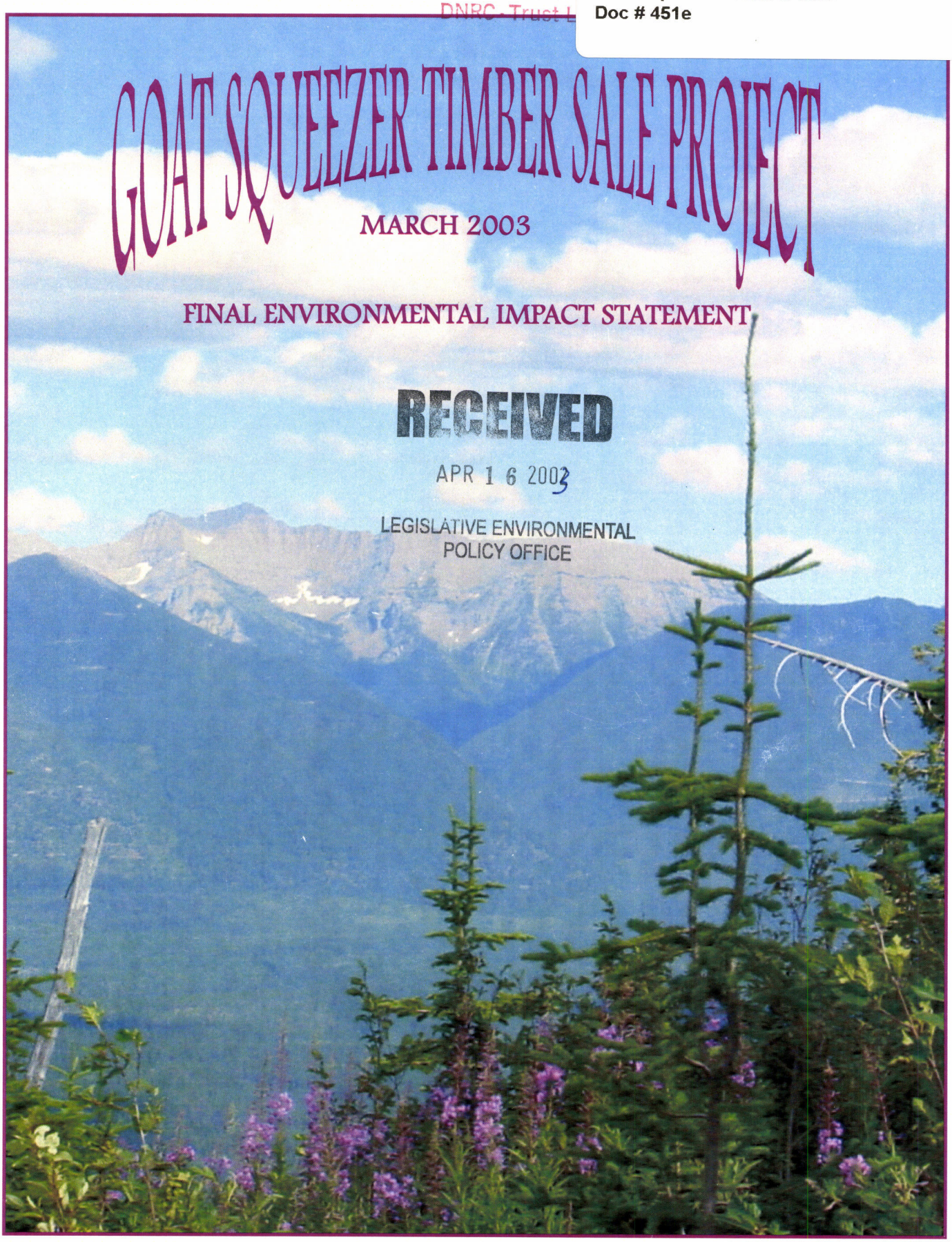
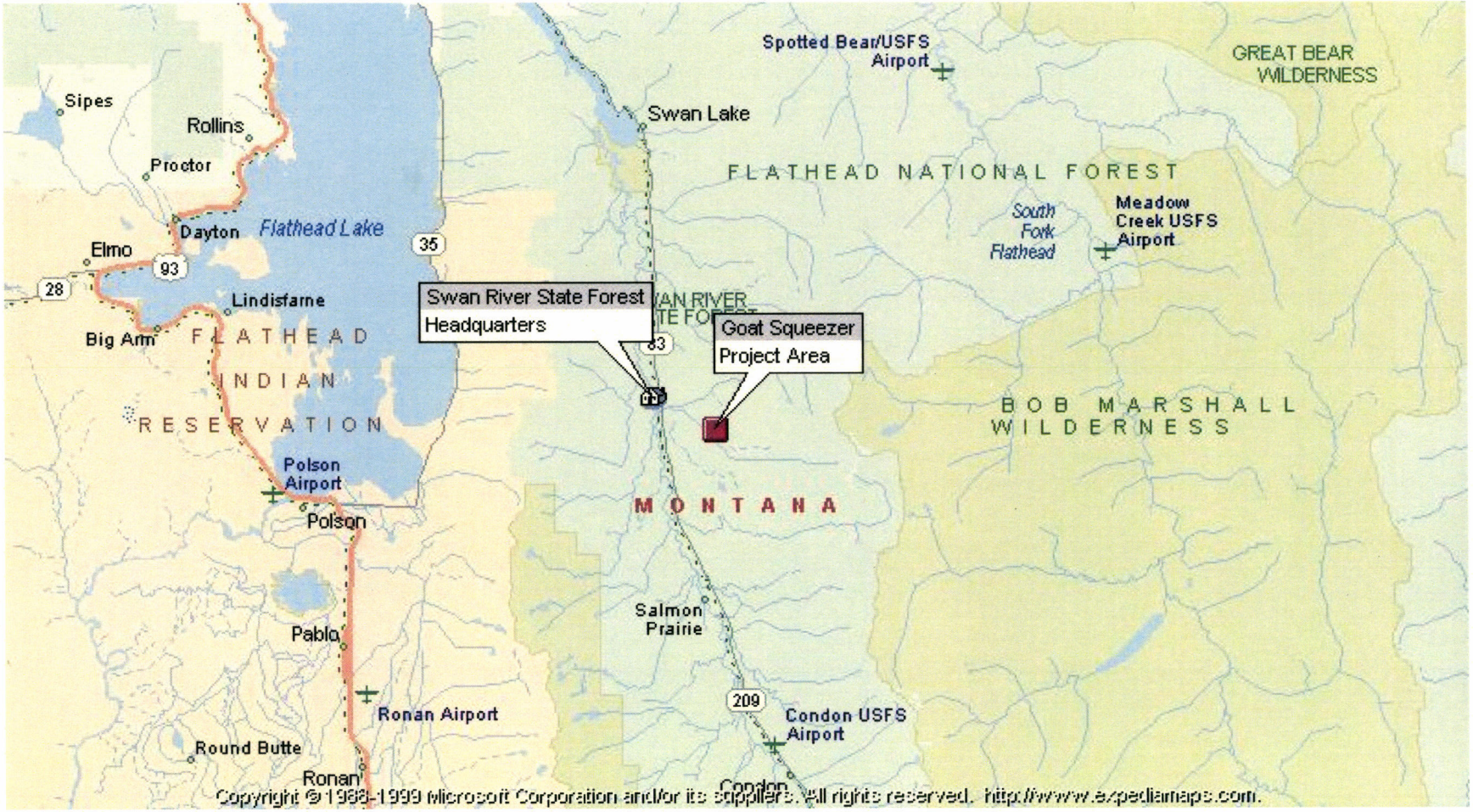
GOAT SQUEEZER TIMBER SALE PROJECT

MARCH 2003

FINAL ENVIRONMENTAL IMPACT STATEMENT



Department of Natural Resources and Conservation
Swan River State Forest


Spotted Bear/USFS Airport
GREAT BEAR WILDERNESS
Swan Lake
Sipes
Rollins
Proctor
FLATHEAD NATIONAL FOREST
South Fork Flathead
Meadow Creek USFS Airport
Dayton
Flathead Lake
Elmo
93
35
28
Lindisfarne
Swan River State Forest
Headquarters
Goat Squeezer
Project Area
Big Arm
FLATHEAD INDIAN RESERVATION
83
BOB MARSHALL WILDERNESS
Polson Airport
Polson
MONTANA
Salmon Prairie
Pablo
209
Ronan Airport
Condon USFS Airport
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DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

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GOAT SQUEEZER TIMBER SALE PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT
April 2, 2003

Enclosed is a copy of the Goat Squeezer Timber Sale Project Final Environmental Impact Statement (FEIS).

The proposed project is located approximately 12 miles southeast of Swan Lake, Montana in Swan River State Forest.

The Department does not present a preferred alternative of the two action alternatives analyzed in the FEIS. Proposed harvest volumes range from 0 million board feet (MMBF) in No-Action Alternative A, to 13.4 MMBF in Action Alternative B, and 10.2 MMBF in Action Alternative C.

My proposed decision in the FEIS is Action Alternative C. I anticipate making my final decision on April 17, 2003.

The FEIS was designed to address Swan River State Forest's primary commitment to Montana's mandated timber-harvest levels over a three-year period. This approach does a better job of analyzing cumulative effects to valuable resources and improves coordination for project planning within the active subunits scheduled by the Swan Valley Grizzly Bear Conservation Agreement.

The FEIS is written in a format that can be understood by a person of any interest level and incorporates pictures in the Executive Summary to promote project understanding. The DEIS consolidates Chapters III and IV into one section that summarizes the analysis in plain English. The bulk of the scientific analysis is located in the tabbed appendices. The information in the appendices will need to be used for scientific, technical, or legal review. This format has improved our ability to communicate with all individuals interested in the management of State lands.

Sincerely,

Robert L Sandman
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RLS:mb
Enclosure
Cc: Project file

PREFACE

GOAT SQUEEZER TIMBER SALE PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

PREFACE

The Goat Squeezer Timber Sale Project Final Environmental Impact Statement (FEIS) format is similar to others written on the Swan River and Stillwater State Forests. This preface explains the format and how to use it to obtain the information of your interest. The key reasons for using this format are:

- *to present an easily read document.*
- *promote understanding of the major effects and conclusions in the analyses without the extensive and complex scientific details.*
- *to present a document that includes the necessary scientific detail to be legally sound.*

To accomplish these goals, the FEIS is split into the following 3 separate, but related, parts.

- **EXECUTIVE SUMMARY**

  This portion summarizes the FEIS by briefly describing:

  - the proposed action
  - the issues connected with each analysis,
  - the alternatives that were considered, and
  - the environmental effects of each alternative.

  The written information has supporting photographs and maps to promote understanding.

- **FEIS**

  Chapter I describes the purpose and need of the proposed action and the issues that guided the alternative development and environmental effects analyses.

  Chapter II describes the alternatives that were analyzed and compares their effects.

  Chapter III displays the existing environment and the environmental effects to each resource for each alternative. The effects analyses are summarized and condensed so that the proposal and its effects can be easily understood. For a more detailed explanation, the Resource Appendices should be read.

- **RESOURCE APPENDICES**

  The Resource Appendices contain the full technical and scientific discussions of:

  - the analysis methods and areas,
  - the existing conditions, and
  - the direct, indirect, and cumulative effects of the proposed actions on the environment.

  The discussions include citations and data from research documents, environmental assessments (EA), and database analyses. Each Interdisciplinary Team (ID Team) member prepared the analysis for his/her individual specialty (fisheries, water, wildlife, etc.). The appendices provide the basis for the information and conclusions that are displayed in the FEIS and Executive Summary. The analyses are summarized in the FEIS; therefore, for scientific, technical, or legal reviews the information in the appendices need to be utilized.

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PURPOSE AND NEED

GOAT SQUEEZER TIMBER SALE PROJECT

CHAPTER I

PURPOSE AND NEED

INTRODUCTION TO THE PROPOSED ACTION

Swan River State Forest, Montana Department of Natural Resources and Conservation (DNRC), proposes the Goat Squeezer Timber Sale Project. Its primary activities include:

- timber harvesting,
- new road construction,
- road improvements,
- ponderosa pine restoration, and
- change of forest covertypes to a desired future condition.

This proposal includes a no-action alternative and 2 action alternatives. If an action alternative were selected, 10 to 14 million board feet (MMBF) would be treated on 1,866 to 2,444 acres. By selecting an action alternative, Swan River State Forest's primary commitment to the State's mandated harvest level would be met for the next 3 years. The harvest volume of 10 to 14 MMBF would be divided into 3 separate contracts. Each contract would harvest 3 to 5 MMBF of timber. The individual contracts would be advertised for bid beginning in 2003, the next in 2004, and the final available in 2005. Under an action alternative 1.8 to 4.0 miles of permanent or temporary road construction and 3.3 miles of road reconstruction would occur. Several roads within the project area would be improved to meet Montana Best Management Practice (BMP) standards for forestry.

The project area is located approximately 12 miles southeast of Swan Lake, Montana, within State-owned Sections 4, 8, 10, 16, 20, 22, 26, 28, 30, 32, and 34, T23N, R17W, and Sections 32, 33, and 34, T24N, R17W.

PURPOSE

The lands involved in the proposed project are held by the State of Montana in trust for the support of specific beneficiary institutions. These include public schools, State colleges and universities, and other specific State institutions, such as the School for the Deaf and Blind (*Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11*). The State Board of Land Commissioners (Land Board) 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 these beneficiary institutions, (*Section 77-1-202, Montana Codes Annotated [MCA]*). DNRC released the Record of Decision for the State Forest Land Management Plan (SFLMP) on May 30, 1996. The State Board of Land Commissioners approved the implementation of the SFLMP on June 17, 1996. The SFLMP outlines the management philosophy of DNRC in managing State forested trust lands and sets out specific Resource Management Standards for 10 resource categories.

The Department will manage the lands involved according to the philosophy and standards in the SFLMP, which states:

> *Our premise is that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forest. Our understanding is that a diverse forest is a stable forest that will produce the most reliable*

and highest long-term revenue stream…. In the foreseeable future, timber management will continue to be our primary source of revenue and our primary tool for achieving biodiversity objectives.

PROPOSED OBJECTIVES

In order to meet the goals of the management philosophy adopted through a programmatic review of the SFLMP, DNRC has set the following specific project objectives:

- Biodiversity would be promoted by managing for appropriate stand structures and compositions based on ecological characteristics (eg., land type, habitat type, disturbance regime, unique characteristics). For threatened, endangered, and sensitive species, a fine-filtered approach would be used that focuses on habitat requirements of single species.
- Provide 10 to 14 MMBF in 3 or more contracts prepared and sold in 2003, 2004, and 2005 to meet the Northwestern Land Office (NWLO) volume contribution of the annual timber harvest volume on State trust lands that is required by State law (*77-5-221 through 223, MCA*).
- To have all project roads, including haul routes to Highway 83, meet BMPs.
- Address insect and disease problems identified by the DNRC-contracted pathologist.
- Include easement exchanges with U. S. Forest Service (USFS) and Plum Creek Timber Company in the analyses, if applicable.

RELATIONSHIP TO THE SFLMP

The SFLMP is a programmatic plan that provides field personnel with consistent policy, direction, and guidance for the management of State forested lands. It contains the general philosophies and management standards that will provide the framework for project-level decisions.

The planning of the proposed Goat Squeezer Timber Sale Project was guided by the SFLMP. The SFLMP philosophy and its appropriate Resource Management Standards have been incorporated into the design of the proposed actions. The Goat Squeezer Timber Sale Project Environmental Impact Statement (EIS) is not intended as a programmatic or area plan and is limited to addressing specific proposed actions in reference to issues that were identified through public involvement and input by the ID Team.

RELATIONSHIP TO NEW RULES

DNRC adopted administrative rules for forest-management activities, including the management of old-growth stands, in March of 2003. Timber sales would comply with the following implementation schedule proposed in the rules:

- Sales associated with environmental documents scoped after adoption of the rules would be required to comply with the rules.
- Given how far along this project is in the MEPA process, sales associated with this EIS would not be required to comply with the rules. This EIS follows the intent of the SFLMP.

EIS PROCESS

EIS Development

This EIS was prepared in compliance with the Montana Environmental Policy Act (MEPA), which requires State government to include consideration of environmental impact in its decisionmaking process. It also requires agencies to inform the public and other interested parties about proposed projects, the environmental impacts that may result, and alternative

actions that could achieve the project objectives.

Public Scoping

The initial stage of an EIS is the public scoping process, during which DNRC:

- informs the public that a State agency is proposing an action,
- invites participation from the public and other agencies,
- compiles internal and public comments,
- identifies issues, and
- identifies potential alternatives.

In June 2001, DNRC initiated public participation in the Goat Squeezer Timber Sale Project proposal by placing an advertisement in the Daily Inter Lake, Bigfork Eagle, and Seeley Swan Pathfinder newspapers. A letter, which included maps and general information about the project, was mailed to individuals, agencies, industry representatives, and other organizations that had expressed interest in Swan River State Forest's management activities. The mailing list for the initial proposal for this project can be found in the project file at the Swan River State Forest office.

The public comment period for scoping was open for 30 days. The ID Team, made up of DNRC resource specialists (see *LIST OF PREPARERS AND CONTRIBUTORS* at the end of *CHAPTER III*), summarized issues and concerns identified through the public scoping. The ID Team, reviewed the issues and concerns and identified the main concerns to be addressed in the DEIS.

In January 2002, the ID Team defined the action alternatives, complete with maps of the potential harvest areas and their respective silvicultural treatments. A newsletter was published in January that described the concerns identified through the scoping process and the action alternatives that were being developed by the ID Team. A 30-day comment period followed. Comments were received during the comment period, but no new issues were expressed. The mailing list for the newsletter is in the project file.

DEIS

In January 2003, a DEIS was prepared. Public comments related to the issues that could affect the project were incorporated into the document. Upon publication, notification that the DEIS was available was sent to individuals on the mailing list. The DEIS and/or Executive Summary were circulated to individuals requesting the documents. Comments pertaining to the DEIS were accepted for 30 days. Responses to those comments are included in *APPENDIX L - COMMENTS AND RESPONSES*.

Final Environmental Impact Statement (FEIS)

After public comments were received, compiled, and addressed, DNRC prepared this FEIS. The FEIS consists, primarily, of a revision of the DEIS that incorporates new information based on public and internal comments. A proposed decision was prepared by Robert L. Sandman, Unit Manager, Stillwater State Forest, and is included at the end of *CHAPTER II - ALTERNATIVES*.

Notification of Decision

Following publication of the FEIS, the decisionmaker for Swan River State Forest will review the public comments, FEIS, and information contained in the project file. No sooner than 15 days after publication of the FEIS, the decisionmaker will consider and determine the following:

- Do the alternatives presented in the FEIS meet the project's purpose?
- Are the proposed mitigation measures adequate and feasible?

- Which alternative or combination/ modification of the alternatives should be implemented? Why?

The determinations will be published and all interested parties will be notified. The decisions presented in the published document would become DNRC's recommendation to the Land Board. Ultimately, the Land Board would make the final decisions regarding the actions to be implemented.

PROPOSED SCHEDULE OF ACTIVITIES

After a decision is published, and if a timber-harvesting alternative is selected, the first Timber Sale Contract package would be prepared in the spring of 2003. The second, and possibly third, contract packages would be prepared in 2004 and 2005. This contract package is tentatively scheduled for presentation to the Land Board in July 2003. If the Land Board approves the timber sale, the sale may be advertised that summer. Separate contracts would be presented to the Land Board and, upon approval, advertised in the following springs of 2004 and 2005. Treatment and roadwork activities would occur for approximately 2 to 3 years after the sale is sold. Posttreatment activities, such as site preparation, planting, and hazard reduction, would occur following treatment activities.

OTHER ENVIRONMENTAL REVIEWS RELATED TO THE PROJECT

In order to address the direct, indirect, and cumulative effects to resources on a landscape level, resource analyses will consider potential effects from past, present, and future State actions as required for that resource and within a defined analysis area. A list of other ongoing projects and/ or timber sales can be found in *APPENDIX A - LIST OF RELATED ENVIRONMENTAL REVIEWS*.

OTHER AGENCIES WITH JURISDICTION/ PERMIT REQUIREMENTS

Montana Department of Fish, Wildlife, and Parks (DFWP) has jurisdiction over the management of fisheries and wildlife in the project area. DFWP is on the mailing list and has received the initial proposal and newsletter.

DNRC has an ongoing contract with DFWP to collect data and monitor streams for the conditions of fisheries habitat and the presence/ absence of bull trout and westslope cutthroat trout on Swan River State Forest.

PERMITS THAT MAY BE REQUIRED TO IMPLEMENT THE PROPOSED ACTIONS

- A Stream Preservation Act Permit (124 Permit) is required from DFWP for activities that may affect the natural shape and form of a stream or its banks or tributaries.
- A Short-term Exemption from Montana's Surface Water Quality Standards (318 Authorization), issued by the Montana Department of Environmental Quality (DEQ) may be required if:
  - Temporary activities would introduce sediment above natural levels into streams, or
  - DFWP feels a permit is necessary after reviewing the mitigation measures in the 124 Permit.

DNRC is a member of the Montana Airshed Group, which regulates slash burning done by DNRC. DNRC receives an air-quality permit through participation in this group.

CONCERNS/ISSUES

Through the public-involvement process, resource specialists of DNRC and other agencies concerns were raised about the project's potential impacts on the environment. DNRC used these concerns in developing the project design, mitigation measures, and alternatives *(CHAPTER II -*

ALTERNATIVES). A summary of the comments incorporated into the alternatives is presented below.

CULTURAL RESOURCES

Logging and road building may adversely impact cultural resources.

This concern was not further analyzed after the DNRC archaeologist's review of the project indicated there were no known cultural resource sites in or around the treatment areas. If, during implementation of this project, cultural resource sites are found, DNRC will take steps to protect those sites (see *APPENDIX B, STIPULATIONS AND SPECIFICATIONS*).

ECONOMICS

- The lack of timber harvesting might reduce money available to education and the number of local jobs.
- Timber harvesting might not generate adequate funds for the trust (education) due to depressed lumber prices and the amount of timber on the market.
- Regeneration after harvesting might not readily occur, thereby increasing reforestation costs.
- Timber harvesting might reduce income generated from tourism.
- Not harvesting dead and dying timber might result in economic loss to the trust due to firewood theft.

VEGETATION

- Populations of Douglas-fir bark beetles may increase and potentially cause continued mortality if timber harvesting does not occur within infested or at-risk stands.
- Dense, overstocked stands might lead to decreased health, vigor, and productivity of shade-intolerant species (western larch, western white pine, Douglas-fir) due to competition from shade-tolerant species (grand fir, Engelmann spruce, subalpine fir, western red cedar).
- Timber harvesting may reduce habitat for endangered plants.
- Harvesting could remove or change attributes of old-growth stands on the Swan River State Forest.

SOCIAL

Winter harvesting near Highway 83 might result in increased collisions between vehicles and big game.

FISHERIES

- Land-management activities may degrade physical habitat in area streams.
- Fish populations could be affected if fish habitat is degraded.

HYDROLOGY

- Minimum buffer zones, as required by the SMZ law, may be inadequate to protect streams from increased sediment introduction.
- Timber removal activities within the Streamside Management Zone (SMZ) may alter fisheries habitat by reducing pool formation. Generally, this refers to large woody debris removal, which is a catalyst for pool formation.
- Timber-harvesting activities may increase sediment introduction to streams.

SOILS

- Soil productivity could be reduced, depending on area and degree of physical effects (skidding, soil compaction, displacement), and the amount of distribution of coarse woody debris retained for nutrient cycling.
- Areas of soil instability could contribute sediment to area streams.

WILDLIFE

- Timber harvesting might reduce biodiversity in the Swan Valley.

  DNRC uses a coarse-filter approach when assessing effects of proposed actions on biodiversity. DNRC assumes that if landscape patterns and processes similar to those that species adapted to are maintained, then the full complement of species will be maintained across the landscape. The main components of DNRC's coarse filter assessment are: stand cover types, age class, patch size and interior habitats, and connectivity. These components are described within the wildlife and vegetative sections of this document.

- Timber harvesting activities might disrupt grizzly bear and other wildlife movements.

- Road construction/use might reduce habitat security for wildlife species such as grizzly bears, Canada lynx, pileated woodpeckers, goshawks, pine martens, and fishers.

  Goshawks and pine martens are not considered as threatened, endangered or sensitive species. General effects to each of their habitats are covered in the coarse-filter analysis.

- Timber harvesting and road construction/use might result in habitat becoming fragmented, losing habitat, and/or displacing wildlife species.

- Timber harvesting might reduce large-diameter snags available to wildlife.

- Timber harvesting in Section 30 might affect the habitat of elk, deer, and grouse.

  Grouse are not considered as threatened, endangered or sensitive species. General effects to their habitat are covered in the coarse-filter analysis.

- Winter harvesting might concentrate big game, which could result in increased mortality.

- Winter harvesting near Highway 83 may result in increased road mortality.

- Timber harvesting would remove old-growth habitat, resulting in negative effects to old-growth-associated species.

CHAPTER II

ALTERNATIVES

GOAT SQUEEZER TIMBER SALE PROJECT

CHAPTER II

ALTERNATIVES

INTRODUCTION

The purpose of Chapter II is to introduce 2 action alternatives for the Goat Squeezer Timber Sale Project area. The effects of implementing each action alternative and the no-action alternative will be summarized. This chapter will focus on the development of the action alternatives and summarize the description of each alternative, followed by a brief outline of the predicted environmental consequences associated with each alternative. *TABLE II–4 - SUMMARY OF ENVIRONMENTAL EFFECTS* summarizes the effects of the detailed environmental analysis in *CHAPTER III* and *RESOURCE APPENDICES C* through *K*.

DEVELOPMENT OF ALTERNATIVES

An ID Team was formed in April 2001 to work on the Goat Squeezer Timber Sale Project. The role of the ID Team is to summarize issues and concerns, develop management options for each alternative within a project area, and analyze the potential impacts of a proposal on the human and natural environments.

Throughout the remainder of 2001 and late winter 2002, ID Team members and other DNRC personnel were involved in a thorough field inspection of the project area. Information about the project area was collected. This information aided in analyzing wildlife habitat, water quality, timber harvesting, road standards, and economics, and developing ways to lessen or eliminate impacts to resources (mitigation measures) that could be applied to the proposal. The ID Team developed 2 action proposals within the framework of the SFLMP and its associated Resource Management Standards. Public comments were also taken into consideration.

A fourth alternative was discussed during the early development of the EIS. This alternative would have been based on harvesting a lower amount of volume from the project area; only areas not identified as providing thermal cover on big game winter range would have been proposed for harvesting. This alternative was not developed because the purpose and need of the project could not be met.

Due to comments received in response to the DEIS, a fourth alternative that would retain thermal cover was again considered. This alternative would use a Conservation Land Use License in lieu of the proposed timber harvesting on a unit-by-unit basis. This alternative would meet the purpose and need by compensating the trust for the areas retained as thermal cover for big game, pursuant to *MCA 77-5-208*. This alternative would allow an individual or group to participate in the bidding process and, if they were the successful bidder, certain units would not have been harvested. This alternative was dropped from further consideration because the agency proposing the alternative in response to the DEIS was not interested in compensating the trust for the retention of thermal cover. Therefore, this alternative will not receive any further analysis.

DESCRIPTIONS OF ALTERNATIVES

This section describes No-Action Alternative A, as well as Action Alternatives B and C. The elements and mitigation measures of the action alternatives are described in this section. Actions designed to protect resources during treatments and road-improvement activities (*APPENDIX B - STIPULATIONS AND SPECIFICATIONS*) are incorporated into the Timber Sale Contract or site-preparation clauses and put into use during contract administration. These stipulations and specifications are mitigation measures to reduce impacts on a particular resource.

- ***No-Action Alternative A***

  - No timber would be harvested, though firewood gathering and some salvage logging would likely continue.
  - Roads would be only maintained; no roads would be built or reconstructed.
  - When funding is available and equipment is in the area, roads and closures would continue to be maintained.
  - Recreationalists would likely continue to use the area for hiking, biking, berry picking, and fishing.
  - Efforts to suppress fires and control the spread of weeds would continue.
  - Trees would continue to die from attacks of Douglas-fir bark beetles and diseases such as root rot.
  - Natural events, including plant succession, trees blown down by wind, insect and disease outbreaks, and wildfires, would continue to occur.
  - Future actions, including timber harvesting, would be proposed and go through the appropriate environmental analysis before they would be done.

