MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

STATE FOREST LAND MANAGEMENT PLAN

FINAL ENVIRONMENTAL IMPACT STATEMENT APPENDIXES

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APPENDIXES

TO THE FINAL ENVIRONMENTAL IMPACT STATEMENT

AUGUST 15, 1999
Third Printing

Order of Appendixes:

APPENDIX WRK

HOW THE STATE FOREST LAND MANAGEMENT PLAN WORKS

THE NATURE OF A PROGRAMMATIC PLAN

The Montana Environmental Policy Act (MEPA) requires agencies to draft and review plans for their administrative programs as well as for site-specific proposals. A programmatic plan is one that establishes a philosophy within which an agency will implement its management programs.

Using the MEPA process, we have prepared seven alternative programmatic plans, or administrative philosophies. The final alternative and resulting State Forest Land Management Plan (Plan) will be the strategy that guides management decisions statewide.

Because of its philosophic nature, the Plan will not tell our managers what to decide; it will help them know how to weigh various factors in making a decision. It will tell us what to emphasize and where to look first when allocating resources. However, it will not prevent us from considering other options which are also consistent with the primary philosophy. The Plan will define DNRC's forest management policy in terms of what assumptions we make about the future, and what priorities we use when we make decisions.

The plan will not allocate any land for specific use. Instead, it will focus our attention on certain types of use, or on a certain stance to take in deciding how to allocate the use. This focus will make certain land-use allocations more likely under some of the alternatives than under others; however, a separate, site-specific MEPA assessment process will decide each actual allocation.

THE SCHOOL TRUST MANDATE

All of the seven draft alternative plans have the goal of managing state lands to secure the greatest long-term income for the school trust. The different approaches represent differing beliefs and assumptions as to the best way to meet the trust mandate. Some people believe we should manage the land intensively for many products. Others think we should emphasize a single use. And some argue that we should minimize current intervention and allow nature to preserve our future options in its own way.

Some assume that future values will far outweigh any returns we could realize now, and that current intervention would eliminate valuable future options. Others assume that relative values will remain pretty much the same as in the past, and/or believe that intervention now need not foreclose important future options.

The range of alternatives we have drafted is meant to fairly consider all of these views. We have estimated the economic and environmental effects of each alternative. DNRC will decide which one offers our best chance to satisfy the trust mandate while managing state forest lands according to high professional standards and giving fair consideration to concerns of the public.

HOW THE PLAN RELATES TO SITE-SPECIFIC DECISIONS AND ALLOCATING LAND-USE

The plan will become one of four major elements in our overall planning process. The other three are (1) the legislature's laws and budgets; (2) DNRC's Biennial Budget Program Implementation Process (BBPI); and (3) Field Operation's annual work plan.

The legislature expresses the wishes of Montana's citizens in the form of laws and budgets, which in turn will shape both DNRC's chosen programmatic plan and each BBPI. The BBPI is an agreement with the legislature on how to allocate finances. It tells us our annual goals and objectives and what budget and staff we have to meet them.

Field operations managers will fit three elements together to draft a list of potential projects: the philosophy and goals of the Plan; the biennial plan's goals, budget, and staffing; and their knowledge of potential uses of state lands. They will then use these potential projects to set the BBPI's annual objectives. Potential projects will be scheduled for MEPA review.

At this point, DNRC will use the Plan to see what resource management standards the projects will need to meet, and to determine whether any of the projects would be exempt from MEPA review (e.g., categorical exclusions). For projects that require MEPA review, we will present the analysis and decision making process in a MEPA document that shows the ties among the proposed land use allocations, the State Forest Land Management Plan, and the BBPI's goals and objectives.

During the year, field operations managers will provide information on what is working and what is not working back to the Trust Land Management Division staff through the BBPI process. This could result in modifying the plan, if the Forest Management Bureau Chief believes the plan is out of date in some way, or asking the legislature to change laws or budgets if the Forest Management Bureau Chief believes DNRC needs such action to properly implement the Plan.

IMPLEMENTING THE PLAN

DNRC will implement the new State Forest Land Management Plan gradually. Some changes would take place almost immediately, while others might take two to five years, or more. DNRC could begin significant changes in land use by modifying traditional uses, followed by mixing new and old uses, and eventually by discontinuing some traditional uses altogether. For example, we might gradually adjust or phase out existing leases and licenses as renewal dates come up.

