 200	3.8	30.2
161 - 180	4.3	34.5
141 - 160	4.9	39.4
121 - 140	5.6	45.0
101 - 120	6.4	51.4
81 - 100	7.3	58.7
61 - 80	8.4	67.1
41 - 60	9.6	76.7
21 - 40	10.9	87.6
1 - 20	12.5	100.0

4. Historic juxtaposition of landscape characteristics

Fewer data are available with which to assess the historic juxtaposition of habitat types and patches. However, Hart, (1994:37), concluded that:

"...the managed landscape of the 1990's exhibits different patterns than the more natural 1930's landscape, including smaller and more numerous patches with more edge and less interior habitat.",

and later (Hart 1994:35), that:

"The major differences in the landscapes for the two time periods -- number of patches, mean patch size, and mean core area index -- suggest a more fragmented landscape in the 1990's than existed in the 1930's."

Specifically, Hart's (1994) analysis suggested that, within her entire Seeley-Swan study area, the number of patches had increased, patch sizes had decreased but become more uniform, patch shape had become more complex, and edge had increased at the expense of patch interior compared to conditions during the 1930's (Table 3.3).

Table 3.3 *Selected landscape metrics comparing 1930's to 1990's conditions in the entire Seeley-Swan valley. Data taken from Hart (1994:66). All distinct patches (mapped at 16 ha minimum mapping unit) were assessed. Shape index is calculated relative to the simplest shape, i.e. a perfect square which takes the minimum value, 1.0 (more complex shapes take larger values).*

Landscape Measure	1930's	1990's
Number of patches	1,320	3,370
Mean patch size (ha)	187.82	73.57
Patch size standard deviation	728.25	291.43
Mean shape index	1.90	2.35
Total edge (km)	5,972	13,278
Patch interior (km^2), i.e., core	1,974	1,491

5. Historic levels of structural and compositional diversity

The current structure and composition of forests in the Swan Valley appears atypical of historic conditions. Active fire suppression since the 1940's has led to substantial filling-in of forest stands throughout the Swan Valley. The chief responses of the forest stands in the Soup and Cilly watersheds to the changes in disturbance regime have been an increase in the number of seedling and sapling stands as well as greatly increased tree density (stocking rates) in undisturbed stands. Comparisons of stand densities before fire suppression with present conditions suggest that the fraction of the forest showing greater than 60% canopy closure has more than doubled while the fraction with less than 29% canopy closure has been reduced by half (Hart 1994:57). Hart (1994:37) summarized the situation:

"Individual stands have become more dense and fuels have accumulated as fires have been suppressed".

Hart (1994:35) also pointed out that cover types had changed with continued fire suppression, as well as the introduction of exotic pathogens:

"Coupled with...structural differences are differences in composition, or in proportion of the landscape occupied by each cover type. Such differences are likely to have important implications for landscape function".

Douglas-fir has succeeded ponderosa pine in drier areas, increasing the area of mature and over-mature Douglas-fir at the same time as mature ponderosa pine has decreased. In moister areas, western white pine, western larch, and red-cedar have declined (the former primarily due to disease), giving way to Englemann spruce and subalpine fir.

B. Current Conditions: Analyses Relating to Ecosystem Sustainability
Here, we perform our own analyses to estimate the current condition of forests within the immediate environs of the project area, and/or the entire SRSF (depending on analysis) relative to the three components of ecosystem sustainability: I) amount of mature forest, ii) spatial (landscape) characteristics, and iii) diversity of structural and compositional components.

1. Analysis areas
In order to assess both the quantity of specified forest attributes and their spatial juxtaposition, we required designation of an analysis area that was larger than the Mid-Soup Creek Project Area (MSPA). Had we limited our analysis only to the MSPA, many forest patches would be both inside and outside the area, and problems of interpreting edges and boundaries would have been considerable. Thus, we identified a slightly larger area for purposes of assessing ecosystem sustainability, which we have termed the "ecosystem sustainability analysis area" (ESAA) . Th ESAA includes the entire MSPA, but extends it out to the boundaries of each section (Fig. 3.1), and totals 8,077 acres. Using the ESAA reduces (but does not entirely eliminate) distortions caused by inevitable "edges" within the chosen analysis area. In assessing the abundance of mature forest types, we were also able to provide estimates of current conditions on the entire DNRC holdings within the Swan River State Forest (SRSF).

2. Conserving mature forest

a. Methods
All DNRC forested stands were categorized as 1 of 8 tree size classes (see glossary size class definitions): old growth (OLDGR), saw timber other than old growth (SAW), multi-storied (MULTI), older pole timber (closed canopy; OPOLE), young pole timber (closed canopy; YPOLE), sapling and young pole timber (open canopy; SAP), grass/shrub/seedling (G/S/S), and non-forested areas (NFOR). For purposes of assessing ecosystem sustainability, old-growth and saw-timber categories were considered to represent mature forest types, while the remaining forested categories were immature, successional forest types.

b. Results
For the entire SRSF, acreage within these 8 vegetative categories is distributed among 792 discrete parcels. Of 39,848 acres of DNRC-owned land within the SRSF, 37,408 acres (94%) are currently classified as forested habitat. In all, 21,715 acres of forest (54%) are classified as mature and 18,133 acres (46%) are immature. Fully 14,506 acres (36.4 %) of forest stands are classified by

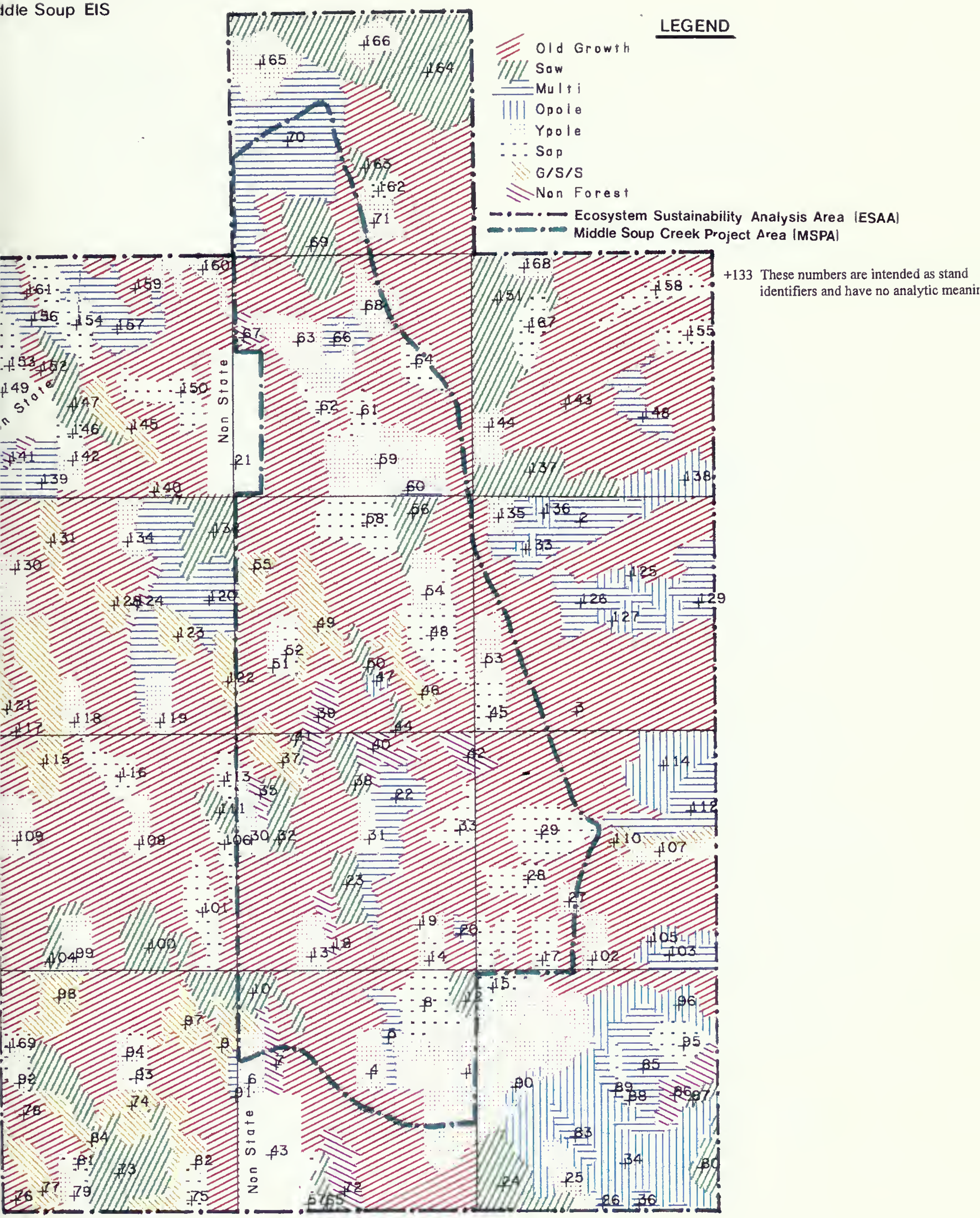


FIGURE 3.1

Current Condition 4/10/96

DNRC as old growth, 40% of which (5,847 acres) are found within the Soup/Cilly Creek drainages and form a significant portion of the proposed sale area.

Within the ESAA, 4,679 acres (57.9%) are classified as mature. Of these, some 3,868 (47.9% of the ESAA) are classified as old growth (Fig. 3.1).

3. Spatial characteristics of forested patches

a. Methods

We first determined unique forest patches by merging all adjacent forest stands with the same tree-size class. (The SRSF Stand-Level Inventory assigns unique identifiers to stands within each legal section, regardless of whether doing so creates artificial boundaries in otherwise continuous landscape patches. Our procedure simply reproduced patches as they actually occur on the ground). We assessed spatial characteristics of the resulting patches using two categorization systems: I) the 8 tree-size classes, earlier described, and ii) a "merged" tree-size classification, in which old-growth, saw-timber, and -- if present, post-old-growth stands were considered as the"mature" tree-size classification, multi-storied, old-pole, young-pole, and sapling stands were considered as the "immature" tree-size classification, and the grass/shrub/seedling category was combined with the naturally non-forested category into a "non-forest" tree-size classification.

Mean and standard deviation of patch size were calculated directly using the PAMAP GIS system. As an index to patch shape, we used the shape index of McGarigal and Marks (1994: C5), which uses both perimeter and area of each patch, but corrects for the effects of patch size. This index, also used by Hart (1994) and presented above in Table 3.3, takes a minimum value of 1.0 when patches are exactly square, and increases with shape complexity. We assessed the spatial juxtaposition of patches by tallying the amount of perimeter of each patch with patches of each other class. We then compared these "adjacency" proportions to those that would hold if all types of adjacency occurred in proportion to the abundances of the tree-size classes. Positive values here indicated that these types of juxtapositions were more common than would be expected based on abundance of types alone, while negative values indicated that these types of juxtapositions were rarer than might be expected. These calculations asked whether contrasts between patch types were greater or smaller than would be expected based on the abundance of the patch types alone.

Finally, we assessed the amount of "core interior" forest habitat by buffering all patches classified as one of the three "mature" types by 100 meters, and then summing only those in which the buffered area exceeded 50 hectares (123.5 acres).

b. Results

Within the ESAA, overall mean patch size is 49.3 acres. However, this figure is highly influenced by a single large patch of 3,371 acres. This large "patch" forms the background upon which all others are laid, and could equally easily be considered the landscape "matrix" (Forman and Godron 1986:159). As well, most of this patch is located outside of the Project Area per se. If this patch is excluded, overall mean patch size within the ESAA drops to 28.9 acres. Of the total 164 patches within the ESAA, 145 (88%) are less than 50 acres in size, and fully 96% (157) are less than 100 acres in size (Fig. 3.2). Mean patch size is largest for the old-growth tree-size class (484 acres), but again, this includes the large "matrix" patch. If this large patch is excluded, mean size for the remaining 7 old-growth patches drops to approximately 71 acres. Mean patch size for the remaining tree-size classes are in the 20-30 acre range. Patch sizes are also relatively uniform, with standard deviations roughly equal to means (Table 3.4a).

Patch sizes are somewhat larger when patches are classified by the merged types "mature", "immature", and "nonforested". Mean patch size across all types is 101 acres, again, largest in the mature types (Table 3.4b).

Table 3.4 ***Forest characteristics existing within the Ecosystem Sustainability Analysis Area (ESAA), by tree-size class. Shown are total and proportion acreage, number of patches, mean and standard deviation of patch size, and shape indices for each class.***

a. Classified by tree-size class.

MERGED	Mature		Immature				Nonforest	
Characteristic	OG	Saw timber	Multi	Old	Young	Sapling	G/S/S	Nonforest
Total Acreage	3868	811	785	393	926	669	453	172
Proportion of ESAA	0.48	0.10	0.10	0.05	0.12	0.08	0.06	0.02
Number of patches	8	24	22	11	36	33	19	11
Mean patch size (acres)	484	34	36	36	26	20	24	16
Standard deviation: patch size	1097	34	36	51	26	11	15	7
Shape Index	2.37	1.38	1.57	1.36	1.21	1.30	1.43	1.46

(Table 3.4 Continued)
b. Classified by merged tree-size classes.

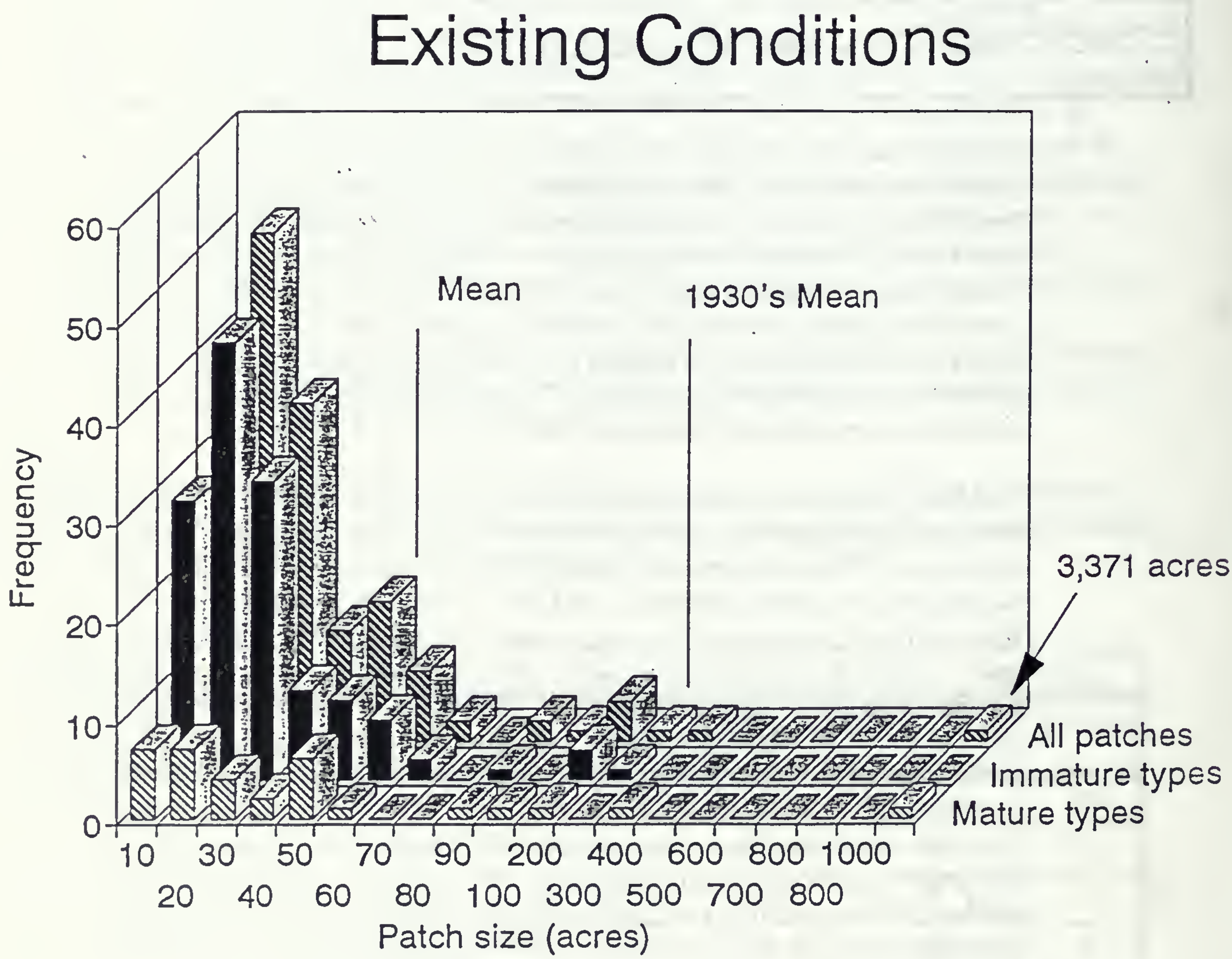
Characteristic	Mature	Immature	Nonforest
Total Acreage	4679	2772	626
Proportion of ESAA	0.58	0.34	0.08
Number of patches	8	45	27
Mean patch size (acres)	585	62	23
Standard deviation: patch size	1503	110	15
Shape Index	2.30	1.34	1.49

Adjacency among tree-size classes is presented in Table 3.5. In general, old growth and saw timber types have greater adjacency to the early seral types and less with each other than would be expected, given the existing abundances of each type (Table 3.5b). For example, there is roughly 4% less adjacency with saw timber among old-growth patches, and 7% more adjacency with both sapling and grass/shrub/seedling patches than would be expected given their abundances. This general pattern, of older patches being disproportionately close to younger patches, is seen throughout the matrix. The result is that edges between patches tend to be more abrupt than would otherwise be the case.

The mean shape index for all stands within the ESAA is 1.41. This is lower than both the 2.35 estimated by Hart (1994) for all of the Seeley/Swan study area, as well as the 1.90 she estimated as characterizing the area during the 1930's. This suggests that, in general, patches in the ESAA are of simpler shape than historically, or in the Seeley/Swan as a whole. However, old growth patches are more complex than are patches of earlier seral stages: the mean index among old-growth stands is 2.37 (and the largest [i.e., "matrix"] patch of old growth has an index of over 7.7). The simpler shapes of earlier successional stages likely reflect the "square-ness" of cutting units. The picture is similar if viewing patches by the coarser "merged" stand-size classification (Table 3.4b). Mean shape index is 1.49, and mature patches are more complex (2.30) than either immature (1.34) or the merged grass/shrub/seedling-nonforest class (1.49). Thus, in general, mature patches have more complex shapes (i.e., have a greater amount of edge per amount of area), and early seral patches have simpler shapes (i.e., have a greater amount of area per amount of edge) than was historically the case.

A total of 1,594 of the 8,077 acres within the ESAA qualified by both our criteria of "mature" and "core interior". Of these, some 1,007 were also classified as "old

FIGURE 3.2


Existing Conditions
60
50
40
30
20
10
0
Frequency
Mean
1930's Mean
3,371 acres
All patches
Immature types
Mature types
10
30
50
70
90
200
400
600
800
1000
20
40
60
80
100
300
500
700
800
Patch size (acres)

growth". However, examination of Fig. 3.3 reveals that the majority of the "mature interior core" forest within the ESAA is located outside of the Project Area per se.

4. Structural and compositional diversity

a. Methods

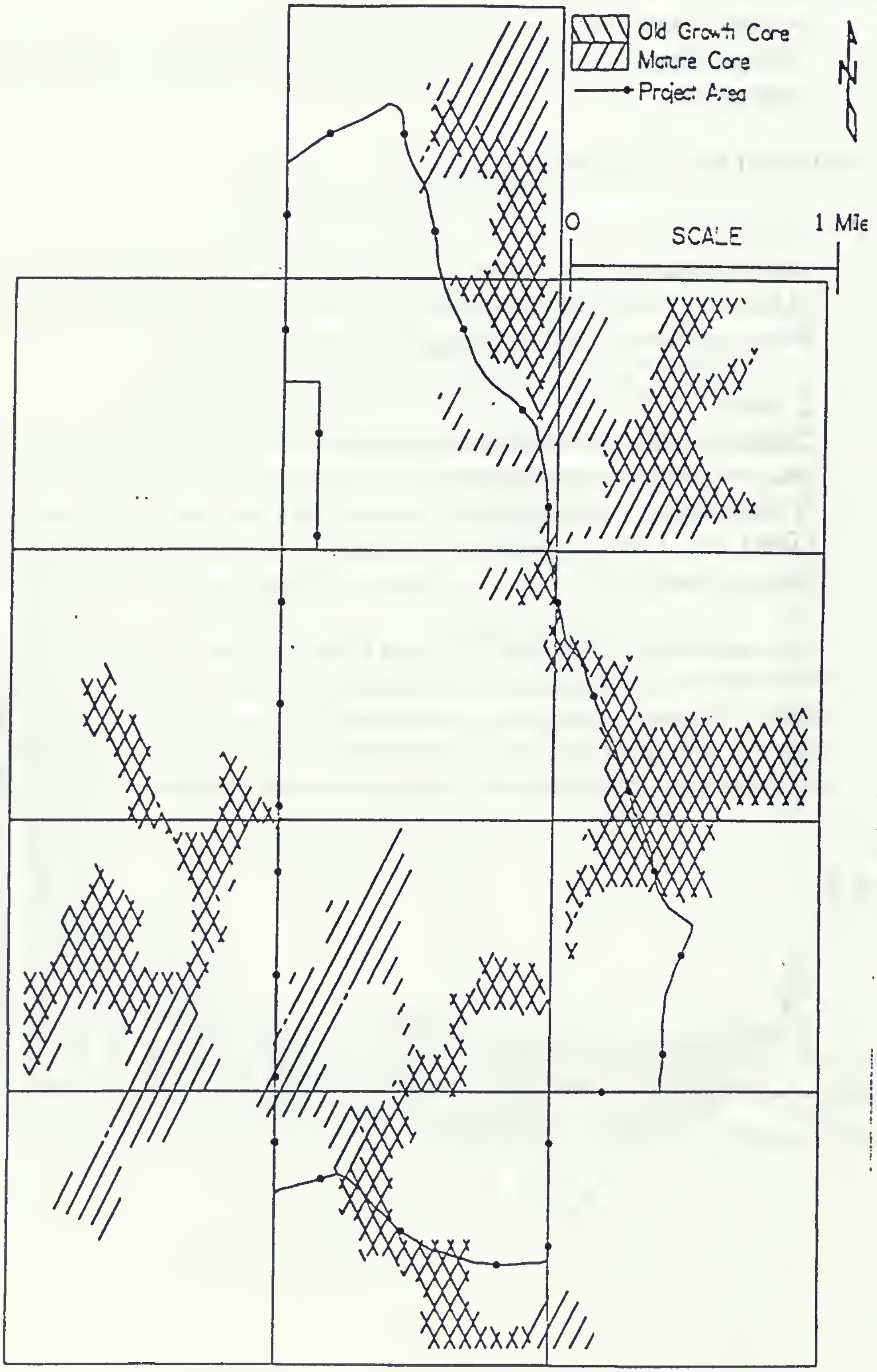
We used existing SRSF Stand-Level Inventory data to describe current conditions in terms of forest types (dominant species), overall stocking levels, and type of forest structure, on both the entire SRSF and the ESAA.

2. Results

Douglas-fir and western larch cover types constitute over 50% of the entire SRSF, and are somewhat more predominant within the ESAA. Over 63% of the ESAA is classified as either Douglas-fir, western larch, or a combination of the two (Table 3.6). Cedar, lodgepole pine, spruce, and subalpine fir types are slightly less common on the ESAA than they are in general within the SRSF.

Most stands within both the SRSF and ESAA are well-stocked (Table 3.7), and there appear to be no important distinctions between the ESAA and the larger SRSF. Similarly, stand structure characteristics within the ESAA display no obvious differences from the overall SRSF (Table 3.8). About an equal acreage of stands exist in single-storied and multi-storied conditions.

FIGURE 3.3



YEAR 0   NO ACTION ALTERNATIVE

Table 3.5 *Adjacency matrices of tree-size classes within the Ecosystem Sustainability Analysis Area (ESAA). Columns are proportion of each size-class that border the class of that row, and hence sum to 1.0. Thus, for example, in Table 3.5a, 15.3% of the total perimeter around existing old growth borders saw timber, but 45.8% of the perimeter around saw timber borders old growth. The difference occurs because there is more old growth within the ESAA than there is saw timber.*

a. Classified by tree-size class.

MERGED	Mature		Immature				Nonforest	
NONMERGED	Old Growth	Saw Timber	Multi	Old Pole	Young Pole	Sapling	G/S/S	Nonforest
Old Growth	--	0.458	0.367	0.297	0.500	0.661	0.663	0.467
Saw Timber	0.153	--	0.082	0.106	0.100	0.108	0.136	0.168
Multi	0.134	0.089	--	0.435	0.123	0.084	0.080	0.220
Old Pole	0.050	0.053	0.203	--	0.056	0.013	0.000	0.003
Young Pole	0.203	0.121	0.137	0.133	--	0.169	0.071	0.102
Sapling	0.228	0.111	0.079	0.027	0.144	--	0.042	0.022
G/S/S	0.176	0.107	0.058	0.000	0.046	0.032	--	0.018
Nonforest	0.057	0.061	0.073	0.002	0.031	0.008	0.008	--
	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

b. Differences from expected, based on existing abundances by type.

MERGED	Mature		Immature				Nonforest	
NONMERGED	Old Growth	Saw Timber	Multi	Old Pole	Young Pole	Sapling	G/S/S	Nonforest
Old Growth		-0.07	-0.16	-0.21	-0.04	0.14	0.16	-0.02
Saw Timber	-0.04		-0.03	0.00	-0.01	-0.00	0.03	0.07
Multi	0.05	- 0.02		0.33	0.01	-0.02	-0.02	0.12
Old Pole	-0.04	-0.00	0.15		0.00	-0.04	-0.05	-0.05
Young Pole	-0.02	-0.01	0.01	0 .01		0.04	-0.05	-0.02
Sapling	0.07	0.02	-0.01	-0.06	0.05		-0.05	-0.06
G/S/S	0.07	0.04	-0.00	-0.06	-0.02	-0.03		-0.04
Nonforest	0.02	0.04	0.05	-0.02	0.01	-0.02	-0.01	

(Table 3.5 continued)
c. Classified by merged tree-size classes. Here, adjacency with the same "class" is possible, because merged classes are composed of >1 tree-size classes.

	Mature	Immature	Nonforest
Mature	0.230	0.565	0.748
Immature	0.554	0.364	0.241
Nonforest	0.216	0.071	0.012
	1.0	1.0	1.0

Table 3.6 *Proportions of area in various forest types within the ESAA and SRSF.*

Forest Type	Proportion of Area	
	SRSF	ESAA
Douglas-fir	.168	.158
Larch	.176	.183
Douglas-fir - Larch	.173	.295
Lodgepole pine	.073	.016
Spruce	.119	.082
Subalpine fir	.073	.008
Cedar	.068	.005
Grand fir	.035	.035
Mixed conifer	.081	.083
Ponderosa pine	.018	.032
Western white-pine	.006	.020
White-bark pine	.004	.000
Noncommercial	.004	.000

Table 3.7 *Stocking levels on forested stands within the SRSF and ESAA.*

Stocking Level	Proportion of Area	
	SRSF	ESAA
Well	0.711	0.744
Moderate	0.150	0.117
Light	0.003	0.000
Poor	0.075	0.062
Nonstocked	0.032	0.056

Table 3.8 *Stand structure on forested stands within the SRSF and ESAA.*

Structure	Proportion of Area	
	SRSF	ESAA
Primarily single-storied	0.439	0.410
Two distinct stores in stand	0.058	0.066
Three or more stories, or uneven-aged	0.430	0.440
Heterogeneous	0.011	0.006

5. Summary.

Given this assessment of the current state of the vegetative environment within the ESAA and the SRSF, primary concerns center not on the amount of mature and old-growth habitat per se, but rather on the degree of fragmentation as it relates to animal species which require large contiguous areas of mature and old-growth stands for population maintenance. Currently the largest stands of old growth and mature forests remaining within the SRSF are located within or adjacent to the proposed sale area. Most of these stands are relatively small in size. Of the 5 stands calculated to be larger than 200 acres (mean = 442 acres) significant portions of 2 lie within sale boundaries. The remaining 3 are isolated from one another. Existing fragmentation, particularly among stands within the sale area, has already greatly restricted available corridors between old growth and/or mature stands.

C. Current Conditions: Analyses Relating to Old Growth

1. Analysis area

The analysis of old growth is primarily based on the 2591-acre project area, but existing quantities of old growth are also considered in the context of the Soup and Cilly Creek watersheds. Data was obtained from the SRSF Stand Level Inventory.

2. Analysis methods

The SRSF Stand Level Inventory identifies stands as old growth if they have a saw-timber stand class code, if the crown density of saw-timber trees in the stand is greater than 39 percent, if they contribute to a contiguous area of old growth at least 50 acres in size, and if they meet one of the following criteria:

1. The stand contains trees that average at least 200 years old.
2. The stand contains trees that average 150 to 199 years old, and it has an uneven-aged stand structure.
3. The stand contains trees that average 100 to 149 years old, and it has an uneven-aged stand structure and fair-to-poor or very poor vigor.

Vigor classes were used to project the relative stability of old-growth stands. The vigor of stands is directly related to the health of individual trees and the relative stability of stands. Stands having good-to-fair vigor or fair-to-poor vigor are likely to remain relatively stable for the next several decades. Some trees in old-growth stands having good-to-fair or fair-to-poor vigor would continue to die, maintaining the presence of snags and large down logs. Large trees of mixed species having varying degrees of shade tolerance would continue to dominate the stands.

Mortality is exceeding growth in stands having very poor vigor. Over the next several decades, stands having very poor vigor would continue to decline; trees would be killed by mountain pine beetle, Douglas-fir beetle, dwarf mistletoe, root rot, white pine blister rust, and other insects and diseases. Live, shade-intolerant trees would become scarce, and shade-tolerant species such as Engelmann spruce, grand fir, or subalpine fir would dominate the stands. Slow rates of natural decomposition would maintain an abundance of large snags and down logs for several decades, but species diversity and the abundance of large, live trees would decrease. Although the stands may be very old, old-growth characteristics that are important to many wildlife species would not exist or would become rare. Stands would move from an old-growth stage to a post-old-growth stage of succession.

3. Affected environment

Old growth represents the later stages of natural development of forest stands. Old-growth stands are dominated by relatively large, old trees. They generally contain a wide variety of tree sizes; exhibit some degree of multistoried structure; have signs of decadence such as trees with rot, broken boles, or spiked tops; and contain standing, large snags and large down logs.

Approximately 36.4 percent of SRSF (14,506 acres) is old growth. About 50.5 percent (1309.2 acres, 9.3 percent of the total SRSF old growth) of the project area is classified as old growth. The old growth in the project area is located in 66 separate stands that range in size from 0.2 to 76.4 acres

About seventy-two percent of the existing old growth in the project area, or 934.6 acres, has good-to-fair or fair-to-poor vigor (Table 3.9, Figure 4.15); it will probably remain stable for the next several decades. About twenty-nine percent of the existing old growth, or 374.7 acres, has very poor vigor. The stands contained in the 374.7 acres would lose important old-growth characteristics over the next several decades.

D. Current Conditions: Analyses Relating to Timber Productivity

1. Analysis area

Timber productivity analyses are based on the 2,591-acre project area. Data used for assessing the existing vigor and timber productivity of the eight stand classes was obtained from the SRSF Stand Level Inventory.

2. Analysis methods

The overall timber productivity of the project area is directly related to the vigor class of stands in the project area. The extent to which silvicultural treatments would affect the future timber productivity of stands depends on existing stand class and vigor. The average stand vigor of the No-Action Alternative provides a bases for comparing relative timber productivity with each action alternative. A vigor value of 1.00 represents a stand having full vigor and optimal timber productivity. A vigor value of 4.00 represents a stand having very poor vigor and negative timber productivity (mortality likely exceeds growth). The following vigor classes and their corresponding vigor values are based on the SRSF Stand Level Inventory.

a. full vigor

The full vigor class has a vigor value of 1.00. It is represented by open-grown trees. Crown closure has not occurred, and growth is optimal.

b. good-to-fair vigor
The good-to-fair vigor class has a vigor value of 2.00. Crowns are closed at least in clumps; crown lengths are greater than 50 percent in young stands and greater than 33 percent in older stands. Growth has not yet slowed greatly.

c. fair-to-poor vigor
The fair-to-poor vigor class has a vigor value of 3.00. Crown ratios are poor. Growth and mortality are nearly balanced.

d. very poor vigor
The very poor vigor class has a vigor value of 4.00. Stands having very poor vigor are generally in a decadent condition due to insects, disease, stagnation, suppression or old age. Mortality likely exceeds growth.

3. Past management activities

Timber harvesting has occurred periodically within the project area since the early 1960's. Past harvesting of old-growth and saw-timber classes have converted 38.6 percent of the project area to grass/shrub/seedling (4.0%), sapling (12.4%), young pole (15.1%) and multistoried classes (7.1%). These conversions have contributed to increases in vigor and timber productivity on the project area.

4. Existing timber productivity of project area

The Middle Soup Creek Project Area has a very high timber productivity potential because of its physical and biological characteristics. Old-growth stands in the project area exhibit lower timber productivity than young stands. The average vigor value of all old-growth stands in the project area is 3.01. Sapling stands have an average vigor value of 1.54, and young pole-timber stands average 1.76 (Table 3.9). Stands in the grass/shrub/seedling stand class are still in a stand establishment phase and will likely reach full vigor within five years. Residual overstory in multistoried stands is likely suppressing established regeneration and timber productivity. Multistoried stands have an average vigor value of 3.0. Saw-timber stands have an average vigor value of 2.24. The average vigor value of all stands in the project area is 2.50.

The existing vigor and timber productivity of the project area are summarized in Table 3.9 and Figure 3.4. Stands with full vigor represent 14.2 percent of the project area and occur on 367.1 acres. Stands with good-to-fair vigor represent 39.5 percent of the project area and occur on 1,024.1 acres. Stands with fair-to-poor vigor represent 28.1 percent of the project area and occur on 728.5 acres. Since nonforested areas (94.4 acres) do not contribute to timber productivity, they are also included in this zero-productivity vigor class. Stands with very poor vigor represent 18.2 percent of the project area and occur on 471.3 acres.

5. Existing timber productivity of stands considered for harvest

The SRSF Stand Level Inventory identifies 19 stands for possible timber harvesting. These stands represent 58.6 percent of the project area and contain 1,517.8 acres. Stands identified for possible timber harvesting include stands with the treatment codes high risk, low risk, and overstory removal. The high-risk category includes commercial, nonvigorous, over mature stands and any merchantable stands which exhibit unmanageable insect or disease problems. The low-risk category includes commercial stands older than 100 years which do not qualify as high risk. These stands have relatively better vigor than high-risk stands. The low-risk category also includes stands dominated by shade-tolerant species regardless of age. The overstory removal category includes stands which contain commercial size trees in excess of 1,000 board feet per acre if the trees are (1) part of an unmanageable stand component, or (2) the trees represent the upper story of a two-storied stand but are inadequately stocked to be treated as a separate, manageable component. Table 3.10 gives the acres considered for treatment within each treatment code, the average volume of timber per acre, and the total volume within each treatment code.

TABLE 3.10 *A Summary of Stands Considered for Harvest*

Treatment Code	Acres	Average Volume Per Acre (MBF)	Total Volume (MMBF)
high risk	939	26	24.4
low risk	495	20	9.7
overstory removal	83	6	0.5
TOTAL	1517	N/A	34.6

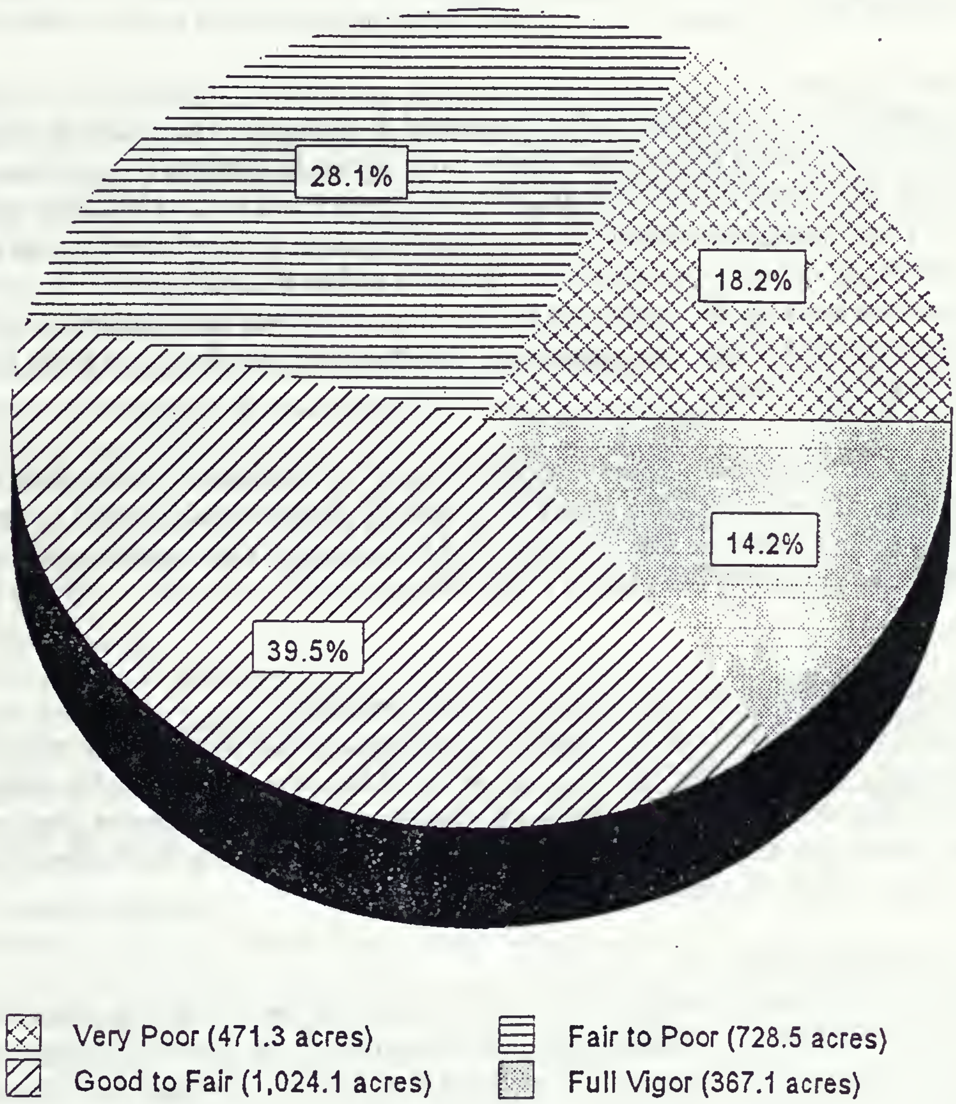
Table 3.9 The Vigor and Productivity of Existing Stand Classes

Stand Class	Vigor Class	Vigor Value	Acres	% of Project Area	*Average Vigor Value
Old Growth	good to fair	2.00	357.9	13.8%	
	fair to poor	3.00	576.7	22.3%	
	very poor	4.00	374.7	14.5%	
	subtotal		1,309.2	50.5%	3.01
Saw Timber	good to fair	2.00	137.7	5.3%	
	fair to poor	3.00	44.5	1.7%	
	subtotal		182.3	7.0%	2.24
Multistoried	full	1.00	21.1	0.8%	
	good to fair	2.00	53.9	2.1%	
	fair to poor	3.00	12.9	0.5%	
	very poor	4.00	96.6	3.7%	
	subtotal		184.6	7.1%	3.00
Old Pole Timber	good to fair	2.00	4.4	0.2%	2.00
Young Pole timber	full vigor	1.00	93.9	3.6%	
	good to fair	2.00	296.6	11.4%	
	subtotal		390.5	15.1%	1.76
Sapling	full vigor	1.00	147.2	5.7%	
	good to fair	2.00	173.6	6.7%	
	subtotal		320.7	12.4%	1.54
Grss/Sdlng/Shrb	full vigor	1.00	104.9	4.0%	1.00
Nonforested	N/A	N/A	94.4	3.6%	3.00
	subtotal		199.3	7.6%	3.00
TOTAL			2,591.0	100%	2.50

Vigor Classes	*Timber Productivity*	*Vigor Value*
Full:	*positive productivity, near yield potential*	*1.00*
Good to Fair:	*positive productivity, growth exceeds mortality but falls short of yield potential*	*2.00*
Fair to Poor:	*zero productivity, mortality balances with growth*	*3.00*
Very Poor:	*negative productivity, mortality exceeds growth*	*4.00*
N/A:	*nonforested*	*3.00*

* Average weighted by area.

Figure 3. 4 *The Existing Vigor of Stands in the Project Area: A Measure of Timber Productivity*



The *percentages are based on 2,591 acres within the project area. The average vigor value for all the stands in the project area is 2.50. Vigor values and classes are as follows:*

vigor value	*vigor class*	*timber productivity*
4.00	*very poor:*	*negative productivity, mortality exceeds growth.*
3.00	*fair to poor:*	*zero productivity, mortality balances with growth.*
2.00	*good to fair:*	*positive productivity, growth exceeds mortality but falls far short of yield potential.*
1.00	*full vigor:*	*positive productivity, near yield potential.*

II. WILDLIFE

A. Grizzly Bear

1. Analysis area

The grizzly bear is federally listed as threatened in Montana. The Middle Soup Creek Project Area is within the Northern Continental Divide Ecosystem Grizzly Bear Recovery Area (NCDE) (US Fish and Wildlife Service 1993). The NCDE is divided into 23 Bear Management Units (BMU's); each BMU is further divided into subunits approximately 50 square miles in area. Subunits define the area in which the existing environment and effects of proposed actions on grizzly bears are evaluated (US Fish and Wildlife Service 1995a). The project area is within the South Fork Lost Soup Subunit of the Bunker Creek BMU.

The South Fork Lost Soup Subunit encompasses 29,923 acres (46.8 mi^2). DNRC administers 62 percent (18,446 acres) of the subunit, the Flathead National Forest administers 36 percent, and Plum Creek Timber Company owns approximately one percent. The remaining one percent of the subunit is in other private ownership (Table 3.11).

2. Analysis methods and environmental characteristics

Attributes of the subunit used to describe the affected environment include motorized access, security habitat, hiding cover, and seasonal habitats. Guidelines for analyses follow DNRC Interim Guidance for grizzly bears in the NCDE (Montana Dept. of Natural Resources and Conservation 1995) and Amendment 19 to the Flathead National Forest Plan (USDA Forest Service 1995).

a. motorized access

Motorized access has been shown to be an important factor affecting grizzly bears (Mace et al. 1993). Increased motorized access results in increased human-caused bear mortality, displacement of bears from energetically important habitats, and habituation of bears which often leads to bears being killed or removed to captivity (Interagency Grizzly Bear Committee 1994).

Motorized access routes in the project area include roads classified as open, restricted, reclaimed, private, administrative, and Highway 83. Definitions for all classes of roads are located in the glossary under roads. Motorized access in the subunit is calculated by two methods: the linear miles of the various road classes and the "precise density" of roads using a "moving windows" method (Ake 1995).

In the moving windows analysis, the South Fork Lost Soup Subunit is divided into

30-meter square "windows." Open road density (ORD) is calculated as the percentage of windows in the subunit with more than one square mile of open road around them. Total road density (TRD) is the percentage of windows in the subunit surrounded by more than two square miles of open and restricted roads.

Within the South Fork Lost Soup Subunit, there are 29.8 miles of open road, 52.2 miles of restricted road, and 19.9 miles of other roads (Table 3.11). The ORD of the entire subunit is thirty-four percent. For DNRC land within the subunit, the ORD is forty-three percent. For the entire subunit TRD is forty-three percent; DNRC land in the subunit has a TRD of fifty-two percent.

b. security habitat

Security habitat or core area (habitat free of motorized access) is an important home-range component of female grizzly bears that successfully raise cubs to adulthood (US Fish and Wildlife Service 1995a). Security habitat is at least 0.3 miles from a motorized road or trail during the nondenning period (3/16-11/15) and a minimum of 2500 contiguous acres. Thirty-eight percent (11,315 acres) of the South Fork Lost Soup Subunit qualifies as security habitat of which DNRC administers 5,074 acres.

c. hiding cover

Hiding cover is defined as a patch of vegetation having a minimum diameter of at least three sight distances or 300 feet--whichever is greater. A sight distance is the distance at which 90 percent of a bear is hidden from view. Approximately 79 percent of the South Fork Lost Soup Subunit qualifies as hiding cover; 92 percent of DNRC land within the subunit meets hiding cover criteria.

d. seasonal habitat

Research in the lower South Fork of the Flathead statistically compared habitats used by grizzly bears with available habitats in the study area for five seasons (Manley et al. 1992): early spring (March 16 - May 7), spring (May 8 - July 15), summer (July 16 - September 30), autumn (October 1 - November 15), and denning (November 16 - March 15). Habitats were described using a combination of satellite imagery and topographic data.

For each season, habitats in the study area were placed into one of three probability categories: use less than, equal to, or greater than expected by grizzly bears. These categories are assumed to reflect the relative seasonal value of habitats to grizzly bears. Habitats used greater than expected are of the highest value to grizzly bears.

Table 3.11 *South Fork Lost Soup Subunit Attributes and Ownerships*

Subunit Attributes	DNRC	FNF	Plum Creek	Small Private	Total
Ownership acres (% of subunit)	18,446 (62%)	10,895 (36%)	147 (1%)	435 (1%)	29,923 (100%)
Hiding cover acres (% of ownership)	16,891 (92%)	6,881 (63%)	unknown	unknown	≥23,772 (≥79%)
Security habitat acres (core area)	5,074	6,241	0.0	0.0	11,315
Open Roads[1,2,3] miles	22.3	7.5	0.0	N/A	29.8
Restricted, non-core roads[1,2,3] (miles)	38.6	8.9	1.0	N/A	48.5
Restricted, core roads[2] (miles)	2.6	1.1	0.0	N/A	
Reclaimed roads (miles)	9.6	2.9	0.5	N/A	13.0
Private roads[3] (miles)	N/A	N/A	N/A	0.7	0.7
Administrative and county roads[3] (miles)	1.3	0.0	0.0	N/A	1.3
Highway 83[3] (miles)	3.0	1.4	0.0	0.5	4.9
Open Road Density >1.0 mi/sq mi	43%				34%
Total Road Density >2.0 mi/sq mi	52%				43%

[1] included in calculation of precise open road density
[2] included in calculation of precise total road density
[3] included in calculation of core area

Table 3.12 *Acres of Grizzly Bear Seasonal Habitats throughout the South Fork Lost Soup Subunit and Core Areas within the Subunit (Manley 1992)*

Early Spring[1] (3/16 - 5/7)	Entire Subunit	Security Areas
use < expected	4,484 (26%)	188 (13%)
use = expected	9,391 (54%)	916 (61%)
use > expected	3,462 (20%)	385 (26%)
Spring (5/8 - 7/15)	**Entire Subunit**	**Security Areas**
use < expected	13,531 (45%)	3,259 (26%)
use = expected	9,104 (31%)	4,507 (36%)
use > expected	7,288 (24%)	4,732 (38%)
Summer (7/16 - 9/30)	**Entire Subunit**	**Security Areas**
use < expected	14,408 (48%)	3,699 (30%)
use = expected	6,256 (21%)	2,583 (21%)
use > expected	9,259 (31%)	6,216 (49%)
Autumn (10/1 - 11/15)	**Entire Subunit**	**Security Areas**
use < expected	11,014 (37%)	2,753 (22%)
use = expected	8,949 (30%)	3,488 (28%)
use > expected	9,960 (33%)	6,256 (50%)
Denning (11/16 - 3/15)	**Entire Subunit**	**Security Areas**
use < expected	13,065 (44%)	3,196 (25%)
use = expected	14,289 (48%)	6,963 (56%)
use > expected	2,568 (8%)	2,338 (19%)

[1] below 5,000 feet elevation

Since habitats were described using remote sensing technology, habitat values outside of the South Fork study area can be described. This has been done for the NCDE west of the Continental Divide (USDA Forest Service 1995). Table 3.12 summarizes existing grizzly bear habitat values in the South Fork Lost Soup Subunit and security habitat within the subunit. Representative proportions of all five seasonal habitats are found within security areas in the subunit.