  No-Action Alternative A, used as a baseline for comparing the effects that Action Alternatives B and C would have on the environment, is considered a possible alternative for selection.

  At this time DNRC does not have a preferred alternative.

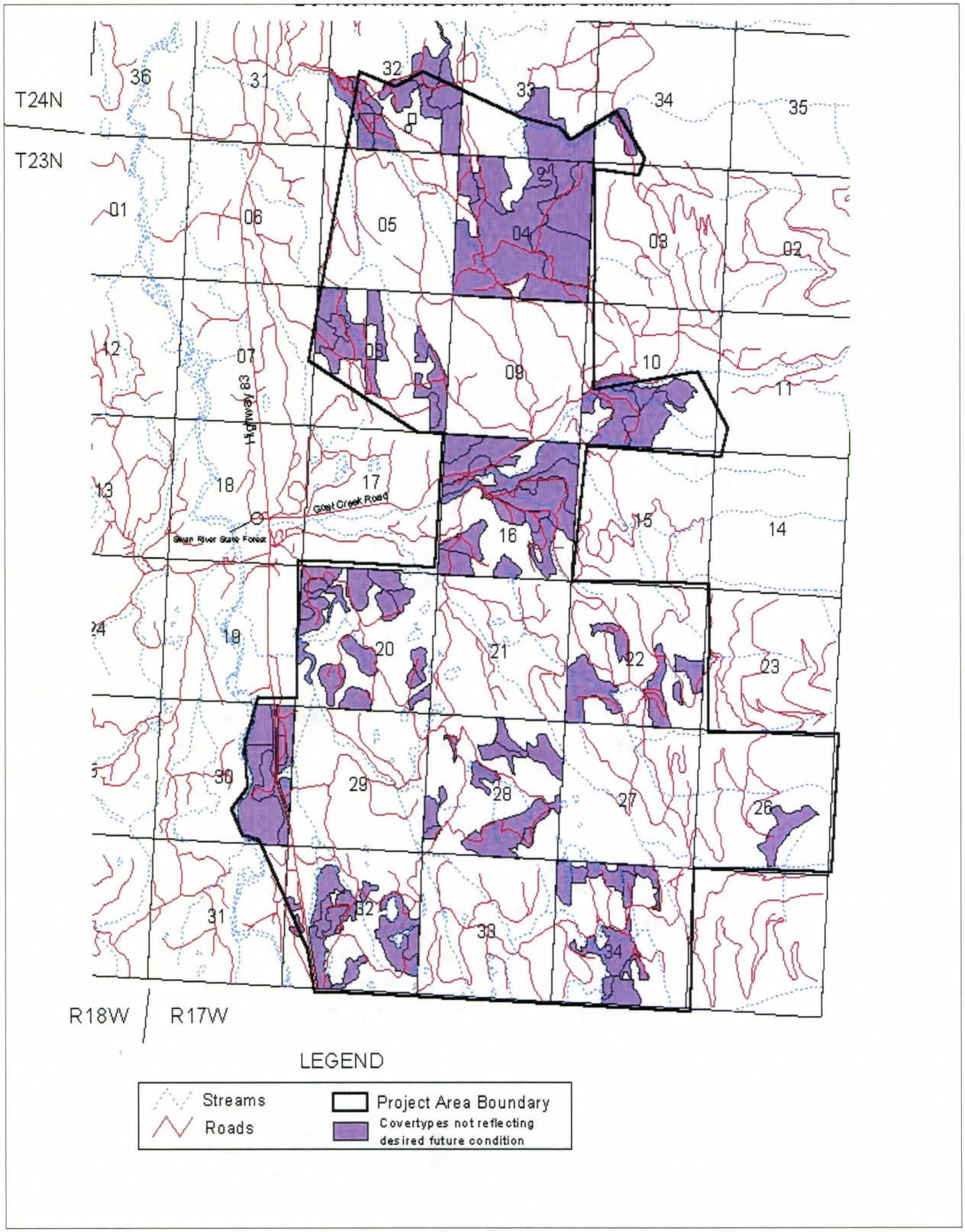
- ***Components Common to Action Alternatives B and C***

  The ID Team developed timber-harvesting strategies for both alternatives within the guidelines in the SFLMP. The majority of the treatments are based on analyzing the current and appropriate timber-stand conditions (*FIGURE II-1 - STANDS WHERE CURRENT COVERTYPES DO NOT REFLECT DESIRED FUTURE CONDITIONS*). Proposed treatments would, in the long term, move timber stands toward a desired age class, species composition, structure, and density that were historically present across the landscape.

  Both action alternatives utilize various types of treatment methods, such as seedtree, individual tree selection, group selection, commercial thinning, sanitation/salvage, and shelterwood.

  - Seedtree harvests are also known as regeneration harvests. There are many variations of seedtree harvests, but they typically remove the overstory and leave behind enough trees to provide a seed source for the unit. The remaining trees can either be individuals scattered throughout the unit or clumps of trees. The number of trees left depends on the objectives of the prescription to be implemented.
  - Individual-tree-selection harvests can vary depending on the objectives of the prescription and needs of the

FIGURE II -1 - STANDS WHERE CURRENT COVERTYPES DO NOT REFLECT DESIRED FUTURE CONDITIONS



stand. This treatment is commonly used when managing uneven-aged stands. Certain trees, generally scattered throughout the stand, would be marked for removal.

- Group-selection treatments would remove groups of trees in varying patch sizes. The size of the patch can be determined by an age class or disturbances such as windstorms, fires, insects, diseases, etc.

- Commercial thinnings are basically a thinning of the stand where the majority of the trees harvested have enough value to offset costs. Merchantable trees would be removed to provide growing space for the remaining trees.

- The sanitation/salvage treatment is listed as a harvest method in this project. The sanitation portion of the treatment would be to remove trees that have been attacked or appear to be vulnerable to damaging agents (insects, diseases, etc.). Salvage harvesting would remove those trees that have died or are at risk of dying because of a damaging agent.

- A shelterwood treatment leaves trees to provide a seed source, shelter for the regenerating stand, and growing room for the remaining trees. This type of harvest has good variability and is widely applicable, depending on the needs of the stand.

Many of the stands selected for treatment also had the problems of insect infestations and disease infections associated with them.

Both action alternatives were designed to be within the allowable water-yield increases for the Goat and Squeezer drainages.

This project was designed within the thresholds and guidelines established by the Swan Valley Grizzly Bear Conservation Agreement (SVGBCA).

The action alternatives implement the Governor's recommended actions for the restoration of bull trout. No timber harvesting would take place in the SMZs of creeks where bull trout populations exist.

Both action alternatives would improve road conditions to meet BMPs. Creek crossings that could be a possible sediment source would be improved to provide better drainage and, therefore, not contribute sediment to the streams. Two high-water areas would be improved, with culvert installations. All roads needed for hauling would have adequate surface drainage and meet current BMP standards.

- ***Action Alternative B***

This alternative is designed to harvest in both old-growth stands and non-old-growth stands. The selected stands include old-growth ponderosa pine, western larch/ Douglas-fir, and mixed-conifer covertypes. The harvest treatments would include, but are not limited to, removal of insect-infested and disease-infected trees, which would be beneficial to the remaining and surrounding stands.

Action Alternative B strives to move timber stands toward a more healthy and vigorous condition, while still maintaining the desired forest species. Silviculturally, Action Alternative B utilizes a variety of treatment methods, depending on the needs of the stand:

- Seedtree methods would be used to improve the western larch/ Douglas-fir habitat type, while broadcast burning and scarification would enhance the regeneration of western larch. Approximately 270 acres would be

treated with a regenerating seedtree harvest.

- Commercial thinning would be utilized on approximately 1,355 acres, which would be similar to the effects of a low-intensity fire with flare-ups. Following the treatment, 90 to 100 trees per acre would be retained. The retained trees would consist of ponderosa pine, western larch, Douglas-fir, and a representation of species that are shade tolerant.
- Individual-tree-selection and sanitation treatments are fairly similar when considering the objectives of both. The difference being that a sanitation treatment would remove more trees per acre and concentrate on insect-/disease-affected dead or dying trees and those that are at high risk to mortality. Action Alternative B would treat 487 acres with the individual-tree-selection treatment and 82 acres with a sanitation treatment. The goal of an individual-tree-selection treatment would be to concentrate on the removal of shade-tolerant trees and/or insect-/disease-affected species.
- Group-selection treatments would focus on species that are affected by insect infestations and disease infections in a stand equaling approximately 207 acres. Actual treatments involving tree removal would only occur in .5- to 2-acre patches within this stand. The intent of the prescription would be to remove dead and dying trees that have been affected by insects and diseases.
- Action Alternative B also would incorporate a shelterwood-type treatment on approximately 43 acres. This treatment concentrates on the removal of shade-tolerant species from the understory. The objectives are to minimize fuel build-up and maintain stand health and historic covertypes. Some of these units would be planted, others would be left for natural regeneration.

The amount of acres treated can be found in *TABLE II–1 - TYPE OF HARVEST TREATMENT AND CORRESPONDING ACRES UNDER ACTION ALTERNATIVE B.*

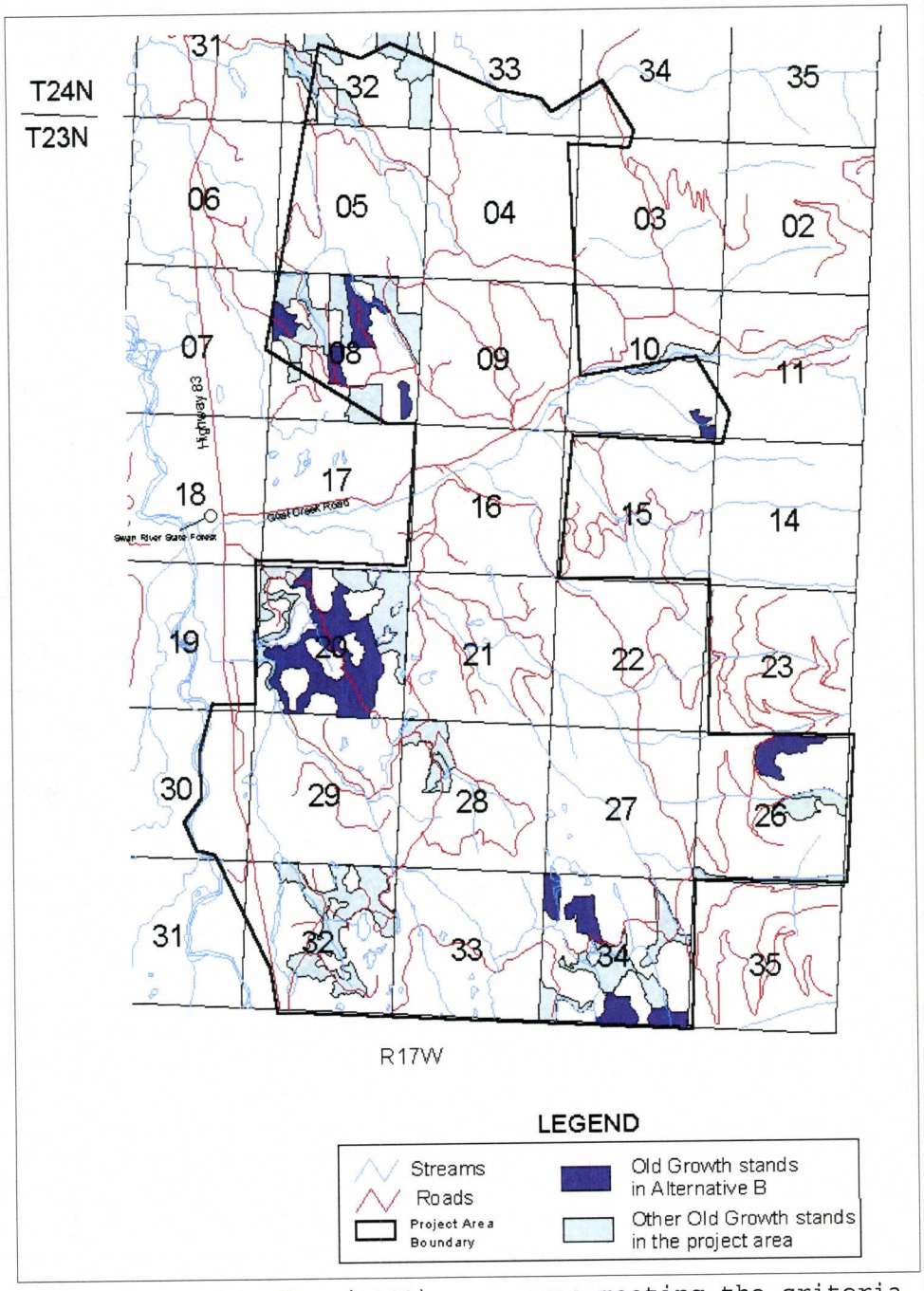
TABLE II-1 - TYPE OF HARVEST TREATMENT AND CORRESPONDING ACRES UNDER ACTION ALTERNATIVE B

HARVEST TREATMENT	NUMBER OF ACRES
Seedtree	270
Commercial thin	1,355
Individual tree selection	487
Sanitation	82
Group selection	207
Shelterwood	43

Action Alternative B would harvest approximately 13.4 MMBF of timber over 2,444 acres; 4.0 miles of permanent or temporary road would be built and 3.3 miles of road would be reconstructed. All roads used for hauling would be improved to meet current BMP standards.

During the writing of the DEIS, DNRC was involved in administrative rule development. Eight sales were enjoined by a court order until rules were developed according to Montana Administrative Procedures Act. This particular project was developed after the court order was in place and prior to the new administrative rules being adopted. Therefore, this project was developed under the auspices of the SFLMP and its Resource Management Standards. At this time, stands that are classified as old-growth were checked to verify that they met the

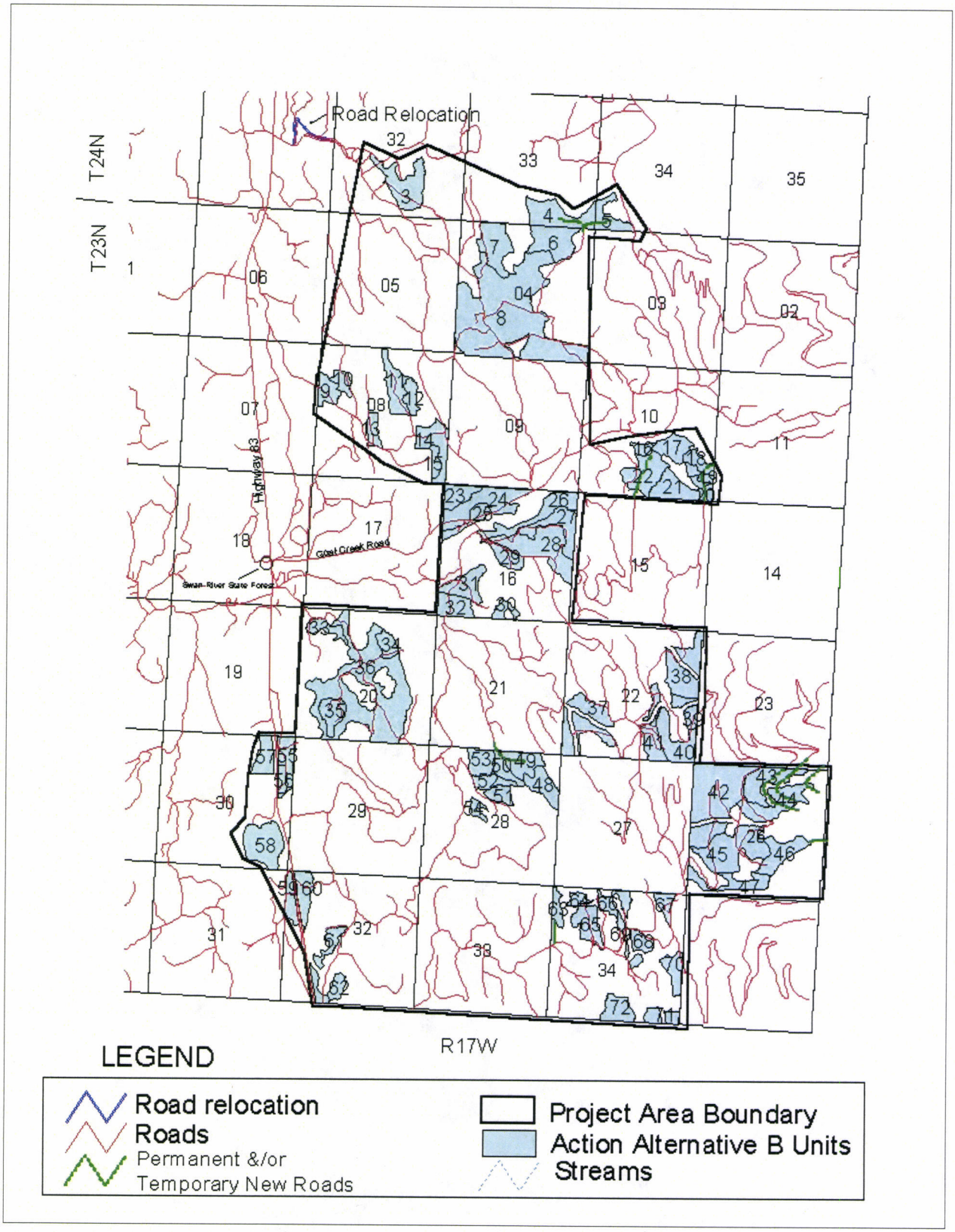
FIGURE II — 2 - STANDS THAT MEET GREEN ET AL DEFINITION FOR OLD GROWTH



definition of *Green et al., (1992) as adopted by the department*. The definition gives a minimum number of large trees per acre by habitat-type group for the stand to be classified as old-growth. See *FIGURE II—2 - STANDS THAT MEET GREEN ET AL., DEFINITION FOR OLD GROWTH*, for stands in the project area meeting the criteria, as presented in the stand-level inventory (SLI) database. As part of the field reconnaissance, the stands selected for treatment were verified.

Roads and proposed unit locations are shown in *FIGURE II—3 — PROJECT*

FIGURE II–3 PROJECT AREA MAP FOR ACTION ALTERNATIVE B



AREA MAP FOR ALTERNATIVE B. Units were randomly numbered, primarily from north to south, in the project area.

- ***Action Alternative C***

  Action Alternative C is very similar to Action Alternative B, except, primarily, it does not harvest in old-growth stands. Action Alternative C also does not harvest in stands that must be accessed through old-growth stands. The types of treatments to occur in each stand are similar to those previously described in Action Alternative B. The seedtree, shelterwood, commercial-thin, individual-tree-selection, and sanitation harvest treatments would be utilized. The amount of acres treated can be found in *TABLE II-2 - TYPE OF HARVEST TREATMENT AND CORRESPONDING ACRES UNDER ACTION ALTERNATIVE C.*

TABLE II—2 - TYPE OF HARVEST TREATMENT AND CORRESPONDING ACRES UNDER ACTION ALTERNATIVE C

HARVEST TREATMENT	NUMBER OF ACRES
Seedtree	233
Commercial thin	1,216
Individual tree	337
Sanitation	37
Shelterwood	43

Approximately 10.2 MMBF of timber would be harvested over 1,866 acres and an estimated 1.8 miles of permanent or temporary road and 3.3 miles of road reconstruction would occur under Action Alternative C. All roads used for hauling would be improved to meet current BMP standards.

Roads and proposed unit locations are shown in *FIGURE II—4 - PROJECT AREA MAP FOR ACTION ALTERNATIVE C* on the next page. The units are numbered the same as under Action Alternative B. Some numbers are skipped due to the lack of old-growth and other stands not being considered under this alternative.

FIGUTE II–4 — PROJECT AREA MAP FOR ACTION ALTERNATIVE C

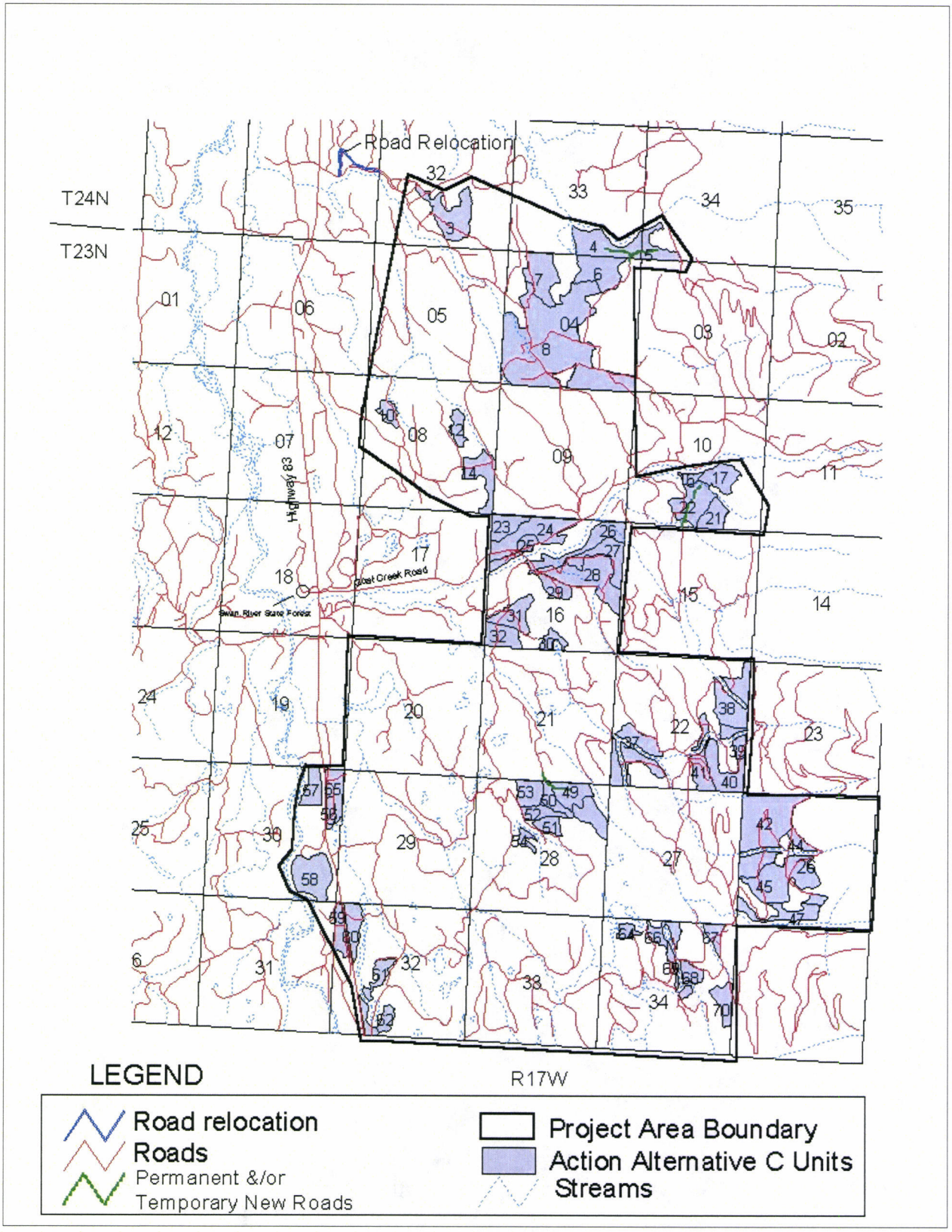


TABLE II-3 - HIGHLIGHTS OF THE ACTION ALTERNATIVES

ACTION ALTERNATIVE	MMBF HARVESTED	ACRES	HARVEST METHODS	MILES OF PERMANENT/ TEMPORARY ROAD CONSTRUCTION AND RECONSTRUCTION	HAZARD REDUCTION AND SITE PREPARATION METHODS	REGENERATION
B	13.4	2,444	- Commercial thin - Seedtree - Individual tree selection - Group selection - Shelterwood - Sanitation	4.0 miles of new road construction: - 2.9 miles of permanent road (0.6 miles of road relocation) - 1.1 miles of temporary road 3.3 miles of road reconstruction, including the replacement of 3 culverts.	Broadcast burn where feasible; pile, slash and scarify other units.	Plant with rust-resistant western white pine, ponderosa pine, and western larch, depending on the need of the unit and type of harvest. Some units would be allowed to regenerate naturally.
C	10.2	1,866	- Commercial thin - Seedtree - Individual tree selection - Sanitation - Shelterwood	1.8 miles of new road construction: - 1.0 miles of permanent road (0.6 miles of road relocation) - 0.8 miles of temporary road 3.3 miles of road reconstruction, including replacement of 3 culverts.	Broadcast burn where feasible; pile slash and scarify other units.	Plant with rust-resistant western white pine, ponderosa pine, and western larch, depending on the needs of the unit and type of harvest. Some units will be allowed to regenerate naturally.

TABLE II-4 - SUMMARY OF ENVIRONMENTAL EFFECTS

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
VEGETATION				
Forest covertype distribution	Current covertype representation is not consistent with the desired future condition of covertypes for Swan River State Forest. The mixed-conifer and lodgepole pine covertypes are overrepresented. The western larch/ Douglas-fir, ponderosa pine, and western white pine covertypes are underrepresented.	***No-Action Alternative A***		
		The natural succession of tree species would continue, which would lead to a shade-tolerant covertype (grand fir, subalpine fir, Engelmann spruce, western red cedar). Species such as western larch, Douglas-fir, or ponderosa pine would eventually have little or no representation unless a disturbance occurred.	The forest would continue through the successional stages, and shade-tolerant species (grand fir, Engelmann spruce, subalpine fir, etc.) would become the dominant covertype. This would continue until a disturbance occurred that would allow shade-intolerant species (western larch, ponderosa pine, Douglas-fir, etc.) to develop.	Forest covertypes in the Swan River State Forest SLI database were changed by the Small Squeezer, Small Squeezer II, and South Wood timber sales. There are now 17,331 acres of mixed-conifer, 480 acres of Douglas-fir, 2,315 acres of lodgepole pine, 2,411 acres of ponderosa pine, 7,746 acres of western larch/ Douglas-fir, 3,769 acres of western white pine, and 3,446 acres of subalpine fir covertypes.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Forest covertype distribution (continued)		***Action Alternative B***		
		Predominantly, covertypes would change from mixed conifer to western larch/Douglas-fir on 1,096 acres; from western larch/ Douglas-fir to ponderosa pine on 112 acres; from mixed conifer to ponderosa pine on 56 acres, and from mixed conifer to western white pine on 45 acres. Other covertype changes would occur to move the forest towards an historical covertype.	Applies a commercial-thin treatment to 1,355 acres, retaining 90 to 100 trees per acre of healthy, preferred species for the site. Individual-tree-selection treatments would target removal of insect-/disease-affected or nonpreferred species. The shelterwood and group-selection treatments would be very similar to individual-tree selection, although treatments would be in clumps for the group selection. For the regeneration treatment on 270 acres, approximately 6 to 10 healthy western larch, Douglas-fir, and some ponderosa pine would be retained.	In combination with the Small Squeezer, Small Squeezer II, and South Wood timber sales, the Douglas-fir covertype is reduced by 34 acres, the lodgepole pine covertype by 20 acres, and the mixed-conifer covertype by 1,208 acres; the ponderosa pine covertype is increased by 127 acres, the western larch/Douglas-fir covertype by 978 acres, and the western white pine covertype by 90 acres.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Forest covertype distribution (continued)		***Action Alternative C***		
		Predominantly, covertypes would change from mixed conifer to western larch/Douglas-fir on 1,065 acres, western larch/Douglas-fir to ponderosa pine on 76 acres; mixed conifer to ponderosa pine on 32 acres; and mixed conifer to western white pine on 45 acres. Other covertype changes would occur to return to an historical covertype.	Applies a commercial-thin treatment to 1,116 acres, retaining 90 to 100 trees per acre of healthy, preferred species for the site. Individual-tree-selection treatments would target removal of insect-/disease-affected or nonpreferred species. The shelterwood and group-selection treatments would be very similar to individual-tree selection, although treatments would be in clumps for the group selection. For the regeneration treatment on 233 acres, 6 to 10 healthy western larch, Douglas-fir, and some ponderosa pine would be retained.	In combination with the Small Squeezer, Small Squeezer II, and South Wood timber sales, the lodgepole pine covertype is reduced by 20 acres, and the mixed-conifer covertype by 1,142 acres; the ponderosa pine covertype is increased by 108 acres, the western larch/Douglas-fir covertype by 997 acres, and the western white pine covertype by 57 acres.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Old-growth forest	Swan River State Forest has 592 acres of old growth in the ponderosa pine covertype, 7,059 acres in the mixed-conifer covertype, 1,113 acres in the subalpine fir covertype, 1,935 acres in the western larch/Douglas-fir covertype, and 1,927 acres in the western white pine covertype. According to the current SLI database, there are 12,626 acres of old growth on Swan River State Forest.	***No-Action Alternative A***		
		The amount, character, and distribution of existing old-growth stands would remain the same within the project area for the short term. Over time, existing covertypes would change with natural plant succession.	A stand-replacement fire would be an increased risk over time. Old-growth characteristics would increase, but, with continued mortality, stands may no longer meet the old-growth definition in the long term.	No changes would occur to Swan River State Forest's SLI database by harvesting. Cumulative effects would be the same as the direct effects.
		Action Alternative B		
		Action Alternative B proposes to harvest in stands that are currently classified as old growth. Approximately 236 acres of ponderosa pine, 141 acres of western larch/Douglas-fir, and 41 acres of mixed conifer of old-growth stands would be affected (418 acres total). Treatments are being developed to enhance and maintain the covertype of these stands.	Individual-tree-selection, sanitation, or commercial thinning harvest treatments would decrease some old-growth characteristics, such as large down woody debris and decayed wood. Some valuable characteristics, such as diameter growth, would increase over time. By utilizing a group-selection-type treatment, only specific areas of the stand would be affected.	Previous timber sales have not harvested in old-growth stands. Cumulative effects would be the same as the direct effects.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Old-growth forest (continued)		***Action Alternative C***		
		The amount, character, and distribution of existing old-growth stands would remain the same within the project area for the short term. Over time, existing covertypes would change with natural plant succession.	A stand-replacement fire would be an increased risk over time. Old-growth characteristics would increase, but, with continued mortality, stands may no longer meet old-growth definitions in the long term.	No changes would occur to Swan River State Forest's SLI database by harvesting. Cumulative effects would be the same as the direct effects.
HYDROLOGY				
Sediment delivery	Road crossing identified on State land as sediment sources would continue to contribute sediment to project-area streams.	***No-Action Alternative A***		
		No effects.	No effects.	No effects.
		Action Alternative B		
		The improvement of existing roads and replacement of 3 culverts may increase sediment to streams in the short-term. The construction of 4.0 miles of new road would cross 1 ephemeral draw and 1 tributary to Goat Creek that is buffered with beaver ponds. Short-term sediment would be minimized through BMPs.	Harvesting operations would be completed on 711 acres in the winter, which would result in less soil disturbance. The risk of sediment delivery would be low under these circumstances. Summer harvesting operations on the remaining acres may have temporary increases of sediment delivery to streams.	Sediment delivery, potentially, would occur as a result of fixing sediment sources on roads. Upgrading and maintaining roads to BMP standards would reduce the risk of sediment delivery.