As DNRC continues to implement the new plan, we would undoubtedly discover features of the plan that were not working well, problems that we had not adequately addressed, and issues that we had not anticipated at the time we developed the Plan. DNRC's plan management strategy (see Appendix MNG) is meant to be flexible enough to accommodate changes as we need them, yet require a sufficiently rigorous process to protect against arbitrary departures from the philosophy of the Plan.

Regardless of which alternative is chosen, we will have a programmatic plan that defines DNRC's intentions, resource management standards, and preferred methods for generating revenue for Montana's schools. By having an underlying, guiding philosophy, all levels of DNRC personnel will be able to make forest management decisions consistent with a single plan that supports Department goals and has been through public review.

APPENDIX MNG

MANAGING THE PLAN

ROUTINE MONITORING

Beginning in the year 2000, and every five years thereafter, the Forest Management Bureau Chief would make a written report to the Director of the Department of Natural Resources and Conservation and the Trust Land Management Division Administrator on the current status of Plan implementation and effectiveness, including a recommendation on the need for significant changes to the Plan.

WHEN IS A CHANGE REQUIRED AND WHAT IS THE PROCEDURE?

The Plan could be reviewed and changed at any time for one or more of the following reasons:

1) new legislation is passed that is not compatible with the chosen alternative;
2) new direction from the State Board of Land Commissioners; or
3) the Forest Management Bureau Chief judges that original assumptions supporting the Plan no longer apply.

Minor changes or additions could be made as long as they were compatible with the overall Plan. Cumulative minor changes could result in a programmatic review of the entire Plan.

Procedure for Making Changes

1) The Forest Management Bureau would be responsible for drafting changes.

2) Draft changes would be sent to all Area Managers for review and comments.

3) The Forest Management Bureau Chief would be responsible for determining the appropriate level of MEPA review.

UNDER WHAT CIRCUMSTANCES WOULD WE BE ABLE TO CHANGE MANAGEMENT DIRECTION WITHOUT CHANGING THE PLAN?

The Forest Management Bureau Chief could change management direction without changing the Plan if the proposed change did not violate the fundamental intent as reflected in the Plan and supporting EIS. For example, as our resource specialists became aware of new information through their ongoing review of scientific literature, we might modify our biodiversity strategy without amending the plan as long as, in the judgment of the Bureau Chief, the changes remained consistent with our original intent.

HOW WOULD WE MAKE THIS "PROGRAMMATIC PLAN" USABLE IN THE FIELD?

Our implementation training process will include opportunities for field managers to test the Plan against various situations they expect to face. We expect that interpretation of the Plan will be an on-going process, especially during the first few years. Interpretation would be through continuing dialogue between field personnel, managers, and the Forest Management Bureau.

HOW WILL WE IMPLEMENT THE PLAN?

Once the Plan has been adopted, the following implementation measures would be taken:

1) DNRC staff will provide initial and on-going training and orientation. Initial training will give our staff the opportunity to have their questions on interpretation and implementation answered immediately. At that time, we will also explain the process field employees would use to get future Plan implementation questions answered. In addition, the training will include discussion of the authority of different administrative levels in Plan implementation.

2) The Department's Biennial Budget Program Implementation (BBPI) process is used to integrate budgets and program objectives. This process will also be used to ensure that the Plan continues to be usable by the field.

   The goals and program direction outlined in the BBPI process are updated each biennium, at which time we recommend modifications to the legislature on proposed budgets and staffing. These updates would reflect management direction provided in the Plan. Program objectives and work plans would then be updated to be consistent with the new BBPI .

   The Forest Management Bureau would meet every year with all the Land Offices to revise program objectives. At that time, they would agree on the objectives that best met the intent of the Plan. They would also discuss the overall ability of the Land Offices to comply with the Plan. Although discussion about Plan implementation should go on throughout the year, this review will guarantee that Plan implementation is reviewed at least annually.

3) We will notify the public, DNRC lessees/licensees, and other state land users when we begin Plan implementation.

HOW WILL WE ENSURE COMPLIANCE WITH THE PLAN?

The following measures would be used to ensure that the Plan is being followed by DNRC staff and field personnel:

1) During our annual review, we would revise Program goals and objectives as necessary to remain in compliance with the Plan.

2) We would monitor individual resources, based on resource management standards specified in the Plan, and take the prescribed corrective actions when problems occurred. We would also ensure that prescribed corrective actions were included in contracts and implemented.