B. Elk

It is assumed that standards for elk habitat are also adequate for mule deer (USDA Forest Service 1994c). The project area is used by elk from early spring through late fall. The conifer and mixed conifer/deciduous stands provide a variety of successional stages and forest types that are used for thermal cover, hiding cover, resting, and foraging.

1. Analysis area

The analysis area is about 5843 acres and contains the project area and a 0.5 mile buffer (Figure 3.5). Areas of private ownership were excluded from analysis because data on hiding and thermal cover and forage were not available. For parts of the analysis, the area was divided into four quadrants of roughly equal size (Figure 3.5).

2. Analysis methods

A method for determining the adequacy of an area as potential elk habitat was developed by the Flathead National Forest and the Montana Department of Fish, Wildlife and Parks (MFWP), based on work conducted in northern Idaho (Leege 1984). This analysis procedure deals with general habitat considerations and not with site specific features such as moist sites and calving areas. This method was applied to the project area using the SRSF Stand Level Inventory and GIS map layers developed for the SRSF. The criteria used to calculate elk habitat potential are road density and human use, size and distribution of hiding and thermal cover, size and distribution of forage areas, and adequacy of security areas. Elk habitat potential is estimated based on the difference between optimal and actual conditions (the "reduction" from optimal conditions). Calculations are located in Project File # 605.

3. Affected environment

a. open roads

Open roads were estimated to receive over 20 vehicle trips per week. The analysis area is 9.2 square miles and has 11 miles of open road; open road density is 1.2 miles per square mile. The analysis assumes that elk avoid areas with roads that are heavily used by humans and considers these areas unavailable as potential elk habitat. Due to road effects, 55 percent of the project area remains available as potential elk habitat.

FIGURE 3.5 ELK AND WHITE-TAILED DEER ANALYSIS AREA

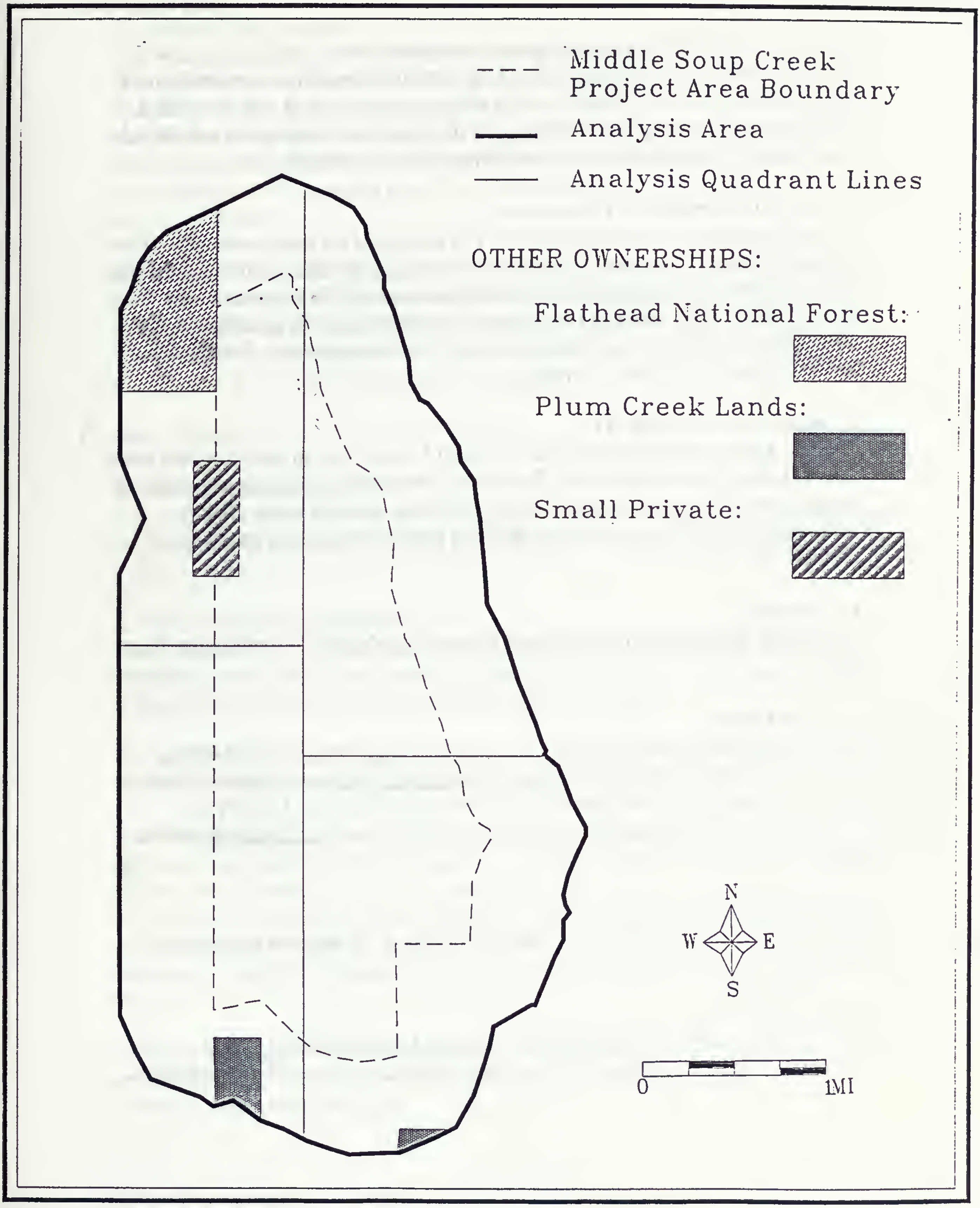


Figure 3.5

b. size and distribution of hiding and thermal cover

Summer thermal cover is provided on 61.2 percent of the analysis area and hiding cover is provided on 90.9 percent of the analysis area. Cover is well distributed, being present in each quadrant of the analysis area. Cover is adequate and elk habitat potential is not reduced due to insufficient hiding or thermal cover.

c. size and distribution of forage areas

Forage is present in all four quadrants and 99 percent of the forage areas are within 500 feet of cover. The value of potential elk habitat was reduced, however, because only 26.2 percent of the analysis area provides forage (≥30% is optimal), and because there is less than 800 feet of cover between most of the openings (optimal conditions are ≥800 feet of cover between ≥75% of the openings). Potential elk habitat is thus reduced by 10 percent.

d. adequacy of security area

Security areas are defined as areas more than 0.5 miles from an open road and larger than 250 contiguous acres in size. Twenty-six percent of the analysis area provides security, and 78 percent of the land in security areas provides cover. This is adequate and elk habitat is not reduced due to insufficient quantity or quality of security areas.

e. summary

Overall elk habitat potential is 50% due to open road density and inadequate forage areas.

C. White-Tailed Deer

The project area is used by white-tailed deer from early spring through late fall during climatically normal years. The area serves as fall-transition range and a migration route to winter range. The conifer and mixed conifer/deciduous stands provide a variety of successional stages and forest types that are used for thermal cover, hiding cover, resting, and foraging.

1. Analysis area

The analysis area used for white-tailed deer is the same as the analysis area for elk (Figure 3.5).

2. Analysis methods

Analysis methods used for white-tailed deer consist of comparing the affected environment to desired conditions that have been recommended by MFWP biologists.

3. Affected environment

The analysis area provides high-quality summer and fall habitat for white-tailed deer. White-tailed deer summer range habitat recommendations are as follows (Cross 1983): at least 50 percent of upland habitat should provide thermal cover, at least 75 percent should provide hiding cover, and about 25 percent should provide foraging areas. These recommendations are all being met: thermal cover is provided on 61.2 percent of the area, hiding cover is provided on 90.9 percent of the area, and forage is provided on 26.2 percent of the area.

Riparian areas are important components of white-tailed deer summer range and the following additional recommendations pertain to these areas (Cross 1983): multispecies, multistoried stands should be maintained adjacent to riparian areas, and these stands should be at least 1.5 sight distances or 100 feet wide, whichever is greater, if unmanaged, and at least 300 feet wide if managed.

D. Gray Wolves

1. Analysis area and methods

The analysis area and method of estimating open road density for wolves are the same as the analysis area and methods for elk and white-tailed deer (project area plus a 0.5-mile buffer) (Figure 3.5).

2. Environmental characteristics

The project area is within the Northwest Montana Wolf Recovery Area (US Fish and Wildlife Service 1987) where wolves are federally listed as an endangered species. Wolves are not known to currently inhabit the Swan Valley.

The primary factors in managing habitat for wolves include (1) maintaining an adequate prey base, and (2) preventing illegal, human-caused mortality.

The most abundant prey species in the project area are white-tailed deer and elk, preferred prey species of wolves in northwest Montana (Boyd et al.1994). Moose also use the area. The area is primarily spring - fall range, although ungulates may remain in the area during winters with below-average snow accumulation. Ungulate calving/fawning sites may be scattered throughout the project area, but no specific sites have been identified. White-tailed deer and elk are addressed separately in this document.

Persistence of disjunct wolf populations have been related to open road densities, proximity to larger populations of wolves (a source of dispersers to offset wolf mortality), and human attitudes.

In Wisconsin (Theil 1985) and Minnesota (Mech 1988), disjunct wolf populations distant from a larger source population did not persist in areas with more than 0.9 miles per square mile. This threshold road density may vary with topography, road use, human attitudes, and other factors. Using the same analysis area for white-tailed deer and elk (the project area plus a 0.5-mile buffer), the open road density is 1.2 miles per square mile.

E. Sensitive Species

Several approaches can be taken to assess impacts to wildlife species that are dependent on old growth and/or that are particularly sensitive or vulnerable to human disturbance; each approach has its strengths and weaknesses. Two broad categories of approach to analysis are the coarse filter and fine filter. Fine filter refers to addressing individual elements in an ecosystem--in this case impacts to individual species of wildlife. Coarse filter refers to addressing the integrity of the ecosystem as a whole. The interdisciplinary team has chosen to analyze impacts to wildlife using primarily the coarse-filter approach. The coarse-filter approach is based on the premise that by maintaining the integrity of ecological systems, habitat for wildlife species that have evolved in these systems will be maintained. This approach can be more effective than the fine-filter approach given the reality of limited resources available for analysis. Analyzing for ecological integrity requires a multifaceted approach. For the analysis of effects of the project on wildlife, these analysis components include the total amount of forest in different successional stages, forest patch size and shape, juxtaposition of forest patches of different successional stages, and connectivity between patches or fragmentation.

The coarse-filter approach was also chosen because it avoids some of the problems inherent in the fine-filter approach. The individual species approach is limited by the lack of information available on the many processes and interactions that must occur to assure viability of a species. For many species, knowledge is limited or lacking on distribution, abundance, and essential abiotic habitat components. Almost nothing may be known about habitat components needed to support essential prey species, community dynamics, or how human alteration of the habitat may affect species and communities. Compounding these limitations is the sheer number of wildlife species existing in a general area and the different habitat requirements of each one.

A recognized limitation of the coarse-filter approach is that some elements will fall outside its purview. In the case of the Middle Soup Creek Project analysis for effects to wildlife, these include wildlife species that occur at low densities and are under threat of over exploitation or are negatively affected by factors in addition to the manipulation of vegetation (We assume that the analysis for ecosystem sustainability will address impacts associated with the manipulation of vegetation). For these reasons, we decided to supplement the coarse-filter analysis with a fine-filter analysis for species that have been identified as sensitive by the adjacent Flathead National Forest (FNF). Sensitive species are species for which there is concern for long-term population viability, that are vulnerable to human actions, and that may become listed under the federal Endangered Species Act without proactive management. Impacts to all nine FNF sensitive species were assessed; four of these species were dismissed in Chapter I, and the remaining five species are discussed below.

Impacts to the following five sensitive species are referenced to other sections of the EIS, when appropriate, to avoid redundancy. Analysis area boundaries thus correspond with the boundaries used for the analysis referenced. Impacts to the western big-eared bat and black-backed woodpecker related to snag availability are referenced to the section on cavity dependent species. Impacts to the fisher and lynx related to forest successional stages, total amount and connectivity of old-growth forest, and forest fragmentation are referenced to the section on ecosystem sustainability.

1. Western big eared bat

Roosting, feeding, and breeding occur in caves, mine shafts, rock outcrops, lava tubes, and occasionally buildings. Tree cavities are occasionally used for daytime roosting. This species is probably limited by the number of suitable roosting sites surrounded by adequate foraging habitat. Although not confirmed, the presence of western big-eared bats is suspected in the Swan Valley (Reichel 1995).

There are no caves within the project area. Rock cliffs, located one or two miles from the project area (see "American Peregrine Falcon," Chapter I), may provide roost sites. Some of the larger hollow trees may also provide roost sites.

2. Fisher

Fishers primarily use riparian areas and mature to old-growth grand fir, subalpine fir, cedar, and hemlock forests, at elevations below 6300 feet. Older forests likely have higher densities of accessible prey as well as resting and natal den sites. High densities of downed logs, large overstory trees, and a relatively closed canopy are important habitat components.

Fishers were extirpated from the Northern Rockies by about 1930. Some fishers now exist in northern Idaho and the west slopes of the Rockies due to reintroduction efforts. Population numbers remain low (Heinemeyer 1994), although fisher have been legally trapped in Missoula and Lincoln counties. The largest concentration of fisher in Montana may now exist in the Swan Valley (Forseman 1996).

3. Lynx
Lynx are associated with boreal and montane forests. They require early successional forest that contains high numbers of prey for hunting, mature forest for denning and cover for kittens, and densely forested cover for travel and security. Predicted denning habitat in the Swan Valley is at higher elevations corresponding with the range of spruce and fir-dominated cover types (USDA Forest Service 1994b). In the vicinity of the project area this would be at an elevation of about 5,000 feet and above. This is higher than the highest elevation within the project area, about 3700 feet, and lynx are consequently not expected to den within the project area.

Lynx are highly dependent on snowshoe hares for prey. Good snowshoe hare habitat is coniferous forest with over 4500 stems per acre. Predicted potential feeding habitat extends across the Swan Valley floor (USDA Forest Service 1994b). About 30 sets of adult lynx tracks have been observed by one individual in the Soup Creek Watershed in the past 30 years, confirming that this area is used by lynx for feeding and travel (Gray 1995).

4. Black-backed woodpecker
The black-backed woodpecker requires areas with high concentrations of recently dead trees and logs for feeding. Feeding trees have usually been dead less than two to three years and harbor high concentrations of wood-boring insects, particularly larvae and pupae of bark beetles. Recently burned areas are heavily used, but patches of unburned insect-infested trees are also used. Nesting is usually in dense patches of green trees, and nest trees are at least 17 inches dbh and have heartrot.

Suitable nest trees exist within the project area. Although no fires have occurred in or near the project area in the recent past, scattered throughout the project area are many pockets of Douglas-fir that are heavily infected with bark beetles that should provide adequate, though not optimal, feeding habitat.

5. Northern bog lemming
Bog lemmings are associated with sphagnum bogs or hummocky meadows dominated by sedges, often containing standing water. Bog lemmings have been seen on the Kootenai and Flathead National Forests, and in Glacier National Park. Suitable bog lemming habitat may exist within the project area.

F. Cavity-Dependent Wildlife
Many species of birds and mammals are totally or largely dependant on dead trees (snags) and defective trees (partially dead, spike top, broken top) for nesting, denning, roosting, feeding, and cover. Snags and defective live trees may be the most valuable individual components of Northern Rocky Mountain Forests for wildlife species (Heijl 1991). The quantity,

quality, and distribution of snags affect presence and population size of many cavity-dependent species. Twenty-one species of birds and two species of mammals are recognized as totally or largely dependent on cavity habitat on the adjacent Flathead National Forest. The following tree species are highly to moderately preferred by cavity nesters: western larch, paper birch (*Betula papyrifera*), ponderosa pine, cottonwood, aspen, and subalpine fir McClelland 1977, Thomas 1979). Most of the Middle Soup Creek Project Area is low-elevation with gentle terrain, and western larch is a dominant tree species in many of the stands. These conditions are of very high value to many species of cavity-dependent wildlife.

Previous salvage harvest in the Soup Creek and Cilly Creek watersheds removed about 0.125 dead and dying trees per acre annually during the 70's and 80's. Using the maximum harvest estimates, a total of about 2.5 dead trees per acre were harvested, although large spatial variation exists. Salvage harvest has not been conducted in the past five years.

Analysis areas for wildlife ideally have biologically meaningful boundaries, such as the area needed to support a certain number of breeding pairs, or an average territory size. the analysis for cavity dependent species covers general habitat availability for a group of diverse species and as such it was not meaningful to delineate an analysis area based on the spatial needs of one or two species. For this reason, and because changes in snag availability due to the project are limited in this case to timber harvest, the project area was chosen as the analysis area.

To obtain a rough estimate of the existing density of snags and snag recruits in the project area, and to address concerns that previous salvage harvests may have reduced snag densities to low levels, eight transects were run throughout the project area. Larger contiguous polygons of forest were chosen for transect locations. It was noted that salvage harvesting had been done to various degrees at all locations sampled. All snags at least 10 inches in dbh and overstory trees at least 21 inches dbh were counted along transects that were 660 feet long (3 220-foot segments) and 66 feet wide, for a total coverage of one acre on each transect.

Table 3.13 *Snags and Overstory Trees on Sample Transects*

Species	average number of overstory trees/acre		average number of snags/acre		
	21 - 30" DBH	≥30" DBH	10-12" DBH	13-20" DBH	≥21" DBH
western red cedar	0.50	0.50	-	-	-
cottonwood	-	-	-	-	0.12
Douglas-fir	2.75	-	0.12	0.75	0.50
Engelmann spruce	0.12	-	0.12	0.12	-
subalpine/grand fir	0.50	-	1.12	1.00	0.12
western larch	8.25	1.87	0.37	0.62	1.12
western white pine	0.50	-	2.00	1.00	0.12
Total	12.75	2.37	3.75	3.50	2.00

Although these transect data give only a rough estimate of snag and snag recruit density, they indicate that there are adequate numbers of snags and large diameter snag recruits to support healthy populations of cavity-nesting birds (Thomas 1979). Decay and decadence is presently increasing in the area due to high, patchy activity of several insects and diseases including the Douglas-fir bark beetle, mountain pine beetle, and the heartrot fungus (*Phellinus pini*). These processes are creating additional larch snags which provide good cavity habitat, and Douglas-fir and western white pine snags which provide good feeding and some cavity habitat.

Some species that use standing snags also require downed wood. Pileated woodpeckers and pine marten, for example, are two species that require both large diameter snags and relatively high densities of downed logs. Pileated woodpeckers are highly dependant on carpenter ants, and find them on the bark and outer surfaces of snags, logs and stumps. Feeding sites are a critical and sometimes limiting habitat component. Marten use large downed logs and stumps for resting and denning sites. Marten also require logs and stumps that project out from the snow to provide access to subnivean spaces when searching for small mammal prey. Because salvage harvesting removes downed wood recruits, data was gathered to estimate existing downed wood densities in the project area.

Eight transects were run in the same area as the snag and overstory tree transects. Pieces of downed woody material that transected a 400-foot straight line (2 200-foot segments) were counted by size class, and tons of downed woody material per acre were estimated by size class. Only whole, relatively sound logs (corresponding to log decay classes 1 to 3) (Maser 1979) at least six inches dbh were counted. This gives a conservative estimate of the total amount of downed wood available. Data from these transects yield an estimate of 10.48 tons per acre of sound wood at least six inches in dbh (range 6.5-13.2 tons/acre), and 8.11 tons per acre of sound downed wood at least eleven inches dbh (range 5.2-12.3 tons/acre).

The amount of woody debris naturally present in mature forests varies greatly, depending on the occurrence of natural and catastrophic events, decomposition rates, and forest type, and precludes predicting the amount that is "normal" for a forest (Hayward 1994, Montana Dept. of Natural Resources and Conservation 1978a). The minimum amount of coarse woody debris necessary to meet habitat requirements of all old-growth associated species is not known. Some estimates have been made on downed wood requirements for some species: at least 40 logs per acre greater than 15 inches dbh for pileated woodpeckers and associated species (Bull 1994); and 15 tons per acre should be adequate for marten habitat (Buskirk 1995). The Middle Soup Creek Project Area has substantially less than the recommendation for pileated woodpeckers, and appears to be marginal for marten, although these species do inhabit the project area.

III. WATER QUALITY

A. Hydrology

Soup and Cilly creeks are perennial streams that flow westerly from the Swan Range to the Swan River. The Soup Creek watershed contains 15.9 square miles of area. The Cilly Creek watershed contains 8.6 square miles. Stream gradients in the upper portions of both watersheds are steep, but stream gradients in the lower portion of the watersheds, within the project area, are more gentle.

Cilly Creek has less seasonal fluctuation in streamflow than Soup Creek; the high-elevation headwaters of Soup Creek receive more snowmelt than Cilly Creek. Soup Creek has high streamflow during snowmelt and relatively low base flow. The average annual precipitation in the project area is 30 inches. Along the crest of the Swan Range, near the headwaters of both creeks, the average annual precipitation is 70 inches.

B. Water Quality Standard

The Swan River Drainage, including Soup and Cilly creeks, is classified as a B-1 drainage (Administrative Rules of Montana, Title 16). The following restrictions apply to B-1 waters: the maximum allowable increase above naturally occurring turbidity is five NTU's (nephelometric turbidity units), and only a one degree maximum increase above naturally occurring water temperature is allowed.

None of the streams within the project area are identified as "threatened" or "impaired" under the Federal Clean Water Act and are therefore not listed under section 303(d).

C. Runoff and Sediment Monitoring Data

The water quality of Soup Creek was monitored near the Soup Creek Campground for five years between 1976 and 1983. Streamflow ranged from 2 to 88 cubic feet per second (cfs). The average flow was five cfs. The highest total suspended solids (TSS) concentration on the forest was 102 milligrams per liter. The average TSS concentration was eight milligrams per liter; eighty-five percent of the measurements were less than 10 milligrams per liter. Average annual TSS yield was 22 tons of sediment per square mile.

The water quality of Cilly Creek was monitored near the creek's crossing of Highway 83 in 1976. Cilly Creek's discharge per unit area was low relative to other monitored SRSF streams at high flow. At low flow, it was similar to the discharge at other low-elevation creeks (Goat, Soup, and Squeezer creeks) on the east side of the valley. TSS concentration ranged from 0.3 to 25.4 milligrams per liter. In 1991, Cilly Creek was monitored in three locations. Thirty-eight samples were taken. TSS concentration ranged from 0.1 milligram per liter to 6.8 milligrams per liter. Discharge ranged from 0.2 cfs to 62 cfs.

D. WATSED Analysis

The WATSED model measures changes in water and sediment yields due to timber harvesting (USDA Forest Service 1991). Water yield and sediment yield values should not be considered as absolute quantities; rather, they should be used to compare the relative differences between the effects of activities. WATSED summaries are located in project file 603.

1. Water yield

Water yield is a term used to describe the amount of average annual runoff for a particular watershed and is measured in acre-feet. Water yield increase is an estimate of the percent increase in average annual runoff over "natural," modeled conditions due to forest canopy removal. The following factors help determine or measure water yield increases: percent of forest canopy removed, timber harvesting methods, number of acres harvested, rate of ground saturation, and amount of snowpack.

"Equivalent clearcut area," or ECA, is the total area within a watershed that exists in a clearcut condition, including clearcuts, partial cuts, roads, and burns. ECA is a function of the amount of canopy removed and the size of the area harvested. Existing ECA is used to describe the number of acres that have been previously harvested and the degree of hydrologic recovery that has occurred due to revegetation. Remaining ECA is the calculated amount of harvest that may occur without substantially increasing the risk of causing detrimental effects to stream channel stability.

A water yield analysis was completed for Soup and Cilly creeks using the WATSED model. Table 3.14 gives the number of acres that have been harvested and the miles of road that have been built in the Soup Creek and Cilly Creek watersheds since the 1960's. The allowable increase in water yield, based on channel stability, is ten percent for both drainages (Haupt 1976). Table 3.15 shows the results. Neither Soup Creek nor Cilly Creek has a water yield that exceeds the allowable increase over natural, modeled conditions. Up to 726 equivalent clearcut acres could be harvested in Cilly Creek Watershed before the allowable water yield increase is exceeded, and up to 2,133 equivalent clearcut acres could be harvested in Soup Creek Watershed before Soup Creek would exceed its allowable increase (Table 3.15).

Table 3.14 *Past Timber Harvesting in Soup Creek and Cilly Creek Watersheds*

Acres or Miles	Cilly Creek Watershed	Soup Creek Watershed
Total Watershed Size (acres)	5,059	9,799
Acres Harvested (percent)	889 (18)	1,353 (14)
Roads Built (miles)	27	26

Table 3.15 *Water Yield of Soup Creek and Cilly Creek Watersheds*

Water Yield	Cilly Creek Watershed	Soup Creek Watershed
Average Annual Runoff (acre-feet)	6,901	19,831
Existing ECA (1996)	474	567
Percent Water Yield Increase	3	1
Allowable ECA	1,200	2,700
Remaining ECA	726	2,133

2. Sediment yield

Sediment yield is the amount of sediment that is carried to streams. The following factors help determine or measure sediment yield: area of cutting units, area of roads, slope steepness, erosivity, and logging methods. Sediment yield analysis is best suited to evaluating alternatives that include different amounts and locations of cutting units, roads, and varying levels of sediment mitigation to roads and structures.

The WATSED analysis shows that Soup Creek Watershed is currently at 18 percent over "natural," modeled sediment yield, and Cilly Creek is 44 percent over natural conditions; however, results indicate that neither Soup Creek nor Cilly Creek are accumulating or storing generated sediment. The WATSED model can estimate the amount of sediment that is stored in deposition and not routed through the creek. The model does not account for point sources of sediment, so they are not reflected in the modeled sediment results.

E. Sediment Source Sites

Several human-made structures in the Soup Creek and Cilly Creek watersheds are existing sediment sources. Two large culverts on perennial tributary streams are not functioning properly and three log sill bridges have failing abutments and are currently producing sediment. The upper reaches of Soup Creek Canyon Road have inadequate surface drainage and erosion control. Two log sill bridges on secondary roads crossing Soup Creek have collapsed and are contributing sediment to the channel.

With the exception of the situations mentioned above, the drainage conditions on DNRC-held portions of Soup Creek and Cilly Creek roads is adequate and meet BMP guidelines (Logan 1991).

IV. FISHERIES

Westslope cutthroat trout and bull trout are species of special concern in Montana; they are found in limited numbers and habitats in Montana. The MFWP manages the Swan Drainage for the native westslope cutthroat trout and bull trout. To restore westslope cutthroat trout to Soup Creek, MFWP removed competing eastern brook trout and restocked the creek with westslope cutthroat trout in 1988. The success of this recovery project is under evaluation. Preliminary evidence suggests that eastern brook trout have reestablished themselves in Soup Creek. A summary of the westslope cutthroat recovery project can be found in Project File 603.

In order to meet the recommendations from the Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program (the cooperative study report) (Flathead Basin Commission 1991), DNRC has contracted MFWP to collect data and develop index values of existing fisheries habitat quality. The DNRC/MFWP strategy is to first develop the index of juvenile bull trout rearing habitat quality using substrate scoring as described in the cooperative study report.

A. Cilly Creek

Eastern brook trout was the only game species found in Cilly Creek (Weaver 1992). Bull trout were not detected; the combination of extremely low summer--fall discharge and warm water temperature probably prevent bull trout from spawning and rearing in the creek. Westslope cutthroat trout may reside in the higher glacial headwaters area; no survey data are available to confirm the presence or absence of westslope cutthroat trout in the upper reaches. In 1983, only the nonnative eastern brook trout were collected during electrofishing surveys. The numbers of eastern brook trout in Cilly Creek were high compared to other Swan River tributaries: there were 252 eastern brook trout that were greater than three inches long per 300 meters of stream (Leathe 1995, US Fish and Wildlife Service 1995d).

B. Soup Creek

Soup Creek contains nonnative eastern brook trout, westslope cutthroat trout, and bull trout. The abundance and distribution of these species varies within the drainage. In 1983 and 1984, numbers of fish greater than three inches long per 300 meters of stream were measured in the lower reach (Reach 1) of Soup Creek (Leathe 1995). The number of eastern brook trout and cutthroat trout compared to the numbers of these species in other Swan River tributaries were high: 241 and 177, respectively (Table 3.16). The number of bull trout was low at 3 fish per 300 meters of stream. In the upper reaches of Soup Creek, only westslope cutthroat trout were found in high numbers.

In cooperation with DNRC, MFWP conducted a habitat survey for the upper reach of Soup Creek in June, 1992. The substrate score indicated that juvenile bull trout rearing habitat was barely above the threshold for "threatened" status. Good in-stream cover provided by large woody debris and overhanging vegetation and a moderate number of high quality pools make the upper reach good to excellent habitat for westslope cutthroat trout. Although bull trout rearing habitat is marginal at best, the greatest threat to both bull trout and westslope cutthroat trout in the upper reach of Soup Creek is probably the presence of eastern brook trout (Weaver 1992).

The substrate score for the middle reach of Soup Creek indicated good rearing conditions for juvenile bull trout. During a survey of Soup Creek in October, 1992, two probable bull trout spawning nests were identified in the middle reach of Soup Creek (Weaver 1992).

C. Swan River

Bull trout and cutthroat trout are known to occur in the Swan River. They are thought to occupy the river as adults and use it as a migratory course to spawning tributary drainages above Swan Lake (Leathe and Enk 1985). Long-term population trends for both species are unavailable.

In July 1994, Tom Weaver, a fisheries biologist from MFWP, completed the substrate scoring for Soup Creek, and spawning surveys and McNeil coring were conducted for bull trout in September, 1994 (Project File 603). Each of these activities were again completed in 1995 for Soup Creek, but results of the 1995 data are yet to be summarized and reported. Results of the 1994 spawning surveys showed no bull trout redds. Although bull trout were occasionally observed throughout the course of the survey, all spawning activity was limited to brook trout redds (Project File 603).

On-going fisheries habitat monitoring for the 1994, 1995, 1996 field seasons included (or will include) substrate scoring, spawning surveys (Table 3.17), and McNeil coring for both migratory westslope cutthroat trout and bull trout. The Flathead Basin Forest Practices, Water Quality, and Fisheries Cooperative Program Study (the cooperative study) showed a direct link between on-the-ground activity (Sequoia Index) and habitat quality (McNeil coring) (Flathead Basin Commission 1991). The cooperative study showed an even stronger tie between spawning habitat quality (percent fines) and embryo survival to emergence. The cooperative study recommended caution when the amount of fine material (percent <6.35 mm) as indicated by McNeil coring exceeded 35 percent. Recommendations call for a red flag at levels above 40 percent. The 1994 McNeil coring sample for Soup Creek showed the fine material (percent <6.35mm) at 34.9 percent (Project file 603). Spawning surveys from other years did not indicate the need for McNeil coring.

Table 3.16 *Fish Population Estimates for Reach 1 of Soup Creek: Number of Fish > 3 Inches per 300 Meters of Stream*

Species	1983	1989	1990	1992	1994
Westslope Cutthroat Trout	0	144	177	108	72
Eastern Brook Trout	241	266	241	198	192
Bull Trout	3	2	0	12	0
Total	244	412	418	318	264

Table 3.17 *Soup Creek Spawning Sites Between Highway 83 and Soup Creek Campground*

Species	1982	1992	1994	1995
Westslope Cutthroat Trout	0	0	9	14
Bull Trout	0	2	0	5

V. AIR QUALITY

The project area is within Montana Airshed #2 (Kalispell) and is not in a sensitive impact zone (USDA Forest Service 1992). Air quality within this airshed is considered good. Temporary reductions in air quality primarily occur during residue-burning activities and wildfires. The airshed is managed by the Montana Airshed Group which monitors weather conditions and imposes burning restrictions when poor dispersion and poor ventilation occur.

VI. SOILS

The Middle Soup Project Area is located within the Swan Valley glacial trough on the east side of the valley floor. Grinell red and green argillite bedrock occurs on the foot slopes and ridges, and the bedrock is overlain by deep glacial till, outwash and alluvial deposits throughout most of the area (Johns 1970). Alluvial soils of somewhat poorly drained silts and gravel occur as riparian stringers adjacent to creeks. Soils are particularly sensitive on wet sites (Table 3.18, Figure 3.6). There are no unique or unstable geologic formations noted on the project area.

Table 3.18 Soils Types in the Project Area: a legend for Figure 3.6

Figure Units	Soil Drainage	Road Limitations	Topsoil Displacement & Compaction	Seedling Establishment	Erosion	Notes
10-3 Alluvial soils	poorly to well drained	mod to severe	severe	good	low	Streamside management guides will be applied.
12 organic soils	poor	severe	severe	poor	slight	These areas will be avoided during harvest.
16 Alluvial Fans 15-30% slope	well drained	low to mod	moderate	fair	slight	Deep gravel and shallow surface soils. Beargrass competition common. Avoid displacement.
26-A-7 deep silty soils from calcareous glacial till; 0-20% slope	well drained	low	moderate (severe if wet)	good	low	Deep productive soil. Fine textured soil remains moist; check soil moisture. Topsoil depth is very important.
26-A-8 deep, silty soils from calcareous glacial till 20-40% slope	well drained	moderate	moderate	good	mod	Deep productive soil. Fine textured soil remains moist; check soil moisture. Topsoil depth is very important.
26-A-9 deep, silty soils in calcareous glacial till; 40-60% slope	well drained	low (some rock)	mod compaction high displacement	good	mod to high	Deep soils, steep slopes limit equipment operations. Cable yarding reduces impacts.
26-C-7 deep glacial till 0-20% slopes	well drained	low	moderate (severe if wet)	good	low	Deep productive soil. Topsoil depth is very important.
26-C-8 deep glacial till 20-40% slope	well drained	moderate	moderate	good	mod	Deep productive soil. Better drainage and longer season of use than 26-C-7 slopes. Topsoil depth is very important.
73 trough wall glacial till and rocky, residual soil slope > 60 %	well drained	mod to severe (rocky, steep)	mod compaction high displacement	fair	mod to high	Steep slopes require cable operation.

FIGURE 3.6 SOILS IN THE PROJECT AREA

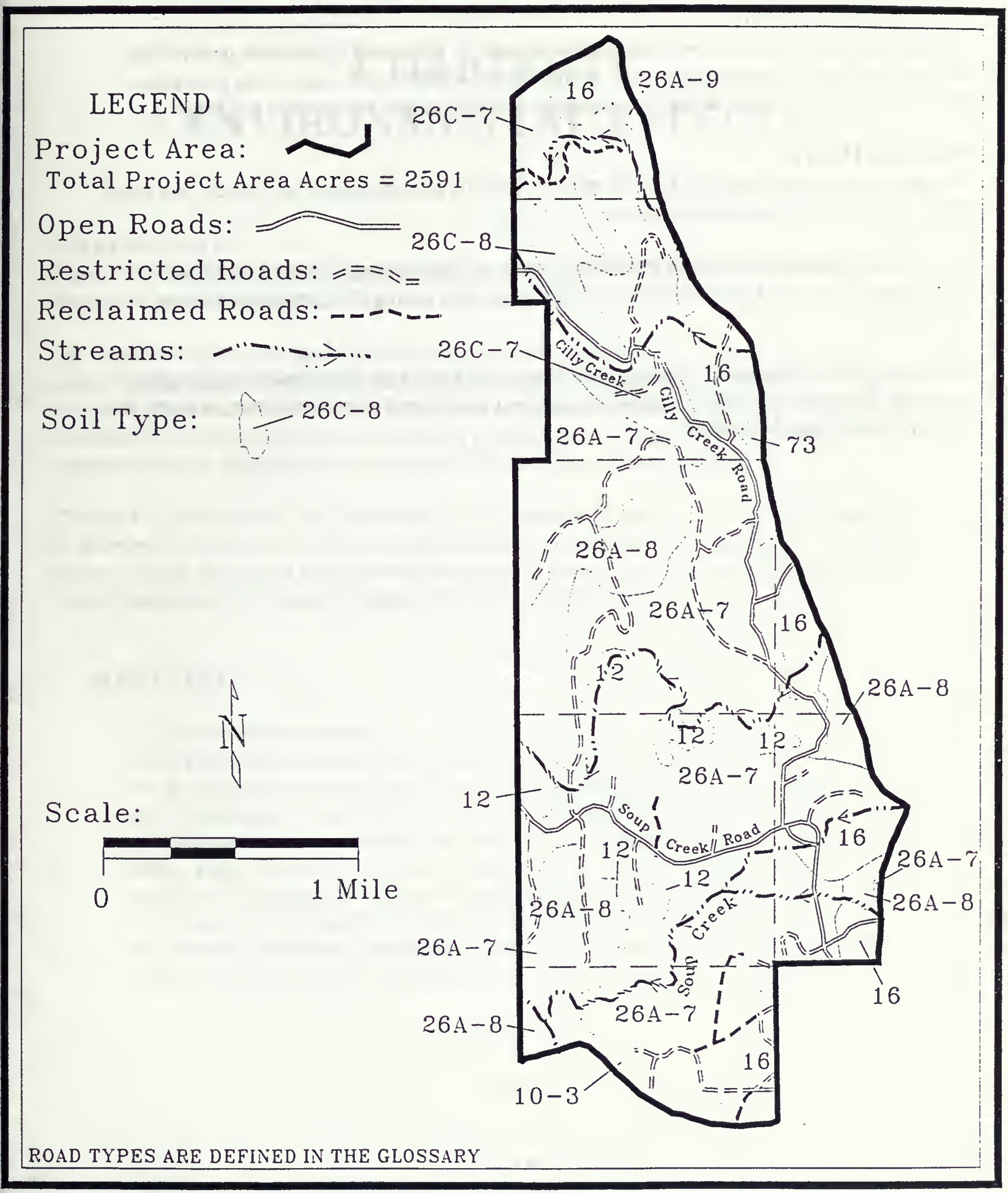


Figure 3.6

VII. NOXIOUS WEEDS

Spotted knapweed (*Centaurea maculosa*) and common St. Johnswort (*Hypericum perforatum*) occur on dry sites within the project area. Both noxious weeds mainly occur along road edges exposed to sunlight--not in adjacent forest stands--probably due to competition and shading.

VIII. AESTHETICS

Because the visual characteristics are the most perceptible components of "aesthetics," the visual effects on the project area are considered.

The project area cannot be viewed from Highway 83, neighboring residences, Point Pleasant Campground, or Swan Lake because of its low topographic setting along the eastern Swan Valley floor.

The project can be viewed from Soup Creek Campground and local forest roads. Foreground vistas are dominated by stands of timber, past harvest areas, creeks, and rock outcrops along the western flank of the Swan Range.

CHAPTER IV
ENVIRONMENTAL EFFECTS

INTRODUCTION

Chapter IV describes the primary, secondary and cumulative environmental effects of each alternative on each resource concern.

The cumulative effects of past activities were previously discussed in Chapter III. The only related project under concurrent consideration in the SRSF is the South Fork Lost Creek Timber Sale EIS. Cumulative effects of the South Fork Lost Creek Timber Sale will be discussed in this document for resources that have overlapping analysis areas with the proposed project. These resources include grizzly bears, elk, white-tailed deer, gray wolves and air quality.

Chapter IV provides the basis for the summary of effects in Table 2.1. Chapter IV also contains an economic analysis. The economic analysis projects the net monetary return from harvesting timber for each alternative and provides a baseline for comparing the net monetary return from timber harvesting with monetary return from a conservation lease.

I. VEGETATION

A. Ecosystem Sustainability

Forest ecosystems are important for more than the timber they produce. Forests provide habitat for many species of plant and animal which have economic or aesthetic value. Many species now recognized as threatened or endangered depend on forests for particular habitat requirements. Other less celebrated species fulfill important functional roles in energy transfer and nutrient cycling that are critical to forest health. If key functional components are not conserved, forest ecosystems will not persist. Consequently, as a management concept, ecosystem sustainability recognizes that all the parts of forest ecosystems are important, and that continued utility of forests for both resource production and non-consumptive purposes depends on continuation of functional ecosystems. The challenge of ecosystem sustainability is to identify the factors that are critical to ecosystem function, and then develop practical guidelines for management that conform to our understanding.

With all that is now known about ecosystem function, development of management plans from a detailed small scale perspective (individual interactions and relationships) quickly overwhelms our ability to reduce the information to a clearly defined set of procedures. Instead some simplifying concepts may be applied that deal with larger scale issues and allow formulation of general guidelines. The first concept we applied is that ecosystems are the smallest ecological unit that can persist independently on a self-sustaining basis. It follows from this that if the ecosystem is intact, then all the parts of the ecosystem must be functioning within their ecologically defined limits. Next is the concept that forest ecosystems within the Rocky Mountains are dynamic systems. They have developed in the presence of repeated disturbance and are adapted to tolerate disturbance within limits of spatial scale, duration, and frequency that are characteristic for particular forest types in different regions. The threat to ecosystem sustainability has been that the scale and frequency of disturbance may have exceeded the limits to which forests have adapted.

These concepts led to three criteria by which the effects of the proposed alternatives on ecosystem sustainability were evaluated:

1) Conservation of mature forest acreage. Total acreage of mature forest has been declining through much of the region. The first step in ecosystem sustainability is to conserve the forest that remains.

2) Reduction of fragmentation. Historically, disturbances were infrequent and influenced large continuous patches of forest. This is much different from recent management practices that have affected small patches of forest at intervals from 50 to 80 years, creating a patch work of small units of increasingly younger successional stage. This fragmentation must be reduced if continuity among forested patches is to be retained.

3) Maintenance of structural complexity and diversity within forest habitats. Another consequence of intensive management has been the simplification of forest habitats. Species diversity and structural diversity have been progressively reduced and must be actively promoted in order to benefit ecosystem sustainability.

1. Methods

a. analysis area

We used the same analysis area (the "Ecosystem Sustainability Analysis Area, ESAA) as described in Chapter III to assess both the quantity of specified forest attributes and their spatial juxtaposition. Again, had we used only the Project Area (MSSA), many forest patches would be both inside and outside the area, and problems of interpreting edges and boundaries would have been considerable. Using the ESAA reduces (but does not entirely eliminate) distortions caused by inevitable "edges" within the chosen analysis area. Unfortunately, using the ESAA also has the effect of "diluting" effects of possible timber harvests, which necessarily occur only within a subset of those stands assessed, i.e., the Project Area. Thus, differences among alternatives often appear small. It should be kept in mind, however, that these small differences would appear larger were we to restrict our focus only to those stands within the Project Area.

b. stand projection

To assess effects of each alternative on the 3 identified components of ecosystem sustainability, a projection was made of successional changes that would occur within stands through time. The projections move stands along a successional gradient depending on their current age, size class, vigor and projected time interval. Projections are based on professional judgement, experienced growth rates, and past modeling using Stand Prognosis and Stand Projection System (SPS). Stand projections are detailed in Appendix F. In addition to the 8 tree-size classes considered as characterizing the existing condition (and used in Chapter III), this projection includes a "post-old-growth" category, which stands enter after the largely-seral overstory begins dying, overhead canopy declines, and the climax dominants begin to take over the stand. "Post-old-growth" stands maintain some of the characteristics of old-growth (e.g., abundance of snags and down-woody material) but lack others (high canopy coverage of large-diametered overstory dominants).

We stress that this projection is not a prediction, much less a commitment to future conditions. Rather, it represents our best understanding of the trajectory of these stands in the absence of disturbance (fire, windthrow, insect or disease epidemic, logging). It is useful for depicting the dynamics underlying these stands, but individual stands will not conform if (or, more accurately, when) disturbance occurs. Nonetheless, natural disturbances are unpredictable, and man-made disturbances (i.e., timber harvest), although predictable, cannot be made stand-specific at this time. Further, we stress that projections might well appear quite differently had we applied repeated harvests, similar to each of the alternatives, at some selected time intervals, rather than applying only a 1-time treatment, followed by growth in the absence of disturbance.

2. Conserving mature forests

Under Alternative A, mature forest would remain unchanged during the period immediately after harvest because no timber harvesting would occur. All old-growth stands and surrounding mature forest areas would be preserved. Initially, at least, this alternative would conserve the mature forest areas within the sale boundary, and thus increase the total area of mature forest in the sale area. In the following 50 years, mature forest is projected to increase to roughly 6,347 acres, the most of any of the Alternatives (Figure 4.1), as younger aged stands mature sufficiently to progress into sawtimber status.

Alternative B proposes structural enhancement timber harvests over a large portion of the existing old-growth stands within the project area. Where structural enhancement cuts are applied, no road building will occur and 90 percent canopy closure will remain after harvest. As a result, where structural enhancement cuts (Figure 2.2) are applied within old growth, none of the stands will be converted to younger stand types. Where moderate reserve regeneration cuts are applied (units B1 and B2) mature stands will be converted to younger stand types. Where heavy reserve regeneration cuts are applied (units B3-B7) a major portion (80 square feet of basal area) of the mature overstory component is maintained. Heavy reserve harvesting is designed to maintain the mature component of a stand while increasing structural diversity through establishment of a younger understory class. Thus, under Alternative B, mature forest declines slightly immediately post-harvest, but by 50 years later is projected to increase to 6,203 acres. Structural enhancement harvests within existing old-growth stands are intended to prolong the longevity of existing old-growth. More than sixty years of fire suppression has allowed stocking rates to increase markedly in old-growth stands as shade tolerant species established beneath the existing canopy. Selective removal of some trees should reduce moisture and nutrient competition and prolong the vigor of the established canopy. Creation of small gaps will also restore spatial and structural heterogeneity within old-growth stands

Under Alternative C, only 2 units (Figure 2.3) would be affected. Unit C1, a 12.9 acre parcel, is currently classified as multi-storied and would be treated by a regeneration harvest with moderate reserve. Unit C2, with 44.6 acres, is currently classified as sawtimber and would be treated by a regeneration harvest with heavy reserve. In the short term, harvesting within these units would not alter existing old growth stands as neither is classified as such. The pattern of mature forest under Alternative C is thus a hybrid of the preceding two: mature forest acreage remains unchanged immediately post-harvest, as in Alternative A, but achieves the same level as that of Alternative B in 50 years.

Under Alternative D, several units (Figure 2.4) would be treated in a similar fashion as that proposed in Alternative B. Units D8 and D9 would be treated by regeneration harvesting with heavy reserve in keeping with the three ecosystem sustainability criteria mentioned at the beginning of this chapter. Units D6 and D7 would receive regeneration harvesting with moderate reserve also meeting the ecosystem sustainability criteria. The biggest effect which this alternative would have on the conservation of mature forest as envisioned for ecosystem sustainability would be in units D1 and D2 where regeneration harvest with light reserve would be applied. Both of these stands are currently classified as old growth. Although the acreages involved here are relatively small they would be lost as old growth acreage under this alternative. Units D3, D4, and D5 (saw timber and old-growth stands) would also receive more heavy harvesting in Alternative D than in Alternative B. This would also decrease the amount of acreage conserved as mature forest and would significantly reduce crown density in these units compared to that proposed under Alternative B. In the same manner Alternative D would more greatly impact units D10 and D11 than would be the case under Alternative B. The significant old growth acreage here lies within the second largest block of mature forest in the ESAA. The silvicultural treatment suggested for these units would set this acreage back from their existing old growth classification most likely more than 50 years. In summary then, acreage of mature harvest would be reduced slightly post-harvest under Alternative D, but increase to 6,129 acres by 50 years post-harvest, slightly less than the levels under Alternatives B and C.

The patterns for all 4 alternatives are largely replicated when the "mature" class is considered to include the "post-old-growth" category (Figure 4.2), although raw acreages are higher, and differences among the alternatives are smaller.