RESOURCE	EXISTING	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Sediment delivery (continued)		***Action Alternative C***		
		The improvement of existing roads and replacement of 3 culverts may increase sediment to streams in the short-term. The construction of 4.0 miles of new road would cross 1 ephemeral draw and 1 tributary to Goat Creek that is buffered with beaver ponds. Short-term sediment would be minimized through BMPs.	Harvesting operations would be completed on 368 acres during the winter, which would result in less soil disturbance than in other seasons. The risk of sediment delivery would be low under these circumstances. Summer harvesting operations on the remaining acres may have temporary increases of sediment delivered to streams.	Sediment delivery, potentially, would occur as a result of fixing sediment sources on roads. Upgrading and maintaining roads to BMP standards would reduce the risk of sediment delivery.
Water yield	Water yields in affected watersheds are below the level where additional erosion is expected.	***No-Action Alternative A***		
		No effects expected	No effects expected	No effects expected
		Action Alternative B		
		No direct effects to water yield would be expected.	Removal of trees would cause an increase in water yield for the following streams at these estimated percent levels: Goat Creek (0.3 percent), Squeezer Creek (0.9 percent), Napa Creek (less than 0.1 percent) Squaw/Perry Creek (2.7 percent), Van Lake (1.1 percent), and Swan River (less than 0.1 percent).	All watersheds would stay below the threshold of concern; therefore, the annual increase in water yield would not result in substantial channel adjustments or increased in-stream erosion.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Water yield (continued)		***Action Alternative C***		
		No direct effects to water yield would be expected.	Removal of trees would cause an increase in water yield for the following streams at these estimated percent levels: Goat Creek (0.3 percent), Squeezer Creek (0.4 percent), Napa Creek (less than 0.1 percent), Squaw/Perry Creek (2.4 percent), Van Lake (0.7 percent), and Swan River (less than 0.1 percent).	All watersheds would stay below the threshold of concern; therefore, the annual increase in water yield would not result in substantial channel adjustments or increases.
FISHERIES				
Fisheries	Surveys of species composition in the project area have identified the presence of bull trout, westslope cutthroat trout, mountain whitefish, sculpin, rainbow trout, and brook trout.	***No-Action Alternative A***		
		No direct effects to fish populations would occur.	No indirect effects to fish populations would occur	No cumulative effects to fish populations would occur.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fisheries (continued)		***Action Alternatives B and C***		
		With minimal amounts of road construction and improvements, some sediment may be contributed to local streams in the short term. Through mitigation efforts, the potential of fine sediments from surface erosion would not have direct effects on the fish populations.	As a result of the design features and mitigation, effects to fish populations from sediment are unlikely.	Harvesting activities would not substantially impact the cumulative amount of fine sediment delivered to the stream channel.
WILDLIFE				
Bald eagles	No eagles currently nest in the project area, though winter and potential breeding habitats exist.	***No-Action Alternative A***		
		Would not be expected to have direct effects.	Wintering bald eagles would benefit due to the retention and long-term development of habitat. On the other side, breeding bald eagles may experience negative effects due to the retention of poor habitat qualities or loss of habitat due to forest succession.	No additional disturbances or modification would occur. Breeding habitat is expected to decrease, but winter use or population levels would be unaffected.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Bald Eagles (continued)		***Action Alternative B***		
		Minor disturbances may occur; however, survivability or reproduction would probably not be altered.	The quality of nesting habitat would be expected to increase on 383 acres. Carrion sources may be reduced in the winter.	Minor positive effects to wintering bald eagles would occur.
		Action Alternative C		
		Minor disturbances may occur; however, survivability or reproduction would probably not be altered.	The quality of nesting habitat would be expected to increase on 134 acres. Carrion sources may be reduced in the winter.	Minor positive effects to breeding bald eagles would occur; however, those changes are not expected to substantially affect populations.
Canada lynx	Suitable Canada lynx habitat occurs on 101 acres in the project area. Of these, 31 acres of mature foraging, and 70 acres of other habitats exist within the project area.	***No-Action Alternative A***		
		No effects expected.	Negative effects to Canada lynx would occur because of the retention of poor habitat quality or loss of habitat due to forest succession.	Forage availability would decrease while denning habitat would increase. Effects would be negative and minor due to the marginal habitat affected.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Canada lynx (continued)		***Action Alternative B***		
		Negligible effects are expected.	Harvesting would modify 31 acres of mature foraging habitat for Canada lynx in Unit 43. The effects are expected to be minor and negative in the short term (less than 5 years.	Harvesting would convert 32 acres of lynx habitat in the Goat Creek Subunit to unsuitable for approximately 5 years. Since this alternative alters a small acreage in marginal habitat for a short period of time, the cumulative effects of this alternative would be minor.
		Action Alternative C		
		Negligible effects are expected.	No lynx habitat would be modified.	Forage availability would decrease while denning habitat would increase. Effects would be negative and minor due to the marginal habitat affected.
Gray Wolf	The project area includes suitable habitat, but no wolf packs are present. Current disturbance caused by open roads decreases the potential for denning/rendezvous sites.	***No-Action Alternative A***		
		No effects would be expected.	Benefits would be expected due to the retention and long-term development of big game habitat.	Benefits would be expected due to the retention of thermal cover, which would sustain current big game populations.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Gray wolf (continuted)		***Action Alternatives B and C***		
		Minor negligible effects would be expected.	Short-term benefits from possible increased winter mortality would be expected. Long-term prey availability could decrease, which could affect the likelihood of recolonization of the area.	Negative effects would be expected due to a reduction in habitat quality and thermal cover, resulting in reductions in big game populations.
Grizzly bear	The project is scheduled to follow guidelines within the SVGBCA. Current hiding cover greatly exceeds 40 percent of the project area.	***No-Action Alternative A***		
		No effects would be expected.	No effects would be expected.	Hiding cover is not limiting, and maintaining this cover could be at the expense of food sources. Through time, this may reduce the foraging habitat, which would result in negative minor effects.
		Action Alternatives B and C		
		Minor disturbances are expected to occur; however, survivability or reproduction would probably not be altered.	The increase in forage habitats may benefit grizzly bears. The expected effects would be positive and minor.	Grizzly bears are not expected to be measurably affected.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Fisher	The project area provides 655 acres of resting/denning habitat, 5,819 acres of forage habitat, and 284 acres of travel habitat.	***No-Action Alternative A***		
		No effects would be expected.	Possible benefits may occur due to the retention and long-term development of habitat.	No effects would be expected.
		Action Alternative B		
		No effects would be expected.	Modifications would occur on 285 acres of denning habitat and on 1,674 acres of foraging habitat, resulting in negative effects. Travel corridors would be retained.	Due to ongoing salvage operations and regeneration treatments, quality fisher habitat could decrease.
		Action Alternative C		
		No effects would be expected.	Modifications would occur on 285 acres of denning habitat and 1,233 acres of foraging habitat. Important fisher habitat would be removed, while travel corridors would be retained, resulting in negative effects.	Due to ongoing salvage operations and regeneration treatments, quality fisher habitat could decrease.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Flammulated owl	The project area contains 1,256 acres of moderate to low-quality nesting habitat.	***No-Action Alternative A***		
		No effects would be expected to occur.	May experience negative effects due to the retention of poor habitat qualities or loss of habitat due to forest succession.	Would continue to decline throughout the area, resulting in minor adverse effects to flammulated owls.
		Action Alternative B		
		Minor negligible effects to flammulated owls would be expected.	Flammulated owls would benefit from enhancement of habitat quality and quantity that would result from opening the canopy and favoring ponderosa pine over 700 acres.	Habitat would be enhanced over 700 acres, resulting in positive effects to flammulated owls.
		Action Alternative C		
		Minor negligible effects to flammulated owls would be expected.	Flammulated owls would benefit from enhancement of habitat quality and quantity that would result from opening the canopy and favoring ponderosa pine over 163 acres.	Habitat would be enhanced over 163 acres, resulting in positive effects to flammulated owls.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Pileated woodpecker	Approximately 2,388 acres of potential nesting habitat exists on State trust lands within the project area. Other areas with large snags may provide foraging and low-quality nesting habitat.	***No-Action Alternative A***		
		No effects would be expected to occur.	Possible benefits to pileated woodpeckers due to the retention and long-term development of habitat.	Pileated woodpecker habitat in and around the project area would increase through time and then decline.
		Action Alternative B		
		Minor negligible effects are expected.	Pileated woodpecker nesting habitat would be affected on 1,146 acres, leaving 1,400 acres of nesting habitat unaltered within the project area. This alternative is expected to have moderate negative effects.	Pileated woodpecker habitat would be reduced and is expected to cumulatively add to decreased reproduction in the area.
		Action Alternative C		
		Minor negligible effects are expected.	Pileated woodpecker nesting habitat would be affected on 679 acres, leaving 1,743 acres of nesting habitat unaltered within the project area. This alternative is expected to have moderate negative effects.	Pileated woodpecker habitat would be reduced and is expected to cumulatively add to decreased reproduction in the area.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Big game	The project area contains winter range for white-tailed deer, elk, and mule deer. Thermal cover is low and near or below critical values for white-tailed deer.	***No-Action Alternative A***		
		No effects to big game would be expected to occur.	Big game may possibly benefit due to the retention and long-term development of habitat.	Would allow retention of hiding and thermal cover for big game, but forage would decrease.
		Action Alternative B		
		No effects to big game would be expected to occur.	Big game winter range would have 2,040 acres of thermal cover harvested, resulting in decreased carrying capacity of the wildlife range, primarily for white-tailed deer and less for elk and mule deer.	Thermal cover reductions are cumulative with other harvesting on State and other ownerships. Harvesting could reduce the number of big game animals able to withstand a severe winter.
		Action Alternative C		
		No effects to big game would be expected to occur.	The big game winter range would have 1,567 acres of thermal cover harvested, resulting in decreased carrying capacity of the wildlife range, primarily for white-tailed deer and less for elk and mule deer.	Thermal cover reductions are cumulative with other harvesting on State and other ownerships. Harvesting could reduce the number of big game animals able to withstand a severe winter.
SOILS				
	Most of the State land in the project area has been harvested since the 1950s.	***No-Action Alternative A***		
		No effects to soil productivity would be expected.		

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Soils (continued)		***Action Alternative B***		
		Soil impacts would be expected to occur on 247 acres in the short term. Long-term effects to soil productivity are unlikely.	No indirect effects are expected.	DNRC would limit the area and degree of cumulative soil effects by using a combination of skid-trail planning to use existing trails and winter harvesting.
		Action Alternative C		
		Soil impacts would be expected to occur on 178 acres in the short term. Long-term effects to soil productivity are unlikely.	No indirect effects are expected.	DNRC would limit the area and degree of cumulative soil effects by using a combination of skid-trail planning to use existing trails and winter harvesting.
ECONOMICS				
	Expenditures are estimated to be $6,038 per pupil per year for children in grades kindergarten through 12 in Montana public schools.	***No-Action Alternative A***		
		No revenue would be earned and no students would be supported.	No local jobs of harvesting timber would be provided.	Contribution to the profitability of DNRC's forest-management program would not occur.
		Action Alternative B		
		The estimated trust income of $1,236,330 would support 204 students for 1 year.	Locally a total of 142 jobs would be provided for 1 year, and estimated wages and salaries of $4,836,700 would be earned.	For FY 2001, DNRC earned approximately $8,524,150 in total harvest revenue. This action alternative would continue to contribute to the profitability of DNRC's forest-management program.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
Economics (continued)		***Action Alternative C***		
		The estimated trust revenue of $817,800 would support 135 students for 1 year.	A total of 108 jobs would be provided locally for 1 year, and estimated wages and salaries of $3,678,600 would be earned.	For FY 2001, DNRC earned approximately $8,524,150 in total harvest revenue. This action alternative would continue to contribute to the profitability of DNRC's forest-management program.
RECREATION				
	The project area receives use from commercial outfitting and noncommercial recreation.	***No-Action Alternative A***		
		No effects would be expected.		Recreational use and revenue income from outfitting and General Recreational Use Licenses are not expected to change.
		Action Alternatives B and C		
		Normal game movement may be disturbed, affecting the success of hunters. Log hauling may cause an inconvenience to recreationalists using the roads.	Recreationalists may avoid areas of hauling and harvesting activities.	This project, combined with activities on adjacent industrial private ownership, may displace some recreational use.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
AIR QUALITY				
	The project area contributes very low levels of air pollution to local population centers. Temporary reductions in air quality occur in the summer and fall from smoke generated from prescribed burning and vehicle dust.	***No-Action Alternative A***		
		No effects would be expected.		
		Action Alternatives B and C		
		Postharvest burning would produce smoke, and harvesting activities would produce dust.	No effects would be anticipated.	Cumulative burning on all ownerships during peak burning periods may cause respiratory illnesses for short durations at local population centers.

RESOURCE	EXISTING CONDITION	DIRECT EFFECTS	INDIRECT EFFECTS	CUMULATIVE EFFECTS
AESTHETICS				
	Foreground views are forests with openings. Middleground views are openings of various sizes resulting from 40 years of timber harvesting. Background views consist of the middle portion of the Swan Range.	***No-Action Alternative A***		
		Vegetation would continue to limit views from open roads.	No effects would be anticipated.	
		Action Alternatives B and C		
		Foreground views would have fewer trees in the harvested areas. The middleground and background views would be stands that are more open.	The commercial-thin and sanitation units would be patterned to look like low-intensity, mixed-severity burns by leaving an even distribution of trees across the landscape. Seedtree units would be visually patterned to look like mixed-severity or stand-replacement fires. Group-selection units would be patterned to look like small openings within a stand. Individual tree selection and shelterwood units would be patterned to look like stands thinned primarily from below the overstory canopy layer.	Vegetative growth, harvesting activities, and natural events would continue to alter views into and from the project area.

GOAT SQUEEZER TIMBER SALE PROJECT
PROPOSED DECISION

This portion of the Final Environmental Impact Statement (FEIS) presents the proposed decision by Robert L. Sandman, Manager, Stillwater State Forest, Department of Natural Resources and Conservation (DNRC).

The scope of the proposed decision is limited to actions associated with the Goat Squeezer Timber Sale Project proposal. The proposed decision is site-specific and is neither programmatic nor a general management plan for Swan River State Forest.

An interdisciplinary team (ID Team) has completed the Draft Environmental Impact Statement (DEIS) and prepared the FEIS for the Goat Squeezer Timber Sale Project proposal. Mr. Sandman proposes the following decision after a thorough review of the DEIS, project file, public correspondence, corrections and additions made by DNRC that were reflected in this FEIS, Department policies, and the State Forest Land Management Plan (SFLMP).

1. PROPOSED ALTERNATIVE SELECTION: Action Alternative C

Three alternatives were developed and are presented in the FEIS:

- No-Action Alternative A includes existing activities, but does not include a timber sale.
- Action Alternative B harvests approximately 13.4 million board feet (MMBF) from 2,444 acres; constructs 4 miles of new road consisting of 2.3 miles of permanent road, 1.1 miles of temporary road, and 0.6 mile of permanent road relocation; and reconstructs 3.3 miles of existing road. Action Alternative B will earn approximately $1,236,330 for the school trust. Both old-growth stands and non-old-growth stands will be harvested.
- Action Alternative C harvests approximately 10.2 MMBF from 1,866 acres; constructs 1.8 miles of new road consisting of 1.0 mile of permanent road, 0.8 mile of temporary road, and 0.6 mile of permanent road relocation; and reconstructs 3.3 miles of existing road. Action Alternative C will earn approximately $817,800 for the school trust. Only non-old-growth stands will be harvested.

(Alternatives A through C are presented in the *FEIS on pages II-1 through II-10).*

To varying degrees, each alternative meets the project objectives and could be chosen.

The proposed decision is to select Action Alternative C with the following modifications:

- Mitigations and specifications identified in the FEIS will be implemented as prescribed.
- The 10.2 MMBF of merchantable timber will be presented to the State Land Board in multiple contracts. Units 3 through 8, 10, 12, 14, 23 through 25, and 30 through 32 with approximately 2.7 MMBF will be in the first contract. The remaining Units and volume will be sold in 1 or more subsequent contracts, yet to be determined.

I have compared the modifications and specifications proposed for Action Alternative C to the analysis presented in the FEIS and have concluded that the modifications and specifications are within the scope of the FEIS.

The rationale for this decision is presented in item 4.

2. **RELATIONSHIP OF THE OBJECTIVES TO THE PROPOSED DECISION**

   a. If sold in today's market, Action Alternative C will yield an estimated return of $817,800 for the school trust.

   b. The timber sale will contribute an estimated 10.2 MMBF to DNRC's annual timber-harvest requirements over a 3-year period.

   c. Action Alternative C promotes biodiversity by managing for appropriate stand-structure characteristics.

   d. All project roads and hauls routes will meet Best Management Practices (BMPs).

   e. Harvesting and regeneration methods address insect and disease problems.

   f. Temporary easements to access harvest units and conduct project-related activities will be obtained from the United State Forest Service and Plum Creek Timber Company.

3. **RELATIONSHIP OF THE ISSUES AND PUBLIC COMMENT TO THE PROPOSED DECISION**

   a. ***VEGETATION*** *(FEIS, pages III-2 through III-11)*

   Harvesting will result in a net 20-acre decrease in the lodgepole pine covertype and a 1,142-acre decrease in the mixed-conifer covertype. The ponderosa pine covertype will increase by 108 acres, the western white pine covertype by 57 acres, and the western larch/Douglas-fir covertype by 997 acres.

   Stand age classes will change with net increases of 233 acres in the 0-to-39-year-old stands. Net reductions of 91 acres will occur in the 40-to-99-year-old stands, 52 acres in the 100-to-149-year old stands, and 90 acres in the 150+-year-old stands.

   All treatments will increase growth rates in retained trees and improve the health of the stand.

   Using forest improvement funds (FI) collected from the purchaser of the timber sale, rust-resistant western white pine, western larch, and ponderosa pine trees will be planted. Some harvest units will be allowed to regenerate naturally.

   No harvesting will occur on acres that currently meet DNRC's old-growth definition (DNRC has formally adopted the old-growth definitions proposed by *Green et al, [Old Growth Forest Types of the Northern Region, R-1 SES 4/92, USDA Forest Service, Northern Region, Missoula, MT]*).

   Ground disturbance by logging equipment will create seedbeds for noxious weeds. Mitigation measures will reduce the risk of noxious weed establishment.

   b. ***HYDROLOGY*** *(FEIS, pages III-12 through III-15)*

   Taking all BMPs and mitigation measures into account, the risk of sediment delivery to streams from harvest units is low. Therefore, it is unlikely that Action Alternative C will adversely affect beneficial use and water quality.

   Direct and cumulative water-yield increases will occur, but all watersheds impacted will remain below conservative annual water-yield threshold levels.

   c. ***FISHERIES*** *(FEIS pages III-16 through III-21)*

   Fish populations will not be directly affected since

harvesting activities are located well away from the fish-bearing streams. Some fine sediment is likely to reach stream channels as a result of road construction, reconstruction, and improvement/maintenance work. However, the application of BMPs, seeding, and location of activities will likely reduce the amount to a level that will not directly affect fish health.

By timing the project, utilizing wider SMZs, following BMPs, locating harvest units away from stream channels, and applying erosion-control measures, harvest-related activities will not substantially impact the cumulative amount of fine sediment delivered to stream channels.

d. *WILDLIFE* *(FEIS, pages III-22 through III-29)*

Displacement and disturbance is expected for wildlife species in the area. In the long term, species that use the more-open stands and more-diverse landscapes will be positively affected. Species that use late-successional forest structure will be negatively affected.

Risks to gray wolves, fishers, bald eagles, Canada lynx, and flammulated owls will be minor. Adequate hiding cover and suitable habitat will remain.

Localized impacts to pileated woodpeckers may occur due to the removal of potential nesting habitat.

A minor level of risk to grizzly bears is expected with 67.2 to 77.7 percent of the area still providing hiding cover. Road density in the Goat Creek, Lion Creek, and South Fork Lost Soup grizzly bear subunits are in compliance with the 33 percent open-road-density standard.

Harvesting may reduce the ability of big game, especially white-tailed deer, to survive severe winters with the reduction of 875 acres of thermal cover. The percent of thermal cover is below the 50-percent threshold recommended for white-tailed deer. To what extent this will affect big game is not clear.

f. *SOILS* *(FEIS, pages III-30 through III-33)*

Harvest methods will impact approximately 10.5 percent of the harvest-unit areas, well below the 15 percent standard, causing minimal levels of soil erosion and little risk of sediment delivery. Of the 1,866 acres harvested, erosion-control, compaction, and displacement mitigation measures will lower the risk of cumulative effects to soil productivity.

e. *ECONOMICS* *(FEIS, pages III-34 through III-37)*

In today's market conditions, the selected alternative will generate approximately $817,800 in trust revenue. In addition, the sale will produce $535,800 in FI collections. The revenue generated by this project represents support for 135 students for 1 year and 108 local jobs for 1 year, with wages and salaries totaling $3,678,600.

g. *RECREATION* *(FEIS, pages III-38 through III-39)*

As a whole, General Recreational Use License revenue not expected to change as a result of implementing

Action Alternative C. Recreationalists may be inconvenienced or temporarily displaced by project-related activities.

h. ***AIR QUALITY*** *(FEIS, pages III-40 through III-41)*

Log hauling and other project-related traffic on dirt roads will generate dust during dry periods. Postharvest burning will produce smoke emissions. None of the impacts to air quality are expected to exceed standards, requirements imposed by the Montana Airshed Group, or negatively impact local population centers.

i. ***AESTHETICS*** *(FEIS, pages III-42 through III-45)*

Action Alternative C harvest treatments will alter foreground and middleground views. Seedtree and group-selection treatments will appear similar to the results of a moderately severe fire. The other treatment types will appear similar to the results of a low-intensity fire of mixed severity.

j. ***IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS*** *(FEIS, page 46)*

Harvesting will cause live trees to be irretrievably lost. Harvested trees will no longer contribute to snag recruitment, stand structure and composition, diversity, aesthetics, wildlife habitat, nutrient recycling, and other important ecosystem functions. However, the loss of trees from harvesting will not be irreversible. Natural and artificial regeneration will promote the establishment of new trees that will ultimately become equivalent in size and ecosystem function as those harvested.

Areas converted from timber production to permanent roads will be irretrievably lost until such time as they are reclaimed.

4. **RATIONALE FOR THE PROPOSED DECISION**

a. The lands involved in this project are held by the State of Montana in trust for the support of specific beneficiary institutions. DNRC is required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run (*Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11; and, 77-1-202 MCA*). The SFLMP provides the management philosophy and framework to evaluate which alternative would maximize real income while sustaining the production of long-term income.

b. The proposed timber sale project contributes to harvest levels mandated by State Statute (*Montana Codes Annotated 77-5-222*) for a 3-year period.

c. The Swan Valley Grizzly Bear Conservation Agreement (SVGBCA) outlays scheduling in the nondenning period for designated subunits. Action Alternative C does the best job of fully complying with the SVGBCA, meeting annual harvest obligations, and analyzing cumulative impacts for all of the management harvests that will occur while this subunit is open for nondenning activities.

d. DNRC is in the final stages of receiving relief from an injunction to harvest old-growth stands that were included in timber sales

developed under DNRC's 1998 Biodiversity Guidelines. Although this may be viewed by some as justification to pursue Action Alternative B, I do not think that new legislation, nor DNRC's attempt at rulemaking, have reduced the legal uncertainty surrounding old growth on State lands in the foreseeable future. I would not expect real resolution to the old-growth issues in time for implementation of this project.

e. Swan River State Forest is about to complete an Environmental Assessment that addresses a salvage operation of primarily blown-down timber from areas classified as old growth. State statutes concerning salvage operations (*77-5-207 MCA*) provide clearer direction concerning harvests within old-growth stands than for proposed management harvests. Given that Swan River State Forest is proposing to enter old-growth stands in the vicinity for salvage, it will be prudent to delay management harvests within old growth in this area until a future date.

f. Since Action alternative C meets target harvest obligations, it is prudent to delay the harvesting within old-growth stands to another entry period with, hopefully, better market conditions.

g. Alternative C retains more big game thermal cover than Action Alternative B.

h. Comments received on the DEIS that recommended an alternative were primarily split between Action Alternatives B and C. Although Action Alternative B addresses needed management actions within more timber stands than Action Alternative C, the political, social, and legal uncertainty surrounding those actions within old-growth stands significantly increases the likelihood that Action Alternative C will be successfully implemented.

Summary

Overall, Action Alternative C best complies with the Agency's legal requirements and the content of the SFLMP; harvests timber in a manner that moves Swan River State Forest toward appropriate conditions while balancing the recovery of value with the limiting of high-risk effects to other valuable resources; and treats a number of timber stands while avoiding the uncertainty surrounding the harvesting of old growth.

CHAPTER III

EXISTING ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

GOAT SQUEEZER TIMBER SALE PROJECT

CHAPTER III

EXISTING ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Chapter III is a summary of resource conditions as they relate to the proposed Goat Squeezer Timber Sale Project. The current, or existing, condition can be viewed as a baseline to compare changes resulting from the selection of any alternative. How each alternative may affect the environment is also described. For more complete assessments and analyses related to the resources for both scientific and judicial review, refer to the appropriate appendices of this EIS.

PROJECT AREA DESCRIPTION

The Goat Squeezer Timber Sale project area is located primarily in the east to southeast portion of Swan River State Forest.