HOW WOULD DNRC RESPOND TO THE POSSIBLE NEED TO MODIFY RESOURCE MANAGEMENT STANDARDS?

1) When Trust Land Management Division staff or field personnel identified a resource or Department activity that may require the development of a new or modified resource management standard, they would submit a proposal to the Forest Management Bureau.

2) The Forest Management Bureau would assess the need to modify a resource management standard, and prepare a recommendation to the Forest Management Bureau Chief. The recommendation would consider the following questions:

    a) How widespread is the issue, resource or activity? Is the issue relevant only on a given Land Office or Unit, or does it affect several Land Offices or a large share of the state land base?

    b) Can the issue or activity be addressed consistently on the majority of state forested lands?

    c) Does the issue or activity have long-term implications, or is it of limited duration?

    d) Is the issue most appropriately addressed in a resource management standard?

    e) To what extent is the resource management standard impacting our ability to make management decisions or to derive income from trust lands?

    f) Is there sufficient information or accepted procedure to support adding or modifying a resource management standard?

    g) How would the modification of the resource management standard affect workloads and our ability to manage other resources?

3) Upon approval from the Forest Management Bureau Chief, the Forest Management Bureau would develop the resource management standard, using the most appropriate expertise, recent data and information, and professional representation.

APPENDIX LGL

LEGAL FRAMEWORK

INTRODUCTION

The purpose of this appendix is to outline the legal framework within which the proposed State Forest Land Management Plan would be implemented. The following major topics will be covered:

General Legal Framework
Planning and Environmental Assessment
Land Administration
Resource Management

Discussion of each topic will include brief descriptions of relevant federal and state laws, and selected rules from the Administrative Rules of Montana (ARM). All applicable federal and state laws and regulations can be assumed to be incorporated as part of this framework. Certain laws and regulations not summarized here are directly incorporated by reference to code citations.

GENERAL LEGAL FRAMEWORK

All state school trust lands are under the direction and control of the State Board of Land Commissioners which consists of the governor, superintendent of public instruction, auditor, secretary of state, and attorney general. (Article X, section 4, 1972 Montana constitution) The Department of Natural Resources and Conservation is charged with the management of state school trust lands under the direction of the State Board of Land Commissioners (§ 2-15-3201, § 77-1-301, Montana Code Annotated [MCA]). The State Board of Land Commissioners and the Department of Natural Resources and Conservation will be referred to collectively hereafter as DNRC.

Federal lands were granted to the state when Montana was admitted into the Union. The Enabling Act of 1889 (25 STAT. 679) granted the state of Montana Sections 16 and 36 in each township (or other lands in lieu of those sections) "for the support of common schools." The Enabling Act also created several other smaller trusts that provide income for the state universities and other state institutions. In Montana's 1889 constitution, the state accepted the lands and promised they would be held in trust and managed to conform with the provisions of the Enabling Act. Article I of Montana's 1972 constitution is a compact with the United States where the state reaffirmed its acceptance of the terms of the Enabling Act.

While all trust lands are considered state-owned, they may only be managed to fulfill the specific purposes for which the trust was created (i.e., the lands must be managed to provide income for the designated trust beneficiary such as the common schools, agricultural college, mining college, asylums, reform school, or public buildings). This means that any use of the lands must result in income to the intended trust beneficiary. Montana's constitution goes further and states that any use of the trust lands must generate "full market value."

The constitution also gives the State Board of Land Commissioners the authority to manage and control the disposition of the trust lands. The Board can take no action contrary to the trust principles outlined above. However, they have broad discretion in applying those principles. That discretion is necessary because DNRC is required not only to satisfy trust principles, but also to comply with state statutes.

The need for discretion on the part of DNRC is alluded to in § 77-1-202 , MCA (as amended in 1995 by HB 263), "... these lands and funds are held in trust for the support of education and for the attainment of other worthy objects helpful to the well-being of the people of this state as provided in the Enabling Act. The board shall administer this trust to secure the largest measure of legitimate and reasonable advantage to the state."

The discretionary authority of DNRC is based on two principles. The first is the concept of sustained yield. The Montana Supreme Court has said, "In exercising its constitutional authority, the legislature has provided that full market value shall encompass the concept of sustained yield." Jerke vs. Department of State Lands (now the Department of Natural Resources and Conservation). Therefore, it is within the discretion of the DNRC to receive less income currently, if this action will maintain the long term productivity of the land and guarantee income to the beneficiaries in the long run.