FIGURE 4.1

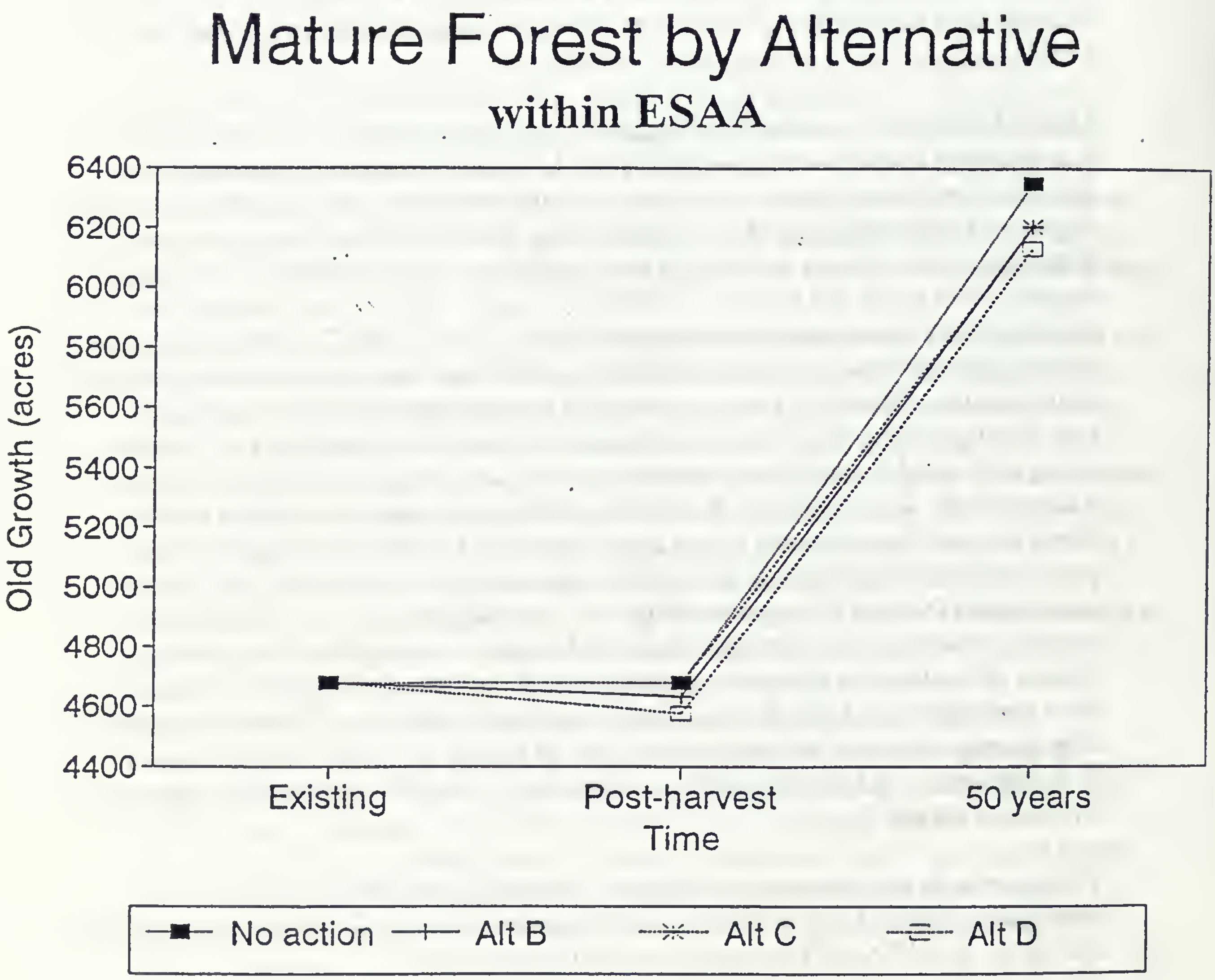
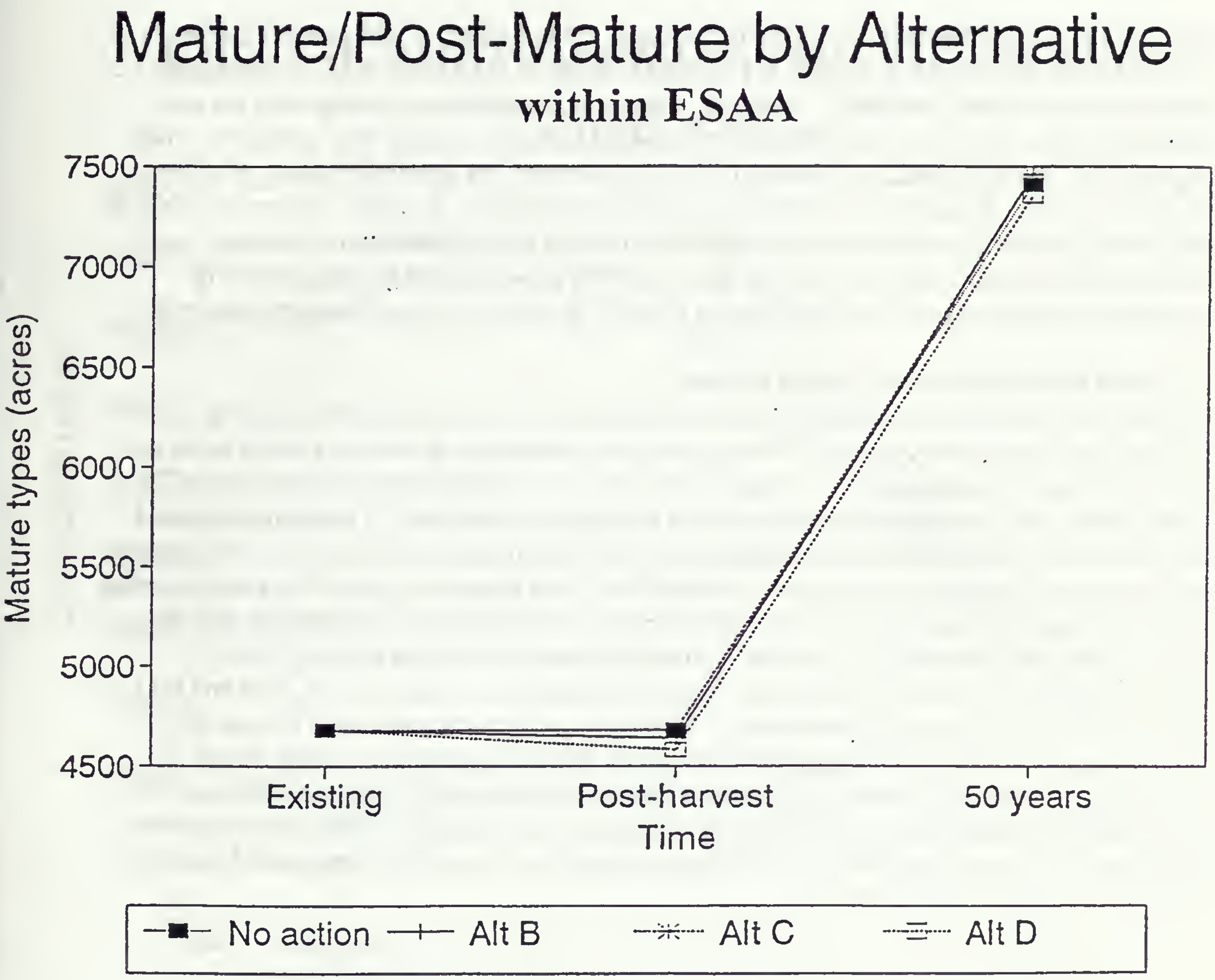

Mature Forest by Alternative
within ESAA
6400
6200
6000
5800
5600
5400
5200
5000
4800
4600
4400
Old Growth (acres)
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D

FIGURE 4.2


Mature/Post-Mature by Alternative
within ESAA
Mature types (acres)
7500
7000
6500
6000
5500
5000
4500
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D

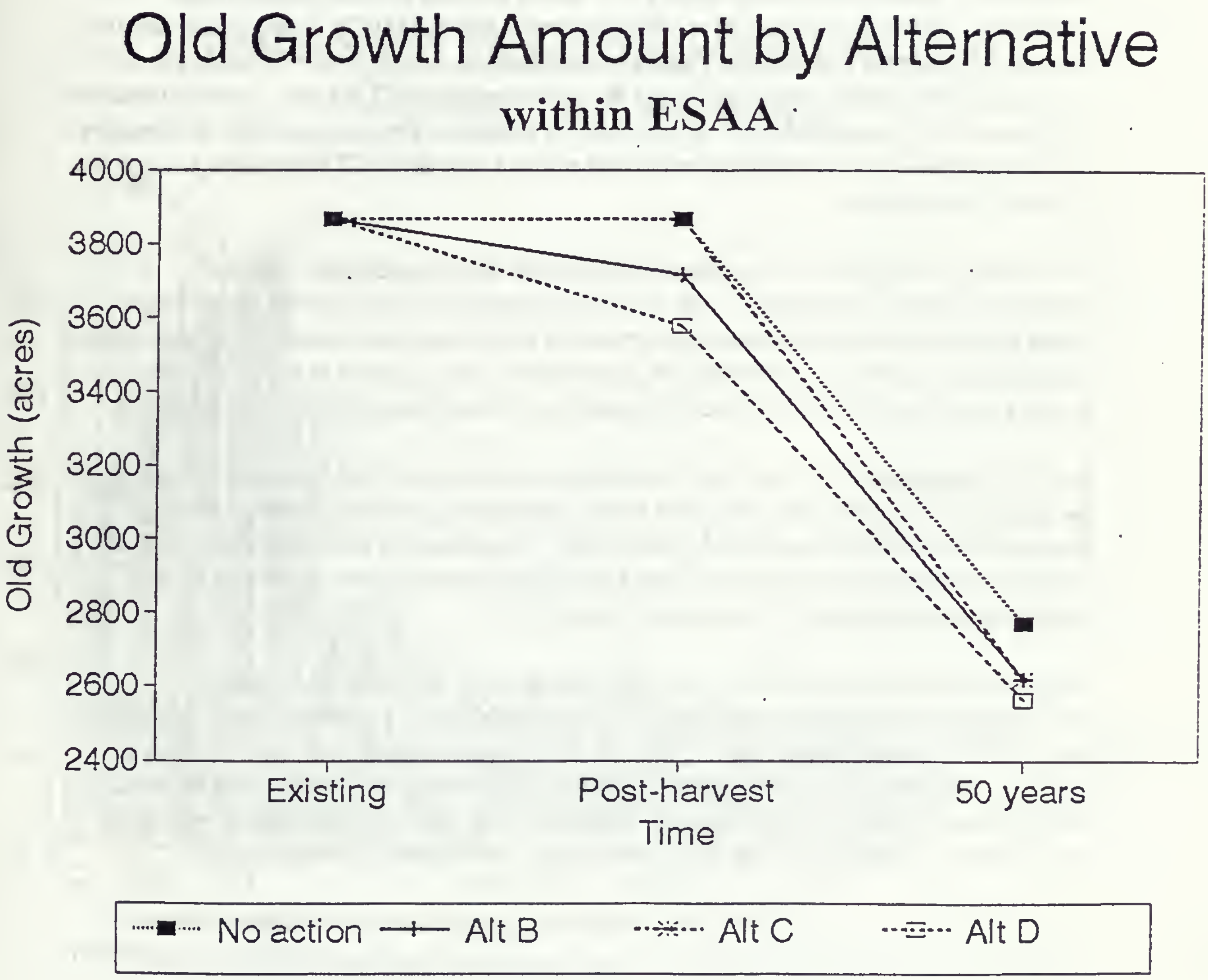
Considering only stands classified as "old growth", the pattern changes dramatically, however (Figure 4.3). Old growth remains constant immediately post-harvest under both Alternatives A and C, dropping by approximately 4% under Alternative B and by approximately 9% under Alternative D. However, by 50 years post-harvest, stands classified as "old growth" are projected to decline dramatically under all alternatives, because of the break-up and succession of seral species to their climax successors.

Considering the broader category of "mature" forests, the reduction in "old-growth" due to it's transformation into "post-old-growth" is projected to be more than compensated by maturation of younger stands into the "sawtimber" category. However, sawtimber and old-growth are not equivalent forest types with respect to structure and composition among other attributes. Much longer intervals are required, on the order of 100 to 150 years, for sawtimber stands to achieve old-growth status. During that interval much more of the old-growth can be expected to break up (becoming post-old growth), creating a long period of time when net old-growth acreage on the ESAA would decrease. By 150 years, the amount of old-growth under any Alternative is projected to exceed current levels (see Project File 602 for results of these longer projections).

3. Spatial characteristics of forested patches

Alternative A, no action, does nothing either to exacerbate or alleviate currently existing problems in spatial characteristics of forested patches. Alternative B takes as a major focus the treatment of spatial considerations. Thus, location and type of treatments were designed to minimize increasing existing fragmentation, and ultimately, to reduce it. Treatments proposed for several units would decrease fragmentation by placing acreage into age/size class categories more consistent with surrounding stands. Alternative C was designed primarily to avoid entering existing old-growth stands; it thus optimizes one element of ecosystem sustainability, but does not explicitly treat the others. Alternative D in general does not address existing habitat fragmentation in the ESAA. For example, treatments proposed on units D1, D2, D10 and D11 (Figure 2.4) would all increase fragmentation by breaking up existing blocks of old growth. In the case of units D1 and D2 there would be additional sharp fragmentation created setting this acreage back to the sapling category. However, treatments proposed for units D3, D4, and D5 would decrease fragmentation by placing this acreage into the sapling category more consistent with surrounding young-pole stands. These units currently exist as highly fragmented, narrow and isolated strips of old growth.

FIGURE 4.3


Old Growth Amount by Alternative
within ESAA
4000
3800
3600
3400
3200
3000
2800
2600
2400
Old Growth (acres)
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D

Patch Size. The pattern of patch sizes remains largely similar among the 4 alternatives immediately post-harvest (Figure 4.4). Most patches are small, and relatively few are > 100 acres in size. At 50 years post-harvest, a few changes in the distribution of patch sizes become evident (Figure 4.5). While most patches remain relatively small (< 50 acres), all alternatives at 50 years post-harvest show a secondary peak at approximately 200 acres. The number of very small (< 10 acres) patches is most reduced under Alternative D, but the number of moderately small patches (40-70 acres) is also smaller than under the other alternatives. As a result, mean patch size, while increasing in 50 years under all alternatives, is projected to remain smallest (87.8 acres) under Alternative D (Figure 4.6). Mean patch size is projected to be largest (96.4 acres) under Alternative A, while Alternatives B and C are projected to have similar (95.2 acre) mean patch sizes 50 years post-harvest.

Patches are considerably larger when classified by the merged types "mature", "immature", and "nonforested", and, with the exception of Alternative D at 50 years, mean sizes are more similar among alternatives than when considered by tree-size classes (Figure 4.7). At 50 years post-harvest, Alternative D is projected to have substantially smaller mean patch size (304 acres) than the three other alternatives (376.4 acres).

Patch Juxtaposition. The analysis of existing condition suggested that older types tend to be disproportionately located adjacent to younger types, and that adjacency among similar types is under-represented (Table 3.5b). Projection of the stands through time suggests that these sharp contrasts would be softened post-harvest under any of the alternatives, although at different rates of speed.

Regeneration harvests planned as part of Alternative B are intended to reduce fragmentation by creating larger areas of similar aged forest in several highly fragmented regions of the project area. The regeneration/heavy reserve harvests would reduce five small fragments of old-growth to multi-storied stands that in 50 years would be more similar to surrounding old-pole stands. Regeneration/ light reserve harvests would be applied to two narrow strips of old-growth that are bounded by old-pole stands.

Except for Alternative A (no action), the sharp edges between "old-growth" and the "sapling" and "grass/shrub/seedling" classes are softened post-harvest, most dramatically

FIGURE 4.4

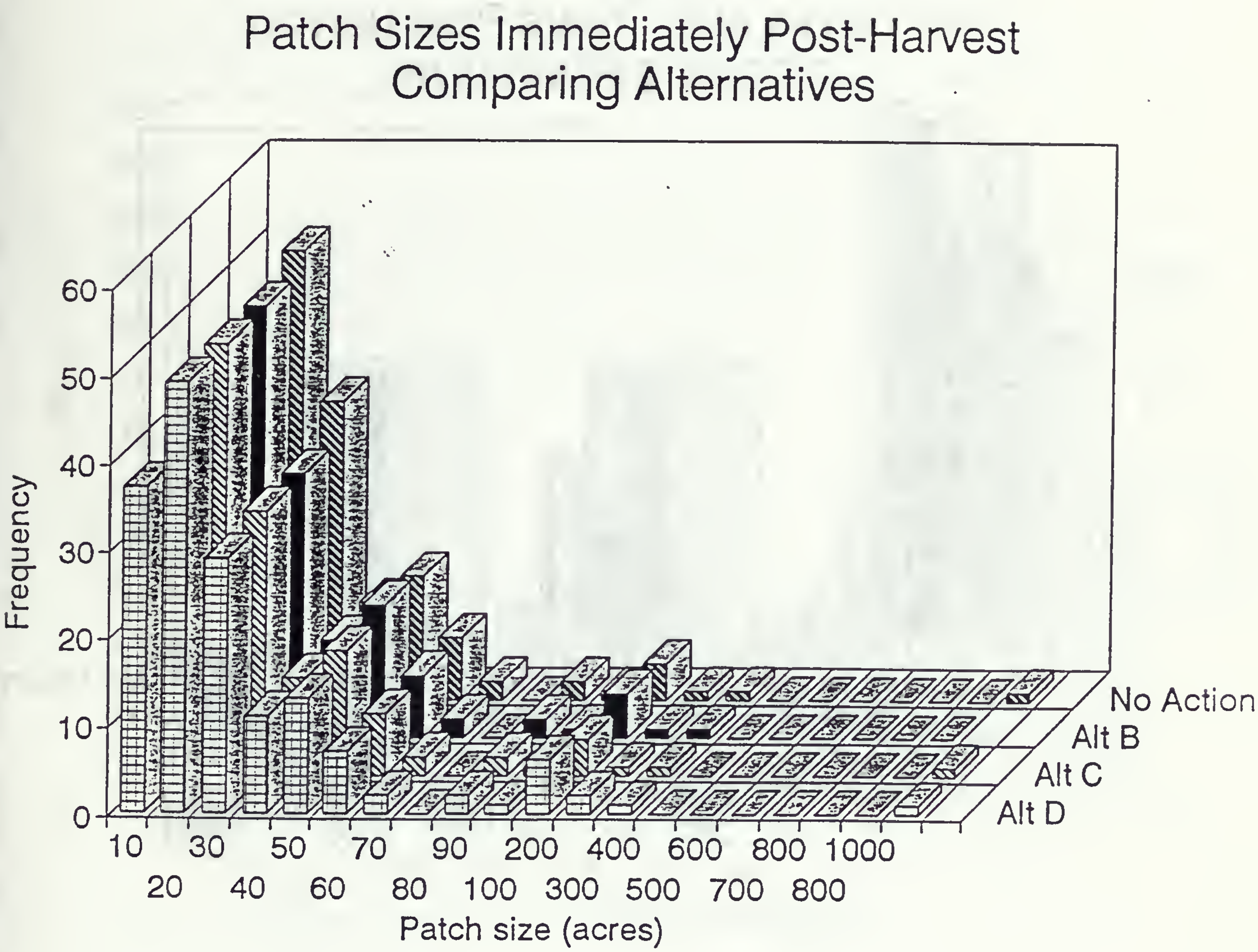

Patch Sizes Immediately Post-Harvest
Comparing Alternatives
Frequency
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
800
1000
Patch size (acres)
No Action
Alt B
Alt C
Alt D

FIGURE 4.5

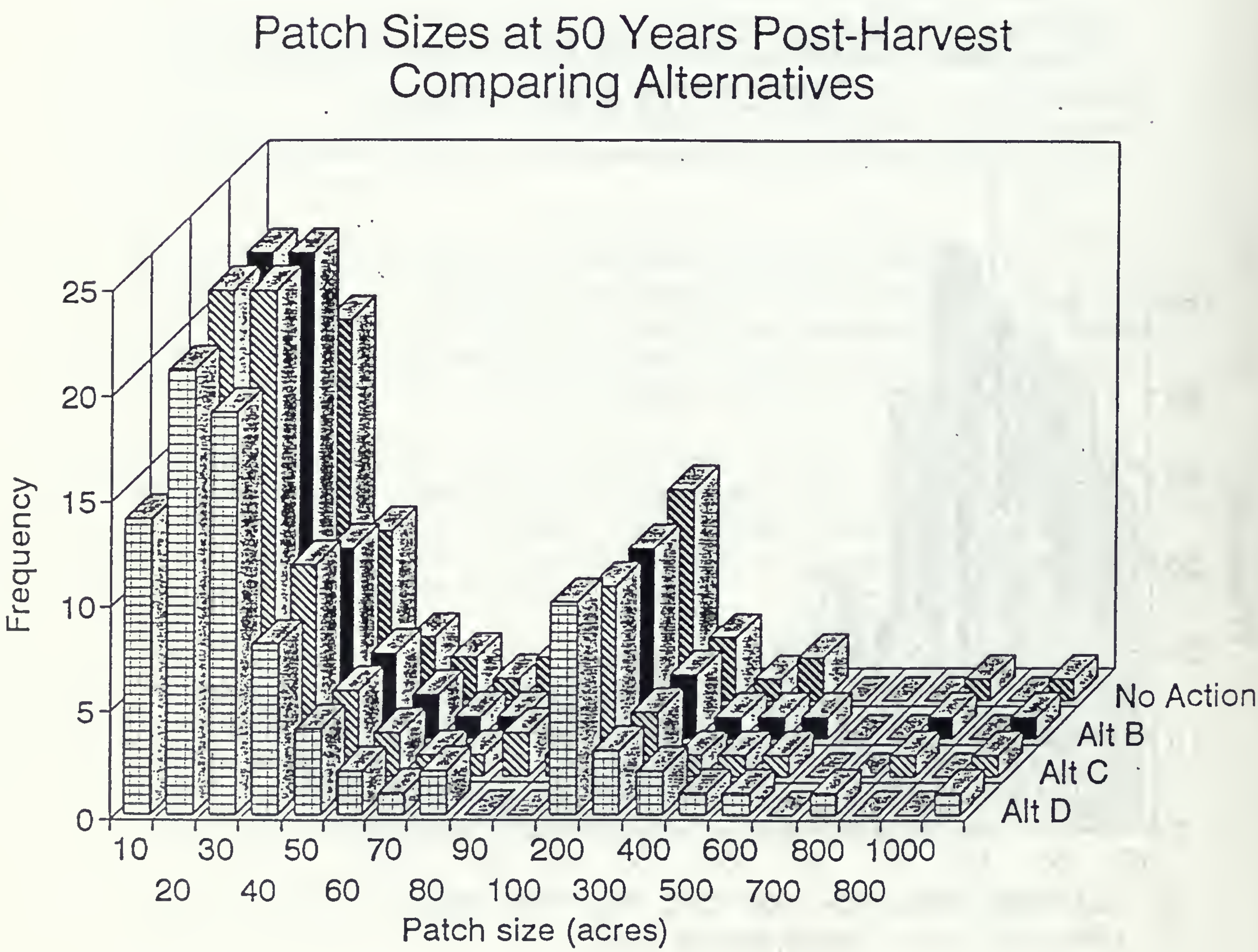

Patch Sizes at 50 Years Post-Harvest
Comparing Alternatives
Frequency
0
5
10
15
20
25
10
20
30
40
50
60
70
80
90
100
200
300
400
500
600
700
800
800
1000
Patch size (acres)
No Action
Alt B
Alt C
Alt D

FIGURE 4.6

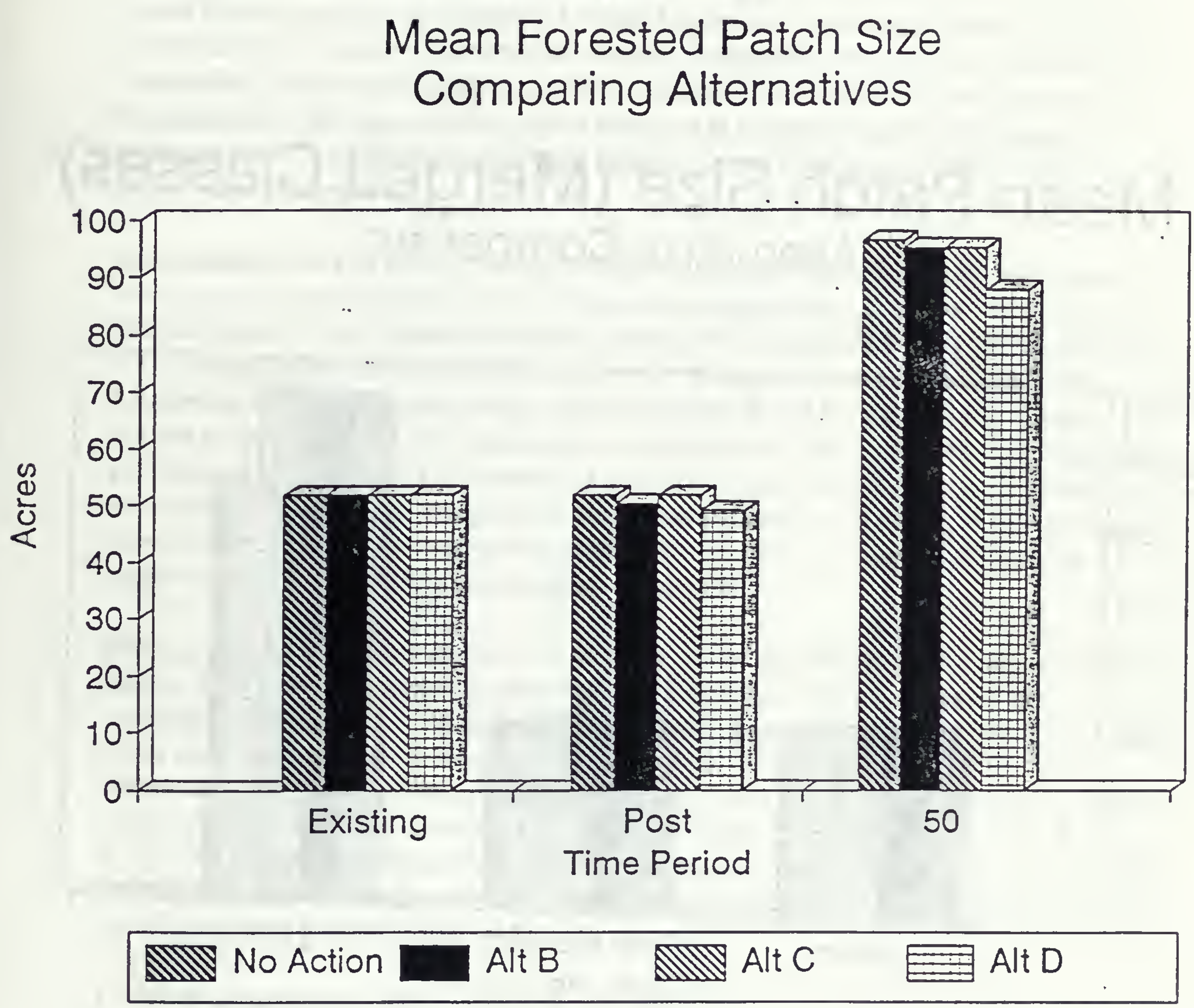
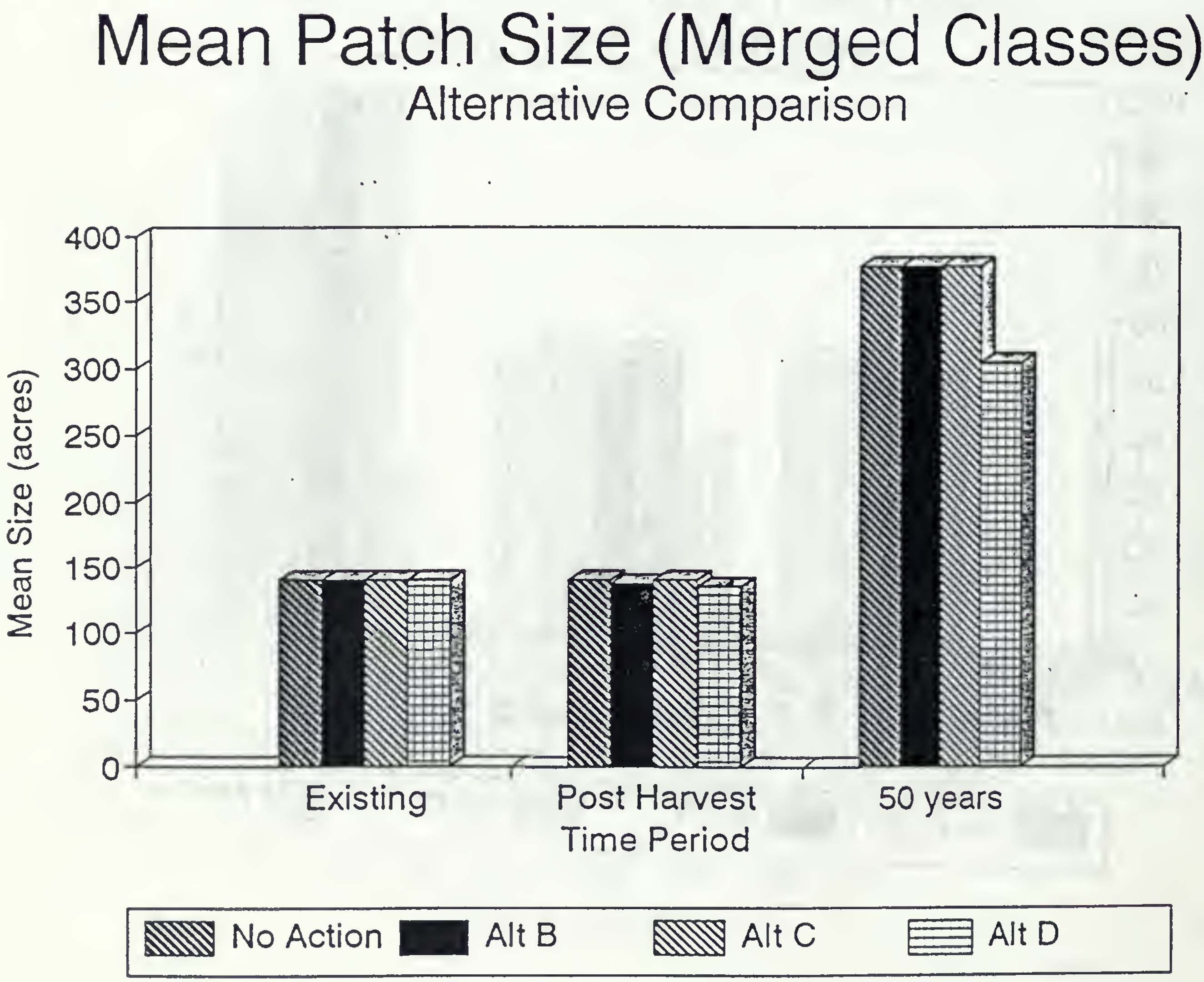

Mean Forested Patch Size
Comparing Alternatives
100
90
80
70
60
50
40
30
20
10
0
Acres
Existing
Post
50
Time Period
No Action
Alt B
Alt C
Alt D

FIGURE 4.7


Mean Patch Size (Merged Classes)
Alternative Comparison
Mean Size (acres)
400
350
300
250
200
150
100
50
0
Existing
Post Harvest
50 years
Time Period
No Action
Alt B
Alt C
Alt D

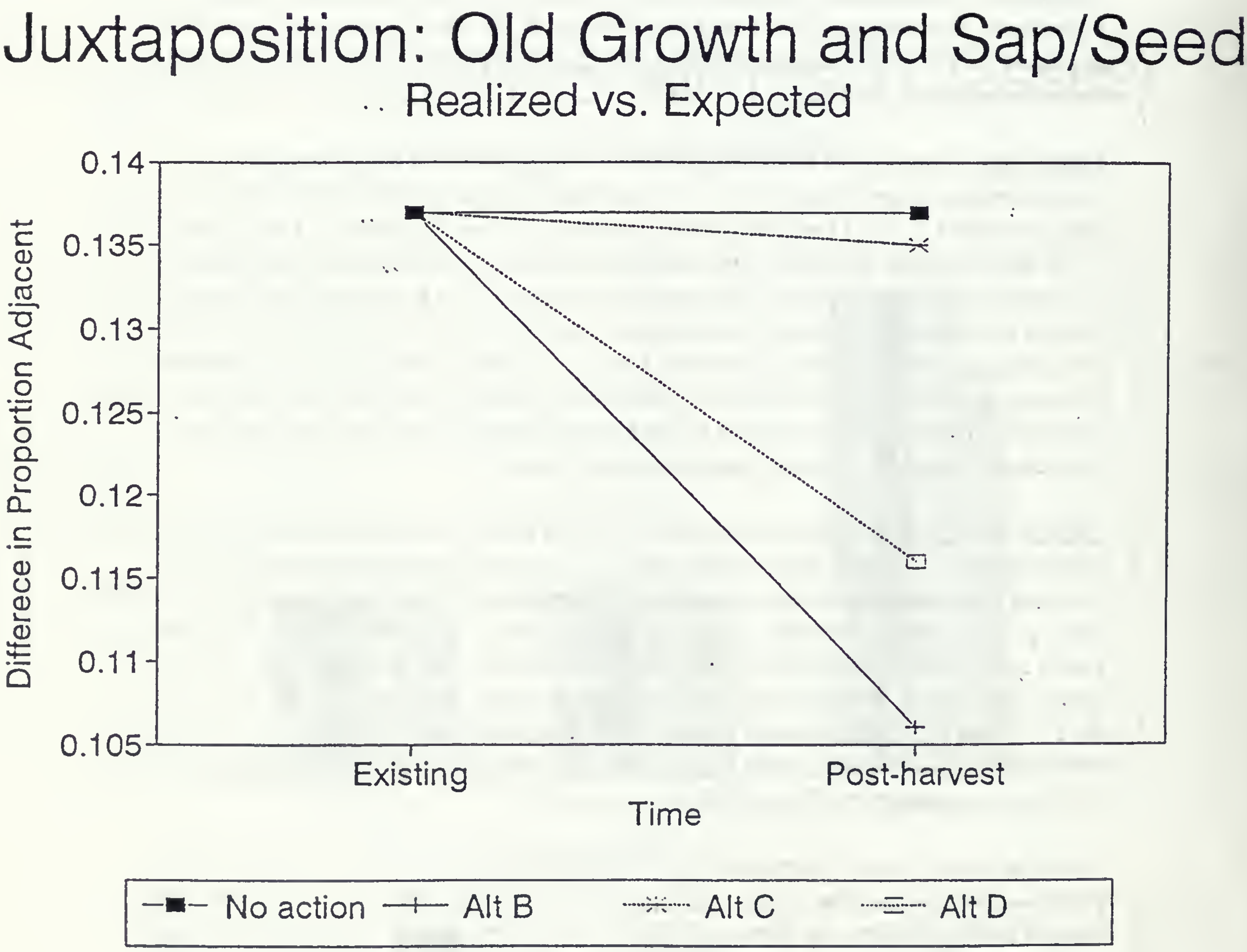
by Alternative B, and least so by Alternative C (Figure 4.8). (Positive values in Figure 4.8 indicate over-representation of this type of adjacency relative to that expected if adjacency was proportional to type abundance). Similarly, immediately post-harvest, Alternative B moves the realized adjacency between "old-growth" and "sawtimber" stands closest back to the expected level (see Methods under Spacial Characteristics of Forest Patches, pg III-9 in chapter III), while Alternative A makes no change (Figure 4.9). However, by 50 years post-harvest, the amount of adjacency between "old-growth" and "sawtimber" stands under Alternative D is projected to exceed that expected based on the abundance of these types, while under Alternative B the adjacency rises to nearly the expected level. The slowest rise toward expected levels of adjacency is projected to occur under Alternative C.

Patch Shape. Analysis of the existing condition suggested that old-growth patches are of more complex shape (mean index: 2.37), and seral type patches of simpler shape (mean indices about 1.2 - 1.6) than the historical average of 1.90 calculated by Hart (1994; Table 3.3). Shape indices of mature types decline (i.e., shapes become simpler) under all Alternatives, but most dramatically under Alternative B and C (Figure 4.10). Shape indices of mature patches become somewhat smaller (i.e., have a greater amount of area per distance of edge) under Alternative D, but at 50 years, match the shape complexity of those under Alternative A. Essentially the reverse pattern is seen among shapes of seral types (Figure 4.11), where patches become more complex with time, particularly as projected through 50 years without additional harvest.

Interior Core Habitat. The amount and location of mature interior core (areas > 100 meters from non-mature types no less than 123.5 acres in size) remains essentially constant immediately post-harvest under all alternatives considered (Figure 4.12). At 50 years post-harvest, maturation of existing stands into the sawtimber class is projected to create considerably expanded acreage of mature interior core, to no less than 5,662 acres (under Alternative D) and as much as 5,847 acres (under Alternatives A,B and C; Figure 4.12). While still predominately located outside of the Project Area per se, mature interior core areas become more abundant in the northern and southern ends of the ESAA by 50 years post-harvest (Figure 4.13).

Considering only those interior core habitats classified as "old-growth", the projected pattern appears somewhat different (Figure 4.14). Acreage and location of these habitats remain unchanged through time under both Alternatives A and C. Under Alternative B, "old growth" interior core is projected to decline by roughly 3% immediately

FIGURE 4.8



Juxtaposition: Old Growth and Sap/Seed
Realized vs. Expected
Differece in Proportion Adjacent
0.14
0.135
0.13
0.125
0.12
0.115
0.11
0.105
Existing
Post-harvest
Time
No action
Alt B
Alt C
Alt D

FIGURE 4.9

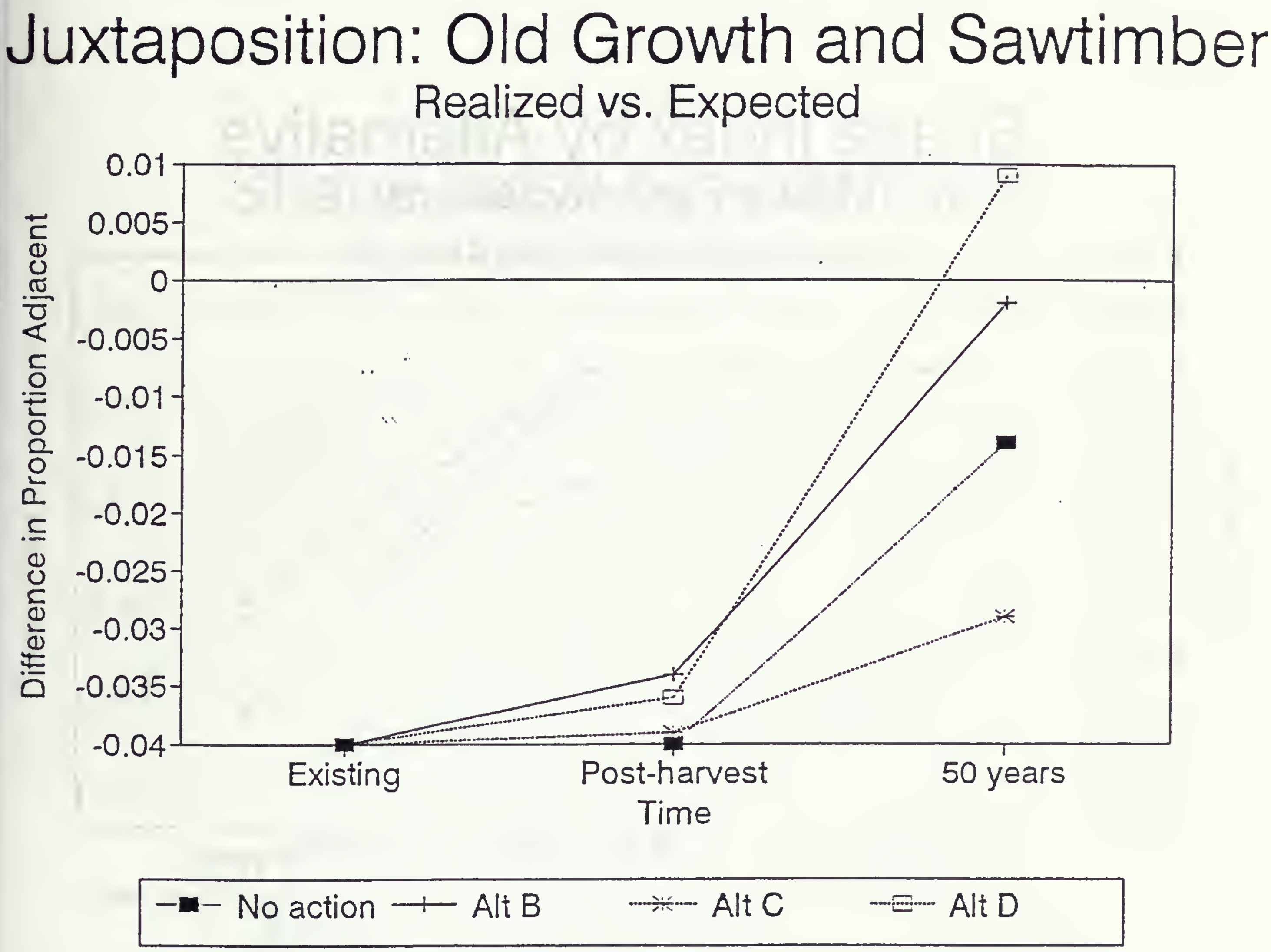

Juxtaposition: Old Growth and Sawtimber
Realized vs. Expected
Difference in Proportion Adjacent
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
-0.03
-0.035
-0.04
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D

FIGURE 4.10

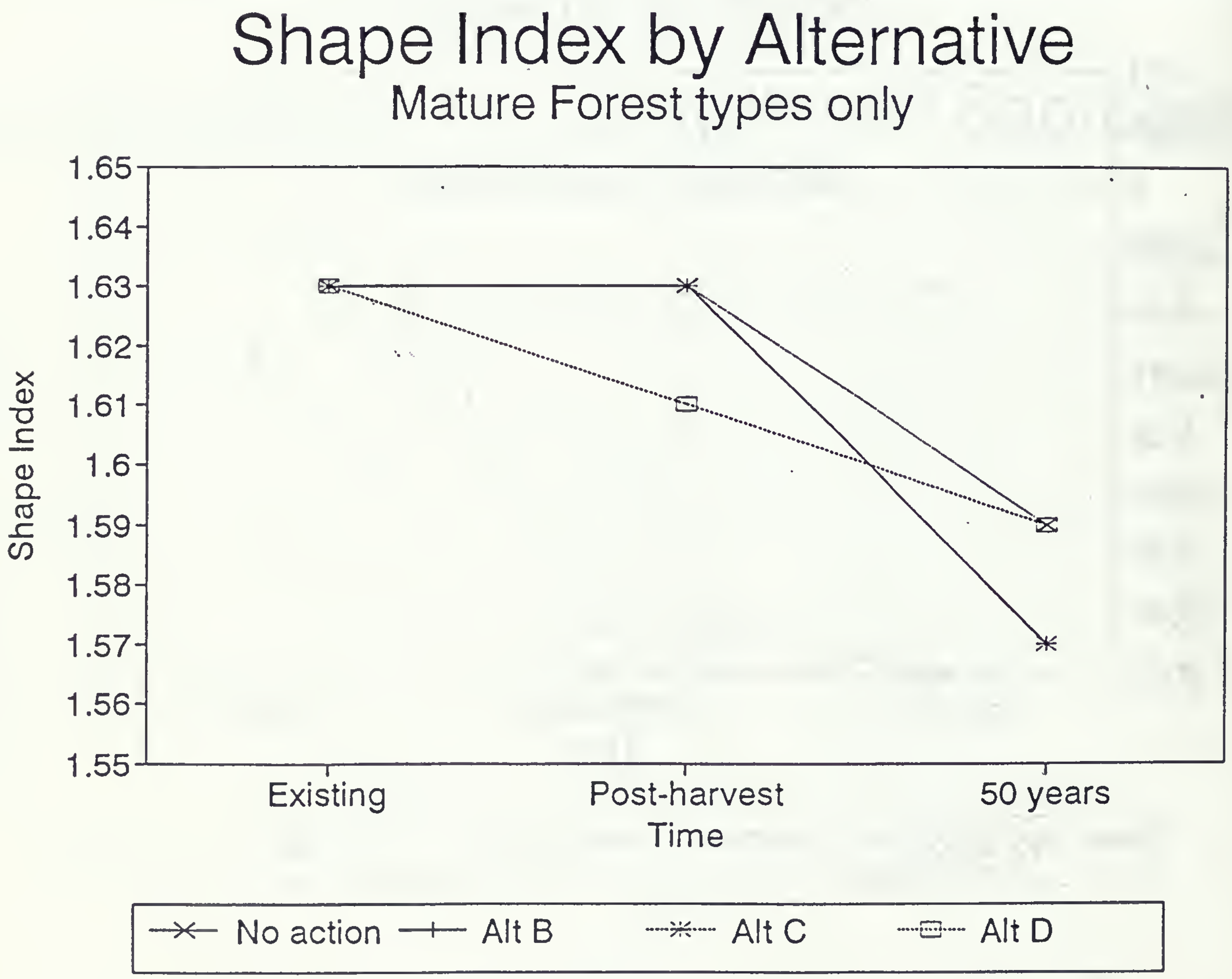

Shape Index by Alternative
Mature Forest types only
1.65
1.64
1.63
1.62
1.61
1.6
1.59
1.58
1.57
1.56
1.55
Shape Index
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D