- The project area encompasses approximately 10,676 acres in 19 sections and is primarily located in the Goat and Squeezer creek drainages. Both creeks flow into Swan River, which empties into Swan Lake 12 miles to the north.
- The topography is composed of moderately steep valley slopes of 20 to 60 percent at elevations of 3,300 to 6,000 feet. Aspects are north, west, and south.
- The project area is accessed from Highway 83 via Goat Creek, Old Squeezer Loop, or Center Loop roads.
- Adjacent landowners include private residences, industrial and nonindustrial timberlands, and USFS lands.

VEGETATION ANALYSIS SUMMARY

INTRODUCTION

The vegetation section addresses the potential effects of the proposed alternatives related to the following issues:

- timber covertypes, distribution of age classes, and forest canopy coverage;
- insect, disease, and wildfire effects;
- old growth;
- sensitive plants; and
- noxious weeds.

The 3 geographic scales included in the vegetation analysis:

- Upper Flathead Valley,
- Swan River State Forest management block, and
- Goat Squeezer project level.

EXISTING VEGETATION

The existing vegetative types on Swan River State Forest and within the project area are a result of various site factors, fire regimes, and past management practices.

Forested stands within the project area were categorized using *Fischer and Bradley's* fire groups. Forest habitat types were assigned to 10 fire groups based on the response of the tree species to fire and the roles these tree species take during successional stages (*Fischer and Bradley*). Within the Goat Squeezer Timber Sale Project area, 75 percent of the timber stands are in the moderately cool and moist habitat-type groups, which mainly include the Engelmann spruce, grand fir, and western red cedar habitat types. The moderately warm and dry habitat-type groups, which includes the Douglas-fir habitat types, make up 17 percent of the timber stands. The cool and moist habitat type-group consists of the subalpine fir habitat type and includes 5 percent of the timber stands. The remaining 3 percent includes the wet (Engelmann spruce), moderately cool and dry (grand fir), and cool and moderately dry (subalpine fir) habitat type groups.

Timber has been harvested in the project area since the 1950s. Most stands were harvested with a clearcut or seedtree prescription. These stands have regenerated to a variety of species, including western larch, Douglas-fir, western red cedar, western white pine, and grand fir.

DNRC has identified desired future conditions by using historic data and found that the mixed-conifer and lodgepole pine covertypes are currently overrepresented, while the western larch/Douglas-fir, ponderosa pine, and western white pine covertypes are underrepresented. Inventory data from *Losensky's "Historical Vegetation of Montana" (1997)* was used to provide an estimate of age-class distribution by covertype for Montana's forests. The current distribution of age class by covertype is much different than the distributions of pre-European settlement. Swan River State Forest is low in stands of the seedling/sapling age class (19.4 percent, or 7,777 acres) and high in stands that are in the 100-to-149-year and 150-year-and-older age class (60 percent, or 24,100 acres). Desired future conditions are 22 percent, or 8,837 acres, in stands of the seedling/sapling age class and 51 percent, or 20,486 acres, in the mature-and-older age class.

Armillaria root disease is widespread and is causing reduced growth and tree mortality within the project area. Armillaria root disease causes widespread damage in some stands, while in other stands the disease is more centralized. The Douglas-fir bark beetle, active across Swan River State Forest, is attacking larger, older Douglas-fir. Beetle activity is often closely associated with areas already

affected by Armillaria root disease. White pine blister rust has reduced the amount of western white pine in stands across the project area to the point where it can be considered only a minor species. The hazards and risks associated with wildfires are at near-natural levels in some stands, while others are above natural levels. Some stands have moderate to high accumulations of downed woody debris and ladder fuels.

The current SLI indicates that approximately 33.7 percent of Swan River State Forest is considered old growth. All covertypes exceed historic amounts in acres of old growth, with the exception of the western larch/Douglas-fir cover type. Many western larch/Douglas-fir stands have progressed through natural succession to mixed-conifer stands by the establishment of shade-tolerant species. DNRC has developed an index of "old growthedness" where attribute levels for old-growth stands can be assessed using the SLI. The attribute levels that are rated include:

- canopy cover,
- volume per acre,
- decadence,
- stand structure,
- snags per acre,
- coarse woody debris, and
- large live trees per acre.

Of the 12,626 acres of old growth on Swan River State Forest, 94 acres have low old-growth attributes, 3,996 acres have medium attributes, and 8,536 acres have high attributes. The old-growth timber stands that are proposed for harvesting in Action Alternative B include 248 acres of high old-growth attributes, 145 acres of medium old-growth attributes, and 25 acres of low old-growth attributes.

Numerous sensitive plants have been identified on Swan River State Forest. Within the Goat Squeezer Timber Sale Project area, 4 plant species and 9 occurrences were found (2 species were found in wet meadows, 1 inhabits a riparian area, and 1 inhabits a pond).

PREDICTED EFFECTS OF ALTERNATIVES

➢ Covertypes

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Covertypes***

  The long-term effects would be continued aging of the overstory, which would eventually be replaced by a shade-tolerant covertype.

  The mixed-conifer, subalpine fir, and lodgepole pine covertypes would continue to be overrepresented on Swan River State Forest. The western larch/Douglas-fir, western white pine, and ponderosa pine covertypes would continue to be underrepresented.

- ***Direct Effects of Action Alternatives B and C on Covertypes***

  Using various treatments, the covertypes in several stands would change from the current covertype to one that is representative of a desired future condition. Changes in covertypes are shown in *TABLE III-1 — CHANGES IN COVERTYPES UNDER ACTION ALTERNATIVES B AND C.*

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Covertypes***

  As stands develop over time, natural forest succession and lack of wildfire influence would reduce the variability of covertypes on the landscape.

TABLE III-1 - CHANGES IN COVERTYPES UNDER ACTION ALTERNATIVES B AND C

CURRENT COVERTYPE	AFFECTED ACRES UNDER ACTION ALTERNATIVE B	AFFECTED ACRES UNDER ACTION ALTERNATIVE C	POSTHARVEST COVERTYPE
Douglas-fir	34	0	Ponderosa pine
Lodgepole pine	12	12	Western white pine
Lodgepole pine	8	8	Western larch/ Douglas-fir
Mixed conifer	45	45	Western white pine
Mixed conifer	56	32	Ponderosa pine
Mixed conifer	11	0	Douglas-fir
Mixed conifer	1,097	1,058	Western larch/ Douglas-fir
Ponderosa pine	19	0	Western white pine
Western larch/ Douglas-fir	14	0	Western white pine
Western larch/ Douglas-fir	112	76	Ponderosa pine
Totals	1,408	1,231	

- ***Indirect Effects of Action Alternatives B and C on Covertypes***

  The mixed-conifer covertype would develop at a reduced rate due to the removal of shade-tolerant trees.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Covertypes***

  The cumulative effects would be the same as the cumulative acres assessed with the Small Squeezer, Small Squeezer II, and South Wood timber sales.

- ***Cumulative Effects of Action Alternative B on Covertypes***

  Small Squeezer, Small Squeezer II, and South Wood timber sales increased the amount of western larch/Douglas-fir covertypes on Swan River State Forest. With the addition of this project, the cumulative changes to covertypes on Swan River State Forest would be as follows:

  - Mixed-conifer covertype reduced by 1,208 acres
  - western larch/Douglas-fir covertype increased by 978
  - ponderosa pine covertype increased by 127 acres
  - western white pine covertype increased by 90 acres
  - lodgepole pine covertype decreased by 20 acres

- ***Cumulative Effects of Action Alternative C on Covertypes***

  Small Squeezer, Small Squeezer II, and South Wood timber sales increased the amount of western larch/Douglas-fir covertypes on Swan River State Forest. With the addition of this project, the cumulative changes to covertypes on Swan River State Forest would be:

  - mixed-conifer covertype reduced by 1,142 acres
  - western larch/Douglas-fir covertype increased by 997 acres
  - ponderosa pine covertype increased by 108 acres
  - Western white pine covertype increased by 57 acres

- lodgepole pine covertype decreased by 20 acres

➢ Age Classes

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Age Class***

  No change would be expected.

- ***Direct Effects of Action Alternative B on Age Classes***

  Approximately 128 acres would be converted from the 150-year-plus age class to the 0-to-39-year age class; 90 acres would change from the 40-to-99-year age class to the 0-to-39-year age class; and 52 acres would change from the 100-to-149-year age class to the 0-to-39-year age class.

- ***Direct Effects of Action Alternative C on Age Classes***

  Approximately 90 acres would be converted from the 150-year-plus to the 0-to-39-year age class; 91 acres would change from the 40-to-99-year age class to the 0-to-39-year age class; and 52 acres would change from the 100-to-149-year age class to the 0-to-39-year age class.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Age Classes***

  Stands in all age classes would continue to grow older. Stands in the 150-year-plus age class would increase in the absence of wildfires and management.

  Long-term effects in age class would show decreases as stands age, mortality increases, and the understory becomes the dominant stand.

- ***Indirect Effects of Action Alternative B and C on Age Classes***

  Regeneration treatments would reduce the age class of some stands. The amount of acres affected would be 270 for Action Alternative B and 233 acres for Action Alternative C. New stands would develop on these acres from natural regeneration and/or planting.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Age Classes***

  The cumulative effects would be the same as the cumulative acres assessed with Small Squeezer, Small Squeezer II, and South Wood timber sales.

- ***Cumulative Effects of Action Alternative B on Age Classes***

  Small Squeezer, Small Squeezer II, and South Wood timber sales have changed the percent of acres in the various age classes. With the addition of Action Alternative B, the cumulative changes to age classes on Swan River State Forest would be:

  - The 0-to-39-year age class would increase from 20.2 percent to 21.2 percent.
  - The 40-to-99-year age class would decrease from 17.3 percent to 16.9 percent.
  - The 100-to-149-year age class would decrease from 17.6 percent to 17.3 percent.
  - The 150-year-plus age class would decrease from 44.9 percent to 44.6 percent.

- ***Cumulative Effects of Action Alternative C on Age Classes***

  Small Squeezer, Small Squeezer II, and South Wood timber sales have changed the percent of acres in the various age classes. With the addition of Action Alternative C, the cumulative changes to age classes on Swan River State Forest would be:

- The 0-to-39-year age class would increase from 20.2 percent to 21.1 percent.
- The 40-to-99-year age class would decrease from 17.3 percent to 16.9 percent.
- The 100-to-149-year age class would decrease from 17.6 percent to 17.3 percent.
- The 150-year-plus age class would decrease from 44.9 percent to 44.7 percent.

➢ Canopy Coverage

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Canopy Coverage***

  No change would be expected. The stands proposed for harvesting would stay at the current amount of canopy coverage. Natural disturbances would change coverage over time.

- ***Direct Effects of Action Alternatives B and C on Canopy Coverage***

  The percentage of canopy coverage would be reduced in harvested stands to the following levels:

  - In seedtree harvests, the residual coverage would be 5 to 20 percent on 270 acres in Action Alternative B and 233 acres in Action Alternative C.
  - In shelterwood harvests, the residual coverage would be 50 to 60 percent on 43 acres in Action Alternatives B and C.
  - In commercial thinning harvests, the residual coverage would be 25 to 55 percent on 1,355 acres in Action Alternative B and 1,216 acres in Action Alternative C.
  - In group selection harvests, the residual coverage would be 5 to 10 percent in the groups selected, estimated to cover 50 percent of the acres on 207 acres in Action Alternative B and 0 acres in Action Alternative C.
  - In sanitation harvests, the residual coverage would be 25 to 50 percent on 82 acres in Action Alternative B and 37 acres in Action Alternative C.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Canopy Coverage***

  No indirect effects are expected.

- ***Indirect Effects of Action Alternatives B and C on Canopy Coverage***

  Canopy cover would increase in areas of seedtree, shelterwood, and group-selection harvests as regeneration replaces the cut trees in 10 to 15 years.

  In individual tree selection, commercial thin, and sanitation harvest areas, residual canopy cover would increase at 10 to 15 percent over 10 years.

➢ Insects and Diseases

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A to Insects and Diseases***

  The infestation of the Douglas-fir beetle would continue and increase due to brood habitat and continued food sources.

- ***Direct Effects of Action Alternatives B and C on Insects and Diseases***

  In harvest units, some older, large-diameter, insect-infested and disease-infected trees would be harvested to remove Douglas-fir bark beetles from the forest. Their removal may reduce successful attacks on green trees due to their higher vigor. Species that are susceptible to Armillaria root disease, such as Douglas-fir, would be removed and tolerant

species, such as western larch, would remain.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Insects and Diseases***

  Insect and disease problems would continue to increase as stands age.

- ***Indirect Effects of Action Alternatives B and C on Insects and Diseases***

  The remaining trees would be less susceptible to the effects of drought and attack by bark beetles. Damage from Armillaria root disease would be reduced due to the selective removal of tree species, such as Douglas-fir, grand fir, and subalpine fir, that are much less resistant to Armillaria root disease than species such as western larch.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Insects and Diseases***

  Insect infestations and disease infections may increase over the long term as stands age and tree vigor decreases.

- ***Cumulative Effects Common to Action Alternatives B and C on Insects and Diseases***

  Insects and diseases would affect fewer trees across Swan River State Forest due to harvesting and salvaging actions of this and other Swan River State Forest projects.

➢ Fire

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Fire***

  No changes would be expected.

- ***Direct Effects of Action Alternatives B and C on Fire***

  Slash may be a fire hazard in the short term. Some units will have slash piled at the landing, while other units, such as individual-tree-selection units, will have slash or piles distributed throughout the units. Seedtree units would be broadcast burned where feasible.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Fire***

  The fire hazard may slowly progress to a higher fire hazard for stand-replacement fires.

- ***Indirect Effects of Action Alternatives B and C on Fire***

  The fire hazard would be very low following slash treatments on acres treated with seedtree prescriptions, and would be reduced within other units. Mortality risk from low- to moderate-intensity fires would be reduced due to removal of fire-susceptible tree species.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Fire***

  Fire hazards may increase over the long term.

- ***Cumulative Effects of Action Alternatives B and C on Fire***

  The potential for a large-scale stand-replacement fire would be reduced across stands where fuel loading has been reduced.

➢ Old Growth

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Old Growth***

  Existing old growth would continue to age and become more decadent. Several stands may no longer be old growth if Douglas-

fir bark beetles kill a sufficient number of large live trees.

- ***Direct Effects of Action Alternative B on Old Growth***

  Harvesting would occur on approximately 418 acres of old-growth stands. The historic range of old growth in the Swan Valley is from 29 to 52 percent. The current percent of old growth for Swan River State Forest is 34 percent. Stands would be treated with commercial thinning, sanitation, group-selection, and individual-tree-selection methods. The attributes of the old-growth stands would be affected in minor amounts. The number of large live trees needed to meet the *Green et al* definition would be retained in the stand. Trees that are dead or dying from Douglas-fir bark beetles would be harvested from these stands.

- ***Direct Effects of Action Alternative C on Old Growth***

  Existing old growth would continue to age and become more decadent. Several stands may no longer be old growth if Douglas-fir bark beetles kill a sufficient number of large live trees. Under this alternative no dead or dying Douglas-fir, due to Douglas-fir bark beetle attacks, would be harvested.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Old Growth***

  As trees age, the amount of old-growth acres would initially increase, but eventually may no longer meet the old-growth definition due to the mortality of large live trees on Swan River State Forest.

- ***Indirect Effects of Action Alternative B on Old Growth***

  Harvesting in these stands would reduce competition for water and nutrients. In turn, this would improve the health and diameter growth of the remaining trees.

- ***Indirect Effects of Action Alternative C on Old Growth***

  As trees age, the amount of old-growth acres would initially increase, but eventually may no longer meet the old-growth definition due to the mortality of large live trees on Swan River State Forest.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Old Growth***

  Not applicable.

- ***Cumulative Effects of Action Alternative B on Old Growth***

  Limited harvesting occurred in old-growth stands during the High Blow 02 Salvage Permit. The Big Blowdown Salvage is proposing to do some salvaging in old growth. Small Squeezer, Small Squeezer II, and South Wood timber sales did not harvest in old-growth stands. Old-growth stands proposed in this project would have affects to old-growth attributes in volume-per-acre reduction, removal of decadence, and decreased canopy coverage.

- ***Cumulative Effects of Action Alternative C on Old Growth***

  No harvesting of old growth would occur under this alternative.

➢ Fragmentation

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Fragmentation***

  The current fragmentation of the land would remain as it is seen today. Changes may occur by disturbances (fire, future logging) that would affect the fragmentation on Swan River State Forest.

- ***Direct Effects Common to Action Alternatives B and C on Fragmentation***

  Generally, patch sizes would not change since the proposed harvest units follow existing stand boundaries. The proposed seedtree harvesting would create new, younger-aged patches. The proposed group-selection unit would have small openings in the stand that would appear as natural breaks. Generally, the proposed commercial-thin, sanitation, individual-tree selection, and shelterwood treatments would not change the patch size or shape.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Fragmentation***

  No indirect effects on fragmentation would be expected.

- ***Indirect Effects Common to Action Alternatives B and C on Fragmentation***

  The seedtree harvest units that are located next to postharvest units and other proposed harvest units may result in bigger patches of the younger age class. In some areas, the same type of treatment across several stands would tend to reduce the differences between stands and increase the patch size. The majority of the stands that share boundaries have different types of treatments, which would reduce patch sizes.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Fragmentation***

  No cumulative effects on fragmentation would be expected.

- ***Cumulative Effects Common to Action Alternatives B and C on Fragmentation***

  When this project is combined with the acres in Small Squeezer, Small Squeezer II, and South Wood timber sales, there is an increase in younger age-class patches. The units that are thinned would not be as dense, but would also not contribute to fragmentation in or between timber stands.

➢ Sensitive Plants

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A to Sensitive Plants***

  Annual seasonal climatic variations and events (drought, flooding, etc.) could alter water levels leading to increases or decreases in plant populations. No significant effects to sensitive plants are expected.

- ***Direct Effects of Action Alternatives B and C to Sensitive Plants***

  No direct effects from harvesting operations are expected.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A to Sensitive Plants***

  Not applicable.

- ***Indirect Effects of Action Alternatives B and C to Sensitive Plants***

  No indirect effects are expected to the population levels of sensitive plants.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A to Sensitive Plants***

  No measurable effects are anticipated from this project or those on adjacent lands.

- ***Cumulative Effects of Action Alternatives B and C to Sensitive Plants***

  No effects to the population levels of sensitive plants are expected, since no changes in water yield or surface-water levels are anticipated from this proposed action or activities on adjacent lands.

➢ Noxious Weeds

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Noxious Weeds***

  The noxious weed populations will continue to spread along road edges and disturbed sites and may increase. DNRC will prioritize efforts to control noxious weeds with available funds. Logging activities on adjacent ownerships and recreational use would continue to introduce weed seeds.

- ***Direct Effects Common to Action Alternatives B and C on Noxious Weeds***

  Logging disturbance would provide opportunity for an increased establishment of noxious weeds; log hauling and equipment use would introduce noxious weed seed from other sites. The construction of new roads would disturb soils and provide an environment for noxious weed establishment. Noxious weeds may increase in the short term. DNRC would promote prompt revegetation and monitor the project areas for noxious weeds. DNRC would prioritize control measures to treat any new noxious weed infestations and reduce existing noxious weeds.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Noxious Weeds***

  The noxious weed populations would continue as they exist. Log hauling and logging on adjacent ownerships and recreational use would continue to introduce noxious weed seeds.

- ***Indirect Effects Common to Action Alternatives B and C on Noxious Weeds***

  Currently, noxious weeds are well established along roads and are beginning to establish in areas away from roads due to past harvesting disturbances and the presence of roads. The spread of noxious weeds would be reduced by mitigation measures that include grass seeding, equipment washing, and spot herbicide spraying. The action alternatives would manage noxious weeds and control any new infestations.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Noxious Weeds***

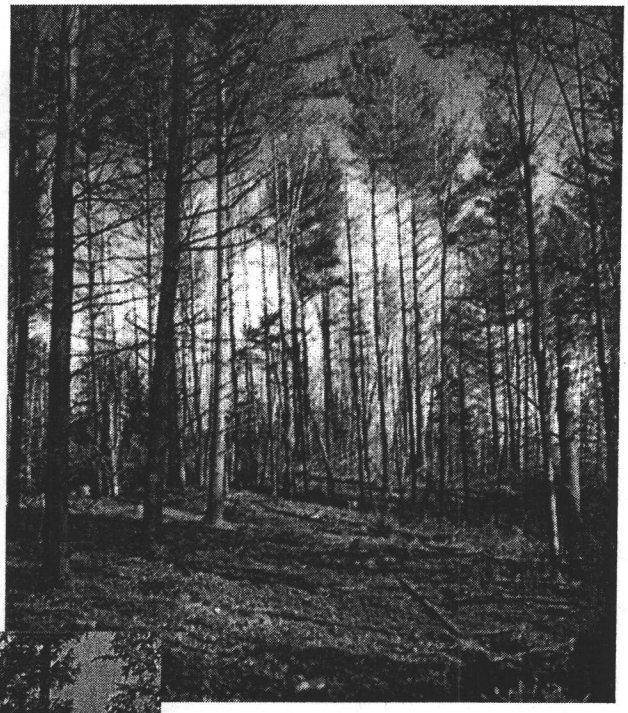
  The spread of noxious weeds across all land ownerships would continue. The opportunity for noxious weed establishment would be available with ongoing forest-management activities on adjacent lands. With limited funding, noxious weeds could increase over time.

- ***Cumulative Effects Common to Action Alternatives B and C on Noxious Weeds***

  Both action alternatives, together with other logging on Swan River State Forest, recreational driving on forest roads, and logging and forest management on other ownerships, would provide disturbed soil for seedbeds for noxious weed seeds carried onto the project area by vehicles. Over the long term, shade and competitive vegetation should reduce noxious weed vigor

and density, coupled with treatments, to reduce noxious weeds and prevent the establishment of new invader species.

Commercial thin



Western larch shelterwood with regeneration in the opening

Western larch stand after slash treatment

HYDROLOGY ANALYSIS SUMMARY

INTRODUCTION

During the initial scoping and subsequent newsletter comments, the following issues were expressed regarding the effects of the proposed timber harvesting. This analysis is designed to disclose the existing condition of the hydrologic resources and display the anticipated effects that may result from each alternative of this proposal.

- Minimum buffer zones, as required by the SMZ law, may be inadequate to protect streams from increased sediment introduction.
- Timber removal activities within the SMZ may alter fisheries habitat by reducing pool formation. Generally, this is referring to large woody debris removal, which is a catalyst for pool formation.
- Timber-harvesting activities may increase sediment introduction to streams from in-channel and out-of-channel sources.

These issues can best be evaluated by analyzing the anticipated effects of sediment delivery and water yield on the water quality of the streams within the project area.

ANALYSIS METHODS

Methodology for analyzing sediment delivery will be completed using a detailed sediment-source inventory that may include quantitative and/or qualitative information. Roads and stream crossings were evaluated to determine sources of introduced sediment. Water yield was calculated using computer modeling. No harvesting is proposed in the SMZs under any of the alternatives. Due to the lack of harvesting in SMZs, large woody-debris recruitment will not be affected and, therefore, no further analysis is deemed appropriate.

In addition to looking at potential sources of sediment introduction from roads, potential sediment delivery to streams from harvest units will be addressed by discussing the effectiveness of buffer zones along streams.

ANALYSIS AREA

The analysis area for this project includes Goat and Squeezer Creeks, which are both listed on the 1996 303(d) list and are used by bull trout for spawning. Only Goat Creek is listed in the 303(d) lists for 2000 and 2002. Other streams in the analysis area are Napa Creek (a tributary to Soup Creek), Squaw Creek, Perry Creek, and the Van Lake watershed.

Beneficial uses in these watershed include coldwater fisheries, domestic water supply, and recreational use in the wetland and surrounding areas.

EXISTING CONDITIONS

Generally, all of the streams in the project area are stable and do not contain many sources of sediment from scouring of the banks. Goat Creek was inventoried; 2 locations of in-stream sediment sources were found. Both locations resulted from trees falling across the stream. Squeezer Creek has a few banks that contribute sediment. The biggest source of sediment from within the stream is debris jams. These debris jams store sediment until the debris jam fails and the sediment is released. The Van Lake, Squaw/ Perry, and Napa Creek watersheds are stable channels with very few locations that contribute sediment from the banks due to low gradient, intermittent channels intermingled with wetlands.

Sediment contributions from sources outside of the stream channel are generally road crossings. Several inventories were completed to identify locations that contribute

sediment. Information from the inventories on DNRC-managed land suggest that approximately .2 tons of sediment is delivered to Goat Creek from road locations on an annual basis, and about 4.9 tons of sediment are delivered to streams from road locations in Squeezer Creek on State land only. Road crossings in the Squaw/Perry watershed are generally grassed over and gently sloped; therefore, the potential for sediment transport on roads is low. The Van Lake watershed has no sites identified that contribute sediment. Napa Creek has 1 crossing that contributes a limited amount of sediment to the stream channel.

Water yields for all watersheds are below the level where additional channel scour and bank erosion is expected.

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A to Hydrology***

  No direct effect to sediment delivery or water yield is expected beyond those occurring under current management.

- ***Direct Effects of Action Alternative B to Hydrology***

  Potential sediment delivery from roads used in conjunction with the proposed timber harvest would be reduced. In addition to improving existing stream crossings in the project area and replacing 3 stream crossings on tributaries to Squeezer Creek, approximately 48 miles of road within the project area would be upgraded and 2.9 miles of permanent and 1.1 miles of temporary road would be constructed to meet current BMP standards. The new road construction would cross 1 ephemeral draw and 1 first-order stream and would be obliterated or restricted at the close of the contract period. Upgrading existing roads that need current BMP standards and maintaining roads that presently meet BMP standards would reduce the amount of sediment delivery to streams in the project area.

  In the process of improving BMPs on existing roads for a long-term reduction in sediment delivery, a short-term increase in sediment delivery would potentially occur while replacing 3 stream crossings in Section 26, T23N, R17W. In order to reduce the risk of sediment introduction, precautions in the form of site-specific, erosion-control measures would be implemented during and immediately after culvert replacement. *TABLE III–2 – DIRECT EFFECTS OF ACTION ALTERNATIVE B TO ANNUAL WATER YIELD* displays the number of acres harvested and the expected increase in annual water yield. All watersheds would remain under the threshold of concern.

TABLE III-2 - DIRECT EFFECTS OF ACTION ALTERNATIVE B TO ANNUAL WATER YIELD

WATERSHED	ACRES OF HARVEST	EQUIVALENT CLEARCUT ACRES (ECA)	PERCENT ANNUAL WATER YIELD INCREASE
Goat Creek	465	282	0.3
Squeezer Creek	655	467	0.9
Napa Creek	55	10	<0.1
Squaw/ Perry	607	456	2.7
Van Lake	571	226	1.1
Swan River	85	49	<0.1

- ***Direct Effects of Action Alternative C on Hydrology***

  Potential sediment delivery from roads used in conjunction with the proposed timber harvest would be reduced. Approximately 1.2 miles of road construction would be implemented to extend existing roads; 0.6 miles of road would be

relocated. The new road construction would cross 1 ephemeral draw and 1 first-order stream and would be obliterated or restricted at the close of the contract. In addition to replacing 3 existing stream crossings in the project area, approximately 39 miles of road within the project area would be upgraded or reconstructed to meet current BMP standards. Upgrading existing roads to meet current BMP standards and maintaining roads that presently meet BMP standards would further reduce the risk of sediment delivery. *TABLE III–3 – DIRECT EFFECTS OF ACTION ALTERNATIVE C TO ANNUAL WATER YIELD* displays the number of acres harvested and the expected increase in annual water yield. All watersheds would remain under the threshold of concern.

TABLE III- 3 - DIRECT EFFECTS OF ACTION ALTERNATIVE C TO ANNUAL WATER YIELD

WATERSHED	ACRES OF HARVEST	EQUIVALENT CLEARCUT ACRES (ECA)	PERCENT ANNUAL WATER YIELD INCREASE
Goat Creek	418	274	0.3
Squeezer Creek	550	381	0.4
Napa Creek	55	10	<0.1
Squaw/Perry	530	402	2.4
Van Lake	228	136	0.7
Swan River	85	49	<0.1

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A to Hydrology***

  No timber harvesting or associated activities would occur; therefore, no indirect effects to sediment delivery would be expected if this alternative were implemented beyond those occurring under existing conditions.