For example, DNRC may require designated skid trails to minimize site compaction and allow for regeneration of a future forest. Harvest values received by the DNRC may be reduced because designated trails were required, but the trails should provide for sustained yield on the site that otherwise might not be realized. Another example is that DNRC may prescribe a shelterwood timber harvest that generates less immediate return than a clearcut, because the shelterwood is expected to provide for regeneration and better long run financial return to the trust.

The second important principle is that DNRC's management of school trust lands is subject to state and federal laws enacted to protect public health, safety, welfare and the environment. Montana's Constitution requires that "The state and each person shall maintain and improve a clean and healthful environment in Montana for present and future generations" and directs the legislature to enact laws to this end (1972 Montana Constitution, Article IX, Section 1). Several such laws are discussed later in this chapter in the section on Resource Management.

PLANNING AND ENVIRONMENTAL ASSESSMENT

DNRC's activities in the management of state school trust lands are also subject to the planning and environmental assessment requirements of the Montana Environmental Policy Act (MEPA) (§ 75-1-101, MCA) and the administrative rules implementing MEPA (ARM 26.2.628-663). This statute sets out broad policies directing state agencies "to create and maintain conditions under which man and nature can coexist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations" (§ 75-1-103, MCA).

MEPA also imposes specific requirements for making decisions on proposed state actions affecting the environment. MEPA includes provisions, among others, which require state agencies "to the fullest extent possible" to:

- use a systematic, interdisciplinary approach in planning and decision making which may have an impact on the human environment;

- study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

- initiate and utilize ecological information in the planning and development of resource-oriented projects;
- use procedures which consider unquantified environmental amenities and values as well as economic and technical considerations; and
- prepare a detailed environmental impact statement on proposals for state actions significantly affecting the quality of the human environment.

In its management of state lands, DNRC is also required to provide citizens a reasonable opportunity to participate in the discussion of proposed projects prior to the final decision of the agency (Article II, section 8, 1972 Montana constitution). Specific requirements for citizen participation are found at § 2-3-101 et seq., MCA, ARM 26.2.701-707, and in the MEPA rules.

LAND ADMINISTRATION

Title 77, MCA and ARM Title 26, respectively, contain statutes and rules which provide specific legal requirements and procedures for state land management. The subjects addressed by these laws are briefly outlined below.

I. Statutes (Title 77, MCA)

   A. Chapter 1, Administration of State Lands, contains general provisions relating to state lands, including powers and duties of the Board and of the Department, multiple use management, classification, equalization payments, resource development, and ownership records. § 77-1-203, MCA provides that:

      1. "The board shall manage state lands under the multiple use management concept defined as the management of all the various resources of the state lands so that:

         a. they are utilized in that combination best meeting the needs of the people and beneficiaries of the trust, making the most judicious use of the land for some or all of those resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions and realizing that some land may be used for less than all of the resources; and

         b. harmonious and coordinated management of the various resources, each with the other, will result without impairment of the productivity of the land, with consideration being given to the relative values of the various resources."

      2. "If a parcel of state land in one class has other multiple uses or resource values which are of such significance that they do not warrant classification for the value, the land shall, nevertheless, be managed insofar as is possible to maintain or enhance these multiple-use values."

   B. Chapter 2, Transfers and Reservations of Property Interests, contains provisions dealing with easements, exchanges, and sales of state land.

C. Chapter 3, Rock, Mineral, Coal, Oil, and Gas Resources, contains provisions dealing with prospecting permits and mineral leases handled by the Mineral Leasing Bureau of the Lands Division of the Department.

D. Chapter 4, Geothermal and Hydroelectric Resources, contains provisions for leasing for development of such resources.

E. Chapter 5, Timber Resources, contains provisions relating to management of state forest lands including:

1. a provision which classifies and designates as "state forests" all state-owned lands "which are principally valuable for the timber that is on them or for the growing of timber or for watershed protection" and reserves said lands "for forest production and watershed protection" (§ 77-5-101, MCA). The statute also establishes seven "state forest units . . . primarily to secure through forestry management a continuous supply of timber and the performance of watershed covers" (§ 77-5-102, MCA).

2. provisions dealing with timber sales and timber permits.