FIGURE 4.11

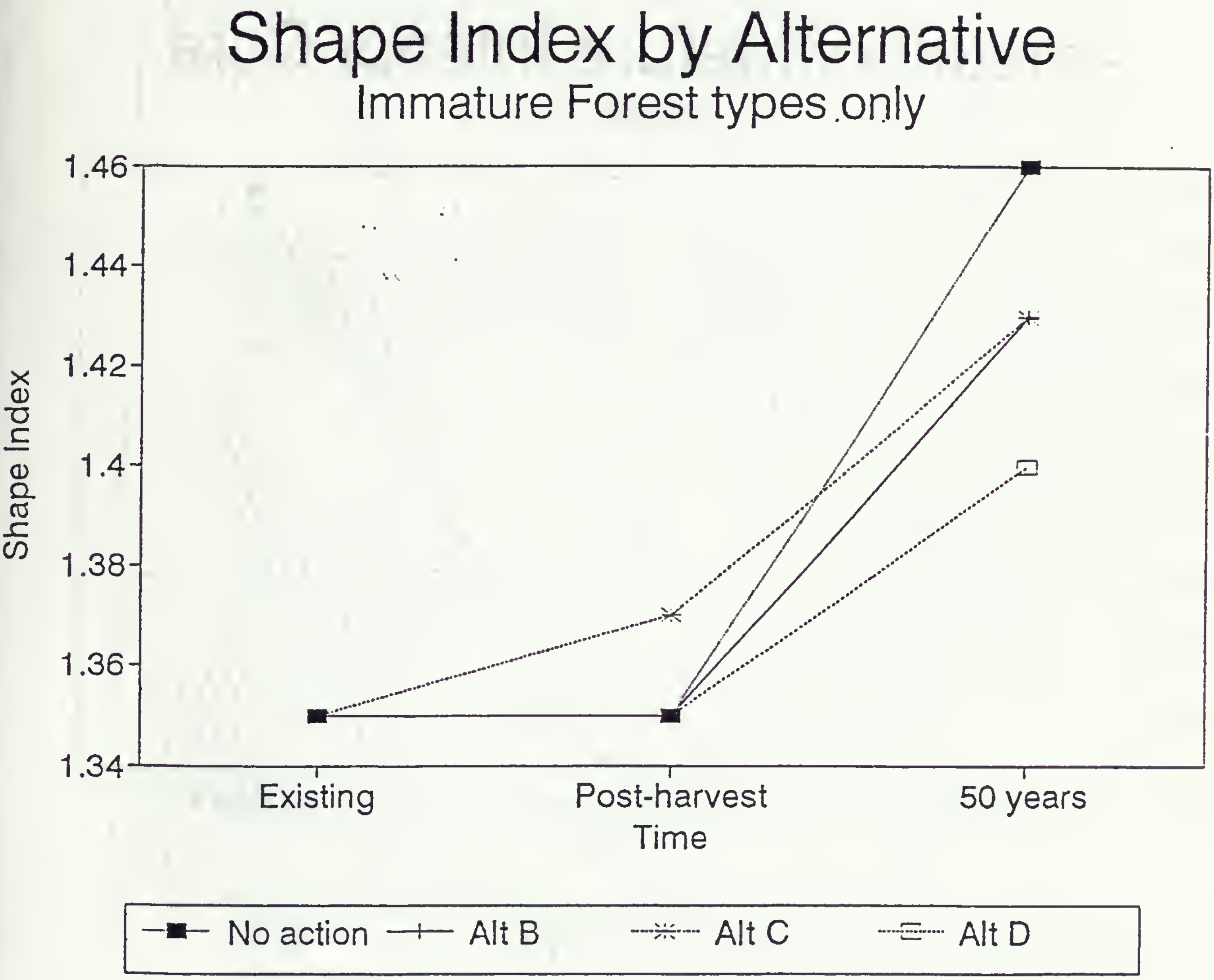
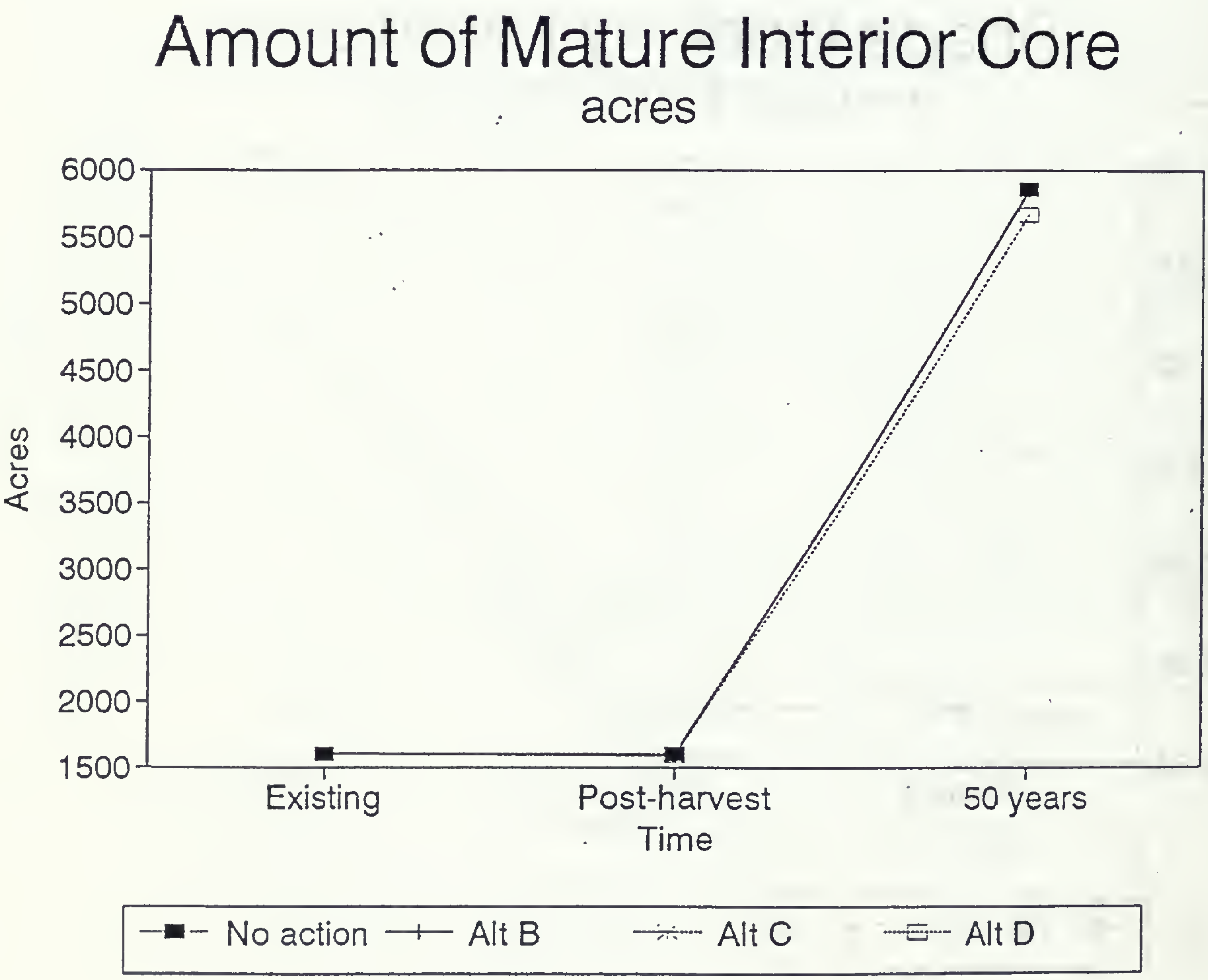
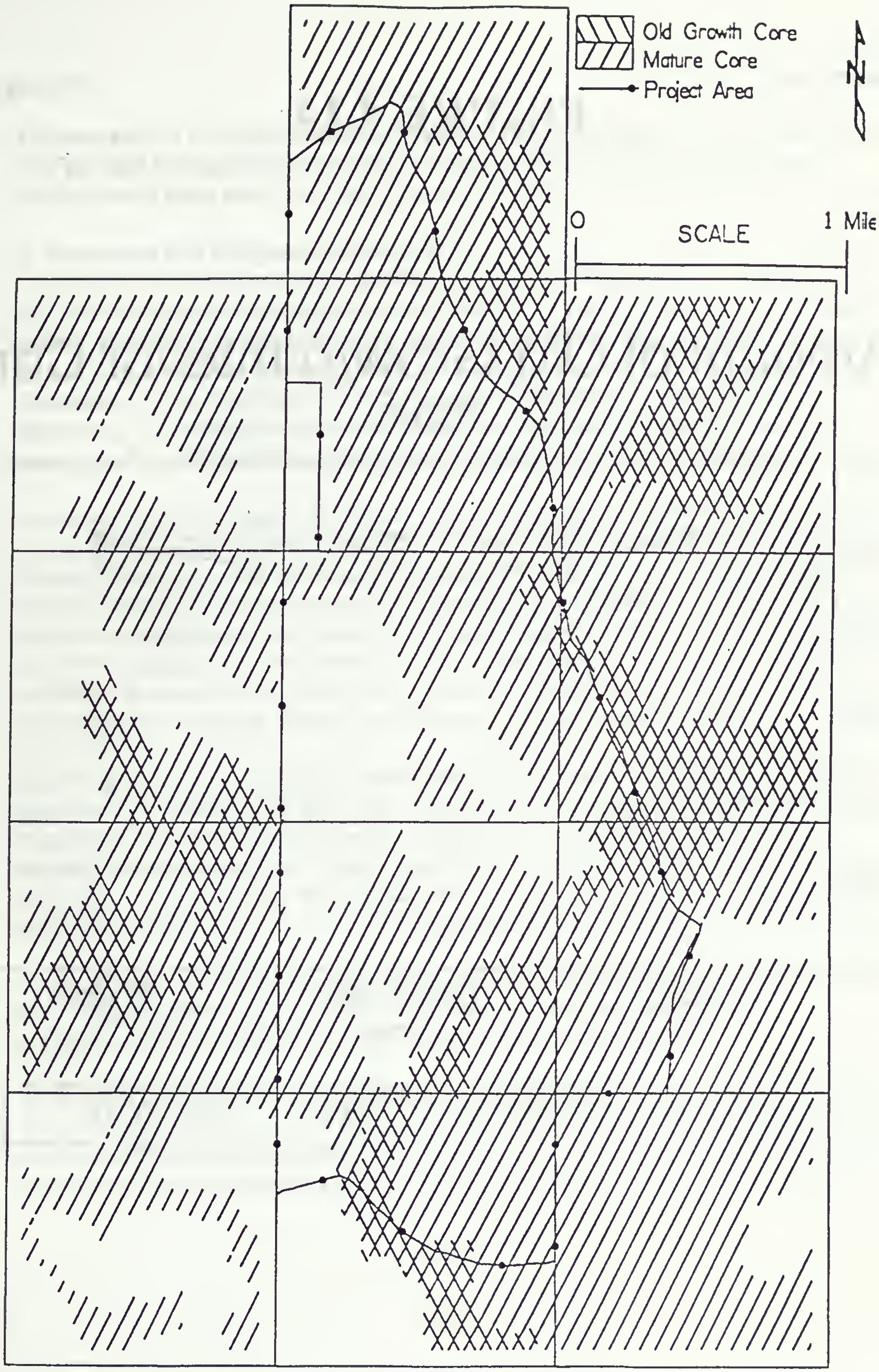

Shape Index by Alternative
Immature Forest types only
1.46
1.44
1.42
1.4
1.38
1.36
1.34
Shape Index
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D

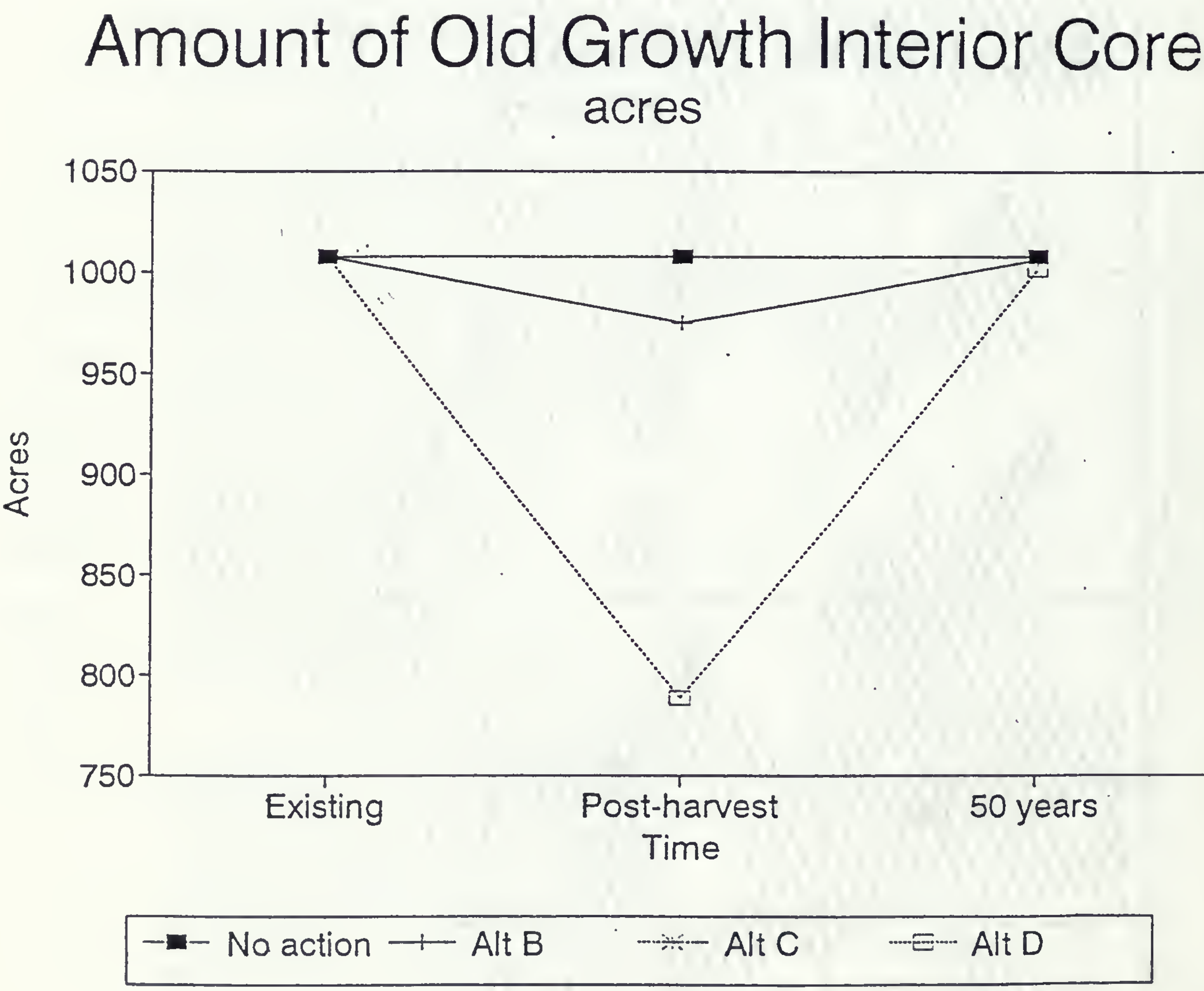
FIGURE 4.12


Amount of Mature Interior Core
acres
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
Acres
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D



YEAR 50 NO ACTION ALTERNATIVE

FIGURE 4.14


Amount of Old Growth Interior Core
acres
Acres
1050
1000
950
900
850
800
750
Existing
Post-harvest
50 years
Time
No action
Alt B
Alt C
Alt D

post-harvest, but to return to essentially its present level by year 50. Under Alternative D, "old growth" interior core is projected to decline by roughly 22% immediately post-harvest, but to again return to existing levels at year 50.

4. Structural and compositional diversity

The effects of Alternative A (no action) on structural and compositional diversity are difficult to anticipate, and were not modeled explicitly. Certainly, as pole timber classes mature, shade tolerant tree species will begin to establish, increasing diversity in those stands. The same will continue to occur in mature forest stands, however, increasing the dominance of Douglas-fir and firs in those stands, decreasing diversity. Structural complexity may increase over the short term as stands age and develop a multi-storied canopy, and as self-thinning and other mortality increase the numbers of snags and

downed trees in the mature forest stands. These developments must be seen as part of the normal process of ecosystem succession in the forests of the ESAA. In fully natural forests, however, periodic disturbance, most often fire, limited the duration and areal extent of the forests that ensue from succession, and created the mosaic and diversity of habitats that were historically present in the area. It seems certain that fire will not be allowed to assume its historical role in ecosystem processes within the ESAA or any of the SRSF, so no action would eventually lead to establishment of a forest with much reduced diversity, spatial variety, and structural complexity than in the past.

Structural enhancement harvests planned under Alternative B should improve structural complexity in the existing old-growth. The addition of small gaps and reduction in numbers of shade tolerant tree species should allow for some regeneration of canopy species that will increase tree diversity and spatial heterogeneity within the stands. With care taken to retain existing snags and downed logs, structural complexity would also be preserved. This should contribute to prolonged structural diversity in the affected stands.

Under Alternative C, stand diversity within the largest mature block would decrease specifically by setting unit C2 (Figure 2.3) back to a multistoried age stand more consistent with the stand lying directly adjacent to its northern boundary.

Alternative D would serve to increase the structural diversity of many stands, in particular those of units D1, D2, D8, D9, D10, and D11 (Figure 2.4) with respect to areas bordering each unit. This however would have an overall negative affect since this diversity would come at the expense of increased fragmentation immediately post-harvest. Furthermore, the treatment proposed for unit D10 would adversely affect its role as a component of a core area for this relatively large existing old growth stand.

5. Summary

In the short term for Alternative A, fragmentation would decrease, and total area of mature forest would increase. In the long term, however, fragmentation would increase again, important old-growth attributes would change as it successionally shifts to post-old growth, and the mixed conifer forest that now exists would be replaced by a less diverse and structurally less complex Douglas-fir dominated ecosystem.

Under Alternative B, lengthening the persistence of existing old-growth attributes, increasing the total acreage of mature forest, improving structure and diversity within existing forest habitats, and reducing fragmentation would all promote the existence of the forest ecosystem within the ESAA for the long term (>50 years). Indeed the net expansion of mature forest acreage should be viewed as a step toward restoration of the ecosystem. Repeated application of harvesting plans similar to the one proposed under Alternative B could, over the long term, reverse the conversion of old-growth to post-old growth that have been occurring in SRSF and ultimately re-establish ratios of disturbed to stable intact forest to near historical levels.

Alternative C does not address the basic tenets of ecosystem sustainability in the long term. Under this alternative the ESAA would still retain the high degree of fragmentation which currently exists immediately post-harvest. Additionally, one of the most important, larger mature stands within it (unit C2) would be significantly altered. The treatment to be applied to unit C2 (Figure 2.3) under Alternative C would remove any usefulness that it would have as a core area for the largest, unfragmented mature stand in the ESAA. In fact application of regeneration harvesting with heavy reserve would set this existing core area back 50 to 100 years and alter the heart of this larger mature stand for the foreseeable future. The treatment proposed for unit C1 would place this acreage back to the sapling stage and greatly increase fragmentation in this area. At 50 years post harvest, many of the elements of ecosystem sustainability would have improved, however juxtaposition of contrasting patch types would recover much more slowly than under the other alternatives. Thus, though the existing mature forest would be largely retained in its current state under Alternative C, such benefits to ecosystem sustainability would be counter-balanced by the much slower movement toward historical conditions of patch shape and juxtaposition than the other alternatives.

Though many of the units slated for harvest in Alternative D are similar to those effected in Alternative B, the degree to which they would be harvested is significantly greater. Over the short term significant affects would be observed both in loss of mature stands as well as in overall increased fragmentation. These would be specifically manifested as the entire loss of small pieces of existing old growth (units D1 and D2) (Figure 2.4), the increased fragmentation that would occur within one of the largest existing blocks of old growth (units D10 and D11), and the additional loss of a primary core area within this same old-growth block. Over the longer term (50 years) some of these affects would still be felt. For example, mean patch size, although much larger than currently, would be smaller than the under the other alternatives, and shapes of immature stands would remain excessively regular. Given 50 years free of disturbance, however, other elements of ecosystem sustainability (e.g., amount of old growth, existence of interior core) are projected to become similar to those under the other alternatives.

B. Old Growth

The analysis of old growth is based on the 2591-acre project area; however, changes in the amounts of existing old growth are also given for the Soup and Cilly Creek watersheds. The methods used to analyze the old-growth preservation major resource concern were described in Chapter III. The environmental effects of the four alternatives on old-growth preservation are described below and summarized in Figure 4.15.

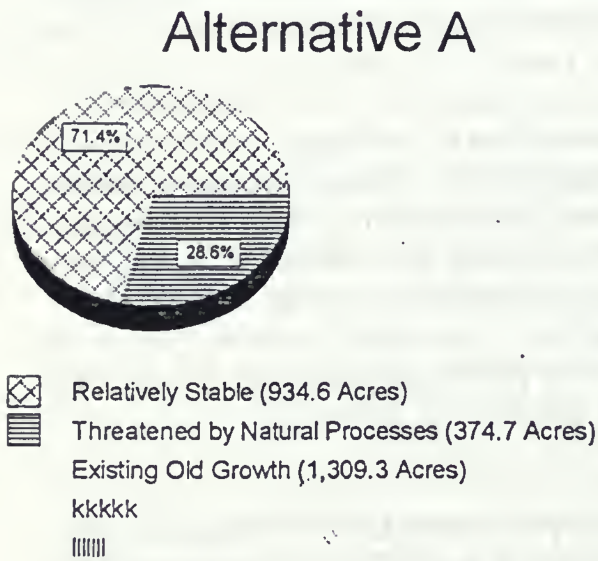
1. Alternative A

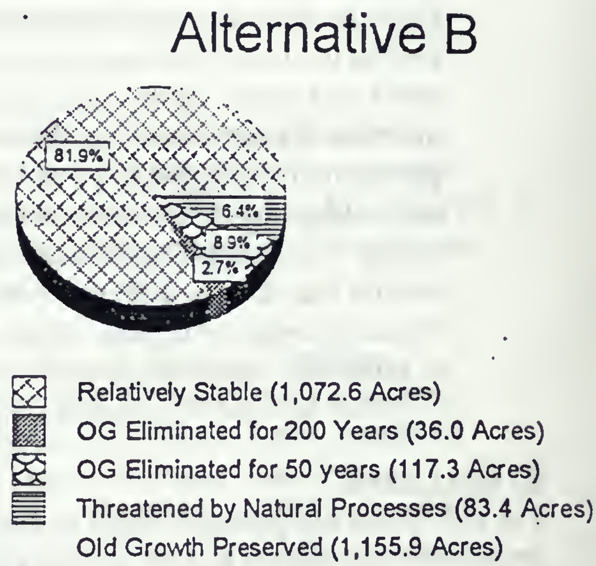
Old growth exists on 1,309.2 acres, representing 50.5 percent of the project area. Old-growth vigor classes and corresponding acreage are as follows: good-to-fair vigor, 357.9 acres; fair-to-poor vigor, 576.7 acres; and very poor vigor, 374.7 acres (Table 3.9) (Montana Dept. of State Lands 1991-1994).

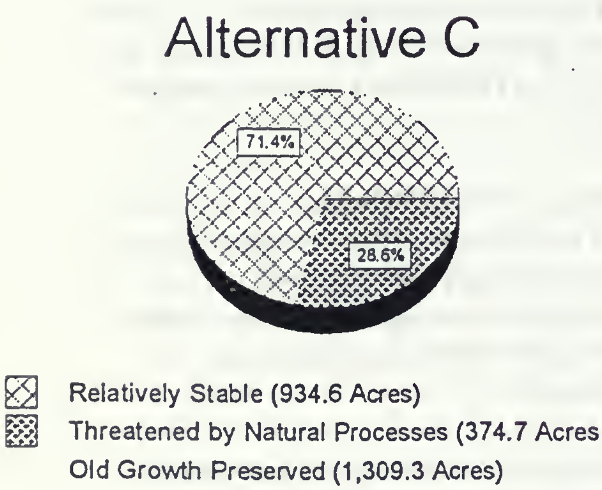
Old-growth stands having good-to-fair or fair-to-poor vigor would probably remain relatively stable for a number of decades. Scattered trees would periodically die, maintaining the presence of snags and large down logs--important ecological attributes of old growth. A diversity of large, shade-intolerant species would continue to codominate old-growth stands. Shade-tolerant species, however, would continue to encroach upon shade-intolerant species, increasing stand densities and decreasing species diversity.

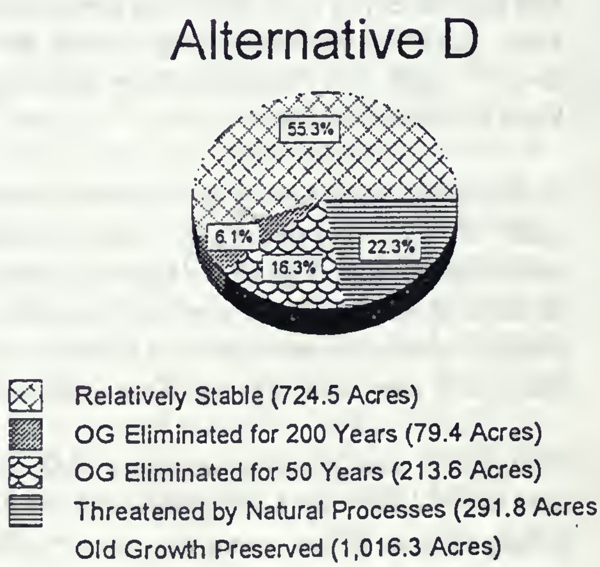
Old-growth stands having very poor vigor would decline due to natural processes over the next several decades. Large, shade-intolerant trees such as western larch, ponderosa pine, lodgepole pine (*Pinus contorta*), western white pine, and Douglas-fir would be weakened or

Figure 4.15 ***Effects of the Alternatives within the Project Area on Old Growth Preservation***









Old Growth Preserved = Relatively Stable Old Growth + Threatened Old Growth killed by mountain pine beetle, Douglas-fir beetle, dwarf mistletoe, root diseases, white pine blister rust, or other insects and diseases that currently exist in project area stands. Shade-tolerant species such as Engelmann spruce, subalpine fir, and grand fir would begin to dominate stands as they encroached on shade-intolerant species. The diminished species diversity and reduced abundance of large trees would successionally push these stands toward post-old growth.

Slow rates of natural decomposition due to the cool, moist climate in the project area-would maintain an abundance of large snags and down logs in stands for many decades. Large accumulations of dead, woody material combined with unnaturally high stand densities and increasing ladder fuels from shade-tolerant species would increase the risk of severe, stand-replacing fire. Stand replacing fire would place existing old-growth stands at risk.

Although the no-action alternative would preserve existing old growth for the short term, it would not promote long-term old-growth preservation (Figure 4.15). Old-growth stands would begin to break up (shifting successionally to post-old growth) as shade-intolerant trees in them died off. The surrounding, even-aged stands would be too small and too young to effectively replace old growth. Mortality of large, shade-intolerant species in old-growth stands would hasten the dominance of shade-tolerant species having ladder fuels. Increased fuel loads may contribute to stand-replacing fire and subsequent destruction of old growth.

2. Alternative B

a. discussion of effects

Under Alternative B, three different silvicultural treatments would be applied to stands containing old growth and each would have different effects on old-growth preservation. Effects of the three treatments are discussed below.

1) moderate-reserve, regeneration harvesting

Moderate-reserve, regeneration harvesting would be applied to cutting units B1 and B2 (Figure 2.2) which contain a total of 44.3 acres. Thirty-six of those 44.3 acres are currently classified as old growth. The 36 acres represent 2.7 percent of the existing old growth in the project area.

Moderate-reserve treatment would retain some important structural and compositional characteristics of old growth in treated stands by leaving eight, large, overstory trees per acre; scattered clumps of healthy understory trees; and fifteen to twenty tons of large, woody debris. Although some old-growth characteristics within stands would be retained, the 36 acres would no longer meet the requirements for old-growth classification. It would probably take 200 years--barring further major disturbance--before the treated stands would once again possess old-growth characteristics.

2) heavy-reserve, regeneration harvesting
Heavy-reserve, regeneration harvesting would be applied to cutting units B3 through B7 which contain a combined acreage of 129.2 (Figure 2.2). These units contain 117.3 acres of old growth representing 9.0 percent of the existing old growth in the project area.

Heavy-reserve treatment would reduce basal area to 80 square feet per acre, retaining approximately 30 large trees per acre along with scattered clumps of healthy understory and 15 to 20 tons of large, down woody material. The 117.3 acres would not meet the requirements for old growth classification. Without further major disturbance, the treated stands would probably attain old-growth status within 50 years[1].

3) structural enhancement
Structural enhancement would be applied to cutting units B8 through B18 which contain a total of 832.7 acres (Figure 2.2). These units contain 775.1 acres of old growth representing 59.2 percent of the old growth in the project area.

The structural enhancement treatment would employ commercial thinning techniques to reduce competition from encroaching shade-tolerant species and prolong the presence of large, shade-intolerant trees. Stand densities would be reduced by 10 percent. Structural enhancement would not reduce the existing acreage of old growth. Old-growth stands with very poor vigor would be improved

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[1]Within 50 years, trees that were released by the treatment would have grown, creating multistoried stands and effectively closing the stand canopies. The numbers of large trees per acre, the numbers of large down logs, and the canopy covers in the stands would all meet the criteria for old-growth classification.

to the fair-to-poor vigor class which would also improve the relative stability of these stands.

b. summary of effects

1) effects immediately post-harvest
Alternative B, reduces old growth within the project area by 153.3 acres or 11.7 percent. About 38.8 percent of the project area would be retained as old growth. In Soup Creek and Cilly Creek watersheds Alternative B reduces old growth by 2.6 percent leaving 36.8 percent of the watersheds as old growth.

2) short- and long-term effects
Under Alternative B, 81.9 percent of existing old growth in the project area would remain relatively stable for several decades; 6.4 percent would remain very unstable and at risk of losing some of its important old-growth attributes (moving successionally towards post-old growth) within several decades; 8.9 percent would lose old-growth status for 50 years; and 2.8 percent would lose old-growth status for 200 years (Figure 4.15). Alternative B would reduce the total amount of old growth on the project area from 1,309.3 acres to 1,155.9 acres. The treatments, however, would increase the amount of old growth that would remain relatively stable from 934.6 acres (71.4 percent) to 1,072.6 acres (81.9 percent) and reduce the amount of old growth that is likely to become post-old growth within several decades from 374.7 acres (28.6 percent) to 83.4 acres (6.4 percent).

3. Alternative C

a. discussion of effects
Under Alternative C, no old-growth stands would be treated; all existing old growth would be preserved. As with Alternative A, 28.6 percent of the existing old growth would remain in very poor vigor. Old growth having very poor vigor would be threatened by natural processes and preserved from becoming post-old growth for the short term only.

Although no old growth would be harvested, some edge effects may degrade the quality of existing old growth in stands adjacent to cutting units. In cutting unit C1 (Figure 2.3), moderate-reserve, regeneration harvesting would be applied to a stand in the multistoried stand class. Approximately three MBF per acre, or three to six trees per acre, would be removed; therefore, effects on existing edge would be minimal. In cutting unit C2, heavy-reserve, regeneration harvesting would retain approximately 80 square feet of basal area per acre and 70 percent crown cover. Edge effects of this treatment would also be minimal.

b. summary of effects

The short- and long-term effects of Alternative C on old-growth preservation would be nearly the same as Alternative A, the no-action alternative (Figure 4.15).

4. Alternative D

a. Discussion of effects

Under Alternative D, three different silvicultural treatments would be applied to stands containing old growth and each would have different effects on old-growth preservation. The effects of these treatments on old growth are discussed below.

1) light-reserve, regeneration harvesting

Light-reserve, regeneration harvesting would be applied to cutting units D1 and D2 which contain 11.2 acres (Figure 2.4). All 11.2 acres are classified as old growth; they represent 0.9 percent of the old growth in the project area.

Light-reserve treatment would change the stand class of the 11.2 acres to grass/seedling/shrub. It would likely take 200 years without further major disturbance before the area would achieve old-growth status again.

2) moderate-reserve, regeneration harvesting

Moderate-reserve, regeneration harvesting would be applied to cutting units D3 through D7 which contain a total of 88.3 acres (Figure 2.4). Of those 88.3 acres, 68.1 are classified as old growth; they represent 5.2 percent of the old growth in the project area.

For the same reasons given under Alternative B, moderate-reserve treatment would change the stand class of the 68.1 acres of old growth to grass/seedling/shrub. The amount of old-growth in the project area would be reduced by 5.2 percent. Without further major disturbance, old-growth conditions would likely be restored within 200 years.

3) heavy-reserve, regeneration harvesting

Heavy-reserve, regeneration harvesting would be applied to cutting units D8 through D11 which contain a total of 224.2 acres (Figure 2.4). This acreage includes 212.5 acres of old growth representing 16.2 percent of the existing old growth in the project area.

For the same reasons given under Alternative B, heavy-reserve treatment would change the stand class of the 212.5 acres of old growth to saw timber. The amount of old growth in the project area would be reduced by 16.2 percent. Without further major disturbance, old-growth conditions would likely be restored within 50 years [1].

b. summary of effects

1) effects immediately post-harvest

Alternative D reduces old growth within the project area by 291.8 acres or 22.3 percent. About 28.2 percent of the project area would be retained as old growth. In Soup Creek and Cilly Creek watersheds Alternative D reduces old growth by 5.0 percent leaving 34.4 percent of the watersheds as old growth.

2) short- and long-term effects

Under Alternative D within the project area, 55.3 percent of existing old growth would remain relatively stable for the next several decades; 22.3 percent would remain at risk of losing some important old-growth attributes (moving successionally towards post-old growth) within several decades; 16.3 percent would lose old-growth status for 50 years; and 6.1 percent would lose old-growth status for 200 years (Figure 4.15). The total amount of old-growth in the project area would be reduced from 1,309.3 acres to 1,016.3 acres, a reduction of 22.4 percent.

[1] Within 50 years, trees that were released by the treatment would have grown, creating multistoried stands and effectively closing the stand canopies. The numbers of large trees per acre, the numbers of large down logs, and the canopy covers in the stands would all meet the criteria for old-growth classification.

B. Timber Productivity

The methods used to analyze the timber productivity major resource concern are described in Chapter III. The effects of the alternatives on timber productivity are described below.

Alternative A reflects the existing timber productivity for the project area. Under Alternative A, stands in the project area would remain at an average vigor value of 2.50. Under Alternative B, the average vigor would improve to 2.36. Under Alternative C, vigor in the project area would improve only slightly to 2.49. The average vigor under Alternative D would improve to 2.39. Although Alternative D would generate the greatest increase in timber productivity on the treated acres, it does not treat as many acres as Alternative B. Alternative B, while not increasing productivity as efficiently as Alternative D, does achieve the best overall improvement in timber productivity.

1. Alternative A

a. discussion of effects

Under the Alternative A no timber would be harvested. Natural processes would proceed uninterrupted by timber harvesting.

1) negative productivity

Stands with very poor vigor occur on 18.2 percent (471.3 acres) of the project area. Stands having very poor vigor probably have negative productivity; that is, tree mortality in the stands probably exceeds growth.

Negative productivity would probably continue for several decades until shade-tolerant species replaced shade-intolerant species. After several decades, growth and mortality would begin to balance, but average timber volumes per acre would remain relatively low.

2) zero productivity

Stands with fair-to-poor vigor occur on 28.1 percent (728.5 acres) of the project area. Growth and mortality nearly balance in these stands, and timber productivity is close to zero.

Relatively high rates of mortality are occurring within stands having fair-to-poor vigor due to old age and natural processes such as insect infestation, disease, blowdown, or fire. If no action were taken, these stands would probably begin to exhibit very poor vigor and negative growth within the next several decades.

3) positive productivity

Stands with good-to-fair vigor occur on 39.5 percent (1,024.1 acres) of the project. Stands having good-to-fair vigor probably have positive growth; that is, tree growth probably exceeds tree mortality but falls far short of yield capability.

If no action were taken, stands having good-to-fair vigor would probably continue to exhibit positive growth for the next several decades or longer.

4) full productivity

Stands with full vigor occur on 14.2 percent (367.1 acres) of the project area. These stands are relatively young and include the young pole, sapling, and grass/seedling/shrub stand classes. Growth is occurring at near optimal rates. The continued health and productivity of these stands are jeopardized by exposure to insects and disease from adjacent older stands

b. summary of effects

If the no-action alternative were selected, no timber would be harvested from the project area, and natural processes would not be interrupted. Timber productivity would likely continue to decline on 46.3 percent (1,199.8) of the project area having very poor or fair-to-poor vigor. Moderate increases in yield would continue within 39.5 percent (1,024.1 acres) of the project area having good-to-fair vigor. Only fourteen percent (367.1 acres) of the project area would approach optimal timber productivity. Most trees that died would become too decayed to be merchantable through future salvage harvesting. Future timber productivity would be further compromised by adjacent insect-infested and diseased stands.

2. Alternative B

a. discussion of effects

1) moderate-reserve, regeneration harvesting

Moderate-reserve, regeneration harvesting would be applied to cutting units B1 and B2 containing 44.3 acres that are currently in either good-to-fair or fair-to-poor vigor. Within five years, regeneration would have established and all of the 44.3 acres would convert to full vigor with growth near full potential. Treated old-growth and saw-timber stands would no longer expose adjacent young stands to risk of infection by dwarf mistletoe.

2) heavy-reserve, regeneration harvesting

Heavy-reserve, regeneration harvesting would be applied to cutting units B3 through B7 containing 129.2 acres (Figure 2.2). This treatment would convert 14.2 acres from fair-to-poor vigor to good-to-fair vigor. It would also convert 103 acres having very poor vigor to a vigor class of fair to poor. Timber productivity on these 103 acres would increase from negative productivity to zero productivity. The risk of adjacent, young stands becoming infected by dwarf mistletoe would be somewhat reduced on the 129.2 treated acres. Within 20 years, the residual overstory would begin to suppress growth of regeneration, reducing future timber productivity.

3) structural enhancement

Structural enhancement would be applied to 832.7 acres within cutting units B8 through B18 (Figure 2.2) This treatment would have little effect on stand vigor within most treated stands. The vigor on 188.2 acres of old growth having very poor vigor would be improved to the fair-to-poor vigor class. The vigor and timber productivity on the remaining 644.5 treated acres would not change. The risk of adjacent, young stands becoming infected by dwarf mistletoe would not change.

b. summary of effects

Alternative B would increase timber productivity (Figure 4.16). Under Alternative B, stands having full vigor would increase from 367.1 acres to 411.5 acres, or 15.9 percent of the project area. Very little change would occur in areas with good-to-fair vigor. Stands having good-to-fair vigor would decrease from

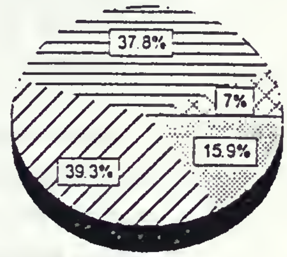
Figure 4.16 *Effects of Alternatives on Timber Productivity*

Alternative A

- Very Poor (471.3 acres)
- Fair to Poor (728.5 acres)
- Good to Fair (1,024.1 acres)
- Full Vigor (367.1 acres)

Average vigor value for the project area: 2.50

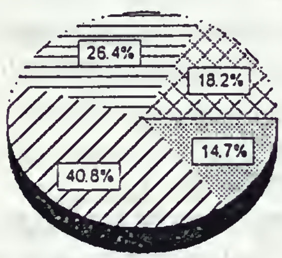
Alternative B



- Very Poor (180.1 acres)
- Fair to Poor (980.0 acres)
- Good to Fair (1,019.4 acres)
- Full Vigor (411.5 acres)

Average vigor value for the project area: 2.36

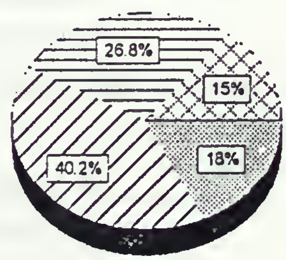
Alternative C



- Very Poor (471.3 acres)
- Fair to Poor (683.0 acres)
- Good to Fair (1,056.7 acres)
- Full Vigor (380.0 acres)

Average vigor value for the project area: 2.49

Alternative D



- Very Poor (388.5 acres)
- Fair to Poor (694.5 acres)
- Good to Fair (104.3 acres)
- Full Vigor (466.7 acres)

Average vigor value for the project area: 2.39

These percentages are based on the 2,591 acres in the project area.

Vigor values and classes are as follows:

vigor value	*vigor class*	*timber productivity*
4.00	*Very Poor*	*:Negative productivity, mortality exceeds growth.*
3.00	*Fair to Poor*	*:Zero productivity, mortality balances with growth.*
2.00	*Good to Fair*	*:Positive productivity, growth exceeds mortality but far short of yield potential.*
1.00	*Full Vigor*	*:Positive productivity, yield near potential.*

Figure 4.16

1,024.1 acres to 1,019.4 acres, or 39.3 percent of the project area. Stands having fair-to-poor vigor would increase from 728.5 acres to 980.0 acres, or 37.8 percent of the project area. The reduction of stands with negative productivity would represent the most substantial change in timber productivity. Stands having very poor vigor and negative productivity would decrease from 471.3 acres to 180.1 acres. The average vigor for the project area would improve from 2.50 to 2.36. The overall risk of young stands becoming infected by dwarf mistletoe would be somewhat reduced on 129.2 acres and substantially reduced on 44.3 acres.

3. Alternative C

a. Discussion of effects

1) moderate-reserve, regeneration harvesting

Moderate-reserve, regeneration harvesting would be applied to a 12.9-acre stand in the multistoried stand class (cutting unit C1) having fair-to-poor vigor (Figure 2.3). Removing the existing overstory would release the established sapling understory and increase the vigor of the stands to full vigor. The risk of the sapling understory and adjacent, young stands becoming infected by dwarf mistletoe would be substantially reduced.

2) heavy-reserve, regeneration harvesting

Heavy-reserve, regeneration harvesting would be applied to a 49.6-acre saw-timber stand (cutting unit C2). This treatment would not change the timber productivity on 17.0 acres that are currently in the good-to-fair vigor class. On 32.6 acres, timber productivity would be improved from a vigor class of fair to poor to a vigor class of good to fair. Heavy-reserve treatment would not reduce the risk of young stands becoming infected with dwarf mistletoe because there are no young stands adjacent to cutting unit C2 (Figures 2.3, 3.1).

b. summary of effects

Under Alternative C only 62.5 acres would be treated. The vigor of 45.5 acres would be increased. The vigor of 17.0 acres would be unchanged. The number of acres in the project area having full vigor would increase from 367.1 acres to

380.0 acres (Figure 4.16), a slight increase of 0.8 percent. The area having good-to-fair vigor would increase to 1,056.7 acres, or 40.8 percent of the project area. The area having fair-to-poor vigor would decrease to 683.0 acres, or 26.4 percent. The area having very poor vigor would remain unchanged by this alternative. The risk of young stands becoming infected with dwarf mistletoe would be substantially reduced on only 12.9 acres.

4. Alternative D

a. discussion of effects

1) light-reserve, regeneration harvesting

Light-reserve, regeneration harvesting would be applied to cutting units D1 and D2 which contain 11.2 acres (Figure 2.4). The treatment would be applied to 6.4 acres currently having very poor vigor and 4.8 acres having fair-to-poor vigor. Within five years, regeneration would establish and all 11.2 acres would have full vigor. The risk of adjacent young stands becoming infected with dwarf mistletoe would be substantially reduced.

2) moderate-reserve, regeneration harvesting

Moderate-reserve, regeneration harvesting would be applied to cutting units D3 through D7 which contain 88.3 acres (Figure 2.4). The treatment would be applied to 30.8 acres with good-to-fair vigor, 37.7 acres with fair-to-poor vigor, and 11.9 acres with very poor vigor. Within five years after treatment, all 88.3 acres would have full vigor. The risk of adjacent young stands becoming infected with dwarf mistletoe would be substantially reduced.

3) heavy-reserve, regeneration harvesting

Heavy-reserve, regeneration harvesting would be applied to cutting units D8 through D11 which contain 225.4 acres (Figure 2.4). The treatment would convert 56.5 acres from very poor vigor to fair-to-poor vigor and 48.0 acres from fair-to-poor vigor to good-to-fair vigor. This treatment would not change 120.9 acres that already have good-to-fair vigor. The risk of adjacent young stands becoming infected with dwarf mistletoe would be somewhat reduced.

b. summary of effects

Under Alternative D, 325.0 acres would be treated. The combination of treatments in this alternative would generate the largest number of acres having full vigor. Eighteen percent of the project area, or 466.7 acres, would be converted to the full vigor class (Figure 4.16). The portion of the project area having good-to-fair vigor would increase from 39.5 percent (1024.1 acres) to 40.2 percent (1041.3 acres). The number of acres having fair-to-poor vigor would be reduced to 694.5, or 26.8 percent. The area having very poor vigor would be reduced to 388.5, or 15 percent. The average vigor for the project area would be 2.39-- just slightly lower timber productivity than Alternative B. The risk of adjacent, young stands becoming infected by dwarf mistletoe would be substantially reduced on 99.5 acres and somewhat reduced on 224.3 acres.

II. WILDLIFE

A. Grizzly Bear

As described in Chapter III, the effects of each alternative were assessed by their effects on motorized access, the amount and distribution of security habitat, hiding cover, and seasonal habitats. The analysis area was the South Fork Lost Soup Subunit in the Bunker Creek Bear Management Unit.

Data on motorized access and hiding cover were provided by the DNRC Inventory Division, Missoula. Habitat value maps were provided by the Flathead National Forest, Kalispell. Open Road Densities (ORD), Total Road Densities (TRD), amount and distribution of security habitat, and seasonal habitats were calculated with the EPPL7 Geographic Information System.

1. Motorized access

None of the alternatives involve new road construction. For all alternatives the TRD would remain at 43 percent for the entire subunit and 52 percent for DNRC land within the subunit. Open Road Densities would be affected differently by the various alternatives.

a. Alternative A

Under alternative A, the status of roads in the subunit would remain the same as the existing condition. The open road density would remain 34 percent for the entire subunit and 43 percent for DNRC land within the subunit.

b. Alternatives B, C, and D

Under the action alternatives, approximately 1.8 miles of the upper Soup Creek Canyon Road and 1.6 miles of the upper Cilly Ridge Road would be gated. This would change their status from open to restricted. The ORD would be reduced to 28 percent for the subunit and 34 percent for DNRC land within the subunit.

2. Security habitat

Reclaimed roads and restricted roads that effectively preclude motorized access are allowed in security areas (Interagency Grizzly Bear Committee 1994). None of the alternatives reclaim any existing roads or make currently restricted roads less passable to motorized vehicles. For all alternatives, security habitat would remain at 38 percent of the subunit.

3. Hiding cover

Hiding cover for grizzly bears would be affected differently by each alternative. Areas receiving light- or moderate-reserve, regeneration harvesting would lose their hiding cover for approximately 15 years. Areas treated with heavy-reserve, regeneration harvesting or structural enhancement would retain hiding cover for grizzly bears.

a. Alternative A

Under Alternative A, hiding cover would not be diminished.

b. Alternatives B, C, and D

The area by which each action alternative would reduce hiding cover in the subunit immediately post-harvest is as follows: Alternative B - 44.3 acres, Alternative C - 12.9 acres, and Alternative D - 99.5 acres. None of these reductions would numerically reduce the hiding cover of the subunit below the existing 79 percent. Neither would they numerically reduce the hiding cover of DNRC land within the subunit below the existing 91 percent. DNRC guidelines (Montana Dept. of Natural Resources and

Conservation 1995) recommend retaining a minimum of forty percent of a subunit in hiding cover.

4. Seasonal habitats

Habitats in the NCDE have been classified into three categories based on their probability of use by grizzly bears: use less than expected, use equals expected, and use greater than expected (Manley 1992); habitats used "greater than expected" are presumed to be preferred by grizzly bears. Habitat values have been described for five seasons (Chapter III).

Areas receiving light- and moderate-reserve treatment are assumed to convert to the "use less than expected" category. Areas receiving heavy-reserve treatment and structural enhancement retain their existing values. There is no assumption that harvest-related activities improve grizzly bear habitat.

Currently, there is no provision for projecting habitat values into the future to account for plant succession. Therefore, habitat values reflect conditions immediately post-harvest.

a. Alternatives A, B, and C

For all five seasons, the percentages of the subunit in any of the three "probability of use" categories is the same as those listed in Table 3.12. Since none of the project area meets security habitat criteria, habitat values within security areas would not be affected.

b. Alternative D

For Alternative D, habitat classified as "use greater than expected" would decline from 19 percent to 18 percent for the early spring season. For the remaining four seasons, habitat values would remain the same as described in Chapter III. Habitat values within security areas would not be affected.

Riparian areas are used extensively by grizzly bears (Interagency Grizzly Bear Committee 1987). Under alternatives B and D, two stands adjacent to wetlands would receive moderate-reserve, regeneration harvesting: stands B1 (=D6) and B2 (=D7). Visual screening would be retained along all interfaces between wetlands and cutting units.

c. mitigation common to all alternatives

To avoid displacement of bears, all action alternatives would limit timber harvesting activities to the denning season, November 16 through March 15.

5. Cumulative effects

Management activities would be guided by the Swan Valley Grizzly Bear Conservation Agreement (SCA). The threshold for cumulative effects established by the SCA would not be exceeded. Guidelines and thresholds established by the SCA would likely preclude cumulative effects for proposed projects on the SRSF from jeopardizing survival and recovery of the grizzly bear population within the Northern Continental Divide Ecosystem Grizzly Bear Recovery Area (US Fish and Wildlife Service 1995c, US Fish and Wildlife Service 1995d, US Fish and Wildlife Service 1995e, Montana Dept. of Natural Resources and Conservation 1995b).

B. Elk

Impacts to elk habitat were analyzed for each alternative using the method described in Chapter III. Post-harvest habitat values of stands treated with each of the silvicultural treatments would be as follows: Stands treated with light- and moderate-reserve, regeneration harvesting would no longer provide hiding or thermal cover, but would provide forage. Stands treated with heavy-reserve, regeneration harvesting would be patchy and numbers of trees per acre post-harvest will vary. An average crown cover of about 70% would be retained, which would provide elk summer thermal cover and hiding cover. Areas so treated would provide some scattered forage post-harvest, but for analysis it was assumed they would not provide forage. Stands treated with structural enhancement would not change substantially with regard to elk habitat value. Hiding and thermal cover would be provided, but forage would not.

1. open roads

No roads would be constructed under any alternative, and all action alternatives would utilize existing roads to access timber. Open road density in the analysis area would remain at 1.2 miles of open road per square mile. The analysis assumes that elk avoid areas near roads that are heavily used by humans, and it considers these areas unavailable as potential elk habitat. Due to road effects, 55 percent of the area would remain available as potential elk habitat under all alternatives.

2. hiding and thermal cover

Areas receiving light- and moderate-reserve treatments would no longer provide hiding or thermal cover. The number of acres in treatments 1 and 2 and the percentages of the analysis area that would provide hiding and thermal cover post-harvest are listed below by alternative.