- ***Indirect Effects of Action Alternative B to Hydrology***

  Ground-based harvest methods would be used on 2,012 acres of the proposed harvest area; 711 acres would be completed during winter operations. Timber harvesting under winter conditions results, potentially, in less soil disturbance than summer operations because equipment would be operating on snow. The SMZ width for perennial streams would be increased to 165 feet on each side of the stream. This expanded SMZ would be expected to adequately filter sediment. By implementing BMPs, the risk of sediment delivery from harvest units is low; therefore, beneficial uses and water quality would not likely be adversely affected.

- ***Indirect Effects of Action Alternative C to Hydrology***

  Ground-based harvest methods would be used on 1,538 acres of the proposed harvest area; 368 acres would be completed during winter operations. Timber harvesting under winter conditions results, potentially, in less soil disturbance than summer operations because equipment would be operating on snow. The SMZ width for perennial streams would be increased to 165 feet on each side of the stream. This expanded SMZ would be expected to adequately filter sediment. By implementing BMPs, the risk of sediment delivery from harvest units is low; therefore, beneficial uses and water quality would not likely be adversely affected.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A to Hydrology***

  No timber harvesting or associated activities would occur; therefore, no additional cumulative effects to sediment delivery or annual water yield would be expected

beyond those occurring under existing conditions as a result of implementing this alternative.

- ***Cumulative Effects of Action Alternative B to Hydrology***

  Potential short-term sediment delivery would occur as a result of replacing 3 stream crossing on existing roads within the project area. Cumulative effects to sediment delivery, would potentially occur as a result of fixing the existing sediment sources on roads within the project area. Upgrading or maintaining the drainage structures on area roads would reduce the risk of sediment delivery to streams. The cumulative effects to annual water yields by watershed are shown below in *TABLE III-4 - CUMULATIVE EFFECTS OF ACTION ALTERNATIVE B TO ANNUAL WATER YIELD.*

TABLE III-4 - CUMULATIVE EFFECTS OF ACTION ALTERNATIVE B TO ANNUAL WATER YIELD

WATERSHED	THRESHOLD (PERCENT)	CUMULATIVE PERCENT ANNUAL WATER YIELD INCREASE
Goat Creek including Squeezer Creek	10	5.3
Goat Creek only	10	7.6
Squeezer Creek	10	6.4
Squaw/Perry	11	10.7
Van Lake	12	5.6

With all of the watersheds staying below the threshold of concern, the cumulative annual water-yield increase would not likely result in substantial channel adjustments. Therefore, no increased in-stream erosion would be expected.

- ***Cumulative Effects of Action Alternative C to Hydrology***

  Potential short-term sediment delivery would occur as a result of replacing 3 stream crossing on existing roads within the project area. Upgrading or maintaining the BMP structures on area roads would reduce the risk of sediment delivery to streams.

  Action Alternative C, as described earlier, would increase the annual water yield in most of the watersheds within the project area. The cumulative effects to annual water yields by watershed are shown in *TABLE III-5 - CUMULATIVE EFFECTS OF ACTION ALTERNATIVE C TO ANNUAL WATER YIELD.*

TABLE III-5 - CUMULATIVE EFFECTS OF ACTION ALTERNATIVE C TO ANNUAL WATER YIELD

WATERSHED	THRESHOLD (percent)	CUMULATIVE PERCENT ANNUAL WATER YIELD INCREASE
Goat Creek including Squeezer Creek	10	5.2
Goat Creek only	10	5.3
Squeezer Creek	10	5.9
Squaw/Perry	11	10.4
Van Lake	12	5.2

With all of the watersheds staying below the threshold of concern, the cumulative annual water-yield increase would not likely result in substantial channel adjustments. Therefore, no increased in-stream erosion would be expected.

FISHERIES ANALYSIS SUMMARY

INTRODUCTION

This analysis is designed to disclose the existing condition of the fisheries resources and display the anticipated effects that may result from each alternative of this proposal. This section summarizes the complete analysis that can be found in *APPENDIX E - FISHERIES ANALYSIS*.

During the initial scoping and subsequent newsletter comments, the following issues were expressed regarding the effects of the proposed timber harvesting:

- Land-management activities may degrade physical habitat in area streams.
- Fish populations could be affected if fish habitat is degraded.

ANALYSIS AREA

The fisheries analysis area for this proposal includes Goat Creek, Squeezer Creek, Napa Creek, and the Squaw Creek, Perry Creek, and Van Lake watersheds.

The analysis area supports native salmonid species, including bull trout (*Salvelinus confluentus*) and westslope cutthroat trout (*Oncorhynchus clarki lewisi*). Bull trout are Federally listed as "threatened" under the Endangered Species Act, and westslope cutthroat trout are considered a "Class A species of special concern" through a joint listing developed by DFWP and the Montana Chapter of the American Fisheries Society. Other native species in the analysis area include another salmonid, mountain whitefish (*Prosopium williamsoni*) and sculpin (*Cottus spp.*). Nonnative salmonid species found in the analysis area include rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*).

ANALYSIS METHODS

Populations will be discussed using existing data when available. Since DFWP is responsible for fisheries populations, effects to populations will be addressed through a risk assessment of habitat.

Physical habitat will address 4 habitat parameters including sediment, woody debris, stream temperature, and fish passage. These parameters will be discussed as follows:

- *Sediment* will be discussed using McNeil cores and substrate scores. McNeil coring is a method used to estimate the size range of material in streambed spawning sites. Results are given as a percentage of material less than 6.35 millimeter and indicate the quality of spawning and incubation habitat. A stream is considered "impaired" if the percentage is above 35 and "threatened" if the percentage is above 40. Substrate scores is an ocular assessment of streambed particle size and the relative degree of embeddedness. A higher substrate score indicates more favorable fisheries habitat. Scores less than 9 are considered impaired.
- Woody debris existing conditions are addressed through a 1997 study on Goat Creek by *Hauer, Gangemi and Baxter*. In addition, Plum Creek Timber Company assessed woody debris during a watershed analysis in 1996. Since no harvesting within SMZs is proposed under the action alternatives, woody debris will not be discussed under the *DIRECT EFFECTS* and *INDIRECT EFFECTS* sections.
- Stream temperature data, where available, has been collected by the DNRC or DFWP continuous recorders or spot-temperature readings. The anticipated effects to stream temperatures will be addressed through riparian

vegetation removal. However, since no SMZ harvesting is proposed under the alternatives, this parameter will not be discussed under the *DIRECT EFFECTS* and *INDIRECT EFFECTS* sections.

- Fish passage as been determined through observations from field investigations of various studies.

EXISTING CONDITIONS

➢ Goat Creek

Populations

According to the *Montana Bull Trout Scientific Group (1996)*, Goat Creek is considered a core area for bull trout and is currently being proposed as critical habitat. Core areas are drainages that historically and currently contain the strongest populations of bull trout and are important for spawning, rearing, and adult habitat needs. These habitats are key to the continued existence of bull trout in the Flathead Basin.

Goat Creek salmonid population levels are relatively stable in both species composition and density. Bull trout redd-count data indicates an increase in bull trout spawning in Goat Creek in recent years.

Sediment

McNeil core trend data on Goat Creek from 1987 to 2001 indicate that out of the 12 years with data, no values were recorded above the 40-percent critical range and 2 years had threatened values from 35 to 40 percent. No substrate scores less than 9 were recorded.

Woody Debris

Goat Creek was analyzed in a 1997 study of bull trout streams for woody-debris presence. In-channel large woody debris in Goat Creek is considered adequate to meet the different salmonid life-history needs.

Stream Temperature

Past monitoring on Goat Creek has shown that the maximum stream temperature is acceptable for a coldwater fishery. During 2001, the highest daily average recorded near the highway bridge was 11.4 degrees.

Fish Passage

Leathe et al (1985) indicate that a 3-meter falls at kilometer 8.5 on Goat Creek forms a barrier to upstream fish movement. This location is roughly 0.66 of a mile downstream from Scout Creek. Bull trout are found upstream from this location and *Plum Creek (1996)* speculates that this is a barrier to upstream migration by cutthroat trout, but not to larger, adfluvial trout. In addition, a barrier exists in Section 8 near the headwaters that consists of 2 falls, 3 meters and 12 meters in height, and a cascade 4 meters in height. No fish are known to exist above this barrier.

➢ Unnamed Tributary (Section 15)- Tributary to Goat Creek

Populations

According to *Plum Creek (1996)*, a population of cutthroat trout is reported to exist in this tributary.

Sediment

The only physical-habitat inventory of this tributary is from a qualitative assessment by *Plum Creek (1996)*. Geomorphically, this tributary is described as a ground moraine intermittent. *Plum Creek (1996)* also reports that spawning gravels are available in limited quantities, but high concentrations of fine sediment indicate that incubation success is expected to be poor.

Woody Debris

No quantifiable data on in-channel woody-debris volume exists for this tributary.

Stream Temperature

Geomorphically, this tributary is described as a ground moraine intermittent. Apparently, groundwater upwelling may play a role in keeping portions of this stream ice-free during the winter months, providing useable rearing habitat at this time of year

Fish Passage

Migration barriers are evident through the intermittent flow patterns, suggesting that barriers to fish passage form at base flows.

➢ Squeezer Creek

Populations

Like Goat Creek, Squeezer Creek is considered a core area for bull trout by the *Montana Bull Trout Scientific Group (1996)* and is proposed as critical habitat by USFWS. Redd counts have been completed on Squeezer Creek during the same time frame as Goat Creek, and trend data shows an increase in recent years.

Sediment

McNeil core data with values from 11 years of sampling on Squeezer Creek indicate that 5 McNeil values were above the 40-percent critical range and 2 fell within the impaired range.

Woody Debris

According to *Plum Creek (1996)*, woody-debris data ranks good for debris pieces/channel width and fair for percentage of wood cover in pools.

Stream Temperature

Past monitoring has shown that the maximum stream temperature is acceptable for a coldwater fishery.

Fish Passage

Between stream mile 4.8 and 5.03 on Squeezer Creek, a sequence of waterfalls and cascades precludes upstream movement of fish (*Plum Creek, 1996*). Above this barrier, no fish have been found, either by snorkeling of electrofishing (*Leathe et al, 1985, Plum Creek, 1996*).

➢ Squaw Creek and Perry Creek

Populations

According to *Rumsey (2001)*, during a recent presence/absence electrofishing survey of Squaw and Perry creeks, only brook trout were found to exist in these stream.

Sediment

No physical-habitat data has been collected on this stream at this time. McNeil coring and substrate scores are generally completed on bull trout streams and, on occasion, westslope cutthroat trout streams.

Woody Debris

No data has been collected at this time. Due to time and funding constraints, DNRC has focused on bull trout and westslope cutthroat trout streams as a priority.

Stream Temperature

No data has been collected at this time. See explanation above.

Fish Passage

No fish passage problems were identified.

➢ Napa Creek

According to *Rumsey (2001)*, Napa Creek, a tributary to Soup Creek, was found to contain a population of brook trout and, potentially, westslope cutthroat trout.

No data on physical habitat has been collected on this stream. McNeil coring and substrate scores are generally completed on bull trout streams and, on occasion, westslope cutthroat trout streams. However, a series of ponds exist near it confluence with Soup Creek that serve as effective sediment-filtering areas.

Woody Debris

No data has been collected at this time. Due to time and funding constraints, DNRC has focused on bull trout and westslope cutthroat trout streams as a priority.

Stream Temperature

No data has been collected at this time. See explanation above.

Fish Passage

Fish passage into and out of Napa Creek is likely to be seasonal with high flows. During spring, passage is available from Soup Creek into the ponds at the mouth of Napa Creek. As the stream level drops, fish passage is likely limited.

➢ Van Lake

Populations

Van Lake has a surface area of 58 acres, with a maximum depth of 37 feet. The Van Lake watershed is drained by a series of intermittent creeks and ephemeral draws. According to *Rumsey (2001)*, Van Lake has been managed as an important fishery by DFWP since 1938. Historically, the lake probably contained no fish; DFWP began a stocking program in 1938. Cutthroat trout were originally stocked, and rainbow trout were stocked in later years because they were more readily available. Presently the lake receives 5,000 rainbow trout annually and is regarded as a put-grow-and-take fishery because little or no reproduction occurs due to the lack of inlet or outlet streams. Redside shiners (*Richardsonius balteatus*) also exist in the lake, and a robust zooplankton community combines to collectively provide a good forage base. Trout growth rates are good and Van Lake has a reputation as a very popular angling lake. Based on the DFWP State-wide mailed creel surveys, pressure estimates range from 510 to 1,373 angler-days annually for the recent period of 1989 through 1999. Compared to nearly 400 waters in DFWP Region 1, Van Lake has ranked as high as 40 in angler popularity.

Woody Debris

Due to the intermittent and ephemeral nature of the channels in the Van Lake watershed, no woody debris data has been collected.

Stream Temperature

Due to the intermittent and ephemeral nature of the channels in the Van Lake watershed, no stream temperature data has been collected.

Fish Passage

Due to the intermittent and ephemeral nature of the channels in the Van Lake watershed, fish passage is not possible.

➢ Swan River

Swan River is considered nodal habitat for bull trout and is being proposed as critical habitat by USFWS. Nodal habitats are waters that provide migratory corridors, over-wintering areas, or other habitat critical to the population at some point during the fishes' life history *(Montana Bull Trout Scientific Group, 1996)*.

Populations

A population estimate conducted by DFWP in 1990 from Fatty Creek

bridge downstream to Point Pleasant Campground (nearest section to proposed action areas) found 107 (+/-57) rainbow trout and 50 (+/-39) brook trout. Westslope cutthroat trout and mountain whitefish were also sampled, but estimates were not obtained. This species composition is consistent with other population estimates conducted on various sections of Swan River in the 1990s.

Sediment

Little physical habitat for Swan River exists, especially as comparable to the data found for the streams of the proposed action area.

Woody Debris

No quantitative data on woody debris in the Swan River has been collected by DNRC.

Stream temperature

Stream temperature data from DFWP during August and September of 2001 at Fatty Creek bridge indicated a maximum temperature of 69.5 Fahrenheit and a minimum of 51.1 Fahrenheit. Recordings at Porcupine Creek bridge during the same time frame indicated a maximum temperature of 65 Fahrenheit and a minimum temperature of 52 Fahrenheit. These maximum temperatures would be stressful to both westslope cutthroat trout and bull trout.

Fish Passage

No fish passage problems were identified on Swan River in the project area. Bridges crossing the river do not present physical barriers.

ALTERNATIVE EFFECTS

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A to Fisheries***

  With no harvesting activities occurring under No-Action Action Alternative A, no direct effects to fish populations or physical habitat parameters in the waters of the analysis area would occur as a result of this alternative.

- ***Direct Effects Common to Action Alternatives B and C to Fisheries***

  Populations

  Action Alternatives B and C would have no direct effects on fish populations of the analysis area due to the anticipated effects to the physical-habitat parameters.

  Sediment

  Action Alternatives B and C include construction, reconstruction, and improvement/ maintenance of roads to access harvest units; these activities would follow BMP guidelines to eliminate or reduce potential sediment sources. In addition, Action Alternatives B and C do not include the installation of stream-crossing structures on perennial fish-bearing streams. Through DNRC-mitigated SMZs, all proposed harvest units and associated activities include a 165-foot buffer on fish-bearing streams and a 83.5-foot buffer on intermittent streams. This minimizes the potential of fine sediment through surface erosion to have a direct effect to fish health. As a result, Action Alternatives B and C would have no direct effects on fish populations of the analysis area.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A to Fisheries***

  With no harvesting activities occurring, No-Action Action Alternative A would not indirectly affect fish populations or physical-habitat parameters in the waters of the analysis area.

- ***Indirect Effects Common to Action Alternatives B and C to Fisheries***

  Populations

  Due to the anticipated effects to the physical-habitat parameters, Action Alternatives B and C would have no indirect effects on fish populations of the analysis area .

  Sediment

  If Action Alternatives B or C were implemented, the potential impacts of harvesting activity (i.e., fine-sediment delivery to the stream channel) would be minimized as a result of the following:

  - winter harvesting for certain harvest units;
  - incorporation of expanded SMZs,
  - following BMPs for harvest-related activities,
  - locating harvest units predominately away from stream channels,
  - grass seeding disturbed areas, and
  - the gentle or moderate slope angles of the proposed harvest units.

  As a result of these design features and mitigation measures, adverse effects to fish populations from sediment are unlikely.

  Fish Passage

  No indirect effects to fish passage were identified.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A to Fisheries***

  No-Action Alternative A would not influence the cumulative effects of natural landscape processes and human-caused factors as they associate with trout populations.

- ***Cumulative Effects Common to Action Alternatives B and C to Fisheries***

  Populations

  No adverse cumulative effects to fish populations are expected from the implementation of either action alternative due to the design features and mitigation measures incorporated into the proposal.

  Sediment

  Under Action Alternatives B and C, harvesting activities would not substantially impact the cumulative amount of fine-sediment delivery to the stream channel as a result of the following:

  - winter harvesting for certain harvest units,
  - incorporation of expanded SMZs,
  - following BMPs for harvest-related activities,
  - locating harvest units predominately away from stream channels,
  - grass seeding disturbed areas, and
  - the gentle or moderate slope angles of the proposed harvest units.

  Fish Passage

  Since no new stream crossings would be installed under either action alternative, no adverse cumulative effects would occur to fish passage in the project area.

INTRODUCTION

The discussion in this section pertains to wildlife species and their habitat in the existing environment and changes to that environment due to each alternative. The discussion occurs on 2 scales:

- The project area includes DNRC-managed State trust lands within Sections 32, 33, and 34, T24N, R17W, and Sections 4, 8, 10, 16, 20, 22, 26, 28, 32, and 34, T23N, R17W. Full descriptions of the project area and proposed harvest units are presented in *CHAPTER II—ALTERNATIVES*.
- The second scale relates to the surrounding landscape for assessing cumulative effects. This scale varies according to the species being discussed, but generally approximates the size of that wildlife species' home range. Under each grouping or species heading, the description for the cumulative effects analysis area will be discussed. In the cumulative effects analysis area, prior State actions and foreseeable future actions, along with current conditions on other ownerships were considered and discussed. Species were dismissed from further analysis if their habitat did not exist in the project area or would not be modified by an alternative.

EXISTING CONDITION

COVERTYPES

The vegetation analysis indicates that over the past century covertypes have changed. The changes have probably reduced the number of wildlife species that use the more open forests containing tree species that do not grow well in the shade, while wildlife species that favor dense forest with closed canopies have increased.

AGE CLASS

Over time, tree species that grow well in shady conditions grew in the understory of tree species that prefer more open stands, thus converting the open stands to dense, closed forests. Other open forests were harvested, allowing young stands to regenerate. Presumably, the wildlife species that use these habitats changed similarly through time.

PATCH SIZE AND EDGE/INTERIOR HABITATS

The project area contains 3,244 acres of forested habitat, 878 acres of interior habitat, and 2,366 acres of edge habitat.

CONNECTIVITY

In the Goat Squeezer project area, connectivity to adjacent ownerships is variable; however, no proposed harvest units are in key wildlife travel areas, such as saddles or near streams.

ENDANGERED, THREATENED, OR SENSITIVE SPECIES

- Bald Eagle - Classified as a threatened species. This project is not proposed in an established bald eagle territory, but winter habitat and 691 acres of potential breeding habitat are present.
- Canada Lynx - Classified as a threatened species. The project area contains approximately 101 acres of lynx habitat. Of these, 31 acres consist of mature forage and 70 acres contain other lynx habitat.
- Gray Wolf - Classified as an endangered species. The project area includes habitat that is suitable to wolves, but presently no wolf packs or wolf activity are documented in the project area.

- **Grizzly Bear** - Classified as a threatened species. The project would follow all the stipulations listed in the SVGBCA. The existing habitat conditions are detailed in *APPENDIX F - WILDLIFE ANALYSIS*.
- **Fisher** - Listed by DNRC as a sensitive species. The project area includes approximately 6,758 acres of habitat that is suitable for fishers.
- **Flammulated Owl** - Listed by DNRC as a sensitive species. The project area consists of approximately 1,525 acres of potential habitat for flammulated owls. Of these acres, 1,256 acres are in dense mixed-conifer stands that are not suitable as flammulated owl habitat.
- **Pileated Woodpecker** - Listed by DNRC as a sensitive species. The project area contains approximately 2,805 acres of potential nesting habitat for pileated woodpeckers.
- **Big Game** - White-tailed deer, mule deer, and elk use most of the project area during the winter. The project area contains 2,779 (43 percent) acres of thermal cover.

ALTERNATIVE EFFECTS

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A to Wildlife***

  No substantial changes in human disturbance are expected under No-Action Alternative A; therefore, no direct effects are expected to bald eagles, Canada lynx, grizzly bears, gray wolves, fishers, flammulated owls, pileated woodpeckers, or big game (white-tailed deer, elk, mule deer). No additional displacement or disturbance of wildlife is expected in the area.

- ***Direct Effects of Action Alternatives B and C to Wildlife***

  Displacement and/or disturbance are expected for wildlife species in the area. However, the extent of disruption is related to the species in question due to a variety of responses by different species. Due to the amount of acreage affected, the amount of road used, and the duration of harvest activities, Action Alternative B is expected to produce more disturbances to wildlife species and occur over a longer period of time than Action Alternative C.

  Bald eagle access to carrion in the winter would probably not be affected by winter harvesting. The increased disturbance associated with Action Alternatives B and C poses a minimal risk of preventing eagles from establishing a new nest. If nesting behavior is observed, or a nest is discovered within 1 mile of the project area, additional mitigation measures outlined in the Habitat Management Guide for Bald Eagles in Northwestern Montana (*Montana Bald Eagle Working Group 1991*) would be applied.

Some disturbance of Canada lynx could occur in areas with adequate cover for lynx to travel through. However, lynx appear to be relatively tolerant of humans and road traffic; therefore, no substantial direct effects would be expected. The risk of negative direct effects is higher under Action Alternative B than Action Alternative C, but very minor risks are expected under both alternatives due to the small amount of habitat affected.

Due to the seasonal timing of harvesting, the increase in human use and traffic would probably not result in disturbance to denning and rendezvous areas if these sites were present. Therefore, the direct effects to the success of wolf reproduction under Action Alternatives B and C are expected to be minimal, with Action Alternative B resulting in a slightly higher risk.

In regard to grizzly bears, both action alternatives would adhere to the stipulations of the SVGBCA. Under these conditions, any additional disturbances to grizzly bears would be minor, with Action Alternative B producing more effects than Action Alternative C.

Some displacement of fishers could occur under either action alternative, though the effects of this displacement would be minor. The risk of displacement is approximately proportional to the amount of habitat affected; therefore, Action Alternative B poses more risk than Action Alternative C.

Flammulated owls appear to tolerate human disturbance and rarely abandon a nest. If harvesting occurs while owls are nesting and a nest tree is inadvertently cut down, some owls could die. However, due to the timing of harvesting activities and the trees that would be retained, this probably would not happen. These action alternatives are not expected to directly affect flammulated owls otherwise.

Pileated woodpeckers could be displaced under both action alternatives if harvesting occurs during the nesting season (May through June); some woodpeckers could die if nest trees are inadvertently cut. This risk would be low because most nest trees possess some rot; therefore, they have low merchantability. Additionally, some displacement of woodpeckers could occur. There would be more risk of direct effects to pileated woodpeckers under Action Alternative B than under Action Alternative C.

In regard to big game species, deer are expected to congregate in harvest units to feed on slash during harvesting activities. This situation could result in increased movement across the highway into the harvest units. To mitigate this potential problem, road signs would warn motorists of logging operations and the potential for deer crossing the highway. Under Action Alternatives B and C, wintering big game may be disturbed by human use of the area. Neither action alternative is expected to result in substantial big game mortality due to displacement or stress related to the project occurring on the winter range.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A to Wildlife***

  In the long-term, wildlife species that use more open stands, younger and/or shade-intolerant tree species, and more diverse landscapes would be negatively affected due to the loss of habitat. Wildlife species that use a late-successional forest

structure and interior habitat would benefit by an increase in habitat. No change in forest connectivity is expected in the short term.

Under this alternative, the quality of bald eagle nesting habitat would decrease through time. Eagle access to winter-killed animals would be reduced, but big game carrion would be expected to be maintained at current levels or increase. The potential of these effects limiting expansion of the bald eagle breeding population is low.

If gray wolves use the area in the winter, the existing or increased amount of prey and the available carrion in the Highway 83 corridor are expected to result in positive effects to wolves. However, taking advantage of this food source could result in increased mortality due to the potential of automobiles colliding with wolves.

Components of grizzly bear habitats would be retained. Hiding cover for grizzly bears would be retained at 74.5 percent of the project area.

The nesting habitat of flammulated owls would be retained in poor condition and would continue to decline.

The nesting habitat of pileated woodpeckers would increase through time, then decline.

Thermal cover for big game would remain at 3,736 acres (57 percent) of the project area. This alternative is expected to maintain the existing carrying capacity of the winter range, resulting in positive effects to big game, especially white-tailed deer.

- ***Indirect Effects of Action Alternative B to Wildlife***

In the long-term, species that use the more open stands, younger and/or shade-intolerant tree species, and more diverse landscapes would be positively affected. Species that use late successional forest structure and interior habitat would be negatively affected. Harvests would retain the same number of forested patches, but reduce the median patch size by 16 acres, while reducing forested habitat by 1,238 acres, interior habitat by 887 acres, and edge habitat by 351 acres. This would reduce habitat for forest-interior wildlife species; however, by retaining larger patches of habitat, those effects would be lessened. The loss of connectivity through Section 4 could provide a barrier to forest-dwelling species until canopy cover recuperates adequately.

The existing potential bald eagle nesting habitat would be improved on 609 acres. However, the disturbance associated with Highway 83 and recreation use on Van Lake could offset any beneficial changes in habitat quality.

Harvesting would modify 31 acres of mature foraging habitat for Canada lynx in Unit 43. The effects to lynx are expected to be minor and negative in the short-term (less than 5 years).

This alternative could reduce big game prey availability due to appreciable loss of thermal cover, resulting in a decreased likelihood of wolves successfully occupying the valley.

Fisher denning habitat would be modified on 262 acres. Fisher forage habitat would be modified on 1,715 acres. Action Alternative B would retain travel corridors along streams, but would remove fisher habitat, resulting in potential minor negative effects to fishers.

The quality and quantity of flammulated owl habitat would be enhanced with this alternative by opening the canopy of the forested areas and favoring ponderosa pine on 671 acres.

Pileated woodpecker nesting habitat would be modified on 996 acres in the project area, leaving approximately 1,809 acres of nesting habitat unaltered. This would result in moderate negative effects to pileated woodpeckers.

Action Alternative B could result in high big game winter mortality, especially in a severe winters, due to harvesting 2,040 acres of thermal cover from State trust lands within the winter range. Thermal cover would be retained on approximately 1,696 acres (26 percent). White-tailed deer would be more susceptible to these losses than elk or mule deer.

- ***Indirect Effects of Action Alternative C to Wildlife***

In the long-term, species that use the more open stands, younger and/ or shade-intolerant tree species, and more diverse landscapes would be positively affected. Species that use late-successional forest structure and interior habitat would be negatively affected. Harvests would retain the same number of forested patches, but reduce the median patch size by 16 acres, while reducing forested habitat by 1,114 acres, interior habitat by 793 acres, and edge habitat by 321 acres. This situation reduces habitat for forest-interior wildlife species; however, by leaving larger patches of habitat, those effects would be lessened. The loss of connectivity through Section 4 could provide a barrier to forest-dwelling species until canopy cover recuperates adequately.

Existing potential bald eagle nesting habitat would be improved on 202 acres. However, the disturbance associated with Highway 83 and recreation use on Van Lake could offset any beneficial changes in habitat quality. Action Alternative C is expected to result in minor negative effects to wintering bald eagles through decreased carrion sources. The effects would be less than under Action Alternative B.

This alternative could reduce big game prey availability due to appreciable loss of thermal cover, resulting in a decreased likelihood of gray wolves successfully occupying the valley. The effects are expected to be less than under Action Alternative B.

Fisher denning habitat would be modified on 254 acres. Fisher forage habitat would be modified on 1,228 acres. Action Alternative C would retain travel corridors along streams, but would remove fisher habitat, resulting in minor negative effects to fishers. Action Alternative C would have less negative impacts than Action Alternative B.

The quality and quantity of flammulated owl habitat would be enhanced with this alternative by opening the canopy of the forested areas and favoring ponderosa pine on 108 acres.

Pileated woodpecker nesting habitat would be modified on 713 acres in the project area, leaving at least 2,092 acres of nesting habitat unaltered. This would result in moderate negative effects to pileated woodpeckers.