3. provisions for salvage timber sales (§ 77-5-207, MCA) and a provision for the removal of timber in cases of emergency due to fire, insect, fungus, parasite, or blowdown ...

   "or in cases where the department is required to act immediately to take advantage of access granted by permission of an adjoining landowner, timber proposed for sale not in excess of 1 million board feet may be advertised by invitation to bid for a period of not less than 10 days."

   In such instances, "the department is not required to comply with the provisions of § 75-1-201(1) [MEPA] to the extent that compliance is precluded by limited time available to take advantage of the sales opportunities described ..." (§ 77-5-201, MCA (as amended in 1995 by HB 274)).

4. provisions for the determination of annual sustainable yield. Section 77-5-222, MCA (HB 201 1995) provides that:

   "The department, under the direction of the board, shall commission a study by a qualified independent third party to determine, using scientific principles, the annual sustainable yield on forested state lands" and

   "Until the study required by subsection (1) is completed, the annual sustainable yield is considered to be a range of 45 million board feet to 55 million board feet."

F. Chapter 6, Agriculture, Grazing, and Other Surface Leases, contains provisions dealing with surface leases of state land.

II. Rules (ARM Title 26)

A. Surface Management Rules (ARM 26.3.128-165) contain provisions dealing with surface leases and licenses of state land.

RESOURCE MANAGEMENT

Management of natural resource areas listed below is, in part, directed by the laws and regulations described in the following section:

A. Air
B. Cultural Resources
C. Natural Areas
D. Soil
E. Vegetation
F. Water
G. Wildlife and Fish

A. AIR

Federal Law: Federal law requires each state to establish air quality regulations that meet federal standards. The Montana regulations, adopted to comply with federal standards, are recorded under Title 75, Chapter 2, MCA.

Clean Air Act of Montana: Under Title 75, Chapter 2, MCA, the State Board of Environmental Quality is empowered to establish limits on emissions of pollutants as necessary to prevent, abate or control air pollution (§ 75-2-203, MCA).

State Regulations: The following air quality regulations may apply to DNRC activities:

Open Burning Permits: DNRC is considered as a "major open burning source" and as such, is required to secure burning permits from MDEQ (Montana Department of Environmental Quality) [ARM 16.8.1304].

Best Available Control Technology (BACT): This regulation prescribes certain conditions for minimizing the adverse air quality effects of open burning [ARM 16.8.1301].

B. CULTURAL RESOURCES

Montana Antiquities Act: DNRC is required to avoid or mitigate damage to antiquities when feasible (§ 22-3-424, MCA).

State Regulations: Regulations interpreting the Antiquities Act are contained in ARM 26.2.800.

Initial Consultation: DNRC must consult with SHPO (State Historic Preservation Office) early in the project planning process. Information and procedures are listed in ARM 26.2.803.

SHPO Recommendations: DNRC must consider SHPO recommendations and consult with SHPO over disagreements; however, compliance with SHPO recommendations is not mandatory (ARM 26.2.804).

Discovery of Antiquities: If antiquities are discovered while a project is active, work must cease immediately and the SHPO consultation process must take place (ARM 26.2.807).

C. NATURAL AREAS

Montana Natural Areas Act: Specifies natural areas as one of the "other worthy objects" which may be supported by school trust lands (§ 76-12-102, MCA). According to an Attorney General's opinion, the school trust must be compensated in money for any lands designated as natural areas (36 Opinions of the Attorney General, No. 92).

State Regulations:

Consideration of Suitability: Assessment of proposed actions that would cause obvious visual changes in natural characteristics of the land must include a review of qualifications to become a natural area (ARM 26.5.203). Guidance in determining suitability is found in § 76-12-104(4), MCA.

D. SOIL

Montana Soil Survey Act: Identifies soils as a basic and precious natural resource and provides for completion of a soil survey and mapping program by DNRC (§ 76-11-202, MCA).

State Regulations:

Protection of Forest Resources: Landowners are required to notify DNRC when a "forest practice" is about to begin. DNRC is required to provide information on BMPs (Best Management Practices) to the landowner (§ 76-13-101,104, MCA).

Other Laws: The following laws have provisions that may affect management of soils on DNRC lands.

Multiple Use Management Act (§ 76-1-203, MCA).
Conservation District Laws (76-15, MCA).
Cooperative Fire Protection and Conservation (§ 76-11-102, MCA)
Natural Streambank and Land Preservation