TABLE 4.1 *Elk Hiding and Thermal Cover in the Analysis Area*

Alternatives	Acres upon which cover would be reduced[1]	Percent of analysis area that would provide thermal cover	Percent of analysis area that would provide hiding cover
A	0	61.2	90.9
B	44.3	60.4	90.1
C	12.9	61.0	90.7
D	99.6	59.5	89.2
MFWP recommenation: greater than 15 percent of the analysis area should provide thermal cover and greater than 40 percent should provide hiding cover.			

[1]Acres receiving light- or moderate-reserve, regeneration harvesting

3. forage areas

Areas receiving silvicultural light- and moderate-reserve treatment would provide forage post-harvest. Acreage are given in Table 4.2. The total percentages of the analysis area that would provide forage post-harvest, by alternative, are as follows: Alternative A, 26.2%; Alternative B, 26.9%; Alternative C, 26.4; and Alternative D, 27.9%. The recommendation is that at least 30 percent of the analysis area provide forage. None of the alternatives meet this recommendation, although Alternative D comes closest. Forage would be evenly distributed across the landscape, present in all quadrants for all alternatives.

Elk prefer to forage in areas with cover nearby and the recommendation is that at least 90 percent of the forage areas be within 500 feet of cover. Most of the current and proposed forage areas in the analysis area are fairly small, and 99 percent of all forage areas would be within 500 feet of cover for all alternatives. Adequate cover between forage areas is also important. and recommendations are that cover between at least 75 percent of the openings should be at least 800 feet in width. Because conditions do not currently meet cover-between-opening recommendations, and would not under any of the alternatives, potential elk habitat is reduced 10% below optimal conditions under all alternatives. The percentage of the openings that would have ≥ 800 feet of cover between them would be 22% under Alternative A; 30% under Alternative B; 29% under Alternative C; and 28% under Alternative D. The action alternatives are closer to the recommendation than the no-action alternative because some of the cutting units are strips between existing openings. Alternative B comes closest to meeting this recommendation.

Table 4.2 *Elk Forage in the Analysis Area*

Alternative	Acres upon which forage would be increased[1]	Percent of Analysis Area that would provide forage	MFWP Recommendation
A	0	26.2	≥ 30 % of analysis area
B	44.3	26.9	≥ 30 % of analysis area
C	12.9	26.4	≥ 30 % of analysis area
D	99.6	27.9	≥ 30 % of analysis area

[1]Acres receiving light- or moderate-reserve, regeneration harvesting

4. security areas

The recommendation is that at least 20 percent of an analysis area provide security, and that at least 60 percent of the security area provide cover (Leege 1984). All alternatives would meet this recommendation. Because no new roads would be constructed, the percentage of the analysis area that provides security would not change from the current 26.7 percent under any action alternative. Alternatives A and C would retain all cover within the secure areas at 78 percent, and alternatives B and D would both reduce cover in secure areas from the current 78 percent to 77 percent.

5. summary of effects
Existing elk habitat potential is 50% below optimal due to open road density, inadequate forage areas, and inadequate cover between openings. Under all alternatives, existing conditions are not changed enough to alter elk habitat potential (remains at 50%).

6. cumulative effects
Five percent, or 290 acres, of the Middle Soup Creek Project analysis area for elk overlaps with the South Fork Lost Creek Timber Sale's analysis area for elk. Since no treatments would be applied by either project within the area of overlap, and the area of overlap represents only five percent of the Middle Soup Creek Project analysis area, cumulative effects would be minimal.

C. White-Tailed Deer
Recommendations from MFWP for managing summer habitat (Cross 1983) are that about 50 percent of the upland habitat be maintained as summer thermal cover, about 25 percent be maintained as hiding cover, about 25 percent be maintained as foraging areas.

Hiding cover, forage, and thermal cover values would be the same as those given in the elk analysis (Tables 4.1, 4.2). Hiding cover is currently provided on at least 90.9 percent of the analysis area and would be reduced to no less than 89.2 percent by any action alternative. Foraging areas are currently available on 26.2 percent of the analysis area. Forage areas would not change under Alternative A, and would increase to 26.9 percent under Alternative B, to 26.4 percent under Alternative C, and to 27.9 percent under Alternative D. Summer thermal cover is currently provided on at least 61 percent of the analysis area, and would be reduced to 60.4 percent under Alternative B; 61.2 under Alternative C; and 59.5 percent under Alternative D. All alternatives would maintain hiding cover, thermal cover, and forage areas well within the MFWP recommended thresholds.

Additional MFWP recommendations for management of vegetation around riparian areas would be followed under all alternatives (Appendix D). Timing of activities could affect white-tailed deer. Logging in the fall and early winter would result in an abundance of lichen on the ground. Lichen is a preferred forage, and deer using the area as fall-transition range and as a migration route to winter range may stay in the area longer than usual to feed on the lichens. In the event of a heavy snowfall, deer may be essentially trapped in the area, which may result in high mortality. To avoid retaining deer in the project area past the time when they should migrate to winter range, logging would be deferred until December 15 or until snow depth exceeds 18 inches.

Five percent, or 290 acres, of the Middle Soup Creek Project analysis area for white-tailed deer overlaps with the South Fork Lost Creek Timber Sale's analysis area for white-tailed deer. Since no treatments would be applied by either project within the area of overlap, and the area of overlap represents only five percent of the Middle Soup Creek Project analysis area, cumulative effects would be minimal.

D. Gray Wolves

Wolves are not known to currently inhabit the Swan Valley. Managing habitat for wolves primarily entails maintaining an adequate prey base (in northwest Montana, white-tailed deer and elk) and preventing illegal, human-caused wolf mortality.

White-tailed deer and elk habitat (foraging area and hiding/thermal cover) will be retained above MFWP recommended minimums for all alternatives.

No new roads are proposed by any alternative; road densities will remain at 1.2 miles per square mile in the analysis area.

All action alternatives would limit logging activity to the winter season. By this time, pups of the year would be traveling with adults in the pack so there would be no disturbance to den or rendezvous sites.

Five percent, or 290 acres, of the Middle Soup Creek Project analysis area for gray wolves overlaps with the South Fork Lost Creek Timber Sale's analysis area for gray wolves. Since no treatments would be applied by either project within the area of overlap, and the area of overlap represents only five percent of the Middle Soup Creek Project analysis area, cumulative effects would be minimal.

E. Sensitive Animal Species

1. western big-eared bat

Impacts from the proposed project on western-big eared bats are limited to the harvest of potential daytime roost sites: snags and live mature tree snag recruits. The analysis for cavity-nesting species addresses snags and snag recruits and the assessment of likely effects generally applies to big-eared bats.

2. fisher

Timber harvesting can affect fishers by reducing the total amount of old growth forest, by selectively harvesting individual large mature trees, and by fragmenting old growth forest by creating more open areas which fishers are reluctant to cross. The analysis for ecosystem sustainability addresses total amount and connectivity of old growth forest, and the analysis for cavity nesters addresses availability of large overstory trees and snags.

Fishers are also very vulnerable to trapping pressure and are easily caught in sets for bobcats, coyotes, and other furbearers. Reductions in the amount of old-growth forest could lead to increases in fisher home range which may increase vulnerability. Alternatives A and C do not reduce existing old growth amounts (50.5 percent of the project area) and should not increase vulnerability. Alternative B reduces old growth to 38.8 percent of the project area and Alternative D reduces old growth to 28.2 percent. The reductions in old growth amounts may increase trapping vulnerability in Alternatives B and D. Despite some anticipated successional changes to old growth, value of post-harvest old-growth habitat to fisher should not change for the next fifty years. Density of roads that can be traveled by snowmobile, and trapping pressure should not change due to the project (see Lynx).

3. lynx

Timber harvesting can affect lynx through habitat fragmentation and alteration of forest successional stages. Proportions of forest in different successional stages and forest fragmentation are addressed under the analysis for ecosystem sustainability.

Timber harvesting can also affect lynx through road building and consequent increased human access and trapping pressure. Lynx with large home ranges are particularly vulnerable. No new roads would be constructed in the project area and about 3.4 miles of road would be closed with gates in the Grizzly Bear BMU (see grizzly bear analysis). However, because most trappers travel by snowmobile and can go around gates, trapping pressure should not increase or decrease.

4. black-backed woodpeckers

Humans impact black-backed woodpeckers primarily through fire suppression, and harvesting trees that are heavily infested with insects. Fire suppression is outside the scope of the proposed project and none of the alternatives proposes to harvest partially burned trees. The analysis for ecosystem sustainability addresses forest processes, of which insect infestations are a natural part. The analysis for cavity nesters addresses availability of snags and decaying trees suitable for nesting and the assessment of likely effects generally applies to black-backed woodpeckers.

5. Northern bog lemmings

Bog lemmings may not inhabit the swan valley: No bog lemmings were detected during surveys in the swan valley in good bog lemming habitat (Reichel 1995). Potential bog lemming habitat would not be affected because: (1) None of the alternatives would measurably alter the water level in bogs (Tony Nelson , DNRC hydrologist, personal communication) and water quality in bogs would not change because mo mew roads would be constructed near bogs.

F. Cavity-Dependent Species

1. Effects of silvicultural treatments

a. light and moderate-reserve, regeneration harvesting

Areas treated with light-reserve, regeneration harvesting would provide very minimal habitat for cavity-dependent wildlife post-harvest. Efforts would be made to retain all existing snags, broken boles not capable of spreading disease, and two large trees per acre. This would provide habitat for species that prefer very open habitat, such as bluebirds and American kestrels. Habitat for these species, however, is not generally limiting. Areas treated with moderate-reserve, regeneration harvesting would also only provide habitat for species preferring open areas, though more trees would be retained and habitat would be of somewhat greater value. Both treatments would open up areas enough so that snags would be easily visible. Snags in cutting units that are near open roads could thus be harvested by firewood cutters. and some snags retained for wildlife probably would not persist far into the future. All the existing nonmerchantable large downed wood would remain post-harvest, and some additional downed wood would be left if necessary so that a total of 15 to 20 tons per acre would remain post-harvest. Much of this downed wood, however, would not be the large intact trees and logs which are of greatest value to wildlife and which would exist after a natural disturbance, but would be unmerchantable long butts and cull logs. This downed wood would provide some feeding opportunities for some bird species, but areas would be too open immediately post-harvest to receive more than minimal use by most small mammals. As shrubs and small trees grow and provide additional overhead cover, areas so treated should receive increased use by small mammals.

b. heavy reserve, regeneration harvesting

Areas treated with heavy-reserve, regeneration harvesting would remove 20 to 60 percent of the trees. Efforts would be made to retain all existing snags, broken boles not capable of spreading disease, and dead trees not infested with bark beetles. This treatment would open up areas enough so that some snags would be easily visible. Snags in cutting units that are near open roads could thus be harvested by firewood cutters, and some snags retained for wildlife probably would not persist far into the future. Because snags would be less visible in this treatment than in the previous two treatments, snags would be less vulnerable to firewood cutters. All the existing nonmerchantable downed wood would remain post-harvest, and some additional downed wood would be left if necessary so that a total of 15 to 20 tons per acre would remain post-harvest. Much of this downed wood, however, would not be the large, intact trees and logs which are of greatest value and which would exist after a natural disturbance, but would be unmerchantable long butts and cull logs. Downed wood density should increase immediately post-harvest, although there will be fewer large, high-quality, downed-wood recruits with removal of 20 to 60 percent of the mature trees. Areas so treated should provide nesting and feeding habitat for most species of cavity-dependent wildlife that naturally occur in this forest type. Habitat quality, however, would be lower because fewer nesting and feeding sites would be available and areas so treated would probably support fewer individuals. Impacts would vary with the age of the trees: in younger stands that are of presently low value to cavity nesters, this treatment would allow some trees to attain larger sizes and the overall effect may be neutral or even positive in the long run. In older stands where the trees are already of high value, impacts would be negative. Some species that prefer denser canopy cover may find more heavily harvested patches within such cutting units suboptimal or not usable. Predation by corvids and owls on songbirds and woodpeckers would probably increase in these areas. Adequate canopy cover and downed wood should remain to provide at least minimal habitat for most species of small mammals.

c. structural enhancement

Habitat quality in areas treated with structural enhancement should not diminish due to the treatment immediately post-harvest, and post-harvest habitat quality may improve in the long run. Many of the trees that would be harvested with this treatment are the shade-tolerant true firs and Douglas-fir which are not highly preferred by cavity-nesting species. Thinning the stand should reduce competition and stress in the shade-intolerant species, larch and ponderosa pine in particular, and promote increased vigor and growth in these species that are preferred by cavity-nesting species. Some trees would probably attain larger sizes at maturity, which would create larger snags and eventually larger downed logs. Because size is an important attribute of snags and mature trees to cavity-nesting species, these trees would be of potentially greater value. All existing downed wood would remain in place. Timber harvesting would not target large mature trees and should not affect high quality downed woody recruits.

d. effects of silvicultural treatments fifty years post harvest

Most of the snags existing immediately post-harvest would probably have fallen naturally (Morrison et al. 1993). Recruitment of snags fifty years post-harvest would be from mature trees retained after harvesting. The number of snag recruits, and habitat quality of these snags for wildlife, depends on many unpredictable factors including wind events, insects and disease, presence and characteristics of decay, and loss to firewood cutters. While the proportion of mature trees that would become high-quality snags is impossible to predict, potential future snag habitat is related to the number, species, decadence, size and morphology of mature trees, and site conditions. Because tree size is often inversely correlated with tree density, thinning a stand will often result in larger trees which can become higher quality snags than smaller trees.

Considering all these factors, fifty year post-harvest habitat for cavity nesters would probably be: (1) Non-existent on most areas treated with light-reserve regeneration harvesting; (2) Available but very marginal (one to three snags per acre) on areas treated with moderate-reserve regeneration harvesting; (3) Adequate to support low to moderate-level populations of most species on areas treated with heavy-reserve regeneration harvesting; and (4) Good to excellent on areas treated with structural enhancement.

2. **Effects of alternatives**

a. alternative a

Habitat quality for cavity-nesting species should remain high. Natural successional and disturbance processes would continue to take place, creating snags as trees die and downed wood as trees fall. Some snags near open roads may be cut by firewood cutters.

b. alternative b

Habitat quality would be reduced substantially for most species of cavity nesters over about 44.3 acres; only the few species of cavity nesters that prefer open habitat would be able to use these areas. Trees in these 44.3 acres are of moderate value to cavity nesters, based on size and age of the trees. Because these 44.3 acres are not adjacent to open roads, snags in the units should not be vulnerable to removal by firewood cutters. Habitat quality would also be reduced, but to a much lesser degree, over about 129.2 acres. Most species would still be able to nest and feed in these 129.2 acres, but probably fewer individuals of each species, and predation would probably increase. Over 832.7 acres, habitat quality should not change immediately post-harvest, and should improve in the long run.

c. alternative c

Over about 12.9 acres, most of the existing trees would be harvested. This area, however, was harvested in the past and at present only provides habitat for those species preferring open habitat. Because these 12.9 acres are not adjacent to open roads, snags in the units should not be vulnerable to removal by firewood cutters. Habitat quality may be reduced in the short term, and possibly improved in the long term, over an additional 49.6 acres. Trees in this stand are fairly young and small, and a partial harvest may benefit the remaining trees. Many species would still be able to nest and feed in these 49.6 acres, but probably fewer individuals of each species, and predation would probably increase.

d. alternative d

Habitat quality would be reduced substantially for most species of cavity nesters over about 99.5 acres. Only the few species of cavity nesters that prefer open habitat would be able to use these areas. About 25 of these acres are presently of very high value to cavity nesters, based on the large size of the trees, stand age, and species composition. The other 74.5 acres are of moderate to high value to cavity nesters. About 20 of these acres have open roads going through them and many of the snags retained for wildlife would be vulnerable to removal by firewood cutters. Habitat quality would also be reduced, but to a much lesser degree, over about 224.2 acres. Most species would still be able to nest and feed in these 224.2 acres, but probably fewer individuals of each species, and predation would probably increase. Open roads are adjacent or go through some of these areas and snags within about 200 feet of the road would be more vulnerable to removal by firewood cutters.

e. summary

Alternative A should retain high habitat quality for cavity-nesting species in the short and long-term. Alternative B would have minimal to negligible negative impacts to cavity-nesting species, and may in the long run have a net positive impact. Alternative C would have moderate negative impacts in some areas and probably some positive impact over a large area in the long run. Alternative D would have substantial negative impacts in some areas and moderate negative impacts in other areas.

III. WATER QUALITY

A. Sedimentation

Sediment delivery to streams (sedimentation) is a key factor affecting water quality. The main sources of introduced sedimentation are road construction and road use. Timber harvesting activities--especially in riparian areas--may also increase sedimentation by reducing the filtering capability of vegetation.

For every action alternative, timber harvesting would comply with BMP's. Timber would not be harvested from SMZ's. The recommendations of a hydrologist and a soil scientist would be incorporated into all timber harvesting activities. No new roads would be constructed.

1. Effects of Alternative A on sedimentation

Alternative A would not directly affect sedimentation in the Soup Creek and Cilly Creek watersheds. Under Alternative A, no new roads would be constructed and no timber would be harvested in the Soup Creek or Cilly Creek watersheds as a result of the Middle Soup Creek Project.

Alternative A may indirectly affect sedimentation in the Soup Creek and Cilly Creek watersheds. Under Alternative A, no stream crossing replacements or road improvements would be made. These sediment source sites would depend upon natural processes for recovery unless funding for improvements became available.

2. Effects of Alternative B on sedimentation

Under Alternative B, risk of sedimentation would increase mainly from timber harvesting activities. Risk would be minimized due to operation on frozen and/or snow-covered conditions. These impacts would be short-term, decreasing as vegetation established on bare soil and BMP's took effect.

Implementing Alternative B would result in a net reduction of sedimentation in the Soup Creek and Cilly Creek watersheds. Improperly designed stream crossings would be replaced to eliminate existing sediment sources. Additional drainage features and a gate restricting motorized traffic would be installed on approximately 1.8 miles of Soup Creek Canyon Road. Approximately 1.7 miles of Upper Cilly Ridge Road would be closed to motorized traffic with a permanent gate (southwest quarter of section 10). These activities may create short-term increases in sediment and turbidity by exposing bare soil during operation, but they would lead to a net, long-term benefit to water quality by stabilizing current erosion sources and revegetating bare soil.

3. Effects of Alternative C on sedimentation

Alternative C would increase the risk of sedimentation in Cilly Creek Watershed mainly through timber harvesting activities. No new roads would be constructed in Soup Creek or Cilly Creek, and no timber harvesting would occur in Soup Creek

Watershed. The risk of sedimentation would be minimized due to operation on frozen and/or snow-covered conditions. These impacts would be short-term, decreasing as vegetation established on bare soil and BMP's took effect.

Implementing Alternative C would also result in a net reduction of sedimentation in the Soup Creek and Cilly Creek watersheds. Improperly designed stream crossings would be replaced to eliminate existing sediment sources. Additional drainage features and a gate restricting motorized traffic would be installed on approximately 1.8 miles of Soup Creek Canyon Road. Approximately 1.7 miles of Upper Cilly Ridge Road would be closed to motorized traffic with a permanent gate (southwest quarter of section 10). These activities may create short-term increases in sediment and turbidity by exposing bare soil during operation, but they would lead to a net, long-term benefit to water quality by stabilizing current erosion sources and revegetating bare soil.

4. Effect of Alternative D on sedimentation

Under Alternative D, risk of sedimentation would increase mainly from timber harvesting activities. The risk would be minimized due to operation on frozen and/or snow-covered conditions. These impacts would be short-term, decreasing as vegetation established on bare soil and BMP's took effect.

Like Alternatives B and C, Alternative D would result in a net reduction of sedimentation in the Soup Creek and Cilly Creek watersheds. Improperly designed stream crossings would be replaced to eliminate existing sediment sources. Additional drainage features and a gate restricting motorized traffic would be installed on approximately 1.8 miles of Soup Creek Canyon Road. Approximately 1.7 miles of Upper Cilly Ridge Road would be closed to motorized traffic with a permanent gate (southwest quarter of section 10). These activities may create short-term increases in sediment and turbidity by exposing bare soil during operation, but they would lead to a net, long-term benefit to water quality by stabilizing current erosion sources and revegetating bare soil.

B. Water Yield

The WATSED model uses the equivalent clearcut area (ECA) method to estimate the increase in water yield caused by removing live trees. Modeled results are best used to evaluate alternatives that include different amounts and locations of cutting units and roads, and various mitigation measures. Tables 4.3 and 4.4 summarize the effects of each alternative on equivalent clearcut area and water yield in Soup Creek and Cilly Creek watersheds.

Table 4.3 *Comparison of Modeled Watershed Effects By Alternative for Soup Creek*

Alternatives	Acres Harvested	ECA Generated	Total ECA[1]	Percent Increase in Annual Run-off[1]	Percent Increase in Annual Sediment[2]
A	0	0	567	1	18
B	634	50	617	1	27
C	0	0	567	1	18
D	284	107	674	1	27

1 Values are based on projection year 1997, following harvest

2 Values are based on projection year 1998, following site preparation

1. Effects of Alternative A on water yield

Alternative A would not affect water yield. ECA levels for water yield would remain at or near present levels and would eventually decrease as previously harvested stands regenerated and moved closer to predisturbance levels of water use and snowpack distribution (Tables 4.3, 4.4).

2. Effects of Alternative B on water yield

Alternative B would generate very little ECA relative to the number of acres harvested. In Soup Creek Watershed, Alternative B would treat 634 acres and generate approximately 50 ECA (Table 4.3). In Cilly Creek Watershed, Alternative B would treat 372 acres and generate approximately three ECA (Table 4.4).

Table 4.4 *Comparison of Modeled Watershed Effects by Alternative for Cilly Creek*

Alternatives	Acres Harvested	ECA Generated	Total ECA[1]	Percent Increase in Annual Runoff[1]	Percent Increase in Annual Sediment[2]
A	0	0	474	3	44
B	372	3	477	3	44
C	63	17	491	3	35
D	40	9	483	3	44

1 Values are based on projection year 1997, following harvest
2 Values are based on projection year 1998, following site preparation

Alternative B would generate very little ECA when compared to acres harvested because 833 of the proposed 1006 harvest acres would be treated with structural enhancement. No ECA would be generated by this treatment because only ten percent of basal area per acre would be harvested. Research indicates that soil moisture and snowpack are not affected when ten percent or less basal area per acre is removed (Troendle 1989).

3. Effects of Alternative C on water yield
Alternative C would treat 63 acres in Cilly Creek Watershed and generate approximately 18 ECA (Table 4.4). The water yield of Cilly Creek would increase by about one percent over existing conditions.

Alternative C would not treat any stands in Soup Creek Watershed.

4. Effects of Alternative D on water yield
Alternative D would treat about 284 acres in Soup Creek Watershed and generate approximately 107 ECA (Table 4.3). In Cilly Creek Watershed, Alternative D would treat about 40 acres and generate approximately nine ECA (Table 4.4). For Soup Creek Watershed, the total ECA level would be 581, and for Cilly Creek Watershed, that figure would be 394. These values are well below the ECA threshold for each watershed.

C. Modeled Sediment Yield

The WATSED model allows relative comparisons of sediment yields resulting from different amounts and locations of road construction and timber harvest. The results of sediment modeling are best used to compare alternatives rather than using the estimates as absolute values.

1. Effects of Alternative A on sediment yield

None of the proposed stream crossing rehabilitations, road improvements or road closures would be completed with this sale. Modeled sediment yields would remain at or near present levels (Tables 4.3 and 4.4), relying on natural or preexisting conditions for recovery until other sources of funding become available to repair them.

2. Effects of alternative b on sediment yield

Alternative B would generate some increase in modeled sediment yield following residue treatment in 1998 in Soup Creek Watershed. These increases would last for approximately one year before returning to pre-harvest levels. In the Cilly Creek watershed, modeled sediment yield would also increase following harvest and residue disposal, but would return to pre-harvest levels in about six years. Much of the sediment increases in Alternative B would be offset by the closure of Cilly Ridge Road and Soup Creek Canyon Road. There would also be decreases in sediment yield due to the repair and stabilization of numerous point sources of sediment. These decreases are not accounted for or reflected in WATSED results.

3. Effects of alternative c on sediment yield

Modeled results of Alternative C show no measurable change in sediment yield in the Soup Creek watershed, and a net decrease for the Cilly Creek watershed. Sediment yield in Soup Creek Watershed would decrease from the existing condition due to the closure of Soup Creek Canyon Road, rehabilitation of existing point sources of sediment, and no proposed timber harvest, but the change is too small to be reflected in model results. Cilly Creek would have a net decrease in modeled sediment yield because of the closure of Cilly Ridge Road, low levels of harvest, and helicopter yarding.

4. Effects of alternative d on sediment yield

Alternative D would produce a net decrease in modeled sediment yield in the Cilly Creek watershed. Closure of Cilly Ridge Road would lead to a decrease in sediment yield. Following residue treatment, model results would return to pre-activity levels for about five years and would then drop back to levels lower than existing ones. In the Soup Creek watershed, modeled sediment yields would increase over existing levels for approximately two years, then return to pre-harvest levels. There would also be decreases in sediment yield not reflected in model results due to the repair and stabilization of numerous point sources of sediment. These decreases cannot be accounted for in WATSED.

D. Summary of Effects

There is little risk of adverse cumulative effects to water quality resulting from any of the proposed action alternatives provided BMP's, the SMZ law, and the recommendations of DNRC hydrologists and soil scientists are followed. No harvesting would occur within the SMZ and no new roads would be constructed. All action alternatives are well within water yield thresholds. All action alternatives would result in a net reduction in sedimentation in Cilly and Soup Creek watersheds.

IV. FISHERIES

SMZ's containing bull trout streams would not receive treatment under any alternative. Fisheries monitoring would continue annually through the duration of the project and for one year after project completion under all three action alternatives but not under the no-action alternative. Under the action alternatives, stream rehabilitations and road improvements as described under "Sedimentation" would be completed. Eliminating sources of sedimentation may lead to improved fisheries.

A. Effects of Alternative A on Fish Habitat

The fisheries habitat condition would remain essentially unchanged under Alternative A. Erosion sources would not be remedied under the No Action Alternative. Monitoring of fisheries habitat by DNRC would be discontinued for Soup Creek until future projects presented the need for additional data.

B. Effects of Action Alternatives on Fish Habitat

In keeping with "Immediate Actions for Bull Trout" recommended by the Governor's bull trout restoration team, none of the action alternatives propose harvesting timber in an SMZ (Montana Dept. of Natural Resources and Conservation 1994). Cutting unit boundaries have been proposed well away from SMZ boundaries in all action alternatives. All action alternatives would close Soup Creek Canyon Road and install erosion control and drainage features over approximately 1.8 miles. Cilly Ridge Road would also be closed to motorized traffic with each action alternative. In addition, several existing sediment sources and improperly installed stream crossing structures would be replaced. These activities would lead to a short-term increase in sedimentation during construction. As the sites revegetate and stabilize there would likely be a long-term benefit to fish habitat by the elimination of long-term and chronic sources of sediment.

C. Summary of Effects

Fisheries monitoring would continue annually through the duration of the project and for at least one year after project completion under all action alternatives.

All proposed harvest activities would present a low risk of impact to fisheries habitat or populations because BMP's; the SMZ law; Immediate Actions for Bull Trout Restoration; and Flathead Basin Forest Practices, Water Quality and Fisheries Program recommendations would be followed. No harvesting would occur in the SMZ and no new roads would be constructed. The project may benefit fish habitat because the recommendations of a fisheries biologist and hydrologist would be followed under all action alternatives. All action alternatives would result in a net reduction of sedimentation in Soup and Cilly Creeks when rehabilitation measures (outlined in the Water Quality section, pages IV 51, 52) are implemented.

V. AIR QUALITY

After timber harvesting, cutting units are burned to reduce logging residue such as nonmerchantable treetops and limbs. Burning logging residue decreases the risk of wildfire by reducing fuel loading. It also prepares sites for tree regeneration. Burning is usually conducted during late summer or early fall when weather conditions and fuel moisture levels are optimal to meet burning objectives. During burning periods, smoke may temporarily reduce air quality in the vicinity of the project area..

A. Effects of Silvicultural Treatments on Air Quality

Light- and moderate-reserve treatments would generate the most fuel loading and have the greatest potential impact to air quality.

Structural enhancement would not affect air quality because no burning would be required. The small amount of logging residue created by structural enhancement treatment would not substantially increase fuel loadings. For this treatment, logging residue would be hand-lopped and scattered.

B. Effects of the Alternatives on Air Quality

1. Alternative a

Alternative A would not directly affect air quality. No timber harvesting and no burning would occur.

2. Alternatives b, c, and d

Alternative C would have the smallest effect on air quality. Under Alternative C, excavator piling and burning would occur on 62.5 acres. Alternative B would treat more total acres than Alternative D, but only 173.5 acres, 17 percent of the total acreage, would require excavator piling and burning. Alternative D would treat 323.7 acres and 100 percent of those would require excavator piling. Alternative D would have the greatest effect on air quality. Impacts on air quality would be short-term; smoke would linger for a few days.

C. Cumulative Effects

Air quality cumulative effects would not exceed the limits defined by the Montana Cooperative Smoke Management Plan (State of Montana Cooperative Smoke Management Plan 1988).

VI. Soil

Timber harvesting activities may rut, compact, or displace soil. Such soil impacts may contribute to poor regeneration, reduced site productivity, and erosion. Soil susceptibility to impact varies with soil types, harvest methods, equipment, and season of activity (Figure 3.6, Table 3.18). The effects of each alternative on soil are described here and summarized in Table 4.5.

Table 4.5 *Soil Effects by Alternative*

Alternatives	Acres Harvested	Acres Harvested by Tractor on Snow	Acres Trafficked by Skid Trails [1]	Acres of Site Prep.	Acres of Soil Impacted [2]	Percent of Cutting Unit Impacted
A	0	0	0	0	0	0
B	1006.2	1006.2	127	17	21	2
C	62.5	12.9	3	63	3	5
D	323.7	323.7	65	107	22	7

[1] 15-20% of cutting units

[2] 7.5-10% of skid trails and < 15% of excavator-piled area

A. Effects of Alternative A on Soil

Alternative A would not directly affect the soil in the project area.

Alternative A may indirectly lead to soil erosion in the project area. Although the existing primary, secondary, and spur roads are currently in good condition, they would not be maintained under Alternative A, and they would begin to erode. Increased erosion may lead to increased sedimentation, a soil-related process that is addressed under "Water Quality."

B. Effects of Alternatives B and D on Soil

Alternative B has the greatest potential impact on soil. Under alternatives B and D, skidding would be conducted on 1006.2 acres and 323.7 acres, respectively. Skidding could negatively effect 17.5 to 20 percent of each cutting unit. Of that 17.5 to 20 percent, 7.5 to 10 percent would be severely impacted, and 10 percent would be moderately impacted. Excavator piling could also impact soil.

Several precautions would be taken to reduce soil impacts due to skidding and excavator piling. Harvesting would be conducted in the winter on snow-covered, frozen soil. Skid trail systems would be planned in advance, and existing trails would be used where available. Track-hoe excavators, rather than brush dozers, would be used; track-hoe excavators have more flexibility and impact soil less than brush dozers. Excavator piling and soil scarification would be limited to less than 40 percent of the cutting units. Trails would not be constructed on more than 20 percent of each cutting unit. Woody debris would be retained to promote long term soil stability and productivity.

C. Effects of Alternative C on Soil

Alternative C would have little effect on soil in the project area because it employs helicopter logging. Ground skidding would occur on about 12.9 acres and excavator piling would occur on about 62.5 acres. All of the same precautions that would be taken under alternatives B and D would be taken under Alternative C.

D. Cumulative Effects to Soil Productivity

Cumulative effects would occur from repeated entries into the harvest area with additional trail construction associated with each entry. Past logging has left numerous skid trails through most proposed harvest sites that can be used again to reduce area of impacts. Alternatives B & D involve ground skidding that could result in cumulative effects, and to a very lessor extent ALT C (12.5 ac.). Cumulative effects would be controlled by limiting the area of trails to less than 20% of ground skidded units, by using existing trails (on suitable locations) and skidding during winter conditions. Skidding and slash disposal mitigation measures would (see soils Appendix D, pg. D-4) limit the area impacted and therefore presents low risk of cumulative effects. Future stand entries would likely use existing trails and landings.

Planned skid trail systems and winter harvest operations would likely further reduce the area and degree of direct and cumulative soil impacts and associated effect on productivity (Bradshaw 1979).

VII. NOXIOUS WEEDS

Noxious weeds are less likely to invade forested sites than nonforested sites; they typically spread along open roads and on barren slopes. The effects of each alternative on the encroachment and establishment of noxious weeds are discussed.

A. Effects of Alternative A on Noxious Weeds

The no-action alternative would not directly affect the encroachment and establishment of noxious weeds. Alternative A would do nothing to reduce the existing noxious weeds in the project area; spotted knapweed (*Centaurea maculosa*) and common St. Johnswort (*Hypericum perforatum*) would continue to spread along open roads and disturbed areas where vegetation has not established.

B. Effects of the Action Alternatives on Noxious Weeds
All action alternatives strive to prevent the encroachment of noxious weeds and to control established populations along open roads by using an integrated weed management approach that includes prevention, control, and prompt revegetation.

To prevent further encroachment of noxious weeds, all equipment would be cleaned of weeds and mud prior to entering the site. Disturbed roadsides and landings would be revegetated with site-adapted grasses. To provide for rapid grass establishment, a special "quick cover mix" of slender wheatgrass (*Agropyron trachycaulum*) or annual ryegrass (*Lolium temulentum*) would be sown concurrently with disturbance. To provide a more permanent cover, a mixture of hard fescue (*Festuca ovinaduriascula*), tall fescue (*Festuca arundinacea*), slender wheatgrass, and redtop (*Agrostis alba*) would be sown concurrent with road construction.

Where noxious weeds occur along Goat Creek Loop Road, Soup Creek Road, Soup Creek Campground, and Cilly Creek Loop Road, a one-time application of herbicide followed by grass seeding would attempt to control established populations. Approximately 2.9 acres per mile of road would be treated, totaling 42.5 acres along 14.6 miles of road.

Biocontrol agents and physical treatments would not be used. Biocontrol agents do not work well in the strip-shaped weed populations that exist in the project area along roads. Physical treatments such as surface blading reduce the dispersal of seed, but they do not control weeds on road cuts or fill slopes.

For this project, herbicide treatment is considered the most effective means to control existing noxious weeds, promote grass and native vegetation and reduce the spread of noxious weeds. Herbicide application would be site specific to locations where weeds occur.

The herbicide treatment would use a combination of picloram, commonly known by the tradename Tordon ®, and 2,4-D (Amine 4 ®). The herbicides would be applied at the doses recommended on their labels. Picloram would be applied at about two quarts per acre (0.12 gallons per acre of active ingredient); 2,4-D would be applied at three pints per acre (0.18 gallons per acre of active ingredient).

C. About the Herbicides
Picloram is a restricted herbicide (It can only be used by certified applicators) that acts on broadleaf plants as a growth regulator. Picloram persists in soil due to its slow degradation

by soil microorganisms and ultraviolet light. Because of its persistence, picloram would provide an effective two- to three-year control of spotted knapweed and common St. Johnswort, allowing native vegetation to re-establish.

2,4,-D is not a restricted herbicide and is used in products marketed for home use. It acts on broadleaf plants as a growth regulator. 2,4,-D does not persist; soil microorganisms break it down in a matter of weeks. Because it breaks down, 2,4-D is safer to use near surface water, but it is less effective than picloram.

D. Effects of the Herbicides on Humans and Wildlife

Human health risks associated with herbicides used for noxious weed control have been documented by the U.S. Forest Service (Monning 1986). The Forest Service report concluded that, even considering mixing errors and a variety of accident scenarios (i.e. spills, leaks), the "no-observable-effects levels" for human health are not exceeded.

Picloram and 2,4,-D are specifically analyzed for human toxicology in a USDA Forest Service EIS (1989) (USDA Forest Service 1989). The EIS summarized studies that show these herbicides do not bioaccumulate. Animals high on the food chain (humans, eagles, wolves) are not expected to acquire concentrated doses of these chemicals by feeding on contaminated plants or animals.

Using picloram and 2,4,-D may reduce forage availability. Knapweed and St. Johnswort are considered unpalatable to wildlife, but they may provide some forage. Seeding following herbicide application is designed to replace weeds with more palatable grasses and control erosion, allowing native plants to establish over the long term. Established grasses would not be affected because the herbicides act on broadleaf plants only.

Wildlife could receive doses of herbicide by eating contaminated food either through direct consumption of herbicide-treated vegetation or indirect consumption, such as a mountain lion feeding on elk that has consumed herbicide-treated grass. Wildlife, especially birds, may be sprayed by herbicide during application. The Forest Service EIS (USDA Forest Service 1989) discusses in-depth toxicology for wildlife species that would typically frequent treated areas. The EIS concludes that both herbicides are nontoxic if applied at recommended label doses.

Herbicide spills could put wildlife at risk. A spill could result in concentrations hundreds of times greater than concentrations occurring in treated areas. Certified applicators would be required to treat these areas as toxic waste spills. Human activity would likely preclude wildlife from entering the spill area until it is cleaned up. Impacted areas would be small and short-term.

Herbicides could impact aquatic and fisheries resources. Impacts could occur from herbicides entering streams, lakes, or wetlands via aerial drift, runoff after storms, or accidental spills. Picloram and 2,4,-D can be highly toxic to some fish and invertebrates, depending on species sensitivity and herbicide formulation. These herbicides can be toxic to some aquatic flora, and if they enter surface water, they may be detrimental to some listed sensitive plant species that occur in the project area.

E. Precautions

To reduce risk to aquatic and terrestrial resources, herbicide application would adhere to Montana BMP's and the herbicide's specific label guidelines. Herbicide application would not be general; it would be specific to areas along roads where noxious weeds occur. No herbicide would be mixed on site to reduce the risk of accidental spills. Application would occur on calm, dry days to limit aerial drift and possible surface movement off road prisms. Because of its persistence, picloram would not be applied within 50 feet of surface water. Because of its ability to break down quickly in the environment, 2,4-D would be used in areas 25 to 50 feet from surface water (Logan 1991). No herbicides would be applied within 25 feet of surface water. Neither would herbicide be applied to areas where relief may contribute runoff directly into surface water. All no-spray areas would be designated on the ground before application began. Herbicides would be applied when they are most effective: in the spring (May-June), when plants are actively growing, or in late summer (late August-September).

VIII. AESTHETICS

None of the alternatives would affect background vistas along the western flanks of the Swan Range. The color, texture, form, and line (dominance elements) of the foreground vistas would be affected by the action alternatives. How each action alternative would affect foreground vistas depends on which silvicultural treatments the alternatives employ.

A. Visual Impacts of Silvicultural Treatments

1. Light- and moderate-reserve, regeneration harvesting

Removing trees and vegetation would create 7- to 30-acre openings in the foreground. Logging residue, cured vegetation, and exposed soil would affect the texture, color, form, and line within openings, on landings, and on skid trails.

Reserving large, mature trees (2-6 per acre) and clumps of healthy understory may feather edges and partially screen openings. Openings may appear more harsh in the winter because of the color contrast between snow and forest canopy; however, new openings may blend with the existing mosaic of openings (from past harvesting) and forest canopy.

2. Heavy-reserve, regeneration harvesting

Removing trees and vegetation would create small, discontinuous openings in the foreground. The small openings made by heavy-reserve treatment would not be readily apparent, but because overstory trees would be removed in groups, skyline vistas in the foreground would become irregular. Logging residue, cured vegetation, and exposed soil would affect color, texture, form, and line within openings, on landings, and on skidtrails. Reserving some overstory and understory trees would screen most skidtrails from view.

3. Structural enhancement

Structural enhancement would not substantially alter the color, texture, form, or line of foreground vistas. Logging residue, cured vegetation, and exposed soil would affect the color, texture, form, and line on log landings and skid trails. Reserving overstory and understory trees would screen most skidtrails from view.

B. Effects of Each Alternative

Table 4.6 gives the number of acres of each silvicultural treatment by altemative and identifies the silvicultural treatment used in each cutting unit.

1. Alternative A

If the no-action alternative were selected, the visual characteristics of the project area would not be altered by timber harvesting activities. However, the visual character of the project area would gradually be altered by time, natural disturbances, and natural processes.

2. Alternative B
Moderate-reserve, regeneration harvesting would visually affect cutting units B1 and B2 (Figure 2.2). Because these cutting units are adjacent to restricted road, the visual effects of this treatment would not be seen by the motorized public, but they would be visible to pedestrians and hikers.

Heavy-reserve, regeneration harvesting would visually affect cutting units B3 through B7 (Figure 2.2). Because these cutting units are adjacent to restricted road, the visual effects of heavy-reserve treatment would not be seen by the motorized public, but they would be visible to pedestrians and hikers.

Structural enhancement would visually affect cutting units B8 through B18. Those cutting units border open and restricted roads (Figure 2.2). The effects of structural enhancement would be visible to motorized traffic, pedestrians, and hikers.

A no-harvest buffer would be placed around the Soup Creek Campground to screen timber harvesting activities.

3. Alternative C
Moderate-reserve, regeneration harvesting would visually affect cutting unit C1. Cutting unit C1 borders restricted road (Figure 2.3). The visual effects of this treatment would not be seen by motorized traffic, but they would be visible to pedestrians and hikers.

Heavy-reserve, regeneration harvesting would visually affect cutting unit C2 (Figure 2.3). Cutting unit C2 does not border any road. The visual effects of heavy-reserve treatment would not be seen by motorized traffic or pedestrians, but they would be seen by hikers. Skidtrails would not visually affect this cutting unit because helicopters would be used for yarding.

Alternative C cutting units are located well away from the Soup Creek Campground and harvest activities are unlikely to be seen from the campground.

4. Alternative D
Light-reserve, regeneration harvesting would visually affect cutting units D1 and D2 (=B1 and B2) (Figure 2.4). These cutting units are adjacent to restricted road. The

visual effects of light-reserve treatment would not be seen by motorized traffic, but they would be seen by pedestrians and hikers.

Moderate-reserve, regeneration harvesting would visually affect cutting units D3 through D7 (Figure 2.4). Cutting units D4 and D5 are adjacent to open road. Cutting units D3, D6, and D7 are adjacent to restricted road. The effects of moderate-reserve treatment would be seen by motorized traffic, pedestrians, and hikers.

Heavy-reserve, regeneration harvesting would visually affect cutting units D8 through D11 (Figure 2.4). With the exception of D11, these cutting units are adjacent to open and restricted road; the visual effects of heavy-reserve treatment would be seen by motorized traffic, pedestrians, and hikers. Cutting unit D11 borders restricted road only, so the relatively small visual effects of treatment would not be seen by motorized traffic, but they would be visible to pedestrians and hikers.

A no-harvest buffer would be placed around the Soup Creek Campground to screen timber harvesting activities.

TABLE 4.6 *Effects of Treatments and Alternatives on Aesthetics*

Treatment & Effects	Alternative A	Alternative B	Alternative C	Alternative D
Light-reserve; Very severe effects cutting units acres	N/A	N/A	N/A	D1, D2 11.2
Moderate-reserve; Severe effects cutting units acres	N/A	B1,B2 44.3	C1 12.9	D3-D7 88.3
Heavy-reserve; Little effect cutting units acres	N/A	B3-B7 129.2	C2 49.6	D8-D11 224.2
Structural enhancement; Negligible effects cutting units acres	N/A	B8-B18 832.7	N/A	N/A

IX. ECONOMIC ANALYSIS

The reasons for completing the following economic analysis are twofold: (1) to project the net monetary return from harvesting timber for each alternative; and (2) to provide a baseline for comparing net monetary return from timber harvesting with monetary return from a conservation lease.

A. Net Return Of The Alternatives

According to the projections outlined below, Alternatives A and C would have negative net returns to the school trust. Alternative D would have the highest net return, generating approximately 14 percent more revenue than Alternative B (Table 4.11).

These projections have three limitations: (1) Only known costs and benefits that are related to timber harvesting activities are considered; (2) None of the potential benefits associated with leaving trees (i.e. snag recruitment, structural diversity, aesthetics, wildlife habitat, nutrient recycling, etc.) are considered; (3) Some of the variables that affect stumpage prices (i.e. cutting unit size, harvesting season) are not isolated from more dominant variables.

1. Treatment costs of the alternatives

Table 4.7 estimates the treatment costs of each alternative. Disposing of brush by hand-lopping and scattering would cost $12.51 per acre. Brush disposal by excavator piling and site preparation would cost $92.00 per acre. Planting white pine would cost $102.35 per acre. All of these values include 15 percent for administration.

2. Gross revenue generated by the alternatives

Table 4.8 estimates the gross revenue that each alternative would generate. The volume of timber that would be harvested under each alternative was based on the SRSF Stand Level Inventory (Montana Dept. of State Lands 1991-1994). The value of timber per thousand board feet for each alternative was estimated using the current transaction evidence model. The model uses information and economic data from previous timber sales to predict the market value of timber with the roads in place. Because the model does not account for the higher costs of helicopter logging, the value per million board feet for Alternative C was reduced by $100.00.

TABLE 4.7 *Estimated Treatment Costs by Alternative*

Alternative	Treatment	Acres	Brush Disposal and Site Prep ($/acre)	Western White Pine Planting ($/acre)	Total Cost ($)
B	Moderate-Reserve	44.3	92.00	102.35	8,609.71
	Heavy-Reserve	129.2	92.00	102.35	25,110.00
	Structural Enhancement	832.7	12.51	0	10,417.08
	Total	1,006.2			44,136.80
C	Moderate-Reserve	12.9	92.00	102.35	2,507.12
	Heavy-Reserve	49.6	92.00	102.35	9,639.76
	Total	62.5			12,146.88
D	Light-Reserve	11.2	92.00	102.35	2,176.72
	Moderate- Reserve	88.3	92.00	102.35	17,161.11
	Heavy-Reserve	224.2	92.00	102.35	43,573.27
	Total	323.7			62,911.09

TABLE 4.8 *Estimated Total Gross Revenue by Alternative*

Alternative	Volume Harvested (MBF)	Value of Timber ($/MBF)	Total Gross Revenue ($)
A	0	0	0
B	5,177	295.65	1,530.580
C	150	-85.75	-12,863
D	5,631	300.13	1,690,032

3. Costs of MEPA, sale preparation, and administration

Table 4.9 estimates the total costs of the MEPA process (includes analysis and documentation), and sale preparation and administration for each alternative. The total estimated cost of the MEPA process was the same for each alternative, but the sale preparation and administration costs varied with the amount of timber that would be harvested. Both estimated costs were based on the Northwest Land Office's (NWLO) five-year average cost ($73.05 per MBF) for the forest products program divided by the average timber volume sold by the NWLO and other department costs prorated to the NWLO. The cost of the MEPA process was estimated at 75 percent of NWLO's average cost and was based on the volume of timber harvested under Alternative D (0.75*$73.05/ MBF*5,631MBF = $308,508.41). The cost of sale preparation and administration was estimated at 25 percent of NWLO's estimated cost and varies with the volume of timber harvested under each alternative (0.25*$73.05/MBF*5,631MBF = $2,739.38). The sale preparation and administration costs were increased by ten percent for Alternative B to account for the added costs of applying structural enhancement treatment over a large area. Structural enhancement would harvest timber on a large number of acres, but a low volume of timber per acre would be harvested.

Because it was partially based on the relatively large volume of timber harvested under Alternative D, the cost of the MEPA process is a conservative estimate; that is, the estimate may be higher than the actual cost. Because it was based on the Northwest Land Office average, specific costs particular to this project may not be accounted for.

TABLE 4.9 ***Estimated Costs for MEPA Process and Documentation, Sale Preparation and Administration by Alternative***

Alternative	Volume (MBF)	NWLO Cost ($/MBF)	MEPA Cost ($)	Sale Prep & Admin Cost ($)	Total Cost ($)
A	0	73.05	308,508.41	0.00	308,508.41
B	5,177	73.05	308,508.41	132,362.95	440,871.36
C	150	73.05	308,508.41	2,739.38	311,247.79
D	5,631	73.05	308,508.41	102,836.14	411,344.55

4. Improvement costs of the alternatives

Table 4.10 estimates the total cost of in-stream rehabilitation projects, noxious weed control, and road maintenance. These costs were accounted for in the current transaction evidence model. Under Alternative A, no improvements would be made, so there is no cost.