Action Alternative C could result in high big game winter mortality, especially in a severe winters, due to harvesting 1,567 acres of thermal cover from State trust lands within the winter range. Thermal cover would be retained on

approximately 2,169 acres (34 percent). White-tailed deer would be more susceptible to these losses than elk or mule deer.

- ***Indirect Effects Common to Action Alternatives B and C to Wildlife***

  Timber harvesting under these alternatives would not substantially alter connectivity. Most of the forested stands affected generally occur at the edge of patches.

  Timber harvesting would reduce grizzly bear hiding cover in the project area by 1,208 acres under Action Alternative B and 1,157 acres under Action Alternative C. Since hiding cover is not limited in the area, these losses are not expected to affect grizzly bears to a great extent. Action Alternative B, however, does reduce hiding cover to nearly 40 percent. The increase in forage is expected to be higher under Action Alternative B then under Action Alternative C. The effects of both action alternatives would be minor.

- ***Indirect Effects Common to No-Action Alternative A and Action Alternative C to Wildlife***

  Under these alternatives, no Canada lynx habitat would be modified. Canada lynx would continue to use the project area similarly in the short-term. In the longer-term, without disturbance, denning habitat is expected to increase, but foraging opportunities are expected to decrease, resulting in a reduced potential for lynx reproduction. However, because the affected habitat is marginal, these effects are believed to be minor.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A to Wildlife***

  Timbered stands would continue to move away from historical conditions, which would result in wildlife habitats shifting toward closed-canopied, dense, older forests.

  In regard to bald eagles, no additional disturbance or habitat modification would occur in the analysis area. Therefore, continued eagle winter use or the probability of establishing a new nesting territory would not be affected.

  The effects of No-Action Alternative A would likely increase the probability of wolf recolonization over the area due to retaining the existing thermal cover for prey species.

  Motorized access to the area would remain unchanged. Hiding cover for grizzly bears would be retained at the expense of food resources, which could result in negative minor effects over time. However, adjacent lands provide a high amount of foraging areas.

  Flammulated owl habitat would continue to decline throughout the area, resulting in minor adverse effects to flammulated owls.

  Pileated woodpecker nesting habitat in and around the project area would increase through time, then decline.

  The retention of thermal cover is expected to retain the carrying capacity of this winter range.

- ***Cumulative Effects of Action Alternative B to Wildlife***

  Nesting habitat of bald eagles and access to carrion on State trust lands would improve on 242 acres in the cumulative effects area. These improvements are expected to result in minor effects.

Under Action Alternative B, 32 acres of lynx habitat in the Goat Creek Subunit would be converted to unsuitable for approximately 5 years. Since this alternative alters a small acreage in marginal habitat for a short period of time, the cumulative effects of this alternative would be minor and is highly unlikely to result in changes to lynx survival, reproduction, or use of the analysis area.

The effects of Action Alternative B, combined with harvesting on adjacent ownerships, are expected to cumulatively degrade the big game winter range carrying capacity.

- ***Cumulative Effects of Action Alternative C to Wildlife***

  Bald eagle habitat would improve on 242 acres of State trust lands in the cumulative effects area. These improvements are expected to be minor.

  The effects of Action Alternative C are expected to cumulatively degrade the big game winter range carrying capacity, but less than under Action Alternative B.

- ***Cumulative Effects Common to No-Action Alternative A and Action Alternative C to Wildlife***

  Barring any disturbance, forage availability for Canada lynx would decrease, while denning habitat would increase. However, the lack of forage is expected to result in lower reproductive rates. The effects to lynx would be minor under these action alternatives due to the project affecting marginal habitat.

- ***Cumulative Effects Common to Action Alternatives B and C to Wildlife***

  Efforts would be made to convert stands to more closely reflect the historic conditions. These action alternatives are expected to benefit native wildlife species by reproducing habitats to which the species are adapted.

  Under Action Alternatives B and C, hiding cover for grizzly bears would not be reduced below 40 percent by timber harvesting in any subunit. Since all estimates are well above 40 percent, no measurable effects to grizzly bears are expected.

  Flammulated owl habitat in the area would improve. This would be in addition to the unknown quantity and quality of habitat on adjacent lands.

  Pileated woodpecker habitat in the analysis area would be reduced more under Action Alternative B than under Action Alternative C. The reduction is expected to cumulatively add to decreased reproduction in the area.

  Both action alternatives would reduce thermal cover appreciably, with Action Alternative B reducing the amount more than Action Alternative C. The effects could reduce the ability for big game population to withstand a severe winter in the analysis area.

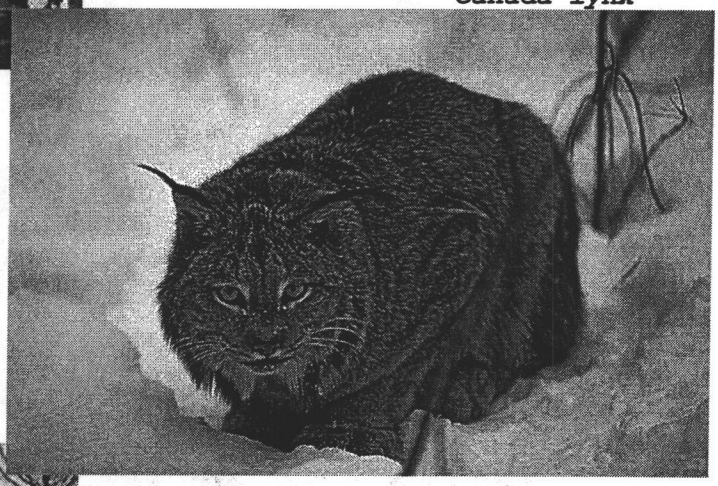
- ***Cumulative Effects Common to No-Action Alternative A and Action Alternatives B and C to Wildlife***

  Under all of the alternatives, fisher movement corridors from the project area into the cumulative effects area would be retained. The effects of the new roads would also apply to the cumulative effects area.

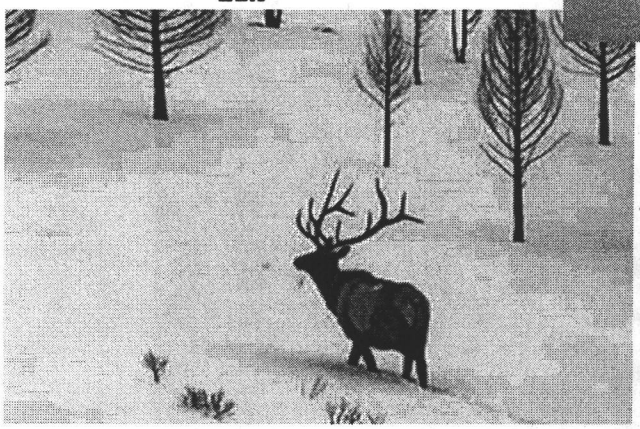
Fisher

Bald eagles

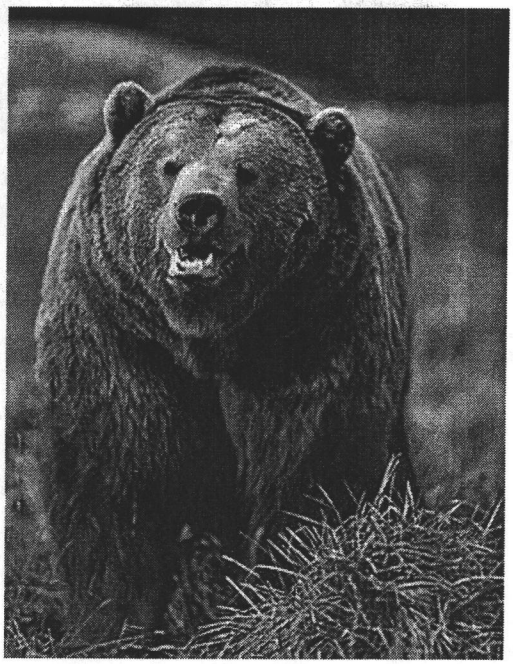
Canada lynx



Elk



Grizzly Bear



SOILS ANALYSIS SUMMARY

INTRODUCTION

This analysis is designed to disclose the existing condition of the soil resources and display the anticipated effects that may result from each alternative of this proposal.

The concern with soils in regards to the project proposal is 2-fold:

- Soil productivity can be reduced depending on area and degree of physical effects (soil compaction and displacement) and amount and distribution of coarse woody debris retained for nutrient cycling.
- Areas of soil instability could contribute sediment to area streams.

ANALYSIS AREA

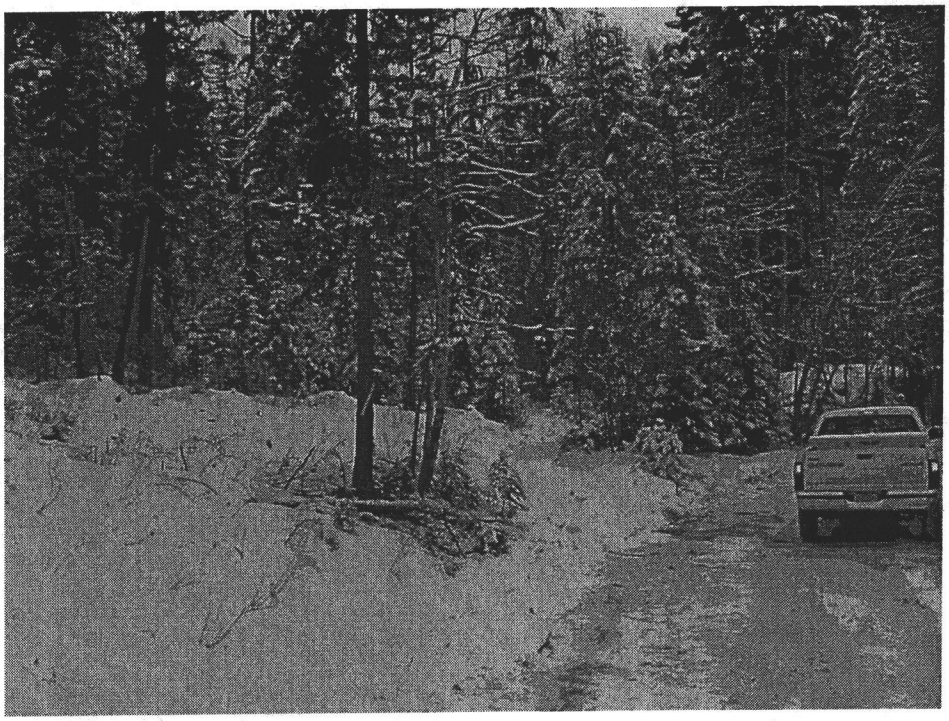
The analysis area for evaluating soil productivity will include DNRC-managed land in the project area. A map of ownership and the project area can be found in *APPENDIX G—SOILS ANALYSIS*.

ANALYSIS METHODS

Soil productivity will be analyzed by evaluating the current levels of soils effects in the proposed project area. Analysis will also include identifying areas with potentially unstable soils.

EXISTING CONDITIONS

DNRC has conducted timber harvesting on State land in the project area since the 1950s, using a combination of ground-based and cable-yarding harvest methods. Ground-based yarding affects soil productivity through displacement and compaction of productive surface layers of soil. The proper spacing of skid trails and season-of-use restrictions are the most effective methods to minimize the loss of productivity. Ten to 15 percent of the area may be affected by existing trails from harvesting in the 1950s, 60s, and 70s. Most trails are well vegetated and past impacts are beginning to improve from frost and vegetation.



Harvesting during the winter helps to protect soils.

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A to Soils***

  Under the No-Action Alternative A, no timber harvesting or associated activities would occur; therefore, no direct effects to soil productivity would occur if this alternative were implemented.

- ***Direct Effects of Action Alternatives B and C to Soils***

  TABLE III-5 - ACRES OF HARVEST AND EXPECTED ACRES OF IMPACT TO SOIL FROM COMPACTION AND DISPLACEMENT BY ALTERNATIVE exhibits the acres of soil impacts expected under Action Alternatives B and C if skid trails and landings are restricted to 20 percent of the harvest units, harvesting during winter operations is conducted on snow, and soil moisture restricts equipment operation in the woods to periods of 20 percent or less soil moisture.

  Due to the compaction and displacement impacts to the soil, as shown in *TABLE III-6 - SEASON OF OPERATION AND ACRES OF IMPACT BY ALTERNATIVE*, DNRC expects reductions in soil productivity on portions of skid trails and landings from both action alternatives. As vegetation begins to establish on the impacted areas and freeze-thaw cycles occur, the area of reduced productivity would decrease. Soil productivity would be maintained by retaining a portion of coarse woody debris and fine litter for nutrient cycling.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A to Soils***

  Under No-Action Alternative A, no indirect effect to soil productivity would occur if this alternative were implemented.

- ***Indirect Effects of Action Alternatives B and C to Soils***

  Indirect effects of Action Alternatives B and C are related to the risk of off-site erosion and slope failure into a stream or other body of water. According to the FNF Land System Inventory, a limited area of failure-prone soils are found in the project area; however, no landslides were identified, and no harvest units or associated activities are planned on this soil type. Therefore, no indirect effects to soils are expected from the implementation of Action Alternatives B or C.

TABLE III-6 - ACRES OF HARVEST AND EXPECTED ACRES OF IMPACT TO SOIL FROM COMPACTION AND DISPLACEMENT BY ALTERNATIVE

HARVEST METHODS AND SEASON		ACTION ALTERNATIVE B		ACTION ALTERNATIVE C	
		ACRES OF HARVEST	EXPECTED ACRES OF IMPACT	ACRES OF HARVEST	EXPECTED ACRES OF IMPACT
Ground-based	Summer	1,301	195[1]	1,170	176[1]
	Winter	711	28[2]	368	15[2]
Cable		426	43[3]	328	33
Total (acres)		2,438	266	1,866	178[3]
Total Harvest Acres			2,438		1,866
Percent Area Impacted			10.9		10.5

[1]75 percent of the summer ground-based skid trails may exhibit impacts.
[2]20 percent of the winter ground-based skid trails may exhibit impacts.
[3]10 percent of the cable ground may exhibit impacts.

CUMULATIVE EFFECTS

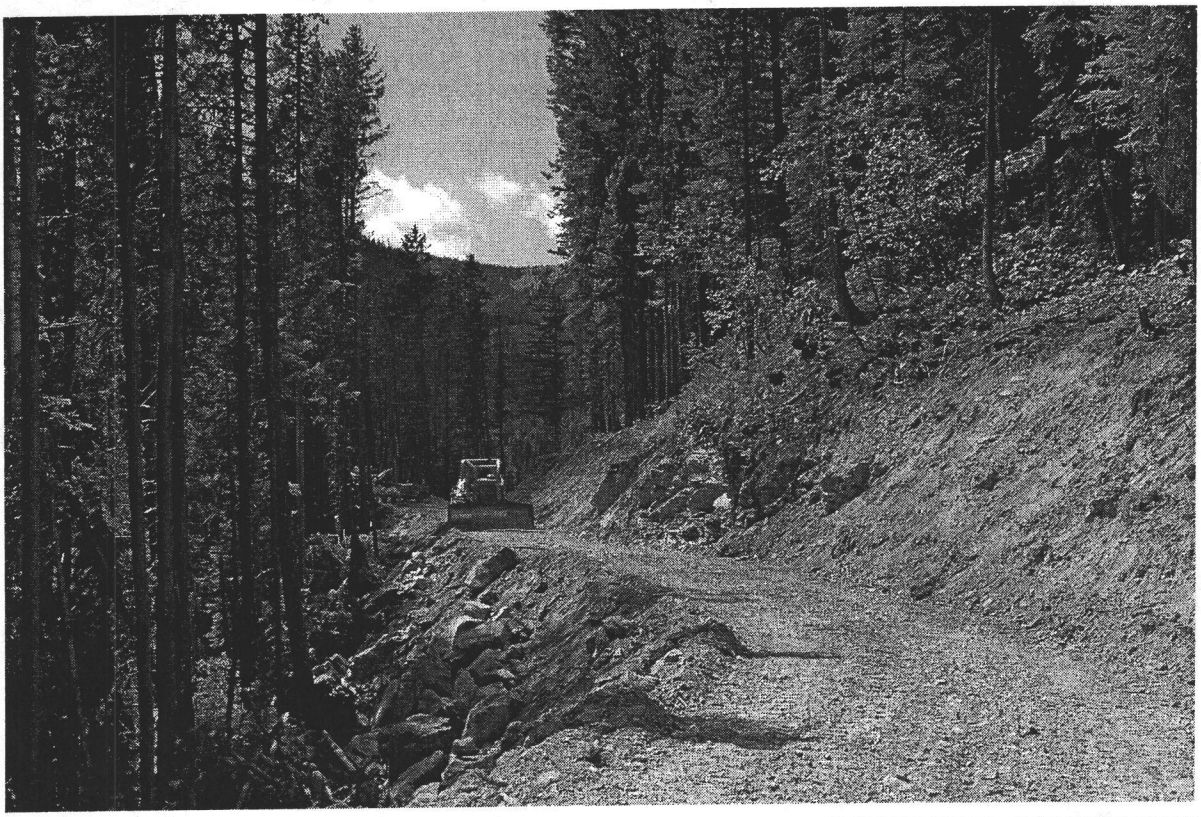
- ***Cumulative Effects of No-Action Alternative A to Soils***

  No additional cumulative effects to sediment delivery would occur as a result of implementing this alternative. We estimate the current area affected by past harvesting to be 10 to 15 percent of ground-skidded units. Skid trails are continuing to improve with time as frost and vegetation breaks up soils and cycles nutrients.

- ***Cumulative Effects of Action Alternatives B and C to Soils***

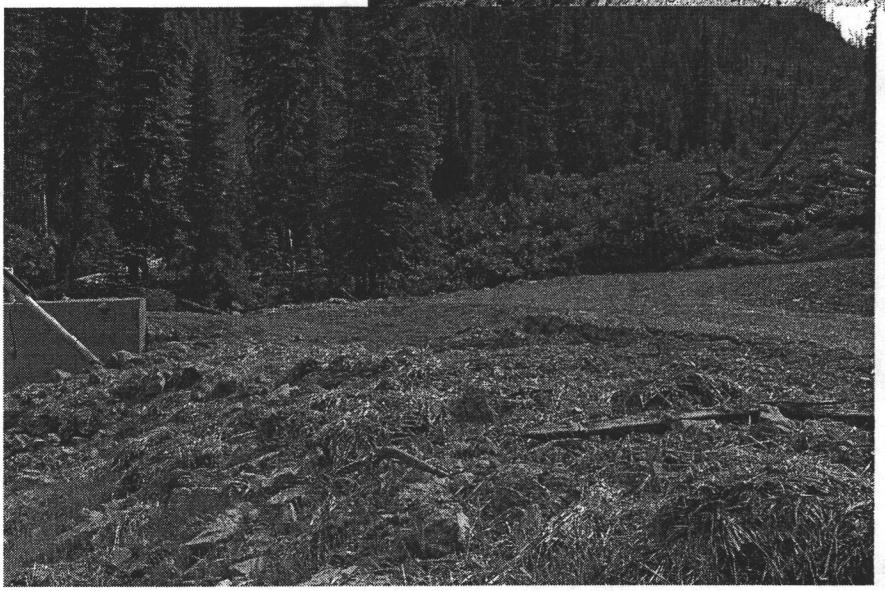
  The majority of the areas proposed for harvesting under these alternatives have been harvested in the past using a variety of silvicultural treatments. DNRC would maintain long-term soil productivity and minimize cumulative effects by reusing existing skid trails and mitigating the potential direct and indirect effects with soil-moisture restrictions, season of operation, and method of harvest. In addition, a portion of coarse woody debris and fine litter for nutrient cycling would be retained.

Cut banks would be seeded to stabilize soils.



Soil displacement occurs during road building.

Rap rip is used to stabilize soils at culvert inlets and outlets.



Soils disturbed during bridge installation will be seeded to provide soil stabilization.

ECONOMICS ANALYSIS SUMMARY

INTRODUCTION

The proposed timber sale is located in the southeastern corner of Lake County, near the northeastern corner of Missoula County. This section analyzes the economic impacts of the proposed timber sale primarily as related to:

- market activities that directly or indirectly benefit the Montana education system, and
- the impact of alternative harvesting on the local economy and socioeconomic institutions as indicated by their impact on employment and income.

Generation of income for the school trust and public buildings from trust forestlands is required under the Enabling Act of 1889, as well as the State of Montana Constitution.

EXISTING CONDITIONS

Enrollment in Montana schools for grades kindergarten through 12 was 157,558 in fiscal year 2000. The most recent information indicates that it costs an average of $6,038 per year to educate 1 student. The average expenditure per pupil in Montana is below the national average.

Distributable income from timber sales is deposited in the State's general fund where it is allocated through the legislative process. Nondistributable income is sent to the permanent fund (school trust fund). Local school districts also raise income through property taxes. The taxable value of property is an important factor that influences the ability of a local school district to generate tax revenue.

ALTERNATIVE EFFECTS

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Economics***

  No income would be provided for schools under this alternative. General fund revenues would be needed to replace money that would not be generated by one of the action alternatives.

- ***Direct Effects of Action Alternative B on Economics***

  This alternative generates an estimated $1,236,330 for the school trust fund. This is enough revenue to send 204 children through school for a year without any other financial support.

- ***Direct Effects of Action Alternative C on Economics***

  This alternative generates an estimated $817,800 for the school trust fund. This is enough revenue to send 135 children through school for a year without any other financial support.

INDIRECT EFFECTS

One of the indirect impacts of timber sales is the employment generated and the income provided to those workers who obtain jobs as a result of the timber harvesting. The estimated employment in the forest industry in Montana is 10.58 jobs for every MMBF of timber harvested. The annual income associated with these jobs is $34,061 per year per job based on a weighted average of the incomes in the timber industry in Flathead, Lake, and Missoula counties. Using this information, together with the timber harvesting associated with each alternative, an estimate of the wage and salary income generated from each alternative is shown in *TABLE III-7 - EMPLOYMENT AND EARNINGS IMPACT*.

TABLE III-7 - EMPLOYMENT AND EARNINGS IMPACT

ALTERNATIVE	JOBS SUPPLIED	TOTAL INCOME
A	0	0
B	142	$4,836,700
C	108	$3,678,600

The Goat Squeezer Timber Sale Project would indirectly provide school revenue through property and income taxes generated by the jobs created by the timber sale. Secondary employment and income are also generated by the sale as workers, who are directly employed as a result of the sales, spend their income in other areas of the economy. If the No-Action Alternative A is selected none of the indirect effects associated with Action Alternatives B and C would occur.

CUMULATIVE EFFECTS

This sale would be part of the annual harvest of timber from the State of Montana forest trust lands. The net revenue from this sale would add to this year's trust fund contribution. Annual trust fund contributions have varied widely over the years, because the actual contribution to the trust is more a function of harvesting than of sales.

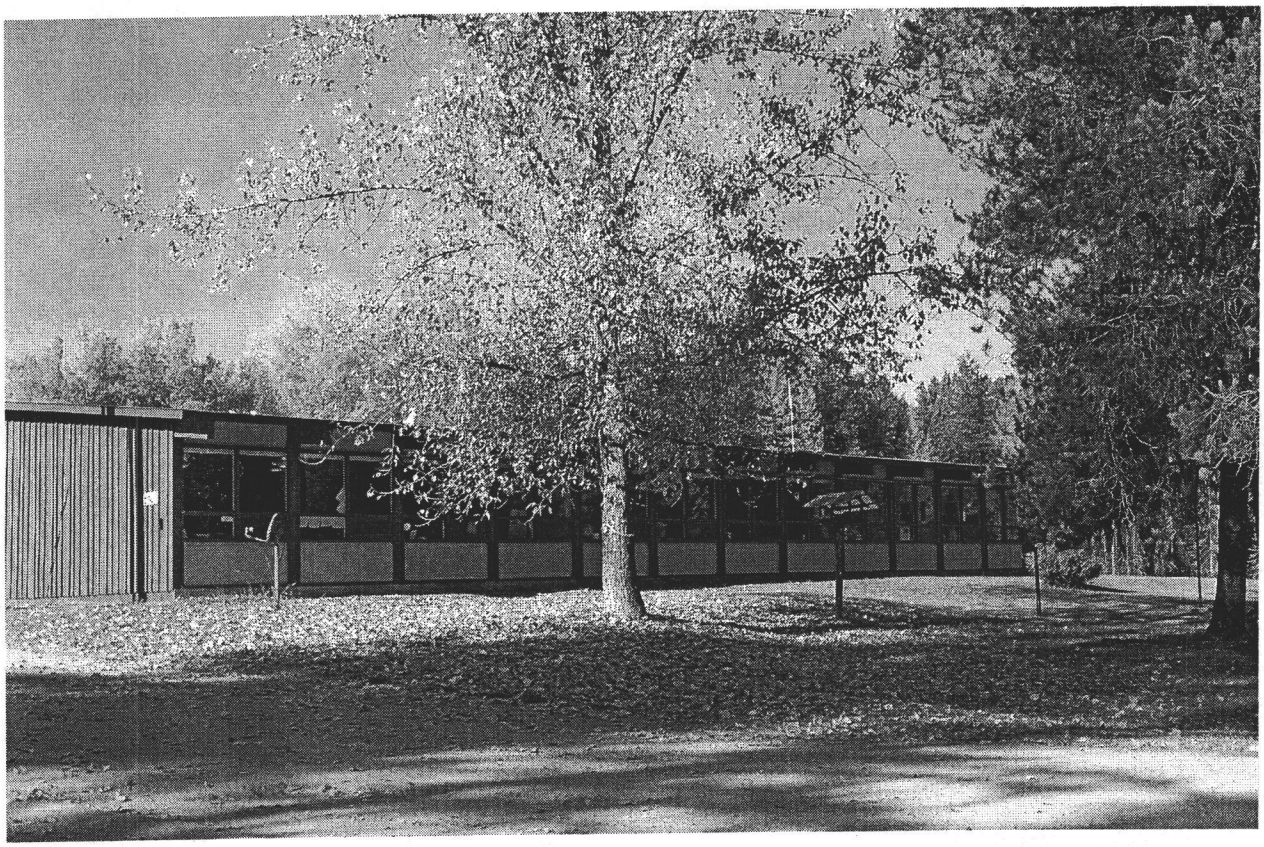
Harvest levels can vary substantially over time; sales tend to be more consistent. Annual revenue from harvesting for the last 5 years is shown in *TABLE III-8 — ANNUAL REVENUE FROM TIMBER HARVESTED FROM MONTANA TRUST LANDS*. The contribution to the trust fund is also affected by the annual costs experienced by the Department for program management, which varies from year to year. The Department should continue to make annual contributions to the trust from its forest-management program.