TABLE 4.10 ***Estimated Cost for In-stream Rehabilitation Projects, Noxious Weed Control and Road Maintenance Cost by Alternative***

Alternatives	In-Stream Projects Cost ($)	Weed Control Cost ($)	Road Maintenance Cost ($)
A	0	0	0
B	28,500	3,000	11,500
C	28,500	3,000	11,500
D	28,500	3,000	11,500

5. Net revenue generated by the alternatives

Table 4.10 estimates the net revenue for each alternative. Alternatives A and C would have negative net revenue. Alternative D would generate the greatest net revenue at $1,215,776.00.

TABLE 4.11 *Estimated Net Dollar Revenue of the Alternatives*

Alternative	Gross Revenue	Treatment Cost	MEPA Cost	Sale Prep & Admin Cost	Net Revenue
A	0	0.00	308,508.41	0	-308,508
B	1,530,580	44,136.80	308,508.41	132,362.94	1,045,572
C	-12,863	12,146.88	308,508.41	2,739.38	-336,257
D	1,690,032	62,911.09	308,508.41	102,836.13	1,215,776

B. Estimating the Value of a Conservation Lease

A conservation lease would exclude timber harvesting from the project area for twenty years. Bids for conservation leases and timber sales will be compared to determine which would generate more income for the school trust. To compare timber sale and conservation lease bids, the value of the timber that would not be harvested would be considered because that timber could be sold after 20 years. A conservation lease (CL) bid would be compared to timber sale bids as follows:

CL Bid + discounted value for same timber sale in 20 years = total value of CL.

The discounted value of the same timber sale in twenty years would be added to the bid value for the conservation lease. The total value for the conservation lease would be compared to the highest timber sale bid, and the highest bid would win. This method of comparing bids assumes that the cost of preparing and administering a timber sale running approximately three years is the same as the cost of administering a conservation agreement over 20 years.

The discounted value of the timber sale in 20 years was estimated based on the following assumptions: (a) Stumpage values will increase at a real rate of 2.789 percent annually (Table 4.12); (b) Costs for MEPA process and documentation, and sale preparation and administration will increase at an annual rate of 3.0 percent (Table 4.13); © The real discount rate is 4.01 percent (Table 4.15); (d) Timber stands will exhibit zero net growth; and (e) There will be no opportunity cost for delaying the establishment of future stands.

TABLE 4.12 *Estimated Total Gross Revenue by Alternative in 20 Years, Assuming a Real Increase of 2.8 percent in the Value of Timber*

Alternative	Volume Harvested MBF	Value of Timber $/MBF	Total Gross Revenue ($)
A	0	0	0
B	5,177	512.52	2,653,315
C	150	-22.85	-3,428
D	5,631	520.29	2,929,731

Table 4.13 *Estimated Cost for MEPA and Sale Preparation and Administration In 20 Years by Alternative, Assuming a Real Increase of 3.0 Percent for MEPA Cost*

Alternatives	Volume (MBF)	NWLO Cost ($/MBF)	MEPA Cost ($)	Sale Prep & Admin Cost ($)	Total Cost ($)
A	0	131.936	557,200.50	0.00	557,200.51
B	5,177	131.936	557,200.50	239,062.21	796,262.72
C	150	131.936	557,200.50	3,369.09	560,569.60
D	5,631	131.936	557,200.50	185,733.50	742,934.01

Table 4.14 *Estimated Future Net Dollar Revenue of Alternatives in 20 Years*

Alternative	Gross Revenue	Treatment Cost	MEPA Cost	Sale Prep & Admin Cost	Net Revenue
A	0	0.00	557,200.50	0	-557,201
B	2,653,315	44,136.80	557,200.50	239,062.21	1,812,916
C	-3,248	12,146.88	557,200.50	3,369.09	-576,144
D	2,929,731	62,911.09	557,200.50	185,733.50	2,123,886

Table 4.15 contains estimated values for a conservation lease based on the discounted values of timber sales for each alternative. The table provides examples of how conservation lease and timber sale bids would be equitably compared. If Alternative B were selected, the discounted value of the future timber sale ($825,802) would be added to the conservation lease bid for comparison with the current timber sale bid. The conservation bid would have to be at least $642,116 to be equivalent to a current total timber sale bid of $1,232,695.

Table 4.15 *The Estimated Dollar Value for 20-Year Conservation Lease*

Alternative	Net Revenue of Timber Sale in 20 Years	Discounted Value of Timber Sale in 20 Years	Total Timber Sale Bid if Harvested Today	Estimated Value for 20-Year Conservation Lease (based on total project area)	
				total	per acre
A	-557,201	-253,810	0	N/A	N/A
B	1,812,916	825,802	1,232,695	642,116	248
C	-576,144	-271,035	-21,494	N/A	N/A
D	2,123,886	967,452	1,366,024	654,423	253

X. CONSISTENCY OF ALTERNATIVES WITH THE STATE FOREST LAND MANAGEMENT PLAN RESOURCE MANAGEMENT STANDARDS.

The Middle Soup Creek Project was initiated prior to DNRC's adoption of the State Forest Land Management Plan (SFLMP). The SFLMP provides for partial compliance of Resource Management Standards (RMS) for projects which were already in a developmental stage. An analysis has been made of the degree to which each alternative complies with requirements of RMS in the SFLMP. The completed analysis is included in the Project File (SFLMP Implementation Checklist). Some alternatives do not comply as effectively to RMS as others. RMS that have not been fully met by all alternatives are discussed below.

A. Biodiversity RMS 2

1. General requirement

Employ a fine filter approach for T&E and sensitive species focusing on species habitat requirements.

2. Level of Compliance

A fine filter approach focusing on species habitat requirements was used for T&E species that are likely to be affected by proposed activities (grizzly bear and gray wolves). An in depth analysis was not provided for species that are not likely to be affected by proposed activities (bald eagles and, American peregrine falcons).

A course filter approach focusing on restoration of historical ecosystem characteristics was used for some impacts on affected sensitive species in combination with a fine filter approach for other impacts (western big-eared bat, fisher, lynx, black-backed woodpecker and bog lemming). An in depth analysis was not provided for species that are not likely to be affected by proposed activities (common loons, harlequin ducks, boreal owls and flammulated owls).

B. Biodiversity RMS 3(a)

1. General Requirement

In areas of large, blocked ownership, ie. the Swan River State Forest, manage for the proportion and distribution of forest types and structures historically present on the landscape.

2. Level of Compliance
Alternative B focuses on restoring historic forest conditions for the long term. Alternatives A, C and D do not focus on long-term restoration of historic conditions.

C. Silviculture RMS 7

1. General Requirement
All recommended silvicultural treatments must produce a net return, for the combined value of current and future stands, higher than the no action alternative.

2. Level of Compliance
Net revenue was estimated for each alternative. The analysis included the combined value of each silvicultural treatment within each alternative. Alternative C generates lower net revenue than the No Action Alternative. Alternatives B and D generate a higher net revenue than the No Action Alternative. A separate analysis was not completed for each silvicultural treatment or for the value of future stands.

XI. IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS OF NATURAL RESOURCES

A. Irretrievable
Many stands in the project area are mature; many individual trees are more than 200 years old. If any of the action alternatives were selected, timber harvesting would occur, and some of these large, old, live trees would be irretrievably lost; they would no longer contribute to future snag recruitment, stand structural and compositional diversity, aesthetics, wildlife habitat, nutrient recycling processes or any other important ecosystem component.

B. Irreversible
The initial loss of trees due to timber harvesting would not be irreversible. Natural regeneration combined with site preparation and artificial regeneration would promote the establishment of new trees. Providing future management decisions allowed for the continued growth of established trees, the trees would ultimately become equivalent in size and age to the irretrievable, harvested trees.

XII. LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG TERM PRODUCTIVITY

Many of the stands considered for treatment by the three action alternatives are currently declining in wood fiber value due to insect and disease, blowdown, and slow growth due to high stocking rates. For some of these stands, timber productivity has slowed to negative growth. The short-term use of harvesting timber would generate immediate income for the school trust, contribute to the local economy, and provide forest products to the marketplace. Establishing new stands of trees at or near their potential growth rates would promote long-term timber productivity.

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GLOSSARY

GLOSSARY

ABBREVIATIONS

BMP	Best Management Practices
CEA	cumulative effects analysis areas
DBH	diameter at breast height
DNRC	Montana Department of Natural Resources and Conservation
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESAA	Ecosystem Sustainability Analysis Area
FNF	Flathead National Forest
ID team	interdisciplinary team
MBF	thousand board feet
MFWP	Montana Fish, Wildlife, and Parks Service
MMBF	million board feet
MSPA	Middle Soup Creek Project Area
NCDE	Northern Continental Divide Ecosystem Grizzly Bear Recovery Area
OSHA	Office of Safety and Health Administration
ORD	open road density
RMS	Resource Management Standard
SCA	Swan Valley Grizzly Bear Conservation Agreement
SFLMP	State Forest Land Management Plan
SRSF	Swan River State Forest
TRD	total road density
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

GLOSSARY

ACRE-FOOT
A measure of water or sediment volume, equal to an amount of material which would cover one acre to a depth of one foot.

ACTION ALTERNATIVE
One of several ways of moving toward the project objectives.

AESTHETIC
Pertaining to beauty.

AIRSHED
A geographical area that, because of topography, meteorology, and climate, shares the same air.

BASAL AREA
A measure of the number of square feet of space occupied by the stem of a tree taken at breast height.

BEST MANAGEMENT PRACTICES
A practice or combination of practices that is determined by a state or designated area-wide planning agency to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

BIOACCUMULATE
The process of a plant or animal selectively taking in or storing a persistent substance. Over time, a higher concentration of the substance is found in the organism than in its environment.

BIOCONTROL AGENTS
Noxious weed control without the use of chemicals, machines, fire, or hand tools. Parasites, grazing, predators, and diseases are some of the agents used for biocontrol.

BOARD FOOT
A piece of lumber one inch thick by one foot wide by one foot long.

BOREAL FOREST
Forested areas of the Northern Temperate Zones and Arctic region.

CANOPY
The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

CAVITY
The hollow excavated in trees by birds or other animals. They are used for roosting and reproduction by many birds and mammals.

COMPACTION
The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

CONNECTIVITY
1. The quality, extent, or state of being joined. 2. The opposite of fragmentation.

CORE AREA

Mature forest interior core

Core areas are defined as contiguous stands of mature forest that maintain a core of 50 hectares (123.5 acres) or greater after being buffered from adjacent immature stands by a 100 meter strip of mature forest.

Grizzly bear security habitat

Areas free of motorized access during the non-denning period.

CORRIDOR

Mature forest corridor

A contiguous area of mature forest at least 100 meters wide, having at least 40 percent canopy cover, and connecting two or more larger areas of mature forest.

Movement corridor

A narrow but contiguous area of habitat connecting larger areas of habitat that animals use for travel. Often referred to as "dispersal " or "wildlife" corridor.

COVER
See HIDING COVER and/or THERMAL COVER.

CUTTING UNITS
Areas proposed for harvest that are composed of one or more stands of trees.

DBH CLASS
Grouping of diameters at breast height that are close to the same measurement. DBH's of 5-10 inches may constitute a dbh class.

DIAMETER PLUS SIX SPACING RULE
A tree spacing guide measured in feet that is determined by adding six to the diameter at breast height. Example: The spacing for a 10-inch diameter tree would be 16 feet. After thinning, the tree would have a 16-foot radius of treeless space around it.

DISCOUNTING
An adjustment for the value of money over time so that costs and benefits occurring in the future are reduced to a common point in time, usually the present, for comparison.

DITCH RELIEF
A method of draining water from roads using ditches and a corrugated metal pipe. The pipe is placed just under the road surface....

DOMINANCE ELEMENTS
Color, texture, form, and line are the primary elements that dominate a landscape. When changes occur within that landscape, changes also occur to these elements. The elements are defined as follows:

Color
Color (or degree of a certain color) on the landscape.

Texture
The surface characteristics, or coarseness, of objects within the landscape or overall patterns of surface characteristics on the landscape.

Form
The overall shape and structure of an object such as a tree or mountain.

Line
The direction of a major pattern within the landscape such as tree trunks in a forest.

DRAINAGE AREA
Another word for "watershed."

ECOSYSTEM
An independent, self-sustaining community of biota.

ENVIRONMENTAL EFFECTS
Those resources (both biological and social) or components of the environment that are likely to be affected by the project.

EQUIVALENT CLEARCUT AREA (ECA)
The total area within a watershed that exists in a clearcut condition, including clearcuts, partial cuts, roads, and burns. ECA is a function of the amount of canopy removed and the size of the area harvested.

Allowable ECA
The estimated number of acres that could have canopy removed (clearcut) before stream channel stability is impacted.

Existing ECA
The number of acres that have been previously harvested taking into account the degree of hydrologic recovery that has occurred due to revegetation.

Remaining ECA
The calculated amount of harvest that may occur without substantially increasing the risk of causing detrimental effects to stream channel stability.

EXISTING CONDITION
Representation of a resource condition, level of resource output, or environmental effect that exists within a defined area.

FALL-TRANSITION RANGE
Forage areas used by deer as they move from the higher elevations they occupy in the summer to the lower elevations they occupy in the winter.

FORAGE
All browse and nonwoody plants available to wildlife for grazing.

FORAGE AREAS (elk)
Areas that do not qualify as cover and may or may not have shrub or tree vegetation present.

FRAGMENTATION (forest)
When large contiguous areas of forest with similar age and structural character are interrupted through disturbance (e.g., stand replacement fire, timber harvesting) reducing connectivity and increasing sharp stand edges.

GRASS/SHRUB/SEEDLING SIZE CLASS
A ground cover predominantly of grass, shrub or seedlings (live trees less than 1.0 inch dbh)

HABITAT
The place where a plant or animal naturally or normally lives and grows.

HECTARE
Ten thousand square meters or 2.47 acres.

HIDING COVER

Elk & White-tailed deer
Vegetation capable of hiding 90 percent of a standing elk from view of a human at 200 feet during that period when elk normally use the area.

Grizzly Bear
A patch of vegetation having a minimum diameter of at least three sight distances (distance at which 90 percent of a bear is hidden from view) or 300 feet--whichever is greater.

HIKER
For this project, an individual who traverses cross-country.

HISTORIC
Patterns and process that occurred within the forest ecosystem before human influence. Typically described as "presettlement conditions."

INTERDISCIPLINARY TEAM
A team of specialists, each with a particular area(s) of expertise, brought together to analyze the effects of a project on the environment.

IRRETRIEVABLE CONSEQUENCES
Consequences such as loss of timber productivity, harvesting, or use of natural resources. A stand of trees that are cut have been irretrievably lost (as opposed to irreversibly lost) because the stand can regenerate.

IRREVERSIBLE CONSEQUENCES
The extractive use of nonrenewable resources such as minerals, cultural resources, vegetation, and habitat lost to permanent roads, or in-place soil development that are renewable only over long time periods. Irreversible also includes the loss of future options.

LOG SILL BRIDGES
A bridge with abutments (sills) constructed with logs.

MATURE FOREST TYPES
Forested stands that are categorized within the old-growth or saw-timber size class.

McNEIL CORING
A method of measuring a sample of stream bed substrate for the percentage of fine material. The higher the percentage of fine material within the stream bed the lower the quality of spawning habitat for trout.

MERCHANTABLE
Describes trees that can be profitably converted into a salable product such as lumber.

MITIGATION MEASURE
Measure designed to make the effect of an action less severe or to compensate for negative effects.

MONTANE FOREST
Forests growing in or inhabiting mountain areas.

MOTORIZED TRAFFIC
Automobiles and snowmobiles.

MULTI-STORIED STANDS
Poorly stocked saw-timber stands with a crown density less than 40 % and usually with a seedling/sapling understory.

NO-ACTION ALTERNATIVE
The option of maintaining the status quo and continuing present management activities, deferring or not doing the proposed project.

NO-OBSERVABLE-EFFECT LEVEL
In a series of tests, the highest dose level at which no effect is observed in the animal species tested.

NON-FORESTED AREA
A naturally occurring area where trees do not establish over the long-term such as a bog or snow chute.

OLD GROWTH
1. Old growth represents the later stages of natural development of forest stands. Old-growth stands are generally understood as being dominated by relatively large old trees, containing wide variation in tree sizes, exhibiting some degree of multistoried structure, having signs of decadence such as rot and spike-topped structure, and containing standing large snags and large down logs.

2. The SRSF Stand Level Inventory identifies stands as old growth if they have a saw-timber stand class code, if the crown density of saw-timber trees in the stand is greater than 39 percent, if they contribute to a contiguous area of old growth at least 50 acres in size, and if they meet one of the following criteria:

1. The stand contains trees that average at least 200 years old.

2. The stand contains trees that average 150 to 199 years old, and it has an uneven-aged stand structure.

3. The stand contains trees that average 100 to 149 years old, and it has an uneven-aged stand structure and fair-to-poor or very poor vigor.

OLDER POLE
Pole-timber stands greater than forty years of age.

OVERSTORY REMOVAL
SRSF Stand Level Inventory code that includes any stand which contains commercial-size trees in excess of 1,000 board feet per acre, and which also meets one of the following conditions (1) The trees in question are relicts (i.e. not part of the manageable stand components); (2) The trees

in question represent the upper story of a two-storied stand, but they are inadequately stocked to be treated as a separate management component.

PEDESTRIAN
For this project, an individual who uses roads for walking.

POLE TIMBER

Pole-timber stands

Stands at least 16.7 percent stocked with growing stock trees of which 50 percent or more of this stocking is in pole timber and/or saw-timber trees, and with pole-timber stocking exceeding that of saw timber.

Pole-timber trees

Trees at least 5.0 inches dbh but smaller than 9.0 inches for softwoods and 11.0 inches for hardwoods.

POLYGON
1. A discrete area of mature forest within the project area that is disjunct from, but connected to, other mature forest polygons by relatively narrow corridors. 2. An ecosystem element (such as vegetation) that is relatively homogeneous internally and that differs from what surrounds it. Also called "patch."

POST-OLD GROWTH
Old-growth stands where the seral overstory begins dying, overhead canopy declines, and the climax dominants begin to take over the stand. This occurs as a result of natural forest succession in stands without major disturbance over a long period of time. Although the stands maintain some of the characteristics of old growth (e.g., abundance of snags and down-woody material) they lack others (high canopy coverage of large-diametered overstory dominants, large snags composed of seral species) that are important to many wildlife species.

PROJECT FILE
A public record of the analysis process, including all documents that form the basis for the project analysis. The project file for the Middle Soup EIS is located at the Swan River State Forest office in Swan Lake, Montana.

REACH
A portion of a body of flowing water.

REDDS
The spawning nests of trout.

REGENERATION
The actual seedlings and saplings existing in a stand; or the act of establishing young trees naturally or artificially.

RESIDUE
Unused logs, uprooted stumps, broken or uprooted stems, branches, twigs, leaves, bark, and ships left on the ground after timber harvesting, storms, fire, or other disturbance.

ROAD IMPROVEMENTS
Specific construction projects along an existing road designed to improve ease of travel, safety, drainage, and water quality.

ROADS
The following kinds of roads were considered in road density estimates for grizzly bear habitat.

Administrative roads
Administrative roads provide access to administrative structures, such as the Napa Fire Lookout, or to noncorporate private property. Administrative roads are excluded from calculations of open road density and total road density.

County roads
County roads and Highway #83 are excluded from open road density and total road density calculations.

Open roads
1. Open roads pertaining to the grizzly bear analysis are roads without use restrictions. They are seasonally opened to the public during the non-denning period (3/16 - 11/15). They are administered by DNRC, Plum Creek, or the U.S. Forest Service (USFS). 2. Open roads pertaining to elk and white-tailed deer analyses are roads receiving greater than 20 vehicle trips per week.

Private roads
Roads on nonindustrial private lands. Private roads are excluded from open and total road density estimates.

Reclaimed roads
Reclaimed roads are generally impassable to motorized vehicles for most of their length. Drainage features on the road are not maintained because future use of the roads is not likely. Reclaimed roads are not included in linear mileage or road density calculations.

Restricted roads
A road administered by DNRC, USFS, or Plum Creek on which motorized use is restricted during the entire nondenning period (3/16-11/15) by a physical obstruction. Restricted roads are included in calculations of total road density.

RISK

High risk

A SRSF Stand Level Inventory code which includes the following: (1) All commercial, nonvigorous, overmature stands, as well as any merchantable stand which exhibits an unmanageable insect or disease problem; or (2) Lodgepole saw-timber stands which are over 100 years old.

Low risk

A SRSF Stand Level Inventory code which includes the following types of stands (1) All commercial stands older than 100 years which do not qualify as high risk (They are of relatively better vigor than high risk stands); (2) All commercial stands which do not qualify as high risk that are dominated by shade-tolerant species (regardless of age); (3) All commercial lodgepole stands which are 50-100 years old and nonvigorous, and which have not qualified as high risk; (4) Various other stands containing commercial material which are not manageable because of poor tree quality and vigor.

ROLL DIPS

Rolling drainage dips. A depression built into the road prism designed to prevent soil erosion by collecting and diverting water from the surface of the road.

SAPLINGS

Trees 1.0 inches to 4.0 inches in diameter at breast height.

SAW-TIMBER TREES

Softwood trees which are 9.0 inches and larger dbh.

SCARIFICATION

The mechanized manipulation of surface vegetation and litter to expose various amounts of mineral soil to enhance the establishment of natural regeneration.

SCOPE

The range of reasonable alternatives, mitigation, issues, and potential impacts to be considered in an environmental assessment or environmental impact statement.

SCOPING

The process of determining the extent of the environmental assessment task. Scoping includes public involvement to learn which issues and concerns should be addressed, and the depth of assessment that will be required. It also includes a review of other factors such as laws, policies, actions by other landowners, and jurisdictions of other agencies that may affect the extent of assessment needed.

SECURITY
The freedom from the likelihood of displacement or mortality due to human disturbance or confrontation.

SECURITY AREA (elk)
An area of at least 250 contiguous acres that is more than one-half mile from all roads having use levels of more than one vehicle per week.

SECURITY HABITAT (grizzly bears)
An area at least 2500 acres in size that is free of motorized and high-intensity, nonmotorized use of roads and trails during the nondenning period. The area is at least 0.3 miles from motorized or high-intensity, nonmotorized use roads and trails.

SEEDLINGS
Live trees less than 1.0 inch dbh.

SEDIMENT
Solid material, mineral or organic, that is in suspension and is being transported or deposited by air, water, gravity, or ice.

SEDIMENT YIELD
The amount of sediment that is carried to streams.

SEQUOIA INDEX
A value for runoff increases within a watershed caused by forest management activities.

SERAL
A biotic community that is a developmental, transitory stage in an ecological succession.

SHADE-INTOLERANT
1. Describes tree species that reproduce and grow in the open or where the overstory is broken and allows sufficient sunlight to penetrate. 2. Seral species that get replaced by more shade-tolerant species during succession. In the Swan Valley, shade-intolerant species generally include ponderosa pine, western larch, Douglas-fir, western white pine, and lodgepole pine.

SHADE-TOLERANT
1. Describes tree species that reproduce and grow under the canopy in poor sunlight conditions. 2. Species that replace less shade-tolerant species during succession. In the Swan Valley, shade-tolerant species generally include subalpine fir, grand fir, Douglas-fir, Engelmann spruce, and western red cedar.

SIGHT DISTANCE
The distance at which 90 percent of a bear is hidden from view.

SILVICULTURE
The art and science of controlling the establishment, composition, and growth of forests.

SITE PREPARATION
A hand or mechanized manipulation of a site designed to enhance the success of regeneration. Treatments are intended to modify the soil, litter, and vegetation and to create microclimate conditions conducive to the establishment and growth of desired species.

SNAG
A standing dead tree.

SNOW INTERCEPT
Snow that is prevented from reaching the ground because it is caught in the forest canopy.

SPUR ROADS
Temporary roads that are constructed to meet minimum requirements for motorized traffic.

STAND
An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

STAND DENSITY
Number of trees per acre.

STOCKING
The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land.

STREAM GRADIENTS
The slope of a stream along its course, usually expressed in percentage.

SUBNIVEAN SPACES
Air pockets or open areas beneath the surface of the snow.

SUCCESSION
The process of progressive changes in plant communities.

THERMAL COVER (elk)
A stand of conifers at least 40 feet tall with an average canopy closure exceeding 70 percent.

TIMBER HARVESTING ACTIVITIES
In general, "timber harvesting activities" refers to all the activities conducted to facilitate timber removal before, during, and after the timber is removed. These activities may include any or all of the following:

- felling and bucking standing trees
- skidding logs to a landing
- processing, sorting, and loading logs at the landing
- hauling logs to a mill
- road construction
  - right-of-way clearing
  - excavation of cut/fill material
  - installation of road surface and ditch drainage features
  - installation of culverts at stream crossings
  - burning right-of-way slash
  - hauling and installation of borrow material
  - blading and shaping road surfaces
- slashing and sanitizing residual vegetation damaged during logging
- machine piling logging slash
- burning logging slash
- scarification
- planting trees

UNDERSTORY
The trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

VIGOR
The degree of health and growth of a tree or stand.

VIGOR CLASS
The following vigor classes are based on the SRSF Stand Level Inventory.

a. full vigor
The full vigor class is represented by open-grown trees. Crown closure has not occurred, and growth is optimal.

b. good-to-fair vigor
Crowns are closed at least in clumps; crown lengths are greater than 50 percent in young stands and greater than 33 percent in older stands. Growth has not yet slowed greatly.

c. fair-to-poor vigor
Crown ratios are poor. Growth and mortality are nearly balanced.

d. very poor vigor
Stands having very poor vigor are generally in a decadent condition due to insects, disease, stagnation, suppression or old age. Mortality likely exceeds growth.

VISUAL SCREENING
The distance at which at least 90 percent of an animal is hidden from view.

WATER YIELD
The average annual runoff for a particular watershed expressed in acre-feet.

WATER YIELD INCREASE
An estimate of the percent increase in average annual runoff over natural conditions due to forest canopy removal.

YIELD CAPABILITY
The maximum mean annual increment attainable in a fully stocked natural stand expressed in cubic feet per acre per year.

YOUNG POLE
Pole-timber stands that are less than thirty years of age.

APPENDIX A

APPENDIX A
MAILING LIST FOR PROJECT PROPOSAL
MAILED 9/16/94

MAILING LIST FOR PROJECT PROPOSAL
MAILED 9/19/94

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William Wood)	

Bader, Ron, Soup Creek Ranch, Swan Lake 59911

Buentemeier, Ron, Stoltze Lumber Company, Box 1429, Columbia Falls 59912

Cluck, Al, President, Scenic Highway 83, Condon 59826

Coates, Kevin, Wildlife Biologist, Department of Fish, Wildlife & Parks, 490 N. Meridian Rd, Kalispell 59901-3854

Fairchild, Mike, 120 Derns Road, Kalispell 59901

Foresman, Kerry, Division of Biological Sciences, Health Sciences 104, University of Montana, Missoula 59812-1002

Harris, Chuck, Swan Lake Ranger District, USFS, Bigfork 59911

Henderson, Colin, Division of Biological Sciences, Health Sciences 104, University of Montana, Missoula 59812-1002

Kaufman, Nathan, President, C.A.R.E., Box 1210, Condon 59826

Martin, Mrs. Howard, Swan Lake, MT 59911

Martin, Ron, Swan Lake Rte, Bigfork, MT 59911

Montana Wilderness Association, Northwest Field Office, 216 Hemler Creek Dr., Kalispell 59901

Montgomery, Arlene, Friends of the Wild Swan, Box 103, Swan Lake 59911

Mood, Doug, Pyramid Lumber Company, Drawer J, Seeley Lake 59868

Nelson, Kathy, P.O. Box 301, Bigfork, MT 59911

Netherton, Frank, Plum Creek Timberlands, Clearwater Unit, Seeley Lake 59868

Passman, Dori, Archaeologist, Resource Development Bureau, Department of State Lands, 1625 11th Avenue, Helena 59620

Rumsey, Scott, Fisheries Biologist, Department of Fish, Wildlife & Parks, 490 N Meridian Rd, Kalispell 59901-3854

Shirey, Wayne, Box 131, Swan Lake 59911

Thweatt, Dick, Attorney, Department of State Lands, 1625 11th Avenue, Helena 59620

Wagner, Peggy, Montanans for Multiple Use, Box 68, Hungry Horse 59919

NEWS RELEASES SENT FOR PUBLICATION (9/19/94)

Bigfork Eagle, 8299 Montana Hwy 35, Bigfork 59911 837-5131 (week of Sept. 25th)

Daily Interlake, Box 8, Kalispell 59901 755-7000 (week of Sept. 18th)

Pathfinder, Box 702, Seeley Lake 59868 677-2022 (week of Sept. 29th)

APPENDIX B
ID TEAM MEMBERS

ID TEAM MEMBERS

DAN ROBERSON, Forest Management Supervisor, Department of Natural Resources and Conservation (DNRC), Swan River State Forest, Swan Lake, MT 59911 **(PROJECT LEADER after January 1996)**

DANIEL C. HALL, Lead Management Forester, Swan River State Forest, Swan Lake, MT 59911 **(PROJECT LEADER until October 1995)**

DAVID L. REMINGTON, Forest Improvement Supervisor, Department of State Lands, Forestry Division, 2705 Spurgin Road, Missoula, MT 59801 **(SILVICULTURIST until spring 1995)**

DR. KERRY R. FORESMAN, Professor, Division of Biological Sciences, Health Sciences 104, University of Montana, Missoula, MT 59812-1002 **(ECOSYSTEM SUSTAINABILITY ISSUES)**

DR. COLIN B. HENDERSON, Professor, Division of Biological Sciences, Health Sciences 104, University of Montana, Missoula, Montana 59812-1002 **(ECOSYSTEM SUSTAINABILITY ISSUES)**

GLEN N. GRAY, Swan Unit Manager, Swan River State Forest, DNRC, Swan Lake, Montana 59911. **(DECISION MAKER, SILVICULTURIST after spring 1995)**

JANE S. ADAMS, Wildlife Biologist, DNRC, Northwest Land Office, Box 7098, Kalispell, Montana 59904-0098 **(WILDLIFE ISSUES)**

MIKE FAIRCHILD, Wildlife Biologist, DNRC, Northwest Land Office, Box 7098, Kalispell, Montana 59904-0098 **(GRIZZLY BEAR, GRAY WOLF ISSUES)**

APPENDIX C
CONSERVATION LEASE

August 24, 1995

LEASE OF CONSERVATION

SWAN STATE FOREST

THIS LEASE OF TIMBER CONSERVATION is made this __________ day of ______________, 1996, State of Montana (lessor), to _______________ ________________ (lessee), whose address is____________________.

WITNESSETH:

WHEREAS, Lessors are the sole owners in fee simple of certain real estate property in Lake County, Montana, more specifically described in Exhibit A attached hereto and incorporated by this reference (the "Property"); and

WHEREAS, the property possesses natural and scenic values of great importance to the Lessee; and

WHEREAS, the specific conservation values of the Property are documented in the Middle Soup Creek Project EIS dated ___________ 19_____, attached hereto as Exhibit B and incorporated by this reference ("Baseline Documentation"), which consists of reports, maps, and other documentation that the parties agree provide, collectively, an accurate representation of the Property during the time of this lease and which is intended to serve as an objective information baseline for monitoring compliance with the terms of this lease; and

WHEREAS, Lessors intend, as owners of the Property, to convey to the Lessee for a period of 20 years, the right to preserve and protect ___________MMB of timber and other vegetation within the Middle Soup Creek Project Area from harvest proposed in Exhibit B. The Lessor reserves control and rights other then timber harvest

described in Exhibit B.

(the language below is optional and should only be used if the high bidder is a tax exempt nonprofit organization)

WHEREAS, Lessee is publicly supported, tax-exempt nonprofit organization, qualified under Section 501 (C)(3) and 170 (h) of the Internal Revenue Code, whose primary purpose is the preservation protection, or enhancement of land in its natural, scenic historical, agricultural, forested, and/or open space conditions; and

WHEREAS, Lessee agrees by accepting this grant to honor the intentions of Lessors stated herein and to preserve and protect for 20 years the **timber** *conservation* values of the Property as **described in Exhibit B;**

NOW, THEREFORE, in consideration of the above and the mutual covenants, terms, conditions, and restrictions contained herein, and pursuant to the laws of the State of Montana and in particular MCA 77-1-202, Lessors hereby lease to the Lessee a **timber** conservation lease for 20 years over the Property of the nature and character and to the extent hereinafter set forth ("Lease").

1. **Purpose.** It is the purpose of this Lease to assure that existing forest conditions be protected from fire and unnatural disturbances including timber harvesting on the Property for a period of 20 years from the date of signature and expire February 28, 2017.

Use if bid lump sum

2. **Lease Rate.** ______________________ Lump sum ________

The Lessee shall pay to the Lessor a lump sum specified above upon issuance of this lease

Use if bid annual payment

2. **Lease Rate.** ______________ annual payment for 20 years

The Lessee shall pay to the Lessor an annual payment specified above. The initial payment is due upon issuance of the lease. Payment 2 through 20 will be due March 1, of each year beginning with year _______. Failure to pay by April 1 of year year automatically cancels this lease. A notice of rental due will be sent to the address noted in paragraph 14 only, unless a change of address is requested in writing, signed by the Lessee and recorded by the Lessor.

3. **Rights of Lessee .** To accomplish the purpose of this Lease the following rights are conveyed to Lessee by this Lease:

(a) To preserve and protect the **timber** *conservation* values of the Property;

(b) To enter upon the Property at reasonable times in order to monitor Lessors compliance with and otherwise enforce the terms of the Lease; provided that such entry shall be upon prior reasonable notice to Lessors, and Lessee shall not unreasonably interfere with Lessors' use and enjoyment of the Property; and

4. **Prohibited Uses.** Any activity on or use by the Lessee of the Property inconsistent with the purpose of this Lease is prohibited.

5. **Reserved Rights.** Lessor reserve to themselves, and to their personal representative, heirs, successors, and assigns, all rights accruing from their ownership of the Property, including the right to engage in or permit or invite others to engage in all uses of the Property that are not expressly prohibited herein and are not inconsistent with the purpose of this Lease.

6. **Notice of Intention to Undertake Certain Permitted Actions.** Lessors shall notify Lessee in writing not less than sixty (60) days prior to the date Lessors intend to exercise reserved rights that might have an adverse impact on the conservation values the Lease intended to protect.

7. **Remedies for Unauthorized Uses and Practices.** If Lessee determines that Lessors are in violation of the terms of this Lease or that a violation is threatened, Lessee shall give written notice to Lessors of such violation and demand corrective action sufficient to cure the violation and, where the violation involves

injury to this Lease, to restore the portion of the Property so injured. If Lessors fail to cure the violation within thirty (30) days after receipt of notice thereof from Lessee, or under circumstances where the violation cannot reasonably be cured within a thirty (30) day period, fail to begin curing such violation within the thirty (30) day period, or fail to continue diligently to cure such violation until finally cured, Lessee may bring an action at law or in equity in a court of competent jurisdiction to enforce the terms of this Lease, to enjoin the violation, by temporary or permanent injunction, to recover any damages to which it may be entitled for violation of the terms of the Lease or injury to any conservation values protected by this Lease and to require the restoration of the Property to the condition that existed prior to any such injury. Without limiting Lessors' liability therefor, Lessee, in its sole discretion, determines that circumstances require immediate action to prevent or mitigate significant damage to the conservation values of the Property, Lessee may pursue its remedies under this paragraph without prior notice to Lessors or without waiting for the period provided for cure to expire. Lessee's rights under this paragraph apply equally in the event of either actual or threatened violations of the terms of this Lease, and Lessors agree that Lessees remedies at law for any violation of the terms of this Lease are inadequate and that Lessee shall be entitled to the injunctive relief described in this paragraph, both prohibitive and mandatory, in addition to such other terms of this Lease, without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies. Lessee's remedies described in this paragraph shall be cumulative and shall be in addition to all remedies now or hereafter existing at law of in equity.

8. **Acts Beyond Lessors' Control.** Nothing contained in this Lease shall be construed to entitle Lessee to bring any action against Lessors for any injury to or change in the Property resulting from causes beyond Lessors' control, including, without

limitation, fire, flood, storm, and earth movement, removal of timber through treaspass, or from any prudent action taken by Lessors under emergency conditions to prevent, abate, or mitigate significant injury to the Property resulting from such causes.

9. **Access.** No right of access by the general public to any portion of the Property is conveyed by this Lease.

10. **Hold Harmless and Indemnification.** The Lessor shall hold harmless, indemnify, and defend the Lessee and its employees, agents and contractors from and against all liabilities, penalties, costs, losses, damages, expenses, causes of action claims, demands of judgements, including without limitation, reasonable attorneys' fees, arising from or in any way connected with injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition or other matter related to or occurring on or about the Land, regardless of cause, unless due to the negligence or willful misconduct of the Lessee or its agents, employees or contractors.

The lessee similarly agrees to hold harmless, indemnify, and defend the Lessor and its employees, agents and contractors from and against all liabilities, penalties, costs, losses, damages, expenses, causes of action claims, demands of judgements, including without limitation, reasonable attorneys' fees, arising from or in any way connected with injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition or other matter related to or occurring on or about the Land, regardless of cause, unless due to the negligence or willful misconduct of the Lessor or its agents, employees or contractors.

11. **Termination, Extinguishment.** It is the intention of the parties that the conservation purposes of this lease shall be carried out over the term of the lease. If circumstances arise during the term of the lease that render the conservation purposes of this Lease impossible to accomplish, this Lease can only be terminated or extinguished, whether in whole or in part, by mutual

agreement or judicial proceedings in a court of competent jurisdiction.

12. **Amendment.** If circumstances arise under which an amendment to or modification of the Lease would be appropriate, the Lessor and the Lessee are free to jointly amend this Lease; provided that no amendment shall be allowed that will affect the qualifications of this lease under any applicable laws and any amendment shall be consistent with the purpose of this Lease.

13. **Assignment.** This Lease is assignable, after proper application has been made to and the written approval secured from the Lessor. Any attempt to transfer this lease without the Lessor's written approval will result in the automatic termination of this agreement. Any assignment under this Paragraph must be only to an organization that is a qualified organization at the time of transfer under Section 170(h) of the Internal Revenue Code, as amended (or any successor provision then applicable), and the applicable regulations promulgated thereunder, and authorized to hold conservation leases under the laws of the state of Montana. As a condition of such transfer the, Lessor and Lessee require that the conservation purposes that this Lease is intended to advance continue to be carried out.

14. **General Provisions**

A. Controlling Law. The interpretation and performance of this Lease will be governed by the laws of the State of Montana.

B. Liberal Construction. Any general rule of construction to the contrary notwithstanding, this Lease shall be liberally construed in favor of the grant to effect the purpose of this Lease and the policy and purpose of Section 76-6-101, et, seg.,MCA. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purpose of this Lease that would render the provision valid shall be favored over any interpretation that would render it invalid.

C. Entire Agreement. This instrument sets forth the entire agreement of the parties with respect to the Lease and supersedes all prior discussions, negotiation, understandings, or agreements relating to the Lease, all of which are merged into this Lease.

D. Termination of Rights and Obligations. A party's rights and obligations under this Lease terminate upon transfer of the party's interest in the Lease or Land, except the liability for acts or omissions occurring prior to transfer shall survive transfer.

E. Severability. If any provision of this Lease is found to be invalid, the remainder of the provisions of this Lease shall not be affected.

15. **Notices.** Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and either served personally or sent by first class mail, postage prepaid, addressed as follows:

TO LESSOR: ______________________ TO LESSEE: ______________________

______________________ ______________________

______________________ ______________________

16. **Executory Limitation.** If Lessee shall cease to exist or to be a qualified organization under Section 170(h) of the Internal Revenue Code of 1954, as amended, or to be authorized to acquire and hold conservation leases under Montana Law, and a prior assignment is not made pursuant to paragraph 13, then the lease will be terminated immediately.

17. **Expiration/Termination.** The Lessee shall peaceably yield possession of these premises upon termination of this Lease for any cause.

IN WITNESS WHEREOF, the State of Montana and the Lessee have caused the Lease to be executed in duplicate and the Director of the Department of Natural Resources and Conservation, pursuant to the authority granted him by the State Board of Land Commissioners of the State of Montana, has hereunto set his hand and affixed the seal of the Board of Land Commissioners the ____________ day of ____________, 19___.

Lessor
Arthur R. Clinch
Director Department of Natural Resources and Conservation

____

Lessee

____

____

Schedule of Exhibits

A. Legal Description of Property Subject to Lease
B. Baseline Documentation (site description/map)

APPENDIX D

APPENDIX D
MITIGATION MEASURES COMMON TO ALL ACTION ALTERNATIVES

Appendix D

MITIGATION MEASURES COMMON TO ALL ACTION ALTERNATIVES

The following mitigation measures are common to all action alternatives. They supplement the mitigations specific to each alternative which are described in Chapter II. Both specific and common mitigations are based on environmental laws, DNRC policies, DNRC standards and guidelines, consensus of scientific literature, and professional judgement. Implementing of these mitigations is intended to assure that each action alternative complies with pertinent environmental laws, policies, and standards and guidelines.

1. Grizzly Bear

   a. DNRC may immediately suspend all timber sale activities permitted in the contract if the suspension is necessary to prevent imminent confrontation or conflict between people and grizzly bears.

   b. All action alternatives meet the intent of the Swan Valley Grizzly Bear Conservation Agreement.

   c. Maintain travel corridors between areas providing suitable habitat.

   d. Consider the individual and cumulative effects of other land management actions within the analysis area of the proposed Middle Soup Creek Project.

   e. Seed disturbed soils along the first 0.5-1.0 miles of closed roads with unpalatable plant species to avoid attracting grizzly bears and other wildlife to reseeded areas along to open roads.

   f. Upon completion of harvest activities, cull logs and root-wads would be placed on spur roads C, D, E, F and G in such a way as to make the road generally impassable to motorized vehicles.

2. Elk and White-tailed Deer

a. The purchaser is authorized to enter project area with motorized vehicles only for the purposes related to the performance of the contract. Road use is restricted to non-motorized transportation for any other purpose beyond any road closure. Motorized vehicle entry for purposes other than contract performance, such as hunting or transporting game animals will be considered in trespass and prosecuted to the fullest extent of the law (Administrative Rules of Montana 45-6-203).

b. Regardless of the harvest method, residue accumulation should not exceed 18 inches in depth to reduce the risk of impeding big game movement.

c. Apply brush disposal and site preparation treatments which will encourage production of desirable shrub species which are present.

d. To help maintain hiding cover, retain large trees either singly, in small groups, or in stringers. Retain clumps of sapling- to pole-size trees.

e. Maintain about 50 percent of upland habitat associated with riparian features in summer thermal cover, about 25 percent in hiding cover and about 25 percent as forage area.

f. Encourage development or maintenance of multispecies, multilayered stands in mixed conifer habitats adjacent to riparian features such as live streams, lakes, potholes, or areas where hydrophytic vegetation indicates a water table near the surface. Such stands should be at least 1.5 sight distances or 100 feet wide--whichever is greater--if the stand remains unmanaged.

g. To avoid the risk of trapping deer in the project area during fall and early winter, delay winter logging until December 15, or when snow depth exceeds 18 inches in the project area--whichever occurs first.

h. Upon completion of harvest activities, cull logs and root-wads would be placed on spur roads C, D, E, F and G in such a way as to make the road generally impassable to motorized vehicles.

3. Aesthetics

a. Wherever possible, retain advanced regeneration and other natural vegetation along roads to screen views into cutting units and landings.

b. Slash damaged vegetation along roads, skidtrails, and landings.

c. Cleanup landing concurrent with timber harvesting activities to reduce the texture and color contrasts of curing vegetation and slash.

d. Seed grass on construction sites concurrently with harvesting to reduce color contrasts of displaced soil.

e. Whenever possible, use existing landings and skid trails to avoid building new ones.

f. Delay harvesting until winter to reduce soil disturbance and vegetation damage on skid trails and landings.

4. Water Quality and Fisheries

a. Limit the amount of activity in the watersheds to a level below which adverse cumulative impacts from water yield or sediment yield increases are anticipated.

b. Inventory and rehabilitate existing human-caused erosion sources in the watersheds and rehabilitate them.

c. Use the findings of the Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program to help design the project. Implement the recommendations of the study as agreed to in the Response of Major Forest Landowners to the "Study of Recommendations".

d. Apply BMP's to all aspects of the sale, including the design, layout, harvest, and post-harvest treatments. Modify BMP's as necessary for site-specific conditions.

e. Monitor implementation of BMP's through aggressive contract administration and interdisciplinary review.

f. Review with the MFWP fisheries biologist to determine specific habitat needs on a case-by-case basis.

Any additional monitoring of Soup Creek as agreed to between DNRC and MFWP will be entered in the Calendar Recall System (CRS)at the SRSF to assure follow-up. Additional information on the CRS can be obtained by contacting the SRSF.

5. Air Quality

Burning piles with moist fuels and high contents of dirt and duff increases smoke emissions. By piling with excavators, dirt and duff would be effectively sorted from logging residue and cleaner piles would result. Piled residue would cure at least one summer season before it is burned. Burning would occur in the fall when fuel moistures are usually at their lowest.

The following logging residue disposal methods would be used to minimize burning: (1) Under light-, moderate-, and heavy-reserve treatments, fifteen to twenty tons per acre of evenly distributed, large, down, woody material would be retained to promote site productivity; (2) In areas where fuel loads are light, residue would be lopped and scattered or machine-trampled.

DNRC is an active member of the Montana Airshed Group. This group has a comprehensive smoke management plan and regulates members' burning activities to minimize impacts to air quality. All burning would be conducted in accordance with the group's recommendations.

To minimize impacts to the Swan Lake area, no ignition would occur while winds are from the east or southeast.

6. Soils

Potential rutting, soil compaction, and displacement can be avoided or reduced by a combination of measures.

a. On harvest areas, limit equipment operations to periods when soils are adequately dry, frozen, or snow-covered.

b. Use existing skid trails where possible; locate additional skid trails only as needed to access timber. Plan skid trail systems to reduce traffic area. Skid trails should not exceed more than 15 percent of the harvest area.

c. For nutrient cycling and to maintain soil productivity, retain 10-15 tons/acre downed large woody material (over 3" dia.) on all harvest areas.

d. Existing roads would be repaired and maintained on a priority basis established by sediment survey and road use to comply with BMP's. Roads to be closed would have drainage features installed at critical locations to stabilize roads, prevent rutting and reduce erosion and sedimentation.

7. Noxious Weeds

To further limit the possible spread of weeds, the following integrated weed management mitigation measures of prevention and control will be implemented:

a. Clean road construction and skidding equipment of weed plant parts and mud prior to bringing on site.

b. Revegetate disturbed roadsides and landings with site-adapted grasses. For grass seeding to be effective it is important to complete seeding concurrent with road construction.

c. Control weeds along access roads by herbicide methods as designated by the forest officer in charge.

8. Herbicides

To reduce the risk to aquatic and terrestrial resources, the following will be required:

a. All herbicides will be applied by licensed applicators in accordance with the laws, rules, and regulations of the State of Montana and the Lake County Weed District.

b. All applications will adhere to Montana BMP's and the herbicide's specific label guidelines.

c. Herbicide application would not be general but site specific to areas along roads where noxious weeds occur. All no-spray areas will be designated on the ground before application begins.

d. Picloram would not be applied within fifty feet of surface water. 2,4,-D could be applied to within 25 feet of surface water. No herbicides would be applied within 25 feet of surface water.

e. Herbicides would not be applied to areas where relief may contribute runoff directly into surface water.

f. Application would occur on calm, dry days to limit drift and possible surface movement off road prisms.

9. Gray Wolves

a. If an active wolf den is located, proposed management activities within 1 mile of the den should be restricted through July 1.

b. Implement site-specific and cumulative effects considerations for big game species to assure perpetuation of a healthy prey base.

10. Soup Creek Campground

Cutting units will be screened from view of the campground.

11. Bald Eagles

DNRC will immediately suspend all timber sale activities permitted in the contact if the suspension is necessary to prevent disturbance to nesting, feeding, perching, roosting, or migration areas if these sites are located within the project area.