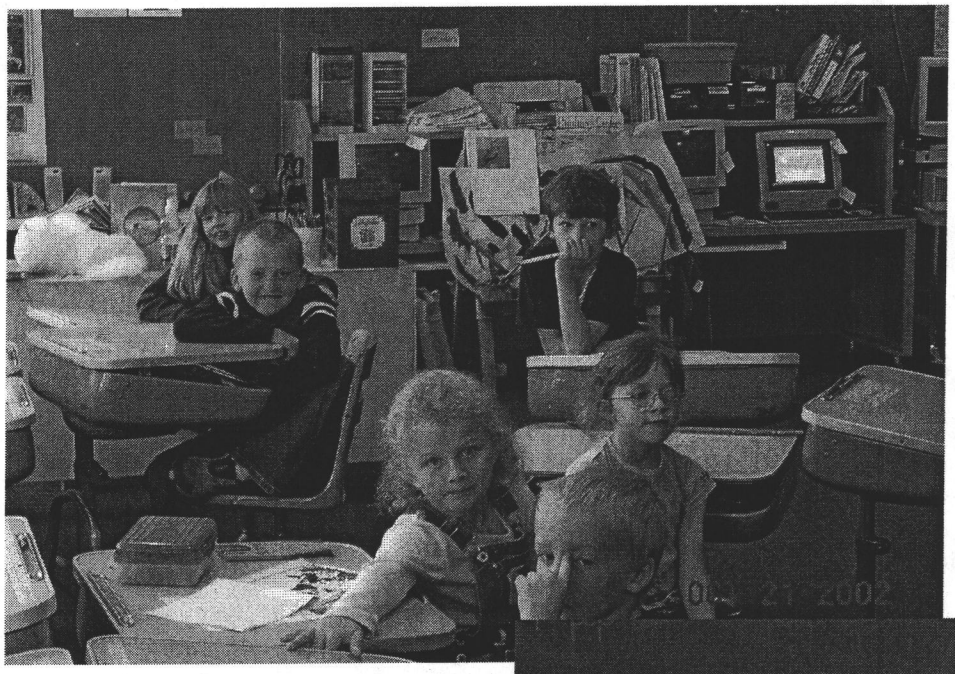
TABLE III-8 - ANNUAL REVENUE FROM TIMBER HARVESTED FROM MONTANA TRUST LANDS

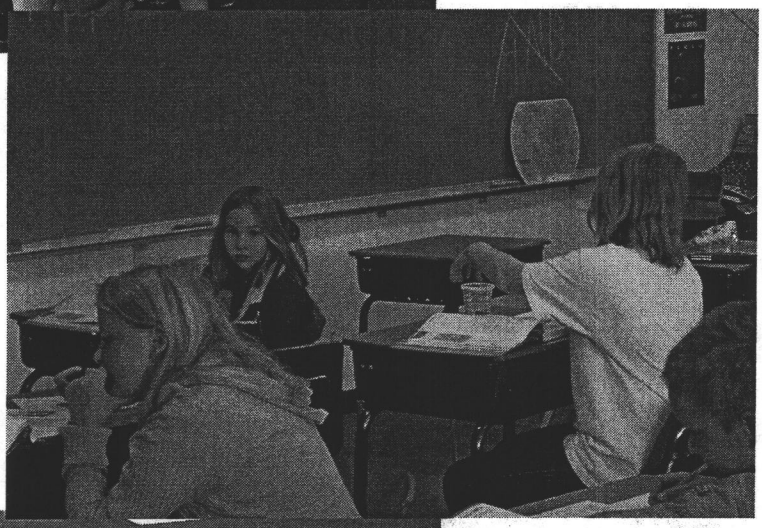
YEAR	HARVEST REVENUE ($)
2001	8,524,150
2000	12,710,311
1999	6,998,847
1998	8,393,485
1997	7,327,641

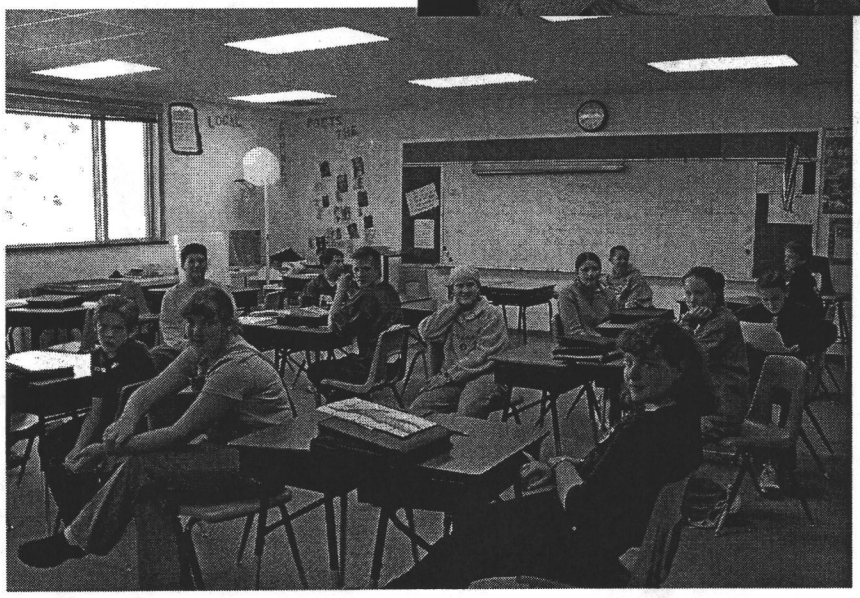
DNRC has a Statewide sustained-yield annual harvest goal of 42.164 MMBF. If timber from this project is not sold, this volume could come from sales elsewhere; however, the timber may be from other areas and not benefit this region of the State.

The forest will not be available for harvesting consideration again for 20 to 60 years, depending on the treatment each area receives. This harvest is consistent with the treatments prescribed in the SFLMP.









RECREATION ANALYSIS SUMMARY

INTRODUCTION

The general public uses the Goat Squeezer Timber Sale Project area for various recreational uses. The methodologies used to portray the existing condition and determine the impacts this project would have on recreation included determining the recreational uses, approximating the revenue received from recreational uses, and determining the potential for conflict between the timber-harvesting activities and recreational uses. The analysis area includes all legally accessible State land within the project area and the roads that would be used to haul equipment and logs. The estimated dollars for comparing alternatives and making decisions may not reflect the actual returns or costs.

EXISTING CONDITION

The project area receives recreational use throughout the year. The primary uses are:

- berry picking,
- snowmobiling,
- bicycling,
- fishing,
- hiking,
- hunting, and
- camping.

State lands are available for nonmotorized recreational use to anyone purchasing a General Recreational Use License for State lands. Revenue from these licenses for the project area is approximately $802.73 per year. Swan River State Forest has 3 hunting outfitter licenses that include the project area. The annual rental fee for these outfitter licenses is $5,150.

RECREATION ANALYSIS SUMMARY

ALTERNATIVE EFFECTS

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Recreation***

  This alternative would not affect recreation.

- ***Direct Effects Common to Action Alternatives B and C on Recreation***

  Hunter success may be affected by disturbing normal game movement patterns with harvesting activities. Log hauling, snowplowing, and short delays during road construction activities may inconvenience snowmobilers, bicyclists, and other recreationalists. However, recreational use and revenue income from outfitting and General Recreational Use Licenses are not expected to change with the implementation of this project.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Recreation***

  No change to the existing condition is expected.

- ***Indirect Effects Common to Action Alternatives B and C on Recreation***

  The amount of recreational use within the project area may change. Recreational users may use adjacent areas to avoid timber-harvesting and log-hauling activities. Recreational use and income from outfitting and General Recreational Use Licenses are not expected to change as this project is implemented.

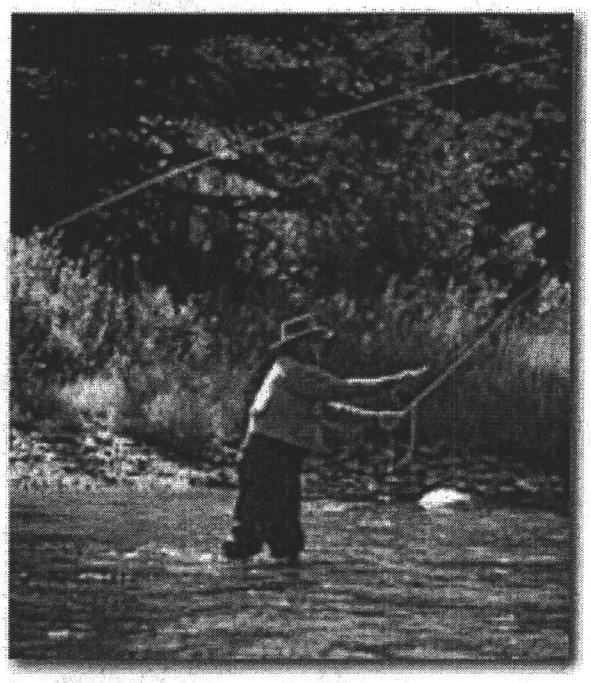
CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Recreation***

  Some recreationalists may be reluctant to use roads in the project area if the roads continue to deteriorate. However, recreational use and the income from General Recreational Use Licenses and outfitting are not expected to change.

- ***Cumulative Effects of Action Alternatives B and C on Recreation***

  The combined timber-harvesting and log-hauling activities of this project and Plum Creek Timber Company projects within the project area may move recreational use to adjacent areas outside of the project area. Existing recreational use on Swan River State Forest is expected to continue at the same level. Therefore, income from General Recreational Use Licenses and outfitting are not expected to change.



AIR QUALITY ANALYSIS SUMMARY

INTRODUCTION

Air quality could be affected by the smoke created from burning the slash that is produced from harvesting timber and road dust generated by project-related activities such as log hauling. The methodologies used to analyze how the air quality would be affected include estimating the location, amount, and timing of smoke and road dust. The analysis area for air quality includes all of Lake County, which is part of Montana Airshed 2, as defined by the Montana Airshed Group.

EXISTING CONDITION

Currently, the project area contributes very low levels of air pollution to the analysis area or local population centers. Temporary reductions to air quality currently exist in the summer and fall due to smoke generated from prescribed burns and dust produced by vehicles driving on dirt roads; neither affect local population centers beyond Environmental Protection Agency (EPA) standards. All burning activities comply with emission levels authorized by the Montana Airshed Group for all major burners in the analysis area. The project area is outside of any local impact zones, where additional restrictions may be imposed to protect air quality.

Burning a seedtree unit

ALTERNATIVE EFFECTS

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Air Quality***

  The existing condition would not change.

- ***Direct Effects Common to Action Alternatives B and C on Air Quality***

  Postharvest burning would produce smoke emissions; log hauling and other project-related traffic on dirt roads would increase road dust during dry periods. None of the increases are expected to exceed standards or impact local population centers if burning is completed within the requirements imposed by the Montana Airshed Group and dust-abatement material is applied to roads during dry periods.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Air Quality***

  The existing condition would not change.

- ***Indirect Effects Common to Action Alternatives B and C on Air Quality***

  Since emissions are expected to remain within the standards set for air quality, no indirect effects to human health at local population centers are anticipated.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative A on Air Quality***

  The existing condition would not change.

- ***Cumulative Effects Common to Action Alternatives B and C on Air Quality***

  Additional smoke produced from prescribed burning on adjacent USFS, private, and State trust forestland would remain within the standards for air quality, but cumulative effects during peak burning periods could affect individuals with respiratory illnesses at local population centers for short durations. All known major burners operate under the requirements of the Montana Airshed Groups, which regulate the amount of emissions produced cumulatively by major burners.

AESTHETICS ANALYSIS SUMMARY

INTRODUCTION

The public generally views the project area while sightseeing. The views of vegetation and topography that are next to roads or trails are known as foreground views. The views of hillsides or drainages from roads and trails are known as middleground views. The views of horizons, mountain ranges, or valleys are known as background views. The existing condition and the impacts to the current views are presented from the perspective of these 3 viewing categories. The foreground and middleground views are discussed in regard to changes in vegetation, soil, and timber stands along roads. Background views were analyzed based on the openness of the proposed harvest areas and the patterns of trees that would be left in those areas. The analysis areas for the foreground and middleground views are along Goat Creek, Squeezer Creek, Old Squeezer Loop, and Center Loop roads. The analysis area for background views is the central Swan Range on the east side of Swan River State Forest, as viewed from Highway 83.

EXISTING CONDITION

Generally, foreground views along open roads are limited to 200 feet and contain views of open and dense forest stands and openings caused by past harvesting. Firewood gathering and salvage logging have caused some damage to live trees; limbs and tops are scattered along roads and ditches.

Middleground views are 200 to 1,000 feet from a road or trail and usually consist of hillsides or drainages. On State ownership, areas that have been harvested in the past range in size from 10 to 150 acres and have a dense cover of 6- to 40-foot trees. Plum Creek Timber Company land has been heavily harvested by using widespread clearcut, seedtree, and selective harvests. Typically, these harvests have left openings of hundreds of acres. The harvest unit boundaries usually follow section lines and appear harsh and unnaturally straight.

Background views of the project area are a collection of drainages and ridges that make up a portion of the central Swan range. The vegetation is a mixture of dense mature forests and past harvest units that range from having few trees to dense retentions of tree regeneration.

ALTERNATIVE EFFECTS

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative A on Aesthetics***

  In the short term, shrubs and trees would continue to grow along the roads and limit views.

- ***Direct Effects of Action Alternative B on Aesthetics***

  Action Alternative B utilizes a variety of harvest treatment methods, which include commercial thinning, group selection, sanitation, seedtree, individual-tree selection, and shelterwood. Treatments would aesthetically affect the harvest area by:

  - opening the view;
  - causing some damage to vegetation;
  - creating logging slash;
  - disturbing soil along skid trails, landings, and while constructing new roads; and
  - creating landing piles along roads in the project area.

  For the most part, foreground views would be altered and have fewer trees. In some areas, treatments would allow for views of the middleground. The middleground views would appear altered and have fewer trees. The background views of this alternative would appear altered and show a variety of tree spacings remaining on the landscape. Some of these units would be visible from Highway 83.

- ***Direct Effects of Action Alternative C on Aesthetics***

  Action Alternative C is very similar to Action Alternative B. The only exception would be the background views from Highway 83, which would be altered slightly. Action Alternative C would utilize a variety of harvest-treatment methods, which include commercial thinning, sanitation, seedtree, and individual- tree selection. Treatments would aesthetically affect the harvest area by:

  - opening the view;
  - causing some damage to vegetation;
  - creating logging slash;
  - disturbing soil along skid trails, landings, and while constructing new roads; and
  - creating landing piles along roads in the project area.

  The foreground views would be altered and have fewer trees. Some of these foreground views would be visible from Highway 83. In some areas, treatments would allow for views of the middleground. The middleground views would also appear altered and have fewer trees.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative A on Aesthetics***

  Aesthetics would not be indirectly affected by this alternative.

- ***Indirect Effects Common to Action Alternatives B and C on Aesthetics***

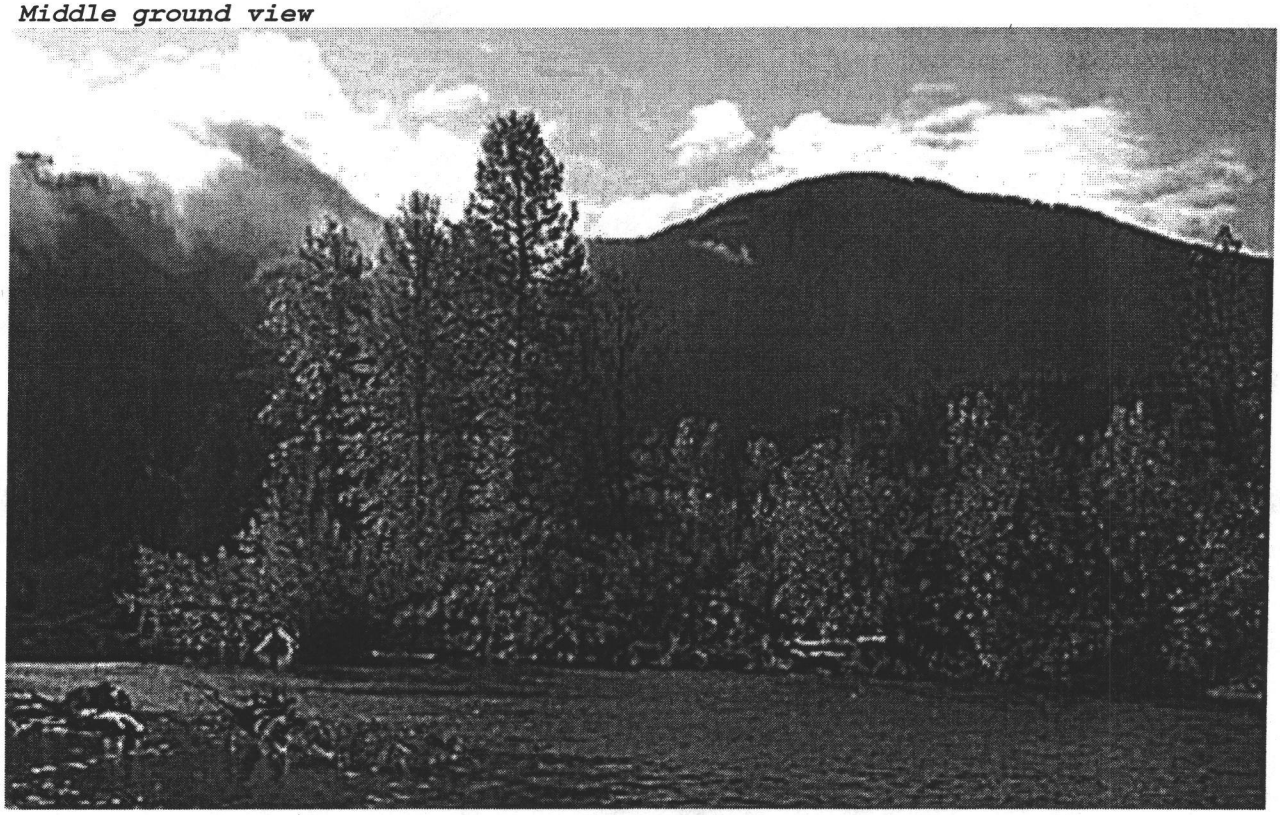
  For units that would be treated by seedtree or group-selection methods, the area treated would appear similar to the results of a moderately severe fire. For the other treatment-type areas, the trees remaining would appear similar to the results of a low-intensity fire of mixed severity. In both situations, the species retained may differ from the species that would survive these types of fires.

CUMULATIVE EFFECTS

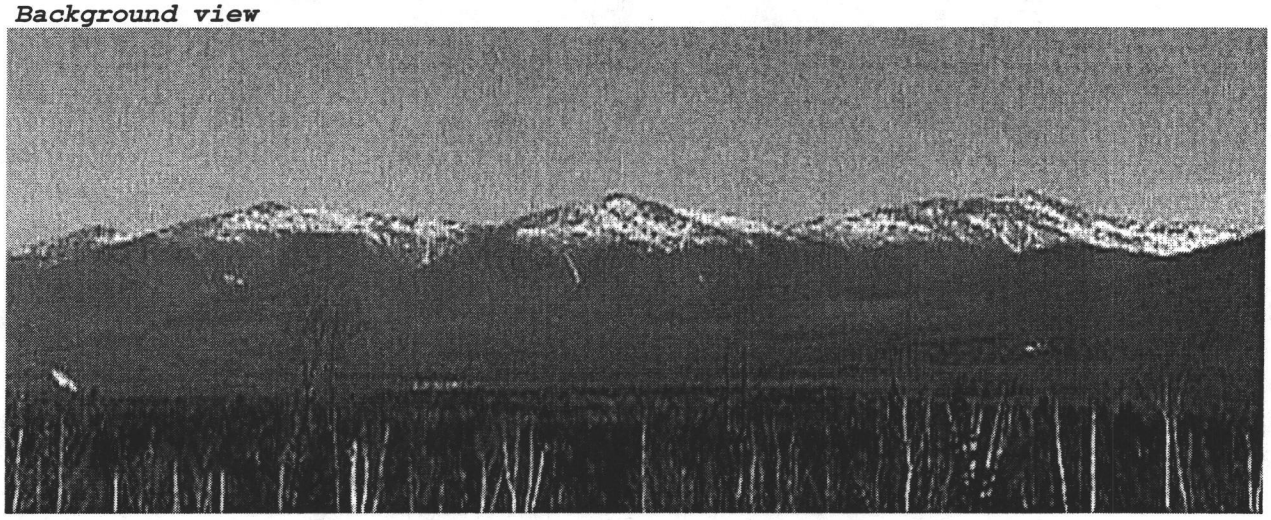
The following effects of other projects may occur in addition to the direct and indirect effects of this project:

- Natural processes on the landscape, such as wildfires, blown down trees, or insect infestations and disease infections, would continue to alter the view over time.
- In the short term, effects to the view would be from present activities such as firewood gathering and timber harvesting on adjacent Plum Creek Timber Company and State trust lands.
- Salvage harvesting and firewood gathering would alter foreground views by damaging vegetation along roads and leaving some debris on road surfaces and in ditches. The administration of salvage permits by DNRC would keep roadside debris at a minimum. Middleground and background viewing would remain unaltered.
- DNRC is planning other harvesting projects in the areas of Napa, Soup, and Cilly creeks, which are located north of the project area. Currently, environmental documents are being written and units are being chosen. Harvest units may only affect foreground and/or middleground viewing in the area.

Middle ground view



Background view



IRRETRIEVABLE

A resource that has been irretrievably committed is lost for a period of time. Many timber stands in the project area are mature; some individual trees are more than 150 years old. Any of the timber-harvesting alternatives would cause live trees to be irretrievably lost; they would no longer contribute to future snag recruitment, stand structure and compositional diversity, aesthetics, wildlife habitat, the nutrient-recycling process, or any other important ecosystem functions.

Areas converted from timber production to permanent roads would be lost from timber production and would not function as forested lands for a period of time.

IRREVERSIBLE

A resource that has been irreversibly committed cannot be reversed or replaced. 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. If management decisions allowed for the continued growth of established trees, they would ultimately become equivalent in size to the irretrievably harvested trees.

Areas that are initially lost to timber production through road construction could, over time, be reclaimed and once again produce timber and function as forested land.

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GOAT SQUEEZER TIMBER SALE PROJECT

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REFERENCES

GOAT SQUEEZER TIMBER SALE PROJECT

REFERENCES

Ake, K. 1994. Protocol Paper: Moving Window Motorized Access Density Analysis and Security Core Area Analysis for Grizzly Bear. Unpublished mimeograph, 2/22/1995. Flathead National Forest, Kalispell, Montana. 10pp.

Aney, W. and R. McClelland. 1985. Pileated Woodpecker Habitat Relationships (Revised). Pages 10-17 in Warren, N. eds. 1990. *Old Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains*. USFS, Northern Region, Wildlife Habitat Relationships Program R1-90-42. 47pp.

Arno, S.F., M.G. Harrington, C.E. Fiedler, and C.E. Carlson. 1997. Restoring Fire-Dependent Ponderosa Pine Forests in Western Montana. Restoration and Management notes: Volume 13, Number 1. Pages 32 through 36.

Beatty, J.S., Filip, G.M., and Mathiasen, R.L. 1997. *Larch Dwarf Mistletoe* in Forest Insect and Disease Leaflet 169. USDA Forest Service, Washington, D.C. 7pp.

Bingham, R.T. 1983. Blister Rust-Resistant Western White Pine for the Inland Empire: The Story of the First 25 Years of the Research and Development Program. General Technical Report INT-146. USDA Forest Service, Intermountain Forest and Range Experiment Station, Odgen, Utah. 45pp.

Bloomberg, W.J.. 1990. Effect of Stand Conditions on Advance of *Phellinus weirii* in Douglas-fir Plantations. Phytopathology 80:553-559.

Bull, E.L., Parks, C.G., and Torgersen, T.R. 1997. Trees and Logs Important to Wildlife in the Interior Columbia River Basin. General Technical Report PNW-391. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. 55pp.

Bull, E., T. Torgersen, A. Blumton, C. McKenzie, and D. Wyland. 1995. Treatment of an Old-Growth Stand and Its Effects on Birds, Ants, and Large Woody Debris: A Case Study. USDA Forest Service. General Technical Report. PNW-GTR-353. 12pp.

Bull, E. personal communication. Research Scientist. USDA Forest Service, Pacific Northwest Res. Sta.

Byler, J.W., and Hagle, S.K. 2000. Succession Functions of Pathogens and Insects: Ecoregion Sections M332a and M333d in Northern Idaho and Western Montana. Summary. Region 1 FHP Report 00-09. USDA Forest Service, Northern Region, State and Private Forestry, Missoula, Montana. 37pp.

DNRC. 1996. State Forest Land Management Plan. Montana Department of Natural Resources and Conservation, Missoula, Montana.

DNRC. 1998. South Fork Lost Creek Supplemental Environmental Impact Statement. Montana Department of Natural Resources and Conservation, Swan Lake, Montana. 182 pp.

Department of State Lands, Idaho Department of Lands, USFS. 1996. Forest Insect and Disease Identification and Management.

Domrose, R. 1974. Northwest Montana Fisheries Study - Fish Management Surveys. Montana Department of Fish and Game, Fisheries Division, Job progress report, Project F-7-R-23, Job I-b. Kalispell, Montana.

Eaglin, G.S. and Hubert, W.A. 1993. Effects of Logging and Roads on Substrate and Trout in Streams of the Medicine Bow National Forest, Wyoming. North American Journal of Fisheries Management 13: 844-846.

Ellis, B.K., Craft, J.A., Stanford, J.A.. Influences of Forest Harvest on Water Quality in Goat Creek, Swan River Basin, Montana. Friends of the Wild Swan, Open File Report 152-99. Swan Lake, Montana.

Etheridge, D.E., and Hunt, R.S. 1978. True Heartrots of British Columbia. Pest Leaflet 55. Canadian Forestry Service, Pacific Forest Research Centre, Victoria, British Columbia. 10pp.

Ferrell, G.T. 1986. *Fir engraver*. Forest Insect and Disease Leaflet 13. USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, California. 8pp.

Filip, G.M. 1986. Symptom Expression of Root-Diseased Trees in Mixed-Conifer Stands in Central Washington. Western Journal of Applied Forestry 1:46 through 48.

Filip, G.M., P.E. Aho, and M.R. Wiitala. 1983. Indian paint fungus: a method for reducing Hazard in Advanced Grand and White Fir Regeneration in Eastern Oregon and Washington. Report R6-FPM-PR-293-87. USDA Forest Service, Pacific Northwest Region, Portland, Oregon. 24pp.

Filip, G.M.,and D.J. Goheen. 1984. Root Diseases Cause Severe Mortality in White and Grand Fir Stands of the Pacific Northwest. Forest Science 20:138 through 142.

Fins, L., J. Byler, D. Ferguson, A. Harvey, M.F. Mahalovich, G. McDonald, D. Miller, J. Schwandt, and A. Zack. 2001. Return of the Giants. Station Bulletin 72. University of Idaho, Moscow. 20pp.

Fisher, W.C., A.F. Bradley. 1987. Fire Ecology of Western Montana Forest Habitat Types. USFS General Technical Report. INT-223.

Ferguson, B.A. 2001. Root Disease Survey, Mapping, and Management Report for the Dog Meadow Project Area, Stillwater State Forest, Montana. Unpublished report to DNRC. December 2001.

Flathead Basin Commission. 1991. Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program, Kalispell, Montana.

Fraley, J.J. and B.B. Shepard. 1989. Life History, Ecology and Population Status of Bull Trout (*Salvelinus Confluentus*) in the Flathead Lake and River System, Montana. Northwest Science 63:133-143.

Goheen, D.J., and E.M. Hansen. 1993. *Effects of Pathogens and Bark Beetles on Forests*. Pages 175 through 196 in Beetle-Pathogen Interaction in Conifer Forests. Schowalter, T.D., and G.M. Filip, eds. Academic Press, San Diego, California.

Hadfield, J.S., D.J. Goheen, G.M. Filip, C.L. Schmitt, and R. D. Harvey. 1986. Root Diseases in Oregon and Washington conifers. USDA Forest Service. Report R6-FP-250-86.

Hansen, E.M., and K.J. Lewis, editors. 1997. Compendium of Conifer Diseases. APS Press, St. Paul, Minnesota.

Harris, R. 1999. Abundance and Characteristics of Snags in Western Montana Forests. General Technical Report RMRS-GTR-31. Rocky Mountain Research Station, Missoula, Montana. 19pp.

Hart, M. 1989. Past and present Vegetative and Wildlife Diversity in Relation to an Existng Reserve Network: A GIS Evaluation of the Seeley-Swan Landscape, Northwest Montana. Master thesis. University of Montana, Missoula, Montana. 288 pp.

Hauer, F.R., J.T. Gangemi, and C.V. Baxter. 1997. Large Woody Debris in Bull Trout Spawning Streams in Northwest Montana. Flathead Lake Biological Station. Open File Report. Polson, Montana.

Heifetz, J., M.L. Murphey, and K.V. Koski. 1986. Effects of Logging on Winter Habitat of Juvenile Salmonids in Alaskan Streams.

Heinemeyer, K and J. Jones. 1994. Fisher Biology and Management in the Western United States: A Literature Review and Adaptive Management Strategy. USDA Forest Service, Northern Region, Missoula, Montana. 108pp.

Heinemeyer, K.S. 1993. Temporal Dynamics in the Movements, Habitat Use, Activity, and Spacing of Reintroduced Fishers in Northwest Montana. M.S. Thesis, University of Montana, Missoula, Montana. 158pp.

Heinemeyer, unpublished. As cited *In* Heinemeyer, K and J. Jones. 1994. Fisher Biology and Management in the Western United States: A Literature Review and Adaptive Management Strategy. USDA Forest Service, Northern Region, Missoula, Montana. 108pp.

Helms, J.A., and J.E. Lotan. 1987. Selecting Silivicultural Systems for Timber. *Ponderosa Pine: the species and its management.* Cooperative Extension, Washington State University.