12. Cultural Resources

Should any cultural resource be encountered during any project activity, a DNRC archaeologist will be requested for a site specific review and recommendations and mitigations incorporated into the project planning process.

13. Plant Species of Special Concern

a. If the Purchaser, their contractors, subcontractors, or any of their employees encounter a plant community of special concern while operating in the project area, the Purchaser will immediately suspend all operations in the vicinity of the observation or discovery and immediately notify the forest officer.

b. Activities associated with tree harvesting and roads will not be allowed in meadows, bogs, or other required habitat associated with plant species of special concern.

14. Other

a. Prior to the letting of a timber sale agreement, the ID Team will review the proposed timber sale area for proper implementation of mitigation measures and other requirements detailed in the Middle Soup Creek Project Environmental Impact Statement.

b. Other interested groups or individuals will be given the opportunity for a field review of site-specific actions and implementation of mitigation measures prior to the letting of a timber sale agreement.

APPENDIX E

APPENDIX E
INTERACTIONS WITH CONCERNED CITIZENS, GROUPS, AND AGENCIES

Interactions with Concerned Citizens, Groups, and Agencies

Date	Interaction
September 1994	★ The project proposal was mailed to interested individuals, owners of adjacent land, groups, private industry, and federal and state agencies (Appendix A) ★ Paid advertisements were sent to local papers (Appendix A) ★ A 30-day comment period began.
October 1994	★ Comments on the proposal were received from two landowners, Friends of the Wild Swan, the USFWS, DNRC land managers, and the ID team ★ Kevin Coats (MFWP) contacted Dan Hall (DNRC) to discuss the elk and white-tailed deer concern statement. He determined that it was sufficient. Kevin requested and received a copy of "Affected Environment" from the Middle Soup EA, the elk and white-tailed deer concern statement, and draft mitigation measures for the Middle Soup EIS ★ John Blair (Swan Valley landowner) stopped at SRSF Headquarters to request a Middle Soup project area map. A map was sent to him by mail.
March 1995	★ Glen Gray and Dan Hall (DNRC), met with Arlene Montgomery (Friends of the Wild Swan) and Ron Bader (Swan Valley landowner) to discuss their comments on the project proposal. An agreement on how their concerns would be addressed in the EIS was reached.
May 1995	★ Arlene Montgomery, Ron Bader, and DNRC project leaders conducted a field reconnaissance to explore the definitions of old growth. Everyone agreed that the examined stands classified as "non-old growth" were not old growth. Because of time restrictions, only two stands were examined.
June 1995	★ As a result of the May field review, DNRC identified ten additional stands not classified as old growth in the SRSF Stand Level Inventory; however, based on its improved understanding of Friends of the Wild Swan's definition of old growth, DNRC dismissed the stands from consideration to resolve the major resource concern "old growth preservation." A map of stand locations and reasons why the stands were dismissed were mailed to Arlene Montgomery and Ron Bader on July 6, 1995.
July 1995	★ DNRC, Arlene Montgomery, and Ron Bader conducted a second field reconnaissance to consider the two stands still slated for timber harvesting. Arlene and Ron suggested that a road constructed to access one of the stands would result in cutting old growth and would further fragment the area. They recommended helicopter logging in lieu of road construction. Arlene also suggested that treating the two stands might impact the integrity of adjacent old-growth stands. Arlene decided to discuss her concerns with Sara Johnson, wildlife consultant to Friends of the Wild Swan, before agreeing to the proposed treatments for the two stands.
August 1995	★ Arlene informed DNRC that she and Sara Johnson recommended no treatment for the two stands.
September 1996	★ Draft EIS issued for public review and comment. A public hearing will be held. The comment period will be 45 days long.
February 1997	★ Final EIS available for public review.
February 1997	The finding issued.

APPENDIX F

APPENDIX F
STAND SUCCESSIONAL PROGRESSIONS

STAND SUCCESSIONAL PROGRESSIONS

IME →

Current Conditions	After Harvest	20 Years	50 Years	150 Years
Nonforest				→
(3) Grass/seedling/sapling		Sapling	Old Pole	Saw Timber
(15) Sapling		Young Pole	Saw Timber	→
(30) Young Pole		Old Pole	Saw Timber	→
(50) Old Pole		Saw Timber		Old Growth
(…ory 200) (…story 15) Multistory			Saw Timber	Old Growth
Light Reserve	Sapling	Young Pole	Saw Timber	→
Moderate Reserve	Sapling	Young Pole	Saw Timber	→
(100) Saw Timber				Old Growth
Light Reserve	Grass/Seedling/Sapling	Sapling	Old Pole	Saw Timber
Moderate Reserve	Grass/Seedling/Sapling	Sapling	Old Pole	Saw Timber
Heavy Reserve	Saw Timber			Old Growth
Old Growth (Not Harvested)				→
(200) With Vigor Value = 2	Old Growth			→
(300) With Vigor Value = 3	Old Growth			Post Old Growth
(400) With Vigor Value = 4	Old Growth		Post Old Growth	→
Old Growth				
Light Reserve	Grass/Seedling/Sapling	Sapling	Old Pole	Saw Timber
Moderate Reserve	Grass/Seedling/Sapling	Sapling	Old Pole	Saw Timber
Heavy Reserve				
(200) With Vigor Value = 2	Saw Timber		Old Growth	→
(300) With Vigor Value = 3	Saw Timber		Old Growth	Post Old Growth
(400) With Vigor Value = 4	Saw Timber		Post Old Growth	→

Numbers in ( ) indicate stand age at current condition

APPENDIX G

APPENDIX G
DEIS COMMENTS RECEIVED
DNRC RESPONSE

INTRODUCTION

In September, 1996 DNRC issued the Middle Soup Creek DEIS for public review and comment. This appendix is divided into two parts. The first contains comments received by DNRC. Each comment that generated a response by DNRC has been given a unique identifier (i.e. **A-1, C-2**...) to the left of the area of concern. This identifier corresponds to DNRC's response wich is located in the second part of the appendix.

SUMMARY LIST OF COMMENT SOURCES ON DEIS

-Arlene Montgomery, Friends of the Wild Swan, letter
-Susan LeValley & Jill Duryee, Montana Wilderness Association, letter
-Tom Tintinger, F.H. Stoltze Land & Lumder Co., letter and oral comment at public hearing
-Ron Bader, Soup Creek Ranch, letter
-Don Bielenberg, oral comment at public hearing
-Dan Hall, oral comment at public hearing

FRIENDS OF THE WILD SWAN
P.O. BOX 5103
SWAN LAKE, MT 59911

October 24, 1995

Swan River State Forest
Swan Lake, MT 59911
Attn Glen Gray

Middle Soup Creek Project EIS Comments

Introduction

The Middle Soup Project EIS is the first major project to implement the programmatic State Forest Land Management Plan (SFLMP). Such an experiment will require considerable additional work in several significant areas identified as "major resource concerns." EIS, p I-5. Various sections of the EIS are contradictory, very confusing to the reader and legally and scientifically inadequate. In addition, the EIS was excessively costly to produce, causing it to be inefficient in its delivery of information to the general public and its delivery of support for Montana schools.

The EIS failed to respond directly to public scoping comments relating to issues that have not changed greatly since they were first raised during the Middle Soup Environmental Assessment process (1991-1993). Other significant issues were rejected, unjustifiably, out of hand.

The EIS failed to consider a reasonable range of alternatives.

The following comments will generally follow the format used to identify "resource concerns" outlined at EIS pages I-5 through I-15.

Ecosystem Sustainability

The EIS fails to disclose the seriousness of the current ecological condition of the Swan River State Forest (SRSF) and the relationship of the project analysis area to the broader landscape and aquatic ecosystem.

Each species requires an ecosystem of varying size and characteristics. For example, what remains of the grizzly bear ecosystem encompasses an area over 50,000 square miles, roughly the entire five-state northern Rockies bioregion. In contrast, water howellia, a recently listed threatened plant species, is limited to an ecosystem of less than 1000 acres in the Swan Valley. No single ecosystem can adequately support the full complement of species found on the SRSF. Many of the species analyzed in the EIS may be in serious jeopardy locally, while other populations continue to thrive in large undeveloped roadless areas, wilderness areas or national parks outside the confines of school trust lands. The aquatic ecosystem is equally complex. These important distinctions must be disclosed in the Final EIS.

Particularly disturbing is DNRC's belief that "[T]imber would be harvested using the structural enhancement silvicultural method within mature forest core and corridors ... to minimize alteration to stand character and function within corridors, old growth, or mature forest core." EIS, p II-7. Logging is no substitute for old growth refugia. DNRC offers no scientific support for its absurd belief that "Alternative B would promote the integrity of ecosystem functions within the project area by employing a combination of three strategies," none of which have been field tested or supported in the scientific literature. *Id.*

Old-Growth Preservation

The EIS fails to provide an adequate definition of old-growth habitat. The EIS avoids identifying, delineating or protecting the 200+ age class commonly used in scientific literature as a starting point to intelligently discuss old-growth habitat. The EIS uses the following terms to describe old-growth habitat:

> *mature forest* at IV-4, *high-risk...nonvigorous, overmature overstory* at III-21; *post-old-growth stage of succession* at III-19, *older types* at IV-12, *mature interior core and interior core habitat* at IV-17, *mature forest types* at IV-19; *old growth interior core* at IV-22, *old-growth* at IV-24, and *old growth, old-growth stands and old-growth vigor classes* at IV-25.

Confusing at best. More likely, DNRC is clueless and/or in deep denial of the fragmentation problem caused by past management practices.

Logging and roads have greatly reduced the amount and distribution of old-growth habitat, which has in turn significantly and negatively affected natural ecosystem functions. Past activities have caused significantly low numbers of total, and large diameter, snags and a scarcity of large diameter down woody material used by old-growth dependent species like goshawk, pileated woodpecker, barred owl, fisher, pine marten and lynx. EIS, p III-36. "The Middle Soup Creek Project Area has substantially less than the recommendation for pileated woodpeckers, and appears to be marginal for marten, although these species inhabit the project area." EIS, p III-37. The EIS fails to relate the highly impacted and fragmented landscape to its reduced capacity to support species that are most sensitive to the adverse effects of clearcutting and roads. It is apparent that DNRC has deliberately avoided a full and fair discussion of the

A-13 above-mentioned species. Cumulative environmental effects have not been adequately assessed, in violation of NEPA.

Old Growth

A-14 DNRC has failed to identify which wildlife species are being targeted for old growth management. Although sensitive species were discussed, this does not address species as the Pileated Woodpecker or pine marten, typical management indicator species (MIS) for old growth in northwestern Montana. As noted in the draft EIS, habitat conditions for both species are already marginal due to low levels of downed woody debris. This habitat feature will in turn be reduced with the proposed action as a defined part of DSL's old growth management program. So you in effect have an old growth program that will not meet the needs of typical old growth-associated species.

A-15 DNRC has failed to evaluate or define a landscape program for old growth habitat, and in effect, thus plan for the long term viability of old growth-associated wildlife, prior to extensive logging of old growth habitat. As a result, the cumulative impacts of existing old growth levels and distribution in the analysis area are never evaluated. Yet existing and planned landscape distribution of old growth will be key to many associated species, including not only the pine marten and Pileated Woodpecker, but other species as the Northern Goshawk, fisher, Boreal Owl and Black-backed Woodpeckers since they require large blocks of high quality old growth. Logging of small fragmented old growth will possibly limit recovery of landscape distributions of old growth to required densities for some or all of these species.

A-16 DNRC has failed to complete an adequate assessment of logging impacts on sensitive wildlife associated with old growth. The analysis draws conclusions without any demonstration that landscape densities and quality of old growth are currently adequate for these species.

A-17 DNRC has failed to clearly define what old growth is as per specific criteria, or how these criteria will be affected with the proposed harvest method called "structural enhancement." DNRC has therefore failed to demonstrate that old growth habitat will be maintained with the proposed harvests under Alternative B. We request that DNRC clearly define the following:

A-18 a. What specific criteria for old growth have been used to identify old growth stands in the project and analysis area? We would like to know these criteria for average number of large trees per acre, the minimum dbh of these large trees, the minimum age of large trees, the average basal area for the stand, the average snags per acre over 9 inches dbh, the average number of trees over 9 inches dbh with broken tops, and the average percent of trees greater than 9 inches dbh showing decay.

b. Have all stands been evaluated according to the above criteria? If not, how has old growth been identified?

A-19 c. How do your criteria for old growth compare to those defined by Region 1 of the Forest Service for old growth on the Flathead Forest? Specifically, what Old Growth Type Codes defined by Region 1 occur in the project area?

A-20 d. Could you define what the sizes of dbh will be of trees to be harvested in old growth for "structural improvement harvest methods," and the estimated number per acre that will be cut?

A-21 e. The EIS claims that old growth will be preserved and eventually enhanced by the proposed logging, especially with "structural enhancement." However, this "maintenance" and "improvement" was only vaguely defined. Could you please demonstrate specifically how old growth criteria included in "a" above will be maintained during logging, and increased over the long term? We would like to know how numerous old growth qualities will be affected by logging, including number of large trees per acre, stand defect, snags, and basal area. We are therefore requesting that DNRC provide a tabular summary (in the appendix) for all old growth stands in the project area which clearly defines all relevant old growth characteristics before and after logging.

f. We would also like DNRC to provide a tabular summary of number of trees within dbh classes (preferably every 2 inches) for all stands in the project area (in the appendix).

g. Could you define why the changes in old growth stand characteristics as per basal area, number of large trees, large snags, and larger trees with defects, which will be provided in a tabular response as per our request in "e" above, correlates to an increased abundance of large cavity trees for wildlife?

A-22 h. What current published studies support the DNRC claim that logging improves old growth?

It is not clear specifically what the management problem in existing old growth stands are, or why these problems will be corrected with logging. We therefore ask DNRC to clarify the following:

a. If stand density has increased above natural levels since the 1940's, what size (dbh and age) of tree is creating these unnatural densities?

A-23 b. Will the trees identified in "a" above be the trees that are removed with logging?

A-24 c. DNRC uses "structural complexity" as a measure of good and bad qualities of old growth. Could you define specifically what criteria you use to identify structural complexity for old growth, and how this is tied in with your old growth definitions?

d. Could you provide a sliding scale of what constitutes good and bad structural complexity for old growth?

e. What stand data is used to measure the level of structural complexity in your old growth stands?

f. What research demonstrates that old growth stands will eventually self-destruct?

g. What specifically happens that causes old growth stands to lose their old growth attributes?

A-25 h. How has DNRC determined that within a given time frame the number of large old trees will fall below the minimum threshold level required for old growth in the project area? You provided no models or other information in the EIS to show how this has been determined.

A-26 i. The draft EIS implies that number of tree species is a key criteria for old growth in that it affects diversity. However, you never defined what your scale of measure of diversity was, or what it was based on. Is this based on some criteria that seral old growth is preferable to climax old growth? If so, why?

A-27 j. How are you balancing out the obvious conflicts between cutting larger older trees to increase regeneration, tree species and seral conditions, against the degradation of key old growth qualities, large old trees and large snags ...

A-28 k. The draft EIS claims that selective thinning of small half acre patches in old growth is needed to create canopy gaps to enhance diversity. However, canopy gaps are a typical characteristic of old growth. Why don't you expect these gaps to develop naturally?

l. The draft EIS claims that logging of old growth is needed to prolong vigor of the upper canopy. Why won't the upper canopy be replaced with other trees through natural processes?

A-29 m. Why isn't mortality in the upper canopy a natural process that creates the canopy gaps you want to develop through logging?

n. If natural succession proceeds in these old growth stands, what will the canopy dominant be, and what is the expected life expectancy of these dominates? Why won't they gradually be replaced with younger trees over time, which is typical of climax stands?

A-30 o. Small canopy gaps will increase the density of young trees, which the draft EIS implies are already too plentiful. What is the purpose of gaps then?

A-31 p. If logging of old growth will improve stand vigor, why will snag recruitment increase?

Timber Productivity

Herein lies the crux of most problems. The Omega alternative of the SFLMP relies on:

> "intensive management to create or maintain an appropriate diversity of stand structures and patterns. Timber management would be instrumental in achieving this diversity and timber harvest would be an important output. This emphasis, plus a reduced emphasis on protection of single species (except Threatened and Endangered Species) would favor increased timber harvest levels."
> SFLMP, p. SCN-12.

The conflict between increased timber harvest levels and the promise of "higher levels of protection for old-growth, fisheries, water and riparian zone quality, and wildlife species," is playing out as expected as "downward pressure on harvest levels." *Id.* Knowing this, DNRC opted for a project that about doubled the harvest level to "approximately six million board feet of timber (mmbf)" from 3 mmbf in the original Soup Creek Timber Sale of 1993. EIS, p. I-3. Common sense tells us DNRC can't have it both ways. The EIS is merely a rationalization and exorbitant covering of the enormous sacrifice of *other worthy objects* caused by DNRC's single-minded pursuit of timber. See Enabling Act of 1889.

A-32 In DNRC's obsession with timber, recreation licensees have been forgotten. We respectfully remind DNRC that it charges a $10 per year license fee to all recreation users. Emphasis added. Nowhere in the EIS is there a discussion of the trade-off of increased harvest levels and potential revenue losses from recreation fees as users are driven from the forest as it is converted incrementally, project by project, to a monolithic tree farm. Concerns relating to Soup Creek Campground, an obvious place where recreational users congregate, were raised in scoping and summarily dismissed with no regard for what recreational activities might occur. The project will adversely impact the quality of a variety of expected recreational experiences that are paid for by user license fees. The "economic analysis" in the EIS failed to mention recreation-related assets, revenues or costs, in violation of MEPA.

A-33 The EIS provided no analysis of the loss of outdoor classrooms and other direct educational benefits resulting from the two-fold timber harvest volume increase in the project area.

A-34 Finally, timber productivity can easily be more efficiently measured in numeric terms that compare yield per acre per year on a site by site basis. The assumptions made about timber productivity in the EIS are flawed for failing to monitor the annual cubic feet (or board feet) per acre growth rates of all age classes on varying soils, species, aspects, growing season length and micro-climates - things that directly influence growth rates and yield per acre. Without annual growth monitoring, estimations of long-term trends and site suitability are wild-ass guesses (WAGs) at best. With DNRCs near-exclusive reliance on timber harvest to support Montana schools, it is essential to know what yield per acre per year is in real numeric terms. Emphasis added. Management by the seat of the pants, using soft and squishy data, is an unacceptable, archaic method of measuring timber productivity.

Grizzly Bear (other resource concern).

A-35 When DNRC places grizzly bears, a threatened species, in an "other" category for analysis purposes, it says alot.

A-36 The Interagency Grizzly Bear Northern Continental Divide Subcommittee (which DNRC is a participant) on March 8, 1995 adopted the Interim Motorized Access Management Direction which states that Total Motorized Access Route Density should be no more than 19% greater than 2 miles per square mile. Open Road and Open Motorized Trail Route Density should be no more than 19% greater than 1 mile per square mile and subunit core areas should be no less than 68%.

A-37 Total road densities exceed the recommended standard found in scientific literature as well as the IGBC standard. Open road densities also exceed these thresholds. Security core habitat is below the IGBC standard. This amounts to a "taking" of grizzlies, in violation of the Endangered Species Act (ESA). See EIS, p. II-17 and III-24 through III-29.

A-38 The EIS does not reclaim any existing roads or make currently restricted roads less passable to motorized vehicles. No discussion. It relies solely on two (2) new gates to restrict human travel on the upper Soup Creek Canyon Road (1.8 miles) and upper Cilly Ridge Road (1.6 miles). EIS, p. IV-38. Numerous field studies have shown that gates are on average 57% ineffective at restricting motorized human use (not including access with a key). See *1995 Roads Scholar Project, Summary of Results Ground Truthing Data.* The EIS fails to account for this well-documented flaw.

A-39 If "open road density in the analysis area would remain at 1.2 miles of open road per square mile," and "due to road effects, 35 percent of the area would remain available as potential elk habitat under all alternatives (65% not secure)," it stands to reason that roads are similarly impacting bears. EIS, p. IV-41.

A-40 The "3 and 7 rule" was not mentioned in the EIS, nor was any analysis done to estimate displacement of bears due to past management activities.

A-41 In addition, "[s]ince none of the project area meets security habitat criteria, habitat values within security areas would not be affected." EIS, p. IV-40. Mitigation? A single measure: Logging will be done while bears are in hibernation (November 16 through March 15). *Id.*

Elk and White-Tailed Deer

A-42 No mule deer, especially after the statewide concern about the sudden crash in most populations? No EIS discussion.

Hunting is a primary activity permitted by the issuance of a school trust lands recreation use license. It is one of the major factors cited by residents when asked what makes living in Montana so attractive. "Negative impacts on elk and white-tailed deer populations may affect the local economy through reductions in wildlife-related recreation." EIS, p. I-7.

A-43 There is sufficient evidence to suggest that reductions in hunting opportunities may significantly affect 1) recreation license receipts, and 2) property tax revenues based on real estate values, the dominating revenue source in support of schools. See Thomas M. Power, *Montana's State Forests, Schools, and Quality of Life: An Economic Study*, 1995.

Managing elk at 50% of its potential is unacceptable on school trust lands where recreation pays its own way. EIS, p. III-31. Soup Creek Campground is used by licensed hunters, yet no impacts analysis was done. No alternative evaluated recreational uses and their relative contribution in support of Montana schools. There are obvious trade-offs when timber adversely impacts recreation, which requires analysis under the provisions of MEPA.

An EIS alternative that combines recreation and timber harvest revenue opportunities should be analyzed.

Gray Wolf

A-44 The open road density of 1.2 miles per square mile is well over the threshold road density of 0.9 miles per square mile, where research shows that "disjunct wolf populations distant from a larger source population did not persist." EIS, p. III-32.

Sensitive Species

Logging in the remaining old-growth habitat found in the project area will adversely affect western big-eared bat (insufficient number of snags and snag recruits), fisher (loss of cover and fragmentation), lynx (fragmentation and human access), black-backed woodpecker (snags), and bog lemmings (interior forest bogs and wetlands). Logging will decrease, not increase, habitat quality for these sensitive species, contributing to their further decline.

Since DNRC has failed to demonstrate why logging almost all the old growth acreage in the project area will not reduce viability of sensitive wildlife species associated with old growth. We are therefore requesting that additional information be provided to address numerous questions left unanswered in the draft EIS

a What specific research and surveys have been used to determine that Boreal Owls would not nest in the project area? The draft EIS claims that this species does not nest at elevations in the project area. We would like to be assured that research on
5 this species in this area has been extensive enough to draw such conclusions

b The draft EIS claims that feeding by the Boreal Owl will not be impacted by the proposed logging. It was not made clear, however, what studies have been completed to demonstrate this. Could you provide a brief summary plus citations of the studies which show how various type of logging affect foraging by this species?

c What surveys were used to determine that the Flammulated Owl is not present in this project area?

d The draft EIS concludes that logging will benefit sensitive species as the fisher and Black-backed Woodpecker. Could you please summarize the research that was done which demonstrates benefits of logging on these species?

6 e. Could you please cite the research that demonstrates that logging enhances old growth characteristics for wildlife, including the fisher and Black-backed Woodpecker?

f. We could not determine how snag recruitment levels were estimated for either existing or logged old growth stands. Since snag levels were used to estimate project impacts on sensitive
7 species associated with cavity trees, DNRC needs to demonstrate that snag levels are based on some data. What criteria were snag recruitment levels estimated for unlogged and logged old growth stands?

8 g. Why is your citation of Thomas dated 1979 the best current science available for measuring logging impacts on cavity-dependent species? These snag guidelines are almost 20 years old.

9 h. What is the expected impact of the project on other old growth species, as the goshawk, Pileated Woodpecker, marten, Great Gray Owl, wolverine, and Boreal Owl?

0 i. What local research shows the lynx does not den at elevations found in the project area?

Cavity-Dependent Wildlife

1 Although the EIS admits "[m]ost of the Middle Soup Creek Project Area is low-elevation with gentle terrain, and western larch is a dominant tree species in many of the stands," and that [t]hese conditions are of very high value to many species of cavity dependent wildlife," the EIS makes no firm commitment to protect the few remaining snags. EIS, p. III-34 - 37.

All silvicultural treatments will make conditions worse, not better, for most cavity nesters. DNRC is apparently creating a new myth. "Habitat quality in areas treated with structural enhancement should not diminish due to treatment immediately post-harvest, and post-harvest habitat may improve in the long run." EIS, p IV-47. This is a blatant lie unsupported by scientific
2 research or by locally gathered data. "Over 897 acres, habitat quality should not change immediately post-harvest, and should improve in the long run." EIS, p IV-48. No citations appear in support of this delusion. Nor is it made clear how the 897 acre figure is calculated.

If "snags within about 200 feet of the road would be more vulnerable to removal by firewood cutters," it is reasonable to expect the EIS to calculate the total post-harvest number of snags
3 per acre. EIS, p IV-49. This was not done, despite the fact that the area has "substantially less" than the recommended number of snags in a highly fragmented forest landscape. If firewood cutters take those snags the loggers leave behind, how many will remain? This is not ecosystem sustainability.

Water Quality

4 The Water Quality Bureau should be consulted to determine if Cilly Creek and/or Soup Creek should be listed as a Water Quality Limited Stream (WQLS). Both streams are exhibiting characteristics making them prime candidates

Specifically, where are the "improperly designed stream crossings (sediment sources)?" EIS, p IV-50. Specifically, where are "additional drainage features" located and why isn't there an alternative designed for complete hydrologic recovery? *Id.* How about a map, and a clean-up plan that isn't tied to logging? DNRC
5 has over $300,000 to burn on MEPA "analysis," but no money to clean-up the messes made by past timber sale activity. Road obliteration is a reasonable alternative that was not considered, in violation of MEPA.

WATSED is no substitute for annual in-stream data. "The model does not account for point sources of sediment, so they are not reflected in the modeled sediment results." EIS, p III-40. Modeling does, however, show that the <u>Soup Creek Watershed and Cilly Creek both have sediment yields significantly "over natural" and that appears to be flushing into Swan Lake, a WQLS/TMDL (Total</u>
6 <u>Maximum Daily Load) waterbody</u> *Id.* <u>Unacceptable.</u> Emphasis added

The EIS shows clearly how inadequate BMP guidelines are at protecting water quality. If BMPs work, how is it possible that the following sediment source sites have persisted for so many

A-56 years without mitigation

> Two large culverts failing, three log bridges failing, inadequate surface drainage and erosion control, and two more collapsed log bridges. EIS, p III-40

The current situation is criminal. Logging should be suspended until all point sources of sediment are remedied and the native cold water fishery (cutthroat and bull trout) has fully recovered

A-57 The EIS does not analyze the impacts of burning on water quality. Wood smoke contaminating the airshed is thought to be a substantial contributing factor to higher phosphorus loading in Flathead Lake. <u>See</u> Stanford, et al., *Monitoring Water Quality in Flathead Lake, Montana, 1992 Progress Report.* Given the oxygen deficit in Swan Lake impacts from burning must be analyzed

A-58 The mere presence of a gate on a road is inadequate to produce a net reduction of sedimentation. Unmaintained roads with culverts still in place are *time bombs* on the landscape. "It is no longer enough to close roads by simply closing the gate or blocking the road. Specific techniques are available to successfully prevent road-and landing-related debris flows, to prevent or correct stream diversions (the leading cause of serious gullying in many areas), and to prevent stream crossing washouts, to prevent fill failures and to dewater gullies and landslides fed by road runoff." <u>See</u> Weaver and Hagans, *Techniques and Costs for Effective Road Closure*

A-59 A cumulative watershed effects analysis was not done for this project as required by the State Forest Land Management Plan.

Fisheries

A-60 A Mt. Dept of Fish, Wildlife and Parks progress report dated July 1996 discloses that 22 westslope cutthroat trout redds were found in Soup Creek. McNeil coring sampling during late winter/early spring, 1995 in Soup Creek was 34.2%. While this is slightly lower than 1994 sampling it is still near the threatened zone of 35% to warrant caution.

A-61 As indicated previously in regard to elk and white-tailed deer, fishing is another activity permitted by the issuance of a school trust lands recreation use license. Impacts from logging on the Swan River/Lake fishery also represents a decrease in revenues to local businesses and the state school trust in the form of recreation use license as well as property taxes. None of this was considered or addressed in the EIS

A-62 Analysis of effects on fisheries in Chapter IV is woefully inadequate. The EIS states that "SMZ's containing bull trout streams would not receive treatment under any alternative" but does not disclose how close to the streams logging would occur except to state that "cutting unit boundaries have been proposed <u>well away</u> from SMZ boundaries ..." EIS pg IV-54. Emphasis added. How far is that?

A-63 The EIS does not consider that westslope cutthroat trout is also a species of special concern in Montana and has become the focus of another state effort spearheaded by Governor Racicot.

Soil

A-64 The EIS acknowledges that skidding could negatively effect 17.5% to 20% of each cutting unit with 7.5% to 10% being severely impacted and 10% moderately impacted. EIS pg IV-58. Yet there is no cumulative effects analysis of land base compacted and/or negatively impacted from past roading and logging nor an analysis of how these negative soil impacts affect productivity.

Noxious Weeds

A-65 The EIS does not analyze the impacts of herbicides on groundwater, surface water or fisheries. The EIS discloses that the use of herbicides can be detrimental to listed sensitive plant species yet does not include measures to ensure that sensitive plant species are not impacted. The EIS also discloses that wildlife
A-66 could receive doses of herbicide by eating contaminated food yet does not analyze impacts to humans of eating game which may have
A-67 been exposed to herbicides. The EIS also does not analyze impacts to birds from exposure

Aesthetics

A-68 The EIS apparently dismisses the visual impacts of this logging project on pedestrians and hikers in Alternatives B, C and D. These people are the purchasers of recreational use licenses. Given the blocked ownership on the Swan River State Forest the state has an obligation to encourage revenues from recreation which can, over the long term, provide continuing income to the school trust. Aesthetic impacts must be analyzed in the EIS in the context of lost revenue to the trust.

Fire

A-69 The EIS does not cite any research to support the theory that management reduces fire risk. Some heavily managed forests have burned with greater intensity than unmanaged forests. The EIS also does not provide any data regarding how many fires have been suppressed over the years or past success of fire suppression. Not all fire suppression is successful yet all the projections in the EIS are based upon being able to suppress all future fires. In fact, this past summer many fires were <u>caused</u> by logging operations and slash piles

A-70 The EIS also does not recognize the beneficial effects of fire that cannot be duplicated by logging

Economics

A-71 The EIS does not account for lost recreational values as a cost
A-72 The EIS does not account for a reduced asset value from timber
cutting. The EIS is biased against the Conservation Lease by
A-73 ignoring recreational and wildlife benefits. It also passes along
the costs associated with the timber sale preparation, treatment
A-74 and administration. This has in effect, tripled the cost of the
conservation lease. The lease does not provide an opportunity for
A-75 lessees to recover costs of the lease through non-consumptive or
low-impact uses.

Cumulative Impacts

A-76 A component of the EIS that is noticeably missing is a cumulative impacts analysis for all of the above resource concerns. This timber sale is not occurring in an area without past impacts from logging and road building. MEPA requires an evaluation of cumulative (defined as: the collective impacts on the human environment of the proposed action when considered in conjunction with other past and present actions related to the proposed action by location or generic type) and secondary (defined as: a further impact to the human environment that may be stimulated or induced by or otherwise result from a direct impact of the action) impacts on the physical environment. There are none in this EIS.

Irretrievable Commitments of Natural Resources

A-77 The EIS does not disclose the irretrievable commitment of resources on direct education. The EIS does acknowledge "timber harvesting may ruin the opportunity to use existing old-growth stands as "outdoor classrooms" where the ecological uniqueness of old-growth forests can be studied." But no analysis of the impacts has been done.

A-78 Also the alternatives analyzed in the EIS forecloses on recreation opportunities and the ability to generate monies to the school trust from recreation. Especially on the Soup Creek Campground which is one of only two public campgrounds on the Swan River State Forest. The state is missing out on an excellent opportunity to generate school trust revenues

General

Throughout this EIS we are constantly reminded of the past practices which are causing current problems on the land. These include road densities that are in excess of scientific standards for grizzly bear and elk, roads causing sedimentation in the streams, river and lake which in turn have degraded the fishery, fragmentation of old growth which has impacted many species, compacted soils, and propagation and spreading of noxious weeds to name a few. It is time for the state to recognize the real costs of perpetuating these same activities that have caused the degradation to begin with and make an effort to remedy the past

problems without compounding them

We expect a response and full consideration of our comments, questions and concerns

Sincerely,

Arlene Montgomery

Arlene Montgomery

SOUP CREEK RANCH 23 Oct 96

P.O. Box [illegible]

SWAN LAKE, MONTANA [illegible]

Re. Middle Soup Creek Project

Dear Sir:

I have reviewed the Draft "Middle Soup Creek Project" Report and the Economic Analysis done by Tom Power (Sept. 96) As usual the State has produced a lengthy document with so much rhetoric and mumbo jumbo an average person or layman would not be able to understand it. You people have a way of complicating things beyond belief. If you read the Power's Economic Report it is simple and easy to understand. You must have spent a fortune on this study and it does not address whats really necessary for the health of the forest. After reading both reports and taking into consideration the school trust mandate. It's my opinion that the no Action Alternative is the best one and that something should be done to restore some of the problems

SOUP CREEK RANCH

P.O. Box [illegible]

SWAN LAKE, MONTANA [illegible]

Created by your past logging practices.

There are only two campgrounds on this State forest and your proposals to log in the area around one of them does not take into consideration the damage and impact it would have on Soup Creek Campground. Its time you people at State Lands look at how valueable these trees are standing and pay more attention to water quality and wildlife habitat. This State Forest could be a model for conservation and good sense management. It's time to start working with the people instead of against them, and I am more than willing to work with you on this.

Sincerely

Ron Bader

MONTANA WILDERNESS ASSOCIATION

October 23, 1996

Glen Gray
Swan River State Forest
Swan Lake, MT 59911

Dear Mr. Gray:

Thank you for the opportunity to comment on the DEIS for the proposed Middle Soup Creek timber sale. MWA's concerns relate to Watershed, Old Growth, Grizzly Bear and Silviculture.

WATERSHED:

The new State Forest Plan states that threshold values for cumulative watershed effects in the Swan River State Forest should be at a level that ensures protection of beneficial water uses. Soup Creek, which has already suffered from an increased sedimentation load due to past management activities in the area, is part of the B-1 classified Swan River Drainage. Streams with a B-1 rating should not be impacted by management activities that would cause an increase above naturally occurring concentration of sediment. Both Alternatives B and D would cause a 9 percent increase in annual sediment in Soup Creek. Is this 9 percent sediment increase considered to be within the naturally occurring range of annual sediment? If not, then Alternative C seems to be in the better interest of Soup Creek.

The "inadequate surface drainage and erosion control" on the spur roads in the project area was noted on a recent field trip. These problems should be fixed before the roads receive heavy use from logging equipment.

OLD GROWTH

A significant amount of Old Growth has already been taken out of the Soup Creek area in past projects. Alternatives B and D propose to take a considerable amount more of Old Growth from the area (and overall, the amount of MMBF proposed for cutting is close to double that of the proposed sale before the injunction.) MWA would prefer less Old Growth to be taken than what is proposed in Alternatives B and D. In light of the northwest's rapidly disappearing stands of Old Growth, MWA concurs with the DEIS that the Middle Soup area's Old Growth stands can serve as an "outdoor classroom" to Montana's students.

Keeping it wild since 1958

Montana Wilderness Association, Northwest Field Office
43 Woodland Park Drive, #9 Kalispell, Montana 59901
406-755-6304 [illegible]

GRIZZLY BEAR

It is our opinion that the Swan Valley Grizzly Bear Conservation Agreement does little to protect the grizzly and other wildlife, especially in light of Plum Creek's plans to sell low-elevation grizzly habitat in two of the four grizzly corridors in the Swan. In addition, Plum Creek has requested several access easements across federal roadless lands that are in prime grizzly bear habitat. In an attempt to mitigate for Plum Creek's carelessness with the vitality of the grizzly, the DNRC should do more than its share to protect the bear. Great care should be taken to ensure that grizzlies are not excluded from the proposed Middle Soup project area and further isolated in the Mission Mountains.

SILVICULTURE

One way to help ensure that the grizzly will not suffer increased mortality as a result of the proposed Middle Soup project is to forego clearcuts (moderate reserve - regeneration harvesting) and use only thinning and structural enhancement treatments. Using only thinning and structural enhancement treatments may also decrease the annual sediment runoff, especially if only 10 percent or less of the basal area is removed.

As is stated in the DEIS, "understory vegetation will be lightly disturbed" as a result of the thinning and structural enhancement. MWA wonders what care will be taken to ensure that the understory is no more than "lightly" disturbed.

Sincerely,

Susan LeValley
MWA Member

Jill Duryee
Northwest Field Representative

F.H. STOLTZE LAND & LUMBER CO.

Lumber Manufacturers
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October 17, 1996

Glen Gray
Swan Unit Manager
Swan State Forest
Swan Lake, Mt. 59911

RE: Comments on Mid-Soup Draft Environmental Impact Statement

Dear Glen:

C-1

I am writing to offer a few brief comments on the Mid-Soup Timber Sale Draft EIS. F. H. Stoltze bid on the original Middle Soup Timber Sale in November 1993, but we were not the successful bidder. The timber sale proposal described in your proposed alternative, Alternative B, is weak in terms of forest health and productivity. I feel that one of the major resource concerns stated in your Draft EIS was not addressed. I believe that mitigation resolving non-timber resource concerns has over-compromised timber productivity and the potential of timber production to support school trusts in both the short and long term. Even though this sale proposes to harvest almost twice as much timber volume as the original sale, it is harvesting this timber on over 4 times as many acres. Alternative D does far more in enhancing forest and productivity in both the short and long term.

C-2

Alternative B prescribes harvesting over 80% of the total sale acres in the structural enhancement sivicultural treatment which only reduces the basal area of stands by approximately 10%. This treatment proposes to harvest predominately shade tolerant understory species. By removing only 10% of the basal area, the state is doing very little to improve the spacing of the leave trees to enhance the health and productivity of these leave trees. Many of the old growth overstory trees are declining in health and vigor and on the verge of becoming decadent where mortality is exceeding growth. Old growth stands are important to eco-system health, but if this old growth is dying, shouldn't the state be making an effort to salvage some of this volume and value.

C-3

Old growth represents 50.5% of the project area which is above the estimated historical levels. Under Alternative D, stands classified as "old growth" will decrease by approximately 9%,

C-4

but under all the alternatives the stands classified as "old growth" are projected to decline dramatically because of the break-up and succession of seral species to their climax successors. This decline occurs just as dramatically in the no-action alternative as in the action alternatives. We need to be salvaging some of the mortality and recovering some value from this mortality. Alternative D harvests some of this old growth and recovers value from this timber. Alternative D also produces the highest net dollars revenue for the school trust.

C-5

I believe Alternative D should be the preferred alternative.

Thank you for the opportunity to comment on this proposal. I hope my comments are of some value in your decision making process.

Sincerely,

F.H. STOLTZE LAND & LUMBER CO.

Tom Tintinger
Forester

TT/hl

MID SOUP HEARING
October 3, 1996

Okay, my name is Tom Tintinger. I'm a forest for F H Stoltze Land & Lumber Company. F H. Stoltze Land & Lumber Company is the oldest family-owned sawmill in Montana. We've been struggling to try to find enough timber to survive on and keep us going. We have 33,000 acres of our own ground, but that 33,000 acres isn't enough to provide us a sustained yield of timber to keep our sawmill running, so these sales--like these state sales--are very vital to our survival. F H. Stoltze--I walked this original sale when it was sold in 1993, and Stoltze bid on it; unfortunately, we were not the successful bidder on this sale. After reviewing this EIS, the proposal that you have developed here--as to say on your Alternative B appears to be, in our minds, a lot weaker in terms of forest health and productivity. I feel that one of the major resource concerns stated in your draft EIS was not clearly addressed. I believe the mitigation--I believe that mitigations resolving non-timber resource concerns have over-compromised the timber productivity and the potential of timber production to support the schools trusts in both the long and the short term. Even though this sale proposes to harvest almost twice as much timber volume as the original sale, one of the proposed--or your identified proposal alternative is harvesting this timber on almost four times as much--on almost four times as many acres. Alternative D does far more--as we feel--in enhancing the forest health and productivity both in the short term and in the long term. Alternative B, which is your--I call your proposed alternative, which you've--recommended alternative, I guess is what it is--prescribes harvesting over 80 percent of the total sale acres in structural enhancement silvicultural treatment, which only reduces the basal area of the stands by approximately 10 percent. This treatment proposes to harvest predominantly shade-tolerant, understory species. By removing only 10 percent of the basal area, we feel the state is doing little to improve the spacing of the leave trees to enhance both the health and productivity of the leave trees. Many of the old growth overstory trees are declining in health and vigor, and on the verge of becoming decadent, where mortality is exceeding growth. Old growth stands are important ecosystem hel--are important in the ecosystem health. But if old growth stands are dying, we feel that the state should be making an effort to salvage some of the volume while it still has some value. Old growth represents 50.5% of the project area, which is above the estimated historical levels according to what the EIS says. Under Alternative D, stands classified as old growth would decrease by approximately 9 percent, but under all our alternatives the stands classified as old growth are projected to decline dramatically because of breakup of successional and serial species to the climax succession--successors, excuse me. So what I'm saying there essentially is that under all the alternatives, the old growth is going out, and in the next 50 years it's stated that the old growth will decline dramatically because it's past its prime and it's declining in successional stage. This declining occurs not just--occurs just as dramatically in the no action alternative as in the action alternatives. We feel you need to be salvaging some of the mortality, recovering some of the value from this mortality. Alternative D harvests some of this old growth and recovers some value in this timber. Alternative D also produces the highest net dollar value return to the school trust funds. We, as a company, would like to see Alternative D chosen as your preferred alternative. Thank you for the opportunity to comment on this project proposal, and I hope my comments were of some use to you.

I've been a resident here in this community for 50 years. My name is Don Beelenburg; I live up here on the corner as you come into Swan Lake. And anyway, 50 years ago, when I came in here, there was no road. All the lumber that went out of here was on--was milled lumber. You couldn't get a logging truck in here. In fact, on Devil's Elbow up there, if you met somebody, you--they'd have to back up to be able to get around, to negotiate to come into Swan Lake. Now that's 50 years ago. In that time, I've seen the lumber industry, the timber industry--if it wasn't for the logging in this area, there probably wouldn't be anybody in this room. I mean, I can see that irrevocably, because its just like the mining industry in--down at Butte, whether they did a good job or a bad job. Now I'd like to make this comment: I'm sure there's enough learned people, they go down to the factories in Bozeman and Missoula, and they spend the time and energy to find out the proper way to log and to harvest the timber in a good, rational manner. Now he came out just a moment ago and had some real learned figures. Now, why the opposition to the logging is so rampant, I haven't any idea. Now, we've had some bad practices, we've got some pretty good ones now. Why there isn't more endorsement--it provides income for the people. When I came to Kalispell, 50 years ago, the logging iodustry was the backbone of Hungry Horse Dam. In fact, when you look at the change in the society, we have an environmental society that's very strong right now. Now, whether the Sierra Club would like to stop logging, stop this and stop that, they've got a wolf over from the other side and drop it into Lost Creek. And that was just happening the other day. What the cost of that was, I don't know. But I do know that a good sustained yield io logging is fundamental; multiple use is a fundamental right that we should be practicing. To say no to these logging practices, when there's good candor--I'm sure that you've got well people that are presenting these logging sales, and they've done their research on them, and they're put out in proper perspective--why the opposition to them, I don't understand. I was at a meeting in Bigfork a few years ago, they had six people on the podium. They all had degrees. They're with the Forest Service. They had a pretty good program put out--now, when you multiply the years that they've had in college, and putting together to try to put a program together, I'm sure that they're trying to do the right thing. Now, maybe the logging practices aren't the best thing in the world, but I do know you've got a resource, we should capitalize on it, and the sustained yield program such as he advocated just a few minutes ago--this is a resource; you can go up Six-Mile right today and see that the timber's coming back. Well, it's--I cut down a tree the other day that had 80 years on it. When I came here, it was 30 years, it was a small tree. Well, if we've got a resource, we thould do it, and should harvest it, in good candor, and I'm sure we're going to make some mistakes on the way, but however we shouldn't say no. Now, that's probably my concluding remark.

Dan Hall of Bigfork Montana. I don't represent any agency or group, just as a tax-paying citizen. Of the four alternatives, I believe that Alternative A, the no-action, is unacceptable because it does not meet the school trust mandate. Alternative B and D both harvest just under 6 million board feet in different types of treatments, and I believe personally that either one of those alternatives are feasible. And I would feel comfortable with the decision maker's findings if either one of them were selected. Alternative D--or (I'm sorry) C, old growth preservation, it only harvests about 150,000 board feet. That's really equivalent to about 20 truckloads of logs. Over half that volume is going to be helicopter log, and I--personally, I feel it's not economically feasible to do that, and if that alternative was selected, I don't think the sale would be sold. I don't think you would get a bidder. That's all I have to say. Thank you.

A-1
Response:
The Record of Decision for the State Forest Land Management Plan (Plan) states that DNRC would phase in implementation of the Plan. The Record of Decision specifically states: "On all projects that have already gone through the MEPA public scoping process, we (DNRC) won't require that all elements of the Plan be implemented."

In the Middle Soup Creek Project, public scoping and alternative development and analysis occurred prior to DNRC's adoption of the Plan and therefore this project was not required to implement all elements of the plan.

However, of the four alternatives presented in the Draft EIS for this project, the preferred alternative, Alternative B, comes closest to meeting Plan philosophy. Alternative B meets Plan standards for road management, watersheds, fisheries, threatened and endangered species, big game and weed management. We used a of coarse-filter analysis supplemented by a fine-filter species specific analysis for affected sensitive species.

This Project does not entirely meet Plan silvicultural standards for assessing the financial value of the treatments. This project relies upon our forest economist's best professional judgement to estimate returns at the alternative level rather than the stand level.

The grizzly bear analysis was completed before the SVGBCA was adopted. Analyses motorized access, security habitat, hiding cover and seasonal habitats follow methods accepted by the US Fish and Wildlife Service in the development of Amendment 19 for the Flathead National Forest Plan. This guidance meets or exceeds cumulative effect thresholds and other requirements established by the SVGBCA.

A-2
Response:
DNRC is required by state law to comply with the Montana Environmental Policy Act (§ 75-1-101, MCA) for the purpose of determining, by using a systematic, interdisciplinary approach, what the impacts of our activities may have on the quality of the human environment. Naturally, it takes time and resources to adequately analyze impacts and address issues raised by the public. However, we believe in the intent of this law, in that it helps us make good decisions and assists the public in better understanding state policies and activities. We feel we have done our best in keeping the public informed of our progress and completing this EIS in as timely and cost efficient manner as possible.

A-3

Response:

Given the lack of specificity in this comment, our response is general. All concerns raised during scoping were carefully considered by the ID Team. DNRC believes it has adequately and each concern has been directly analyzed within the EIS.

A-4

Response:

The Administrative Rules of Montana (ARM) which govern DNRC's implementation of MEPA define alternative as "an alternate approach or course of action that would appreciably accomplish the same objectives or results as the proposed action" (ARM 26.2.642(2)(a)(I)). The alternatives in this project were designed to meet two goals: (1) to meet the project objectives identified on Page I-3 of the DEIS: and (2) to address the issues that were identified through the scoping process. DNRC believes the proposals for both the timber sale and the conservation lease meet the MEPA requirements of providing a reasonable range of alternatives.

A-5

Response:

Chapter III of the EIS clearly lays out the current forest landscape within the Ecosystem Sustainability Analysis Area (ESAA) and, where appropriate, the Swan River State Forest (SRSF). Individual stands were mapped and classified according to age class and timber type, then grouped according to similar ages and type to produce a map of the forest landscape. Edge-to-mature-forest-interior-core-relationships, total area, and total mature forest interior core analyses were produced and compared to the most recent research on historical landscape patterns in the Swan Valley. This analysis focuses on relating current forest landscapes within the ESAA to broader historic landscapes with the idea of managing the SRSF for a desired future condition characterized by the proportion and distribution of forest types and structures historically present on the landscape. This is consistent with the Philosophy of the State Forest Land Manage Plan.

A-6

Response:

Our understanding is that large animals like bears and small ones like rodents perceive their habitats differently and consequently function at different spacial scales. This does not necessarily mean that the appropriate scale for analysis is the entire species range (e.g. 50,000 mi^2 for grizzly bears cited in the comments). Any species distributional range encompasses numerous distinct populations that are self sustaining at much smaller spatial scales. Exchange between populations maintains a certain level of genetic diversity and is critical to conservation of rare or dwindling species. None of these concerns relates to determination of appropriate ecosystem size.

An ecosystem is defined in nearly every technical work on the topic as the combination of abiotic (none-living) and biotic (living) components existing within a defined space at a given time. The definition is nebulous and focuses on process (energy transfer and nutrient cycling) within the ecosystem and not its boundaries. Operationally, many ecologists define an ecosystem as a geographical unit that contains self-sustaining biological communities and their resources within its boundaries; it requires no additional inputs except for solar energy and water. Transport of nutrients or movement of organisms in and out of the ecosystem is possible and expected, but is not a necessary requirement for a functional ecosystem. Secondly, we realized that the feasibility of completing the study diminished greatly at scales much larger than the Ecosystem Sustainability Analysis Area (ESAA).

During analysis of potential harvest sites, we considered connectivity of the old-growth and mature forest interior core habitats within the ESAA analysis area to adjacent forest. We were principally concerned with long distance movement of animals, such as might be expected with large species such as bears, lynx, and mustelids. We mapped practical limits to major north-south and east-west travel corridors and examined alternatives within the context of the sustained viability of those corridors on the watershed level. Fortunately watershed level analysis relies on natural biological boundaries that typically encompass functional ecosystems. We defined an ecologically sensible ecosystem boundary and also considered broader ecosystem effects in performing our analysis. The scales were reasonable and relevant to the animal populations that exist within the Swan Valley.

A-7
Response:
Your comment is correct. Thus we developed an alternative for timber harvesting (Alternative B) that responded to the need to maintain the integrity of those forest characteristics needed by many species dependent upon old-aged stands (e.g., coarse woody debris, large snags, etc.). Recognizing that the Middle Soup Creek Project Area lies in close proximity to the Bob Marshall Wilderness allows this region (the wilderness) to serve as an important refugium for species that may use the SRSF.

A-8
Response:
We agree that logging does not produce identical effects to those arising with complete lack of disturbance (which if implied by the commentor's use of the term "refugia"). However, old-growth stands that potentially lend themselves to structural enhancement treatments are hot maintained indefinitely in the absence of disturbance. In fact, we believe that er can prolong the persistence of many of the old-stand characteristics which vertebrate species rely on n by applying such treatments as proposed under Alternative B.

As it stands now if the Middle Soup Creek Project Area were left totally undisturbed the stands which now have "old growth" characteristics important to wildlife would lose these in subsequent years as these stands progress in age. Other younger stands would not attain this stage of development for 50 to 100 years or more. Alternative B is proposed as a means of lengthening the time over which the older aged stands are retained as to allow younger aged stands to reach this stage and serve as a replacement for these desired forest characteristics.

Alternative B was also developed with the thought in mind to decrease the overall fragmentation that is apparent in the current stands and to allow larger blocks of land to develop at a similar stage of stand structure so that the fragmentation problems are significantly lessened.

The older aged stands (cores and corridors) really do not function effectively as refugia for many species because the fragmentation that presently exists is so extensive and since they are too small to support these species. Only by increasing the size can these stands then function in this manner. These stands can only increase in size by bringing other stands up to their approximate age with similar stand characteristics. Such changes would only happen with the management of both older aged stands and adjacent younger stands appropriately. In other words, prolong the older aged stands by effectively opening up some of the stands, setting them back slightly successionally, while allowing adjacent stands to catch up. In turn larger, more contiguous stands of older age are created. Stand successional progressions are extensively described in Chapter IV and Appendix F.

A-9

Response:

The term "old growth" is not well defined, nor consistently defined in the literature. "Old growth" ponderosa pine stands are a different age than are "old growth" stands of Douglas fir or lodgepole. "Old growth" stands along the west coast may be a thousand years old; age is simply not an adequate indicator of an old-aged stand. It is much more appropriate and meaningful to try and describe the characteristics which a stand possesses; descriptive terms such as "mature', "nonvigorous, over-mature" etc. better describe the state of the forested stand. The term "old growth" conjures up an image of thousand year old red wood stands; it is so poorly used and defined in the literature as to be of any use to the public or professional alike. It is confusing because a stand does not have to be 200+ years old to possess "old growth" characteristics; large snags, dead down woody material, etc. For the purposes of this project, old growth was defined to provide a common context for understanding the project area. The definition of old growth for the Middle Soup Creek EIS is found in the glossary.

A-10

Response:

This comment correctly states that the Middle Soup Creek Project Area has less than the recommended amount of coarse woody debris for pileated woodpeckers and may appear to be marginal for marten (page III-37). It also states that both species are found in the project area and that the minimum amount of coarse woody debris necessary to meet habitat requirements of all old growth associated species is not known.

The comment incorrectly implies that there are low numbers of large diameter snags. Rather, the DEIS states (page III-36) data " indicates that there are adequate numbers of snags and large diameter snag recruits to support healthy populations of cavity-nesting birds."

A-11
Response:
It is precisely for this reason that an ecosystem sustainability alternative was developed; one in which an attempt was made to allow highly fragmented sections of land to mature and be incorporated by adjacent, similarly aged stands so that overall fragmentation would be reduced.

A-12
Response:
"Old-growth" dependent species require certain characteristics from their habitat, most of which are similar among these various species. All of these species need these important characteristics of older stands. If we develop management strategies that will maintain large, dead snags (as Alternative B does) we have provided this characteristic for all of these species. We believe that our approach, focusing on processes and patterns, is more reliable and credible than one which attempted to analyze effects on a large number of individual species, in part, because existing information is simply insufficient to predict exactly what is needed for each. This is a necessary analysis method since there is not enough information available for many species to understand what is specifically needed. We feel it is more appropriate to try and protect many characteristics which are known to be needed for a large number of species.

A-13
Response:
The DEIS did not include specific subheading that identified the cumulative or secondary impacts of resources. However, that information was not missing. Rather, it was embedded with the discussion of the baseline information in Chapter 3 and the impacts to resources in Chapter 4.

Chapter 3 of the DEIS included in the discussion of affected environment the baseline information of the present status of each resource. The present status of a resource includes any past human and/or natural activity that have influenced the resource to its current state. In the Final EIS, we have clarified this point in the Introduction of Chapter 3.

The discussion of impacts due to present actions and related future actions under concurrent consideration by any state agency was first discussed on page I-13 of the DEIS. In that discussion, we identified a concurrent project. the South Fork Lost Creek Project that would be evaluated for cumulative effects in conjunction with the Middle Soup Creek Project. Later, in Chapter 4, the discussion of cumulative impacts was included within the text for each resource. However, we acknowledge that since this information was embedded, it may have been difficult for the reader to identify. We have clarified this information by providing subheadings which specifically identify the cumulative impacts discussion for each resource that may be affected by a known concurrent project.

A-14
Response:
For this project, DNRC is not targeting old-growth species for management. Instead, we are managing for the attributes which nearly all old-growth species require. In this way, we feels that we are proactively managing for all species that may be (even unknowingly) dependent on old growth.

A-15
Response:
DNRC is not required to evaluate or define a specific landscape program for old growth with the Middle Soup Creek Project. Instead, three different approaches for the management of old growth are proposed to resolve issues identified through scoping. We believe we have adequately analyzed all known impacts (including cumulative impacts) anticipated for old growth and old-growth dependent species within Chapter IV.

A-16
Response:
We believe that an adequate assessment for sensitive species was presented in the DEIS. A coarse-filter approach was used to look at how the project would affect attributes important to old-growth dependent species. Alternative B (preferred alternative) was specifically designed to maintain or prolong attributes that are important to the maintenance of old-growth dependant species. The coarse-filter approach was supplemented by a fine-filter approach for species of special concern (western big eared bat, fisher, lynx, black-backed woodpecker and bog lemming).

A-17
Response:
The EIS has clearly defined old growth for the Middle Soup Creek Project in the glossary. The definition contains the criteria used by DNRC to identify stands as old growth. DNRC believes that the effects of structural enhancement harvesting on stand character are adequately covered in Chapter 4.

A-18

Response:

DNRC identified old-growth stands with the Swan River State Forest Stand Level Inventory. Specific criteria are identified in the EIS on pages III 18 and 19 and in the glossary under old growth. DNRC believes it has used the best information reasonably available to identify old growth for this analysis.

A-19

Response:

DNRC did not use the Forest Service's criteria for identifying old-growth stands. Our methodology, as described in the EIS, is appropriate for state land in this project.

A-20

Response:

The information requested in this comment would require us to complete an extensive timber cruise specifically designed for each alternative. This would add to the time and cost involved in the preparation of this document, as pointed out in your earlier comments (A-2). However, we did complete some computer modeling from the original cruise data taken during the Middle Soup Creek Timber Sale and Environmental Assessment. The results indicate that an average stand where structural enhancement harvesting may occur contains about 129 trees per acre of trees greater than 7 inches DBH with an average basal area of 180 ft^2. Harvesting would remove about 18 trees per acre. The following table approximates DBH ranges and species composition of harvested trees and represents only a modeled approximation of what structural enhancement harvesting may remove on an average acre.

DBH Range for Trees Harvested
8 trees @ 7-10" DBH
2 trees @ 11-14" DBH
5 trees @ 15-18" DBH
3 trees @ 19-21" DBH
0 trees > 22" DBH

Species Composition of Trees Harvested
33% Douglas-Fir
28% Grand Fir
17% Subalpine Fir
17% Engelmann Spruce
5% Western White Pine

A-21

Response:

We believe that structural enhancement harvesting would not affect existing character or criteria used to define old growth for this analysis. DNRC has defined criteria for its old-growth analysis in the glossary under old growth. Structural Enhancement harvesting is mainly designed to enhance the vigor and health (to prolonging existence rather than increase abundance) of large dominant shade-intolerant species (defined in the glossary) through understory thinning to reduce moisture and nutrient competition. Harvesting specifically targets shade-tolerant species (defined in the glossary). All live trees with broken boles, large down woody material, and dead, standing trees that do not qualify as hazards under OSHA regulations would be retained.

We Believe that structural enhancement harvesting would not affect existing old-growth stand character. Therefore, collecting and presenting such requested tabular data would be unnecessarily time consuming and costly.

A-22
Response:
Structural enhancement harvesting does not improve old growth but primarily prolongs the existence of an important structural characteristic of old growth, large dominant shade-intolerant species. Most silvicultural textbooks will confirm that tree vigor and health are improved when competition for moisture and nutrients are reduced.

A-23
Response:
Generally, trees targeted for harvest under structural enhancement would be trees that normally experience mortality (due to thin bark and crowns low to the ground) if a low intensity ground fire occurs beneath them (subalpine fir, grand fir Engelmann spruce, western red cedar, understory Douglas-fir). These trees are usually occur within the understory structure of the stand. Age and DBH would vary greatly depending on when the last fire occurred within the stand. Some shade-intolerant species would also be removed to improve spacing and extend the presence of other healthy, shade-intolerant dominant and codominant trees.

A-24
Response:
Existing stand structures within old growth in the project area are not necessarily measured as "good" or "bad." Rather, they do not reflect what would naturally occur if fire were allowed to play its natural role. Shade-tolerant species are beginning to dominate both the understory and overstory in increasing densities. Large overstory shade-intolerant species are beginning to lose their vigor and are at risk of being slowly removed as a component (important to old-growth dependant species) of the stand structure. Increased stand densities, especially in the understory, put stands at risk of high intensity stand replacement fires. Historic structural and compositional changes are described further on III-6 of the DEIS. Structural enhancement harvesting within these stands would be a step taken toward restoring historic structure, species composition and density without the use of fire.

A-25
Response:
The Middle Soup Creek DEIS does not intend to portray old growth as self-destructing over time. However, it does portray the character of old-growth changing due to natural forest succession. In a stand without major disturbance over a long period of time, the seral overstory begins dying, overhead canopy declines, and the climax dominants begin to take over the stand. Although the stand may maintain some of the characteristics of old growth (e.g., abundance of snags and down-woody material) it lacks others (high canopy coverage of large-diameter shade-intolerant overstory dominants, snags composed of seral species) that are important to many wildlife species.

A-26
Response:
See Response A-24.

A-27
Response:
No specific alternative or silvicultural treatment is given here to help guide the response. For Alternative B (Preferred Alternative), moderate and heavy reserve regeneration harvesting is not intended to retain stand old-growth characteristics, but rather to reduce existing fragmentation (create larger patch sizes) by placing acreage into age/size class categories more consistent with surrounding stands. Structural enhancement harvesting is not considered a regeneration treatment and its effect on old-growth character is discussed in Response A-21. Alternatives A&C do not harvest within old growth. Alternative D uses regeneration treatments within old growth, but the primary focus of the alternative is optimizing timber productivity, not maintaining old-growth character.

A-28
Response:
Gaps usually occur naturally as light intensity ground fires kill shade-tolerant species in the understory (see Response A-23) and some of the less fire-resistant shade-intolerant species in the overstory. This promotes the persistence of large shade-intolerant species, important to old-growth dependant species, in the overstory (see Response A-22). It is unlikely that fire would be reintroduced into these stands. Fuel loading from past fire suppression efforts make these areas a high risk for catastrophic stand replacement fires. Successional trends in the analysis area indicate that without fire stand densities of shade-tolerant species would continue to increase and eventually crowd out shade-intolerant species.

A-29
Response:
If disturbance continues to be excluded from these old-growth stands forest succession would continue. Shade-intolerant species would be replaced by shade-tolerant species. Structural enhancement harvesting is intended to simulate fires natural role in this disturbance process. The idea is to prolong the existence of shade-intolerant species in the overstory so that these trees can become larger, increasing their value to old-growth dependent species and emulating a more historic stand structure.

A-30
Response:
Regeneration would not be promoted by structural enhancement harvesting. Site preparation for seedling establishment would not occur. Shade-tolerant species would eventually reestablish in the understory. Health and growth in the overstory would be improved over a long period of time until understory densities again affected stand vigor.

A-31
Response:
The DEIS does not imply that snag recruitment would increase with structural enhancement harvesting within old growth. The DEIS does state that structural enhancement harvesting maintains the dominant shade-intolerant species (preferred by cavity dependant species) in the overstory for possible future recruitment as snags. Also, the prolonged existence and improved vigor of these trees would improve potential snag attributes (i.e. size, potential for decay ...) important to old-growth dependant species.

A-32
Response:
The Record of Decision for the State Forest Land Management Plan states: "In the foreseeable future, timber management will continue to be our primary source of revenue and primary tool for achieving biodiversity objectives."(ROD-2, 1996) Net income to schools gained from the sale of recreational use licenses throughout the entire state is projected at about $200,000 for 1995/96. If it is assumed that income is proportioned according to the percent of total Trust land holdings, the Middle Soup Creek Project Area's share of that income is approximately $100. Alternative B (preferred alternative) would net approximately one million dollars from the project area for schools. In this case, it is clearly not in DNRC's best interest as trust managers to manage entirely for recreational use.

The majority of the effects relating to recreation are discussed under Aesthetics (page IV-62 of the DEIS). Careful consideration was given to the possible effects on recreational use of Soup Creek Camp Ground. This issue is discussed in Chapter I (page I-8).

A-33
Response:
During public scoping, preservation of old-growth forests for possible future use as outdoor classrooms was identified as an issue. DNRC identified the main issue as the preservation of old growth and developed Alternative C primarily to address this issue. Also, DNRC has completed an extensive analysis of possible effects to old growth by all alternatives in the vegetation section of Chapter IV.

A-34
Response:
DNRC has established an extensive stand level inventory system for the Swan River State Forest. That system contains unique information about every stand on the Swan River State Forest. DNRC has used this system to determine stand character and condition and believes it is relevant and reasonable for the Middle Soup Creek analysis. DNRC has not "assumed" or "guessed" stand character and condition. Thus, the information used in the analysis is based on hard, factual, relevant data.

A-35
Response:
Grizzly bears were placed in the "Other Resource Concerns" section of Chapter I because mitigations for grizzly bear concerns were decided to be the same for all action alternatives. Placement of resources in this category reflects only how they affected the alternative development process and does not indicate an assessment of the importance of these resources.

A-36
Response:
The IGBC NCDE Interim Motorized Access Management Recommendations (March 8, 1995) state that "This direction is to be implemented throughout the NCDE recovery zone on Federal lands and for projects on tribal lands requiring National Environmental Policy Act compliance". State trust lands are excluded from numerical targets for Total Motorized Access Route Density, Open Road and Open Motorized Trail Route Density and Percentage of the Analysis Area [BMU subunit] in Core Area/s by Recommendations #1, #2, and #3, respectively. IGBC NCDE Subcommittee Recommendation #4 states that in subunits containing State trust lands a strategy to manage access parameters be cooperatively developed. Subsequently, DNRC cooperatively developed the Swan Valley Grizzly Bear Conservation Agreement which establishes guidelines for grizzly bear habitat management in the Swan Conservation Area which includes the Middle Soup Creek Project Area.

A-37

Response:

Recently published scientific literature (Mace, R., J. Waller, T. Manley, J. Lyon. *Relationships among grizzly bears, roads, and habitat in the Swan Mountains, Montana.* J Applied Ecology, in press) does not recommend a total road density standard although they do document that total road density on multiple use lands of < 6.0 km/km^2 differentiates areas used by female grizzly bears from unused areas.

As stated above, interim numerical targets recommended by the IGBC NCDE Access Task Group for Total Motorized Access Route Density, Open Road and Open Motorized Trail Route Density, and Percentage of the Analysis Area in Core Area/s are directed towards Federal and Tribal lands. The Swan Valley Grizzly Bear Conservation Agreement (SVGBCA), cooperatively developed as recommended for State trust lands by the IGBC, establishes a maximum open road density of 33 percent greater than 1.0 $mile/mile^2$ for BMU subunits in the Swan Conservation Area. The existing open road density for the Bunker Creek BMU is 34 percent; all action alternatives reduce open road density to 28 percent. Guidelines for Total Motorized Access Route Density and Percentage of the Analysis Area in Core Area/s are omitted in the SVGBCA.

"Take", as it pertains to grizzly bear habitat modification, has been defined only with regard to Section 7 of the Endangered Species Act and not in regard to Section 9 (i.e., habitat management responsibilities of non-federal entities). The Proposed Middle Soup Creek Project is in compliance with applicable habitat management guidelines, including motorized access.

A-38

Response:

Temporary spur roads C, D, E, F and G, totaling 0.5 miles in length would be obliterated at the completion of logging through revegetation and slash obstruction. These will be discussed in Appendix D of the FEIS.

Roads restricted by gates or barriers, as identified in the Middle Soup Creek Project EIS, are in compliance with the SVGBCA definition of an "Active Subunit Restricted Road". The efficacy of gates to accomplish access restriction goals is a valid concern. Siting and strength of barriers and subsequent maintenance and monitoring are important considerations if gates are to accomplish stated goals. These are, however, matters of implementation and do not detract from the potential value of gates to mitigate the adverse effect of motorized access on grizzly bears.

A-39

Response:

Analysis areas and techniques for describing road densities are different for elk and grizzly bears reflecting differences in research design and analytic methods. It is inappropriate to extrapolate modeled effects of roads on elk habitat effectiveness to grizzly bears.

All action alternatives reduce the percent of the Bunker Creek BMU with an open road density greater than 1.0 mile/mile^2 to 28%. The Biological Opinion on the SVGBCA (U.S. Fish and Wildlife Service, 1995) states that if guidelines in the SVGBCA are adhered to, impacts to grizzly bears by open road densities less than 33 percent are within acceptable levels.

A-40
Response:
In the NCDE, but outside of the Swan Conservation Area, the strategy of ±5,000-15,000 acre displacement areas and activity scheduling (the '3 and 7 rule') was replaced by IGBC recommended guidelines employing a moving window generated estimate of open and total road densities and security core area[s] applied to ±50,000 acre BMU subunits. Since grizzly bear habitat analyses for the Middle Soup Creek Project were completed prior to the effective date for the SVGBCA, IGBC recommended analysis techniques for assessing grizzly bear habitat were used to describe the existing condition and effects of alternatives. The '3 and 7 rule' is no longer a recognized or appropriate strategy for grizzly bear habitat management in the NCDE. Hence, there is no mention of the '3 and 7 rule' in Chapters 2, 3, or 4 of the EIS.
As stated in Chapter 1 of the EIS, future analyses and management of grizzly bear habitat in the Swan River State Forest will follow the SVGBCA. Displacement of grizzly bears by human activity is managed in the SVGBCA by open road density limits, linkage zone management, timber harvest guidelines, and rotation of commercial activities among BMU subunit. The '3 and 7 rule' is not recognized in the USFWS Biological Opinion on the SVGBCA as a mitigative measure for grizzly bear displacement.

A-41
Response:
Seasonal restriction of human activity and motorized access in preferred grizzly bear habitats may be one of the most effective methods to coordinate human and grizzly bear use of a specific area. Winter logging is a conservative approach, assuring that grizzly bear displacement does not occur during any portion of the non-denning season.

A-42
Response:
It is assumed that standards for elk habitat would also be adequate for mule deer. This will be made clear in the FEIS.

A-43
Response:
Deer are a disturbance adapted species; they prefer a mosaic of patches of forage with cover nearby. Elk are grazers; they used grass that does not grow well under forest canopies. Past

management for deer and elk production promoted the idea of many dispersed clearcuts, and is responsible for much of the landscape fragmentation existing today. Management for elk produced the 100 m wide clearcut strips prevalent throughout the Swan Valley. Deer populations have increased dramatically under timber management practices and the Swan Valley has some of the highest deer populations in Montana.

Habitat potential for deer and elk in the analysis area is currently 50% of optimal due to open road densities and inadequate forage areas (EIS, III-31). The two ways to increase elk habitat potential would be to: (1) decrease open road density or somehow limit public use of these roads, which would be incompatible with high recreational use of the area, or (2) increase forage areas by harvesting more acres with regeneration type methods, which would be at the expense of old growth and mature forests. There are tradeoffs in any management plan

We believe that this project would not change existing deer and elk habitat quality. Therefore, we anticipate no changes in use of the area for hunting.

A-44

Response:

Published studies from Minnesota and Wisconsin (which described the 0.9 mile/mile^2 threshold) caution that different thresholds may apply in different areas. Wolves are not adverse to roads, per se, and often travel on them. The correlation between road density and wolf mortality is influenced by the number and attitude of people utilizing roads. Minnesota and Wisconsin roads in wolf habitat exist in the context of a higher human population with more permanent residences (primarily farms) than in western Montana. Three wolf packs have persisted (recruiting pups in $\geq$ 2 seasons) in highly roaded, managed landscapes in western Montana suggesting that a different threshold may exist in the northern Rocky Mountains than the upper Midwest.

A-45

Response:

Analyses for the Middle Soup Creek Project rely primarily on existing scientific literature and professional opinion. The available information suggests that the project area would not provide suitable nesting habitat for boreal or flammulated owls. To conduct surveys to see if possibly they could inhabit the project area would be costly and time-consuming ~~a waste of resources~~, and while surveys can demonstrate presence of a species in an area, they can not prove that a species could not use an area. Information on impacts of logging on boreal owl foraging habitat was based on a phone conversation with Jim Reichel, MT Natural Heritage. Other information on boreal and flammulated owls was obtained primarily from Hayward et al. 1994.

A-46
Response:
It is a well documented fact that logging can have severe effects on habitat for black-backed woodpeckers and fishers. The DEIS makes no generic conclusions that logging enhances old growth characteristics for the fisher and black-backed woodpecker. Conclusions on effects are limited to the particular actions proposed in this project. The DEIS says that the proposed project should not impact black-backed woodpeckers because fire suppression and harvesting insect infested trees are not part of this project (DEIS page IV-45). It also says that fishers should not be impacted by logging methods that do not individually harvest large mature trees, reduce the total amount of late-successional forest, or increase fragmentation (DEIS page IV-44). Logging, as proposed in the preferred alternative, should not negatively affect fishers or black backed woodpeckers.

A-47
Response:
Availability of snag recruits depends ultimately on the quantity and characteristics of the standing trees, which in this case are represented by the data on overstory trees shown in Table 3.13 in the DEIS, page III-36. Precise rate of recruitment cannot be predicted because it is affected by several unpredictable factors, including insect and disease infestations, fire, natural mortality, and loss to windthrow and fire-wood cutters.

A-48
Response:
The Thomas 1979 publication was used because it is a well-known, easily-accessible source that has information that is still useful and considered reliable. It attempts to quantify the number of snags, by size class, needed to support populations of cavity dependent species in different forest types. This publication is not the best available science for looking at the impacts of logging on cavity dependent species, but that is not what it was used for.

A-49
Response:
Most of these species were analyzed with the coarse-filter approach. The approach is discussed extensively in the DEIS page III-33. The effects for pileated woodpeckers are discussed under cavity-dependent species (DEIS page IV-46).

A-50
Response:
For lynx, as for most all other species, "local" research pertaining to habitat requirements "in the project area" is lacking. Managers can, and must. make inferences about likely patterns of habitat use from studies conducted in other areas; ideally, inferences are made from the studies in the most similar habitats to those in question. The most up-to-date, comprehecsive compilation

of lynx habitat requirements (Ruggiero et al. 1994, "American Marten, Fisher, Lynx and Wolverine in the Western United States, USDA Forest Service GTR RM-254) suggests that, "Lynx occupy habitats ... above 1,463 meters (4,800 ft.) ... in western Montana."

A-51
Response:
The DEIS (pages II-2 through II-5) does commit to retaining all dead, standing trees that do not qualify as hazards under OSHA regulations. This commitment is made for each silvicultural treatment.

A-52
Response:
Structural enhancement harvesting does not improve existing habitat quality but primarily prolongs the existence of important habitat characteristics important to old-growth and cavity-dependant wildlife (maintenance of: large dominant shade-intolerant species, historic structure, large snags and coarse woody debris). The primary long-term advantage of this treatment would be to help large trees grow larger by reducing moisture and nutrient competition. Further logic and rational for this silvicultural treatment is thoroughly discussed under Silvicultural Treatments (page II-1) and Vegetation (page IV-1).

The 897 acre figure will be changed to 832.7 acres in the FEIS. This is the number of acres treated with structural enhancement under Alternative B.

A-53
Response:
We do not anticipate the number of snags per acre to change substantially between pre-harvest and post-harvest. All treatments commit to retaining all dead, standing trees that do not qualify as hazards under OSHA regulations. It is impossible at this time to predict which snags may be removed as hazards, but the numbers are anticipated to be low. No new roads would be accessible to firewood cutters. Therefore, access to snags by firewood cutters would not increase. Cutting firewood in the project area would be prohibited during project implementation and this would be monitored during project administration.

A-54
Response:
Soup and Cilly Creeks are not listed in the 1994 305(b) Water Quality Report as threatened or impaired, nor is either creek listed in the 1996 draft 303(d) list or the 1996 update submitted by the US Forest Service proposing additions to the 303(d) list.

A-55

Response:

No map is currently available with the location of proposed stream crossing rehabilitation sites. A map would become available with the timber sale contract. There are four crossing sites and they are all located on Soup Creek: 1) an old highway bridge just above the Soup Creek Ranch, 2) wood stringer bridge 1.7 miles above the junction of Highway 83 and Soup Creek Road, 3) wood stringer bridge 2.4 miles above the junction of Soup Creek Road and Soup Creek Canyon Road, 4) wood stringer bridge 2.9 miles above the junction of Soup Creek Road and Soup Creek Canyon Road. The additional drainage features in question refers to standard drain dips and ditch relief culverts on open roads, and to water bars and slash filters on road segments proposed for closure.

Upon completion of harvest activities, cull logs and root-wads would be placed on spur roads accessing harvest units would be reclaimed in such a way as to make the road generally impassable to motorized vehicles. These roads would also be revegetated with grass.

We believe we have complied completely with MEPA. Through scoping we hace identified issues that drove development of different alternatives for meeting our project objectives.

A-56

Response:

As stated in the DEIS, page III-38, part 4, WATSED analysis, "Water yield and sediment yield values should not be considered as absolute quantities; rather, they should be used to compare the relative differences between the effects of activities." The sediment yield values generated in WATSED are percentages over an estimated natural sediment load generated by the model. This baseline is not based on actual field data, but on watershed characteristics such as soil type and watershed size. As stated in the DEIS, the repair of existing point sources of sediment, which WATSED is unable to account for, is expected to further reduce sedimentation to Soup Creek from the current condition (page IV-54, 55).

A-57

Response:

DNRC is an active member of the working group developing the Total Maximum Daily Load (TMDL) for the Flathead drainage, including Swan Lake. The TMDL effort is proceeding toward recommendations for a voluntary nutrient reduction strategy. As of yet, this strategy has not been finalized. Once the strategy has been finalized, DNRC intends to fully comply with the recommendations on nutrient reduction from all sources, including burning. In the interim, burning for the Middle Soup Creek Project will follow the mitigation measures found under Air Quality in Appendix D (page D-3).

A-58

Response:

Gated and closed roads reduce effects of sedimentation in two primary ways. First, the restriction of traffic prevents the formation of ruts which transmit sediment down roads. Secondly the lack of motorized traffic allows for faster and more complete revegetation of the traveled surface of the road by grasses and other ground cover species, which greatly reduces the amount of sediment generated by raindrop impact. In addition, under current standards, roads are no longer abandoned or closed without first ensuring that they have adequate ditch relief and surface drainage. Closed roads would meet open road BMPs as a minimum with standard drain dips and/or conveyor belt water diverters at standard spacing, and may have water bars and slash placed in additional areas to provide additional surface drainage. Drainage structures would be evaluated periodically to ensure effective operation.

A-59

Response:

A cumulative watershed affects analysis was completed for this project using the PC version of the R1WATSED computer model, as stated in Chapter III (pages III-38-40)and Chapter IV (pages IV-52-55). The WATSED computer model takes past, present, and projected future activities such as timber harvesting and road construction and estimates the effects of water yield increases and sediment delivery when compared to a baseline set by the model.

A-60

Response:

This comment correctly states that Soup Creek is near the threshold value of 35% fine material which constitutes threatened status for westslope cutthroat trout habitat according to the Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Report. There has been a slight decrease in fine material in the past year. However, as a standard operating procedure and as a precautionary measure, each of the proposed action alternatives take steps consistent with the reports management recommendations for activity in threatened watersheds. The recommendations state that , "If any disturbance activity is planned in the watershed, the land owner should: a) Take active precautions to minimize new sediment loading to the stream, b) Steps also should be taken to ameliorate past roading or other human land disturbances that continue to contribute sediment to streams." Each of the action alternatives in this EIS is clearly consistent with these recommendations by proposing to eliminate numerous existing sediment sources, updating the existing road system to meet current BMPs, locating harvest units outside of SMZs, and specifying winter harvest in many units to minimize ground disturbance and sediment production.

A-61
Response:
As stated in the DEIS (page IV-56): All action alternatives would result in a net reduction in sedimentation in Cilly and Soup Creeks if recommended rehabilitation measures (described on page IV 51,52) are implemented. The project would likely improve fish habitat and therefore not contribute negatively to the local economy. Also, for information regarding the value of recreational use licenses, see response A-32.

A-62
Response:
Proposed harvest units were designated outside of the SMZ as a minimum, and in some cases boundaries may be located up to an additional 100 feet or more away from the SMZ boundary. DNRC has agreed to the immediate actions for bull trout restoration set down by a team appointed by the Governor which states among other things, that cooperators will "Voluntarily discontinue timber harvest ... in SMZs along streams containing bull trout."(Montana Dept. of Natural Resources and Conservation 1994) These are interim measures until further research is completed to determine basin specific recovery plans. DNRC feels that the SMZ law and the immediate actions are adequate to prevent adverse impacts to water quality and subsequently, fisheries habitat and will continue to abide by these laws and agreements until better information is available.

A-63
Response:
The DEIS states, "Westslope cutthroat trout and bull trout are species of special concern in Montana; they are found in limited numbers and habitats in Montana (DEIS page III-41)." The DEIS goes on to explain some of the efforts undertaken to aid the recovery of westslope cutthroat trout populations to Soup Creek. DNRC is a partner to the effort to protect westslope cutthroat trout initiated by the Governor as it was with the bull trout restoration team. Once the team develops guidelines and standards, DNRC will develop management strategies to deal with the recommendations.

A-64
Response:
An estimate of existing soil impacts (10-15% of project area) was listed in table 2.1 of the DEIS under Soils Impacts: Displacement & Compaction, but was not included in table 4.5 of effects. In the process of the environmental analysis, the project area was field reviewed by the DNRC Soil Scientist to verify soil types and estimate the condition of forest soils under tree canopy and in disturbed areas along old skid trails and landings. No new roads will be built under any alternative and land dedicated to transportation will not effect future productivity.

Observed soils impacts of past compaction and displacement are most noticeable on old skid trails and landings. Heavy impacts occur along portions of main skid trails, but only a few had impacts along the total length or width. Some of the impacts of past harvest are barely discernable surface features of duff mixing and slight compaction that appear to be remediating after years of freeze/thaw cycles. A cumulative effects section for soils has been added to Chapter IV for the FEIS.

A-65

Response:

Some ground water studies were mentioned, for these particular herbicides, in a USDA Forest Service EIS (USDA Forest Service 1989). There was an indication that at higher application rates (4.5 lbs/acre of Picloram) some low level detection in the ground water (<0.024 parts per million) was achieved for a short duration. 2,4-D was not detected in the ground water. The application rate on the Middle Soup Creek Project are less (four times less for Picloram and about half for 2,4-D) than the referenced study. Also, the study application was concentrated in one area where the Middle Soup application is spot specific and not concentrated in one area.

The measures to reduce risk to aquatic and terrestrial resources are identified under "Precautions" on page IV-62 of the DEIS and also in Appendix D (page D-5). The mitigation measures are intended to keep herbicides from contaminating ground and surface water.

A-66

Response:

Human and wildlife toxicology is specifically covered in the DEIS on page IV-61.

A-67

Response:

Wildlife toxicology is specifically covered in the DEIS on page IV-61.

A-68

Response:

Visual effects to pedestrians and hikers are discussed on page IV-63,64 of the draft EIS. Also, for information regarding the value of recreational use licenses, see Response A-32.

A-69

Response:

DNRC knows of no conclusive evidence that indicates fire intensities are greater in managed stands if State hazard reduction laws are followed.

The DEIS includes information on (DEIS pages III-1-3, 6) ~~to~~ changes in fire frequency and stand structure and composition that attest to the general success of fire suppression.

A-70
Response:
DNRC recognizes that restoring the historic natural role of fire to the ecosystem is unlikely. The risk to life, property, air and water quality is unacceptable in today's society. The DEIS recognizes that fire effects within a stand can not be entirely duplicated with harvesting, but some of the ~~more favorable~~ effects can be duplicated (i.e. historic structure and composition ...) (DEIS pages II-1 and IV-23-24).

A-71
Response:
Lost recreational value can be approached in two ways: 1) Reduced dispersed recreational use in the area that may result in lost revenue due to a reduction in sales of recreational use licences; 2) lost value for future development such as cabin lease sites.

The effects of this timber sale in the project area related to dispersed recreational use is uncertain. Creating or reducing the density of the forest in some of the stands in the project area may promote use from people who like to hunt in less dense stands or from huckleberry pickers. People who use state land for the experience of walking in old growth stands may be displaced to stands of old growth where no past harvest activity is evident. It is difficult to predict whether people will buy or not buy a permit that accesses all state trust lands based on this project. See also Response A-32 and A-78.

The values for future development are based on discussions with the Special Use Management Bureau. Cabin site leases are an example of possible future development. The value for future development is retained as long as the volume per acre is greater than 1.5 to 2 thousand board feet (MBF) and the aesthetics of the land is maintained in a park like appearance. The evidence for 1.5 to 2.0 MBF per acre is based on properties found in the market place. The market place property values range between $2,500 to $6000 per acre for comparable properties of 40 to 140 acres. For the purposes of this analysis we will use $3000 per acre for the value of land that meets the 1.5 to 2.0 MBF criteria, and other lands with less than 1.5 to 2.0 MBF per acre will equal $400 per acre. If the entire project area was offered in one block for development the value per acre would be reduced. A marketing strategy over a period of years could be used to reduce the impact related to supply and demand for such properties in the market place.

The following tables estimate the loss in asset value for development related to timber cutting for the alternatives in the Middle Soup Creek Project DEIS. Each table contains two estimates for loss of asset value related to development. The first estimate assumes that the acres treated with either the light or moderate reserve asset value for development goes from $3000 per acre to $400 per acre. The second estimate assumes that the acres treated only with light reserve asset value for development goes from $3000 per acre to $400 per acre. Three scenarios are shown for recovery of development asset value; no recovery, recovery in 30 years and recovery in 50 years.

A 4.01 percent real discount rate is used to discount future land values to present. A zero percent rate of increase was assumed for the value of land with development possibility.

Estimated Loss of Asset Value Related to Future Cabin Site License Development on Lands Desirable for Recreational Use Assuming no Recovery in Development Value:

Alternative	Both Light & Moderate Reserve: Acres	Both Light & Moderate Reserve: Value Loss	Light Reserve Only: Acres	Light Reserve Only: Value Loss
A	0	0	0	0
B	44.3	$111,180	0	0
C	12.9	$33,540	0	0
D	99.5	$258,700	11.2	$29,120

Estimated Loss of Asset Value Related to Future Cabin Site License Development on Lands Desirable for Recreational Use Assuming Value Recovery in 30 Years:

Alternative	Both Light & Moderate Reserve: Acres	Both Light & Moderate Reserve: Value Loss	Light Reserve Only: Acres	Light Reserve Only: Value Loss
A	0	0	0	0
B	44.3	$79,770	0	0
C	12.9	$23,229	0	0
D	99.5	$179,168	11.2	$20,168

Estimated Loss of Asset Value Related to Future Cabin Site License Development on Lands Desirable for Recreational Use Assuming Value Recovery in 50 Years:

Alternative	Both Light & Moderate Reserve: Acres	Both Light & Moderate Reserve: Value Loss	Light Reserve Only: Acres	Light Reserve Only: Value Loss
A	0	0	0	0
B	44.3	$99,050	0	0
C	12.9	$28,843	0	0
D	99.5	$222,472	11.2	$25,042

A-72
Response:
The following is an estimate of the added value of the standing timber inventory and the added value after timber harvesting by the Middle Soup Creek Project. A stumpage value of $241.05 per MBF was used. This is based on the average value from all the state sales for the years 1991-1995 with a high and low drop. The volume estimate is from the stand level inventory. An assumed leave volume of 2 MBF per acre was left to protect the future development value of the area. Also it was assumed that no change in the standing volume over time for growth or decay.

	Alternative A	Alternative B	Alternative C	Alternative D
Starting Timber Volume (MBF)	29,621	29,621	29,621	29,621
Starting Timber Asset Value	$7,140,142	$7,140,142	$7,140,142	$7,140,142
Ending Timber Volume After Harvest (MBF)	29,621	24,444	29,471	23,990
Ending Timber Asset Value	$7,140,142	$5,892,226	$7,103,985	$5,782,790

A-73

Response:

The amount of dollars generated from the conservation lease related to recreation or wildlife from increased sales of recreational use licenses or some future use is uncertain. We currently have no evidence that says, having a conservation lease in place would increase the return to the trust from other uses related to recreation or wildlife.

A-74

Response:

The cost for sale preparation and administration of a three year timber sale and the cost of administering a conservation agreement over twenty years was assumed to be the same (DEIS page IV-70). If these costs for the timber sale were subtracted from the total timber sale bid then the administration cost related to the conservation lease would have to be subtracted from the sum of the conservation lease bid plus the discounted value for the same timber sale in twenty years.

The conservation lease value is an estimate. If the timber sale was to sell the actual value of the total timber sale bid would be known. In the EIS it was assumed the sale bid value would be $295.65 per thousand board feet plus a forest improvement fee. The forest improvement fee is used for post-harvest treatments (i.e. hazard reduction, reforestation ...). The forest improvement fee is a cost that occurs after sale preparation and administration and should be subtracted from the cost of administering the conservation lease. Table 4.15 in the FEIS is revised to reflect this change and assumes that the bid value equals the value of timber dollars per thousand board feet from Table 4.8 minus $57.54 for the forest improvement fee.

A-75

Response:

The conservation lease would only preclude timber harvesting from the lease area for twenty years. Other uses of the area may be proposed by anyone. However, an environmental analysis would have to be completed for such a proposal and DNRC would have to be compensated through a land-use-license.

A-76

Response:

See Response A-13.

A-77

Response:

The statements made in the DEIS on pages I-5 through I-13, including the one quoted in your letter, are issues that were identified during the public involvement process for this project. They are not statements of potential impacts identified through the environmental analysis for this document. The statement made regarding the loss of outdoor classrooms was made by the public and identified in the document as an issue of concern regarding the project.

This particular statement was not carried through the analysis, primarily because the old-growth analysis showed that the short and long term effects of timber harvesting in the project would not preclude the use of the remaining old growth as outdoor classrooms.

A-78
Response:
Soup Creek Campground is an undeveloped recreational facility and requires no use fees other than the recreational use licence that is required for all state lands. At this time further development of the campground is not planned. There has been no noticeable drop in campground usage following past harvest activities in the vicinity. Harvest activities can only occur after December 15 or when snow reaches a depth of 18 inches and must end by April 1. Usually, during this time, the campground is unusable due to deep snow. Since the public will still have access to the campground and timber is a renewable resource, DNRC does not consider a change in recreational use as an irreversible or irretrievable commitment of resources. Also, for information regarding the value of recreational use licenses, see response A-32.

B-1
Response:
All threshold values were set based of channel stability data gathered from Soup and Cilly Creeks according to procedures outlined in Forest Hydrology Part II (need to find out where this comes from). These thresholds were designed to incorporate a low level of risk of adverse cumulative watershed effects, and are consistent with direction in the State Forest Land Management Plan. The sediment increases projected by WATSED are increases over a baseline generated by the model based on parameters such as watershed size and soil type. These estimates are only valid as a comparison of proposed activities to the computer generated baseline, not as absolute numbers (DEIS, page III-40, subsection b. Sediment yield, and page IV-54, subsection 3. Modeled sediment yield). The DEIS also states that there are numerous point sources of sediment that WATSED has no way of accounting for. An action alternative would rehabilitate these sediment sources which would further lower the sedimentation rates in Soup and Cilly Creek and likely lead to a net reduction in sediment delivery (DEIS, page IV-54-55).

B-2
Response:
As a standard operating procedure, and DNRC policy, all roads used for hauling timber or to access timber harvest units must meet current best management practices (BMPs) during the course of activity as a minimum. Through the timber sale contract and contract administration, all BMPs would be met on roads prior to hauling and throughout the course of the proposed activity.

B-3
Response:
Alternative B (Preferred Alternative) uses a considerable amount of structural enhancement harvesting within old-growth stands. DNRC believes that structural enhancement harvesting would not affect existing old-growth character. See also, Responses A-21, A-22, A-23 and A-24.

B-4
Response:
DNRC is the majority landowner in the South Fork Lost Soup Grizzly Bear Subunit (DNRC: 62%; USFS: 36%; Plum Creek: 1%) which contains 1 of 4 linkage zones designated to facilitate trans-valley movements of grizzly bears. We have the opportunity and responsibility to maintain (or enhance) the viability of this subunit to support grizzly bears and facilitate use of this linkage zone. Each subunit and linkage zone, however, must function on its own merits. Compounding mitigation or habitat enhancements in one area does not result in a corresponding population increase in another.

B-5
Response:
Limiting major activities to the grizzly bear denning season is the best way to ensure that grizzly bears are not excluded from this important low elevation habitat by the Middle Soup Proposed Timber Sale.

B-6
Response:
No clearcuts (Society of American Foresters, Silviculture Terminology, 9/93) are prescribed by any alternative in the Middle Soup Creek Project. Proposed cutting units in which hiding cover is lost after harvest (light and moderate reserve regeneration) are designed to follow SVGBCA guidelines to manage risk by grizzly bears incurred by hiding cover loss. SVGBCA guidelines recommend that no point in the unit be more than 600 feet from hiding cover, that visual screening is maintained between open roads and roads which access the unit or that seed tree units or clearcuts adjacent to an open road be less than 1 acre, that efforts be made to maintain hiding cover around natural openings, and that cover is retained to reduce line-of-site distance in large units (>40 acres). To insure that cumulative activities do not excessively eliminate hiding cover, at least 40% of the BMU subunit is to be maintained as hiding cover. Individually proposed units in all action alternatives of the Middle Soup Creek Project follow SVGBCA guidelines and cumulatively retain at least 79 percent hiding cover in the South Fork Lost Soup BMU Subunit.

There is little risk of adverse cumulative effects to water quality resulting from any of the proposed action alternatives. In stream rehabilitation projects and road closures would result in a net reduction in sedimentation for Soup and Cilly Creek watersheds.

B-7
Response:
To minimize vegetative disturbance, harvesting activities would be guided by best management practices (BMPs). In addition, harvesting would only occur during the winter with 18 inches or more of snow cover likely. The tractor size would not exceed the equivalent of a JD 650C/D6D track-type tractor or a JD 540/518C rubber-tired skidder (machines that do not exceed nine feet in width and twenty feet in length). These limitations provide maneuverability that protects remaining trees and limits soil compaction. Skid trails would be located in advance so that they do not exceed 15 percent of the harvest area.

C-1
Response:
We can only respond generally to this comment since no specific non-timber resource is identified as having over-compromised timber health and productivity. We believe Alternative B focuses on promoting forest health and productivity by managing for biological diversity at both the stand and landscape level.

C-2
Response:
Removal of ten percent of existing stand basal area through the structural enhancement treatment is projected to improve vigor on 188.2 of the 832.7 acres treated. Although other, more intensive, silvicultural treatments would have a greater increase on timber productivity on the acres treated, the structural enhancement treatment, within Alternative B, provides for the greatest overall improvement of stand vigor in the Project Area (page IV-34). We believe a primary benefit of this treatment will be to provide management flexibility in the future. Stands would be monitored for possible additional treatments needs in the future.

C-3
Response:
Projections of historic old-growth amounts in the Swan Valley are not consistent and range from approximately 25 to 50 percent (see DEIS, page III-4). Alternative B would reduce old-growth in the project area from 50.5 percent to 38.8 percent, and in the Soup Creek and Cilly Creek watersheds from 39.4 percent to 36.8 percent (see DEIS, page IV-29). Old-growth would therefore continue to remain within the range of historical projections. The structural enhancement silvicultural treatment would also enhance the vigor class of remaining old-growth and thereby reduce potential mortality. Actions considered in the DEIS would not preclude consideration of other salvage operations in the future if excessive mortality occurred in the Project Area.

C-4

Response:

In fifty years, if there are no other disturbances (i.e. fire, harvesting) we project that the amount of stable old growth within the project area would be 36.1 % for Alternatives A and C, 36.2% for Alternative D and 45.9% for Alternative B. These old growth amounts are a function of natural break-up, how harvesting will affect the vigor of existing stands and how fast stands will regain their old growth character after harvesting activities have occurred within them.

C-5

Response:

Alternative D does provide for the highest net dollar return for the school trust in the short-term but the State Forest Land Management Plan directs DNRC to produce long-term income by managing intensively for both healthy and biologically diverse forests. We believe Alternative B best provides for this long-term income by managing for biological diversity through maintenance and improvement of sensitive ecological functions within the project area while harvesting timber for income at the same time.

C-4

Response:

In fifty years, if there are no other disturbances (i.e. fire, harvesting) we project that the amount of stable old growth within the project area would be 36.1 % for Alternatives A and C, 36.2% for Alternative D and 45.9% for Alternative B. These old growth amounts are a function of natural break-up, how harvesting will affect the vigor of existing stands and how fast stands will regain their old growth character after harvesting activities have occurred within them.

C-5

Response:

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MIDDLE SOUP CREEK PROJECT

Final Environmental Impact Statement
Deparment of Natural Resources and Conservation
Northwest Land Office

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Swan Lake, Montana 59911
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