Hicks, L. 1990. Habitat Use by White-Tailed Deer in Relation to Winter Range Silvicultural Treatments in the Thompson River Drainage, Northwestern Montana. PhD dissertation, University of Montana, Missoula, Montana. 79pp.

IGBC. 1998. Grizzly Bear/Motorized Access Management. Interagency Grizzly Bear Committee. 6pp.

Jageman, H. 1984. White-Tailed Deer Habitat Management Guidelines.

Johnson, S. 1984. Home Range, Movements, and Habitat Use of Fishers in Wisconsin. M.S. Thesis, University of Wisconsin, Stevens Point, Wisconsin. 78pp.

Jones, J.L. 1991. Habitat Use of Fisher in Northcentral Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho. 147pp.

Joslin, P. 1967. Movements and Home Sites of Timber Wolves in Algonquin Park. American Zoology. 7:279-88.

Kanda, N. 1998. Genetics and Conservation of Bull Trout: Comparison of Population Genetic Structure Among Different Genetic Markers and Hybridization with Brook Trout. Doctoral dissertation, University of Montana, Missoula, Montana.

Kanda, N. and F.W. Allendorf. 2001. Genetic Population Structure of Bull Trout from the Flathead River Basin as Shown by Microsatellites and Mitochondrial DNA Markers. Transactions of the American Fisheries Society, Volume 130:92 through 106.

Kelsey, R.G., and G. Joseph. 1998. Ethanol in Douglas-fir with Black-stain Root Disease (*Leptographium wageneri*). Canadian Journal of Plant Pathology 18:194 through 199.

Kitano, S., K. Maekawa, S. Nakano, and K. Fausch. 1994. Spawning Behavior of Bull Trout in the Upper Flathead Drainage, Montana, with Special Reference to Hybridization with Brook Trout. Transactions of the American Fisheries Society, Volume 123:988 through 992.

Koehler, G.M. 1990. Population and Habitat Characteristics of Lynx and Snowshoe Hares in North Central Washington. Can. J. Zool. 68:845 through 851.

Land and Water. 2002. Road Sediment Data for Goat and Squeezer Creeks. Data supplied to Montana Department of Natural Resources and Conservation, Kalispell, Montana.

Leathe, S.A. and M.D. Enk. 1985. Cumulative Effects of Micro-hydro Development on the Fisheries of the Swan River Drainage, Montana. Volume I. Summary Report. Montana Department of Fish, Wildlife and Parks, Kalispell, Montana, and the Flathead National Forest, Bigfork, Montana. Prepared for Bonneville Power Administration, Portland, Oregon.

Leathe, S.A. et. al. 1985. *Cumulative Effects of Micro-hydro Development on the Fisheries of the Swan River Drainage, Montana.* Volume III. Fish and Habitat Inventory of Tributary Streams. Montana Department of Fish, Wildlife and Parks, Kalispell, Montana, and Flathead National Forest, Bigfork, Montana. Prepared for Bonneville Power Administration, Portland, Oregon.

Lesica, Peter. 1996. Using Fire History Modds to Estimate Proportions of Old Growth Forest in Northwest Montana, USA. Conservation Biological Research, University of Montana, Missoula, Montana. Biological Conservation 77:33 through 39.

Livingston, R.L. 1999. Douglas-fir Beetle in Idaho. State Forester Forum No. 18. Idaho Department of Lands, Coeur d'Alene, Idaho. 4pp.

Losensky, B.J. 1997. Historical Vegetation in Region One by Climatic Section - Draft Report, Revision Three. USDA Forest Service, Northern Region, Missoula, Montana.

Losensky, B.J. 1997. Historical Vegetation of Montana. Unpublished report done under contract for Montana Department of Natural Resources and Conservation, Missoula, Montana.

Mace, R., J. Waller, T. Manley, L. Lyon, H. Zuuring. 1997. *Relationships Among Grizzly Bears, Roads, and Habitat in the Swan Mountains, Montana.* Pages 64-73 *in* Mace, R.D and J.S. Waller. 1997. Final Report: Grizzly bear ecology in the Swan Mountains. Montana Fish, Wildlife and Parks, 1920 Fifth Avenue East, P.O. Box 200701, Helena, Montana 59620-0701.

Maloy, C. 1991. Review of *Echinodontium tinctorium* 1895-1990. Extension Bulletin 1592. Washington State University Cooperative Extension, Pullman. 29pp.

Marten, P. 1979. Productivity and Taxonomy of the *Vaccinium Globulare, V. Membranaceum* Complex in Western Montana. M.S. Thesis. University of Montana, Missoula, Montana. 136pp.

Mathiasen, R.L. 1998. Infection of Young Western Larch by Larch Dwarf Mistletoe in Northern Idaho and Western Montana. Western Journal of Applied Forestry 13:41 through 46.

McClelland, B.R. 1979. *The Pileated Woodpecker in Forests of the Northern Rocky Mountains.* Pages 283-299 *in* Role of Insectivorous Birds in Forest Ecosystems. Academic Press.

McClelland, R. and P. McCelland. 1999. Pileated Woodpecker Nest and Roost Trees in Montana: Links with Old-Growth and Forest "Health". Wildlife Society Bulletin 27(3): 846-857.

Meehan, W.R., editor. 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society, Special Publication 19.

Montana Bald Eagle Working Group. 1991. Habitat Management Guide for Bald Eagles in Northwestern Montana.

Montana Bald Eagle Working Group. 1994. Montana Bald Eagle Management Plan. USDI Bureau of Land Management. Billings, Montana. 61pp.

Montana Bull Trout Restoration Team, 2000. Restoration Plan for Bull Trout in the Clark Fork River Basin and Kootenai River Basin, Montana. 113 pp.

Montana Bull Trout Scientific Group, 1995. Flathead River Drainage Bull Trout Status Report (Including Flathead Lake, the North and Middle Forks of the Flathead River and the Stillwater and Whitefish Rivers). Prepared for: The Montana Bull Trout Restoration Team, Helena, Montana.

Montana Bull Trout Scientific Group. 1996. Swan River Drainage Bull Trout Status Report (Including Swan Lake). Prepared for: The Montana Bull Trout Restoration Team, Helena, Montana.

Montana Bull Trout Scientific Group. 1998. The Relationship Between Land Management Activities and Habitat Requirements of Bull Trout. Prepared for: The Montana Bull Trout Restoration Team, Helena, Montana.

Morrison, D., and K. Mallett. 1996. Silvicultural Management of *Armillaria* Root Disease in Western Canadian Forests. Canadian Journal of Plant Pathology 18:194 through 199.

Morrison, D., H. Merler, and D, Norris. 1991. Detection, Recognition, and Management of *Armillaria* and *Phellinus* Root Diseases in the Southern Interior of British Columbia. Forestry Canada and the British Columbia Ministry of Forests, Victoria, British Columbia, Canada. FRDA Report 179.

Morrison, D., and K. Pellow. 1994. *Development of Armillaria Root Disease in a 25-Year-Old Douglas-fir Plantation* in Proceedings of the Eighth International Conference on Root and Butt Rots. IUFRO Working Party S2.06.01. Johansson, M., and J. Stenlid, eds. Swedish University of Agricultural Sciences, Uppsala, Sweden.

Morrison, D.J., K.W. Pellow, A.F.L. Nemec, D.J. Norris, and P. Semenoff. 2001. Effects of Selective Cutting on the Epidemiology of *Armillaria* Root Disease in the Southern Interior of British Columbia. Canadian Journal of Forest Research 31:59 through 70.

Morrison, D.J., R.E. Williams, and R.D. Whitney. 1991. *Infection, Disease Development, Diagnosis, and Detection*. Pages 62 through 75 in Armillaria Root Disease. Shaw, C. G., III, and G.A. Kile, eds. USDA Forest Service. Agriculture Handbook 691.

Mowat, G, K.G. Poole, and M. O'Donoghue. 2000. *Ecology of Lynx in Northern Canada and Alaska*. Chapter 9 in Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al., tech eds. Ecology and Conservation of Lynx in the United States. University Press of Colorado. Boulder, Colorado. 480pp.

Paine, T.D., and Baker, F.A. 1993. *Abiotic and Biotic Predisposition*. Pages 61-79 in Beetle-Pathogen Interactions in Conifer Forest. Schowalter, T.D., and G.M. Filip, editors. Academic Press, San Diego. 252pp.

Pearson, D. 1999. Small Mammals of the Bitterroot National Forest: A Literature Review and Annotated Bibliography. USDA Forest Service General Technical Report RMRS-GTR-25.

Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest Habitat Types of Montana. USDA, Forest Service General Technical Report. INT-34.

Pierce, John, and Drake Barton. Sensitive plant survey in the Swan River State Forest, Montana. Unpublished report to DNRC. June 2001.

Plum Creek, 1996. Goat Creek and Piper Creek Watershed Analysis. Plum Creek Timber Company, Missoula, Montana.

Powell, R. 1982. The Fisher: National History, Ecology, and Behavior. University Minnesota Press, Minneapolis, Minnesota. 217pp.

Redfern, D.B., and G.M. Filip. 1991. *Innoculum and Infection*. Pages 48 through 61 in Armillaria Root Disease. Shaw, C.G., III, and G.A. Kile, eds. USDA forest Service. Agriculture Handbook 691.

Reiman, B. and J. Clayton. 1997. Wildfire and Native Fish: Issues of Forest Health of Sensitive Species. American Fisheries Society; Fisheries Volume 22, No. 11.

Rinne, J.N. 1990. The Utility of Stream Habitat and Biota for Identifying Potential Conflicting Forest Land Uses: Montane Riparian Areas. Forest Ecology and Management 33/34:363-383.

Rizzo, D.M., R.A. Blanchette, and G. May. 1995. Distribution of *Armillaria ostoyae* Genets in a *Pinus resinosa–Pinus banksiana* Forest. Canadian Journal of Botany 73:776 through 787.

Robinson, R.M., and D.J. Morrison. 2001. Lesion Formation and Host Response to Infection by *Armillaria Ostoyae* in the Roots of Western Larch and Douglas-fir. Forest Pathology 31:371 through 385.

Robison, G.E. and R.L. Beschta, 1990. Indentifying Trees in Riparian Areas That Can Provide Coarse Woody Debris to Streams. Forest Science, Volume 36, No.3:790-801.

Rosgen. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Ross, D.W., K.E. Gibson, and G.E. Daterman. 2001. Using MCH to Protect Trees and Stands From Douglas-fir Beetle Infestation. Report FHTET-2001-09. USDA Forest Service Forest Health Technology Enterprise Team, Morgantown, West Virginia. 11pp.

Roth, L.F., L. Rolph, and S. Cooley. 1980. Identifying Infected Ponderosa Pine Stumps to Reduce Costs of Controlling *Armillaria* Root Rot. Journal of Forestry 78:145 through 148, 151.

Roy, K. 1991. Ecology of Reintroduced Fishers in the Cabinet Mountains of Northwest Montana. M. S. Thesis, University of Montana, Missoula, Montana. 94pp.

Ruediger, B, J. Claar, S. Mighton, B. Nanaey, T. Tinaldi, F. Wahl, N. Warren, D. Wenger, A. Williamson, L. Lewis, B. Holt, G. Patton, J. Trick, A. Vandehey, S. Gniadek. 2000. Canada Lynx Conservation Assessment and Strategy (2nd Edition). USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service, Missoula, Montana. 122pp.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al. 2000. *The Scientific Basis for Lynx Conservation: Qualified Insights.* Chapter 16 in Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, et al (Tech. Eds). 2000. Ecology and Conservation of Lynx in the United States. University Press of Colorado, Boulder, Colorado. 480pp.

Rumsey, S. 2001. Montana Department of Fish, Wildlife and Parks. Personal communication.

Schmitz, R.F., and K.E. Gibson. 1996. *Douglas-fir Beetle.* Forest Insect and Disease Leaflet 5. USDA Forest Service, Washington, D.C. 8pp.

Schroeder, L.M., and A. Lindelow. 1989. Attraction of Scolytids and Associated Beetles by Different Absolute Amounts and Proportions of Alpha-pinene and Ethanol. Journal of Chemical Ecology 15:807 through 817.

Shaw, C.G., III. 1980. Characteristics of *Armillaria mellea* on Pine Root Systems in Expanding Centers of Root Rot. Northwest Science 54:137 through 145.

Shaw, C.G., III., L.F. Roth, L. Ralph, and J. Hunt. 1976. *Dynamics of Pine and Pathogen as They Relate to Damage in a Forest Attacked by Armillaria.* Plant Disease Reporter. 60:214 through 218.

Squires, J and T. Laurion. 2000. *Lynx Home Range and Movements in Montana and Wyoming: Preliminary Results.* Chapter 11 *In* Ruggiero, L. F., K.B. Aubry, S.W. Buskirk, et al (Tech. Eds). 2000. Ecology and Conservation of Lynx in the United States. University Press of Colorado, Boulder, Colorado. 480pp.

USDA Forest Service. Flathead National Forest Plan, Amendment 21, DEIS, Management Direction Related to Old Growth Forests. Kalispell, Montana. 85pp.

USFWS 1987. Northern Rocky Mountain Wolf Recovery Plan. USFWS, Denver, Colorado. 119pp.

USFWS. 1986. Recovery Plan for the Pacific Bald Eagle. USFWS. Portland, Oregon. 160pp.

USFWS. 1993. Grizzly Bear Recovery Plan. Missoula, Montana. 181pp.

USFWS. 1995. Biological Opinion on the Proposed Amendment #19 to the Flathead Forest Plan. Helena, Montana.

USFWS. 1999. Rocky Mountain Wolf Recovery: 1999 Annual Report. USFWS. Helena, Montana. 22pp

Washington Forest Practice Board. 1995. Standard Methodology for Conducting Watershed Analysis Under Chapter 222-22 WAC, Version 3.0. Olympia, Washington.

Weaver, T. and Fraley, J. 1991. Fisheries Habitat and Fish Populations. Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program. Flathead Basin Commission, Kalispell, Montana.

Wright, M. and R. Escano. 1986. Montana Bald Eagle Nesting Habitat: A Macro-Habitat Description. USDA Forest Service. Wildlife and Fish Habitat Relationships Program. Missoula, Montana. 24pp.

Zager, P. 1980. The Influence of Logging and Wildfire on Grizzly Bear Habitat in Northwestern Montana. PhD. thesis. University of Montana, Missoula, Montana. 130pp.

GLOSSARY

GOAT SQUEEZER TIMBER SALE PROJECT

GLOSSARY

Acre-foot
A measure of water or sediment volume equal to an amount of material that would cover 1 acre to a depth of 1 foot.

Action alternative
One of several ways of moving toward the project objectives.

Adfluvial
A fish that out migrates to a lake as a juvenile to sexually mature and returns to natal stream to spawn.

Administrative road use
Road use that is restricted to DNRC personnel and contractors for purposes such as monitoring, forest improvement, fire control, hazard reduction, etc.

Airshed
An area defined by a certain set of air conditions; typically a mountain valley where air movement is constrained by natural conditions such as topography.

Ameliorate
To make better; improve.

Appropriate conditions
Describes the set of forest conditions determined by DNRC to best meet the SFLMP objectives. The 4 main components useful for describing an appropriate mix of conditions are cover-type proportions, age-class distributions, stand-structure characteristics, and the spatial relationships of stands (size, shape, location, etc.); all are assessed across the landscape.

Background view
Views of distant horizons, mountain ranges, or valleys from roads or trails.

Best Management Practices (BMPs)
Guidelines to direct forest activities, such as logging and road construction, for the protection of soils and water quality.

Biodiversity
The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems where they occur.

Board foot
144 cubic inches of wood that is equivalent to a piece of lumber 1-inch thick by 1 foot wide by 1 foot long.

Canopy
The upper level of a forest consisting of branches and leaves of the taller trees.

Canopy closure
The percentage of a given area covered by the crowns, or canopies, of trees.

Cavity
A hollow excavated in trees by birds or other animals. Cavities are used for roosting and reproduction by many birds and mammals.

Centimeter
A distance equal to .3937 inch.

Commercial-thin harvesting
A harvest that cuts a portion of the merchantable trees within a stand to provide growing space for the trees that are retained. For the South Wood Timber Sale Project, thinning would reduce stand densities to approximately 100 trees per acre.

Compaction
The increase in soil density caused by force exerted at the soil surface, modifying aeration and nutrient availability.

Connectivity
The quality, extent, or state of being joined; unity; the opposite of fragmentation.

Core area
See Security Habitat (grizzly bears).

Cover
See HIDING COVER and/or THERMAL COVER.

Coarse down woody material
Dead trees within a forest stand that have fallen and begun decomposing on the forest floor.

Crown cover or crown closure
The percentage of a given area covered by the crowns of trees.

Cull
A tree of such poor quality that it has no merchantable value in terms of the product being cut and manufactured.

Cutting or harvest units
Areas of timber proposed for harvesting.

Cumulative effect
The impact on the environment that results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor actions, but collectively they may compound the effect of the actions.

Direct effect
Effects on the environment that occur at the same time and place as the initial cause or action.

Discounting
In economics, a method of accounting for the value of money over time, its ability to earn interest, so that costs and benefits occurring at different points in time are brought to a common date 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.

Dominant tree
Those trees within a forest stand that extend their crowns above surrounding trees and capture sunlight from above and around the crown.

Drain dip
A graded depression built into a road to divert water and prevent soil erosion.

Ecosystem
An interacting system of living organisms and the land and water that make up their environment; the home place of all living things, including humans.

Embeddeness
Embeddedness refers to the degree of armour, or the tight consolidation of substrate.

Environmental effects
The impacts or effects of a project on the natural and human environment.

Equivalent clearcut area (ECA)
The total area within a watershed where timber has been harvested, including clearcuts, partial cuts, roads, and burns.

Allowable ECA - The estimated number of acres that can be clearcut before stream-channel stability is affected.

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 harvesting that may occur without substantially increasing the risk of causing detrimental effects to stream-channel stability.

Excavator piling
The piling of logging residue (slash) using an excavator.

Fire regimes
Describes the frequency, type, and severity of wildfires. Examples include: frequent, nonlethal underburns; mixed-severity fires; and stand-replacement or lethal burns.

Fluvial
A fish that outmigrates to a river from its natal stream as a juvenile to sexually mature in the river, and returns to its natal stream to spawn.

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

Foreground view
The view immediately adjacent to a road or trail.

Forest improvement (FI)
The establishment and growing of trees after a site has been harvested. Associated activities include:

- site preparation, planting, survival checks, regeneration surveys, and stand thinnings;
- road maintenance;
- resource monitoring;
- noxious weed management; and
- right-of-way acquisition on a State forest.

Fragmentation (forest)
A reduction of connectivity and an increase in sharp stand edges resulting when large contiguous areas of forest with similar age and structural characteristics are interrupted through disturbances, such as stand-replacement fires and timber stand harvesting.

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

Habitat type
Land areas that would produce similar plant communities if left undisturbed for a long period of time.

Hazard reduction
The abatement of a fire hazard by processing logging residue with methods such as separation, removal, scattering, lopping, crushing, piling and burning, broadcast burning, burying, and chipping.

Hiding cover
Vegetation capable of hiding 90 percent of a standing adult mammal from human view at a distance of 200 feet.

Historical forest condition
The condition of the forest prior to settlement by Europeans.

Indirect effects
Secondary effects that occur in locations other than the initial action or significantly later in time.

Inoculum
The material (spore) used to introduce a disease in order to immunize, cure, or experiment.

Intermediate trees
Characteristics of certain tree species that allow them to survive in relatively low-light conditions, although they may not thrive.

Interdisciplinary team (ID Team)
A team of resource specialists brought together to analyze the effects of a project on the environment.

Landscape
An area of land with interacting ecosystems.

Kairomone
Chemicals emitted by a plant that act as attractants to insects (ex. The volatiles emitted by a root-diseased tree that make them attractive to bark beetles).

Kilometer
A distance equal to 3,280.8 feet or .621 mile.

McNeil Coring
McNeil coring is a method used to determine the size range of material in streambed spawning sites.

Meter
A distance equal to 39.37 inches.

Middleground view
The view that is 200 to 1,000 feet from a road or trail, usually consisting of hillsides and drainages.

Millimeter
A distance equal to .03937 inch.

Mitigation measure
An action or policy designed to reduce or prevent detrimental effects.

Multistoried stands
Timber stands with 2 or more distinct stories.

Nest site area (bald eagle)
The area in which human activity or development may stimulate the abandonment of the breeding area, affect successful completion of the nesting cycle, or reduce productivity. It is either mapped for a specific nest, based on field data, or, if that is impossible, is defined as the area within a ¼-mile radius of all nest sites in the breeding area that have been active within the past 5 years.

No-action alternative
The option of maintaining the status quo and continuing present management activities by not implementing the proposed project.

Nodal habitats
Waters which provide migratory corridors, over wintering areas, or other critical life history requirements.

Nonforested area
A naturally occurring area, (such as a bog, natural meadow, avalanche chute, and alpine areas) where trees do not establish over the long term.

Old growth
Working definition - Old growth as defined by *Green et al.*
Conceptual definition - The term old growth is sometimes used to describe the later, or older, stages of natural development of forest stands. Characteristics associated with old-growth generally include relatively large old trees that contain a wide variation in tree sizes, exhibit some degree of a multi-storied structure, have signs of decadence, such as rot and spike-topped structure, and contain standing large snags and large down logs.

Old-growth network
A collection of timber stands that are selected to meet a management strategy that would retain and recruit 150+-year-old stands over the long term (biodiversity, wildlife, the spatial arrangement of stands and their relationship to landscape patterns and processes) are elements that are considered in the selection of stands.

Overstory
The level of the forest canopy that include the crowns of dominant, codominant, and intermediate trees.

Patch
A discrete (individually distinct) area of forest connected to other discrete forest areas by relatively narrow corridors; an ecosystem element (such as vegetation) that is relatively homogeneous internally, but differs from what surrounds it.

Potential nesting habitat (bald eagle)
Sometimes referred to as 'suitable nesting habitat', areas that have no history of occupancy by breeding bald eagles, but contain potential to do so.

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 South Wood Timber Sale Project EIS is located at the Swan River State Forest headquarters office at Goat Creek.

Redds
The spawning ground or nest of various fish species.

Regeneration
The replacement of one forest stand by another as a result of natural seeding, sprouting, planting, or other methods.

Relict
A scientific term used when talking about trees left over from fires, residual soil or geologic features, etc.; something that has survived destructive processes.

Resident
Pertaining to fish, resides and reproduces in natal stream.

Residual stand
Trees that remain standing following any cutting operation.

Road-construction activities
In general, "road-construction activities" refers to all activities conducted while building new roads, reconstructing existing roads, and obliterating roads. These activities may include any or all of the following:

- constructing road
- clearing right-of-way
- excavating cut/fill material
- installing road surface and ditch drainage features
- installing culverts at stream crossings
- burning right-of-way slash
- hauling and installing borrow material
- blading and shaping road surfaces

Road improvements
Construction projects on an existing road to improve the ease of travel, safety, drainage, and water quality.

Saplings
Trees 1.0 inches to 4.0 inches in dbh.

Sawtimber trees
Trees with a minimum dbh of 9 inches.

Scarification
The mechanized gouging and ripping of surface vegetation and litter to expose mineral soil and enhance the establishment of natural regeneration.

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 the 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
For wild animals, the freedom from the likelihood of displacement or mortality due to human disturbance or confrontation.

Security habitat (grizzly bears)
An area of a minimum of 2,500 acres that is at least 0.3 miles from trails or roads with motorized travel and high-intensity, nonmotorized use during the nondenning period.

Seedlings
Live trees less than 1.0 inch dbh.

Seedtree harvesting
Removes all trees from a stand except for 6 to 10 seed-bearing trees per acre that are retained to provide a seed source for stand regeneration.

Sediment
Solid material, mineral or organic, that is suspended and transported or deposited in bodies of water.

Sediment yield
The amount of sediment that is carried to streams.

Seral
Refers to a biotic community that is in a developmental, transitional stage in ecological succession.

Shade intolerant
Describes tree species that generally can only reproduce and grow in the open or where the overstory is broken and allows sufficient sunlight to penetrate. Often these are seral species that get replaced by more shade-tolerant species during succession. In Swan River State Forest, shade-intolerant species generally include ponderosa pine, western larch, Douglas-fir, western white pine, and lodgepole pine.

Shade tolerant
Describes tree species that can reproduce and grow under the canopy in poor sunlight conditions. These species replace less shade-tolerant species during succession. In Swan River State Forest, shade-tolerant species generally include subalpine fir, grand fir, Douglas-fir, Engelmann spruce, western hemlock, and western red cedar.

Sight distance
The distance at which 90 percent of an animal is hidden from view by vegetation.

Silviculture
The art and science of managing the establishment, composition, and growth of forests to accomplish specific objectives.

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

Slash
Branches, tops, and cull trees left on the ground following harvesting.

Snag
A standing dead tree or the portion of a broken-off tree. Snags may provide feeding and/or nesting sites for wildlife.

Spur roads
Low-standard roads that are constructed to meet minimum requirements for harvesting-related traffic.

Stand
An aggregation of trees that are sufficiently uniform in composition, age, arrangement, and condition and occupy a specific area that is distinguishable from the adjoining forest.

Stand density
Number of trees per acre.

Stocking
The area of a piece of land that is now covered by trees is compared to what could ideally grow on that same area. The comparison is usually expressed as a percent.

Stream gradient
The slope of a stream along its course, usually expressed in percentage, indicating the amount of drop per 100 feet.

Stumpage
The value of standing trees in the forest. Sometimes used to mean the commercial value of standing trees.

Substrate scoring
Rating of streambed particle sizes.

Succession
The natural series of replacement of one plant (and animal) community by another over time in the absence of disturbance.

Suppressed
The condition of a tree characterized by a low-growth rate and low vigor due to overcrowding competition with overtopping trees.

Texture
A term used in visual assessments indicating distinctive or identifying features of the landscape depending on distance.

Thermal cover
For white-tailed deer, thermal cover has 70 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller. For elk and mule deer, thermal cover has 50 percent or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

Timber-harvesting activities
In general, 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 standing trees and bucking them into logs
- skidding logs to a landing
- processing, sorting, and loading logs at the landing
- hauling logs to a mill
- slashing and sanitizing residual vegetation damaged during logging
- machine piling logging slash
- burning logging slash
- scarifying, preparing the site as a seedbed
- 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 overstory of adjacent trees and other woody growth.

Uneven-aged stand
Various ages and sizes of trees growing together on a uniform site.

Ungulates
Hoofed mammals, such as mule deer, white-tailed deer, elk, and moose, that are mostly herbivorous and many are horned or antlered.

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

Visual screening
The vegetation that obscures or reduces the length of view of an animal.

Watershed
The region or area drained by a river or other body of water.

Water yield
The average annual runoff for a particular watershed expressed in acre-feet.

Water yield increase
An increase in average annual runoff over natural conditions due to forest canopy removal.

GOAT SQUEEZER TIMBER SALE PROJECT

ACRONYMS

AF	Subalpine fir
ARM	Administrative Rules of Montana
BMP	Best Management Practices
C.	Celcius
cm	Centimeter
dbh	Diameter at Breast Height
DEQ	Department of Environmental Quality
DF	Douglas-fir
DFWP	Montana Department of Fish, Wildlife and Parks
DEIS	Draft Environmental Impact Statement
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
EAC	Environmental Assessment Checklist
ECA	Equivalent Clearcut Acres
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FI	Forest Improvement
FNF	Flathead National Forest
FOGI	Full Old-Growth Index
ID Team	Interdisciplinary Team
LPP	Lodgepole pine
m	Meter
m^3	Cubic millimeter
MBF	thousand board feet
MC	Mixed conifer
MCA	Montana Codes Annotated
MEPA	Montana Environmental Policy Act
mm	Millimeter
MMBF	Million Board Feet
NCDE	Northern Continental Divide Ecosystem
NWLO	Northwestern Land Office
PP	Ponderosa pine
SB	Senate Bill
SFLMP	State Forest Land Management Plan
SLI	Stand-level Inventory
SMZ	Streamside Management Zone
SVGBCA	Swan Valley Grizzly Bear Conservation Agreement
TMDL	Total Maximum Daily Load
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WL/DF	Western larch/Douglas-fir
WWP	Western white pine

124 Permit	Stream Preservation Act Permit
318 Authorization	A Short-term Exemption from Montana's Surface Water Quality Standards
Land Board	State Board of Land Commissioners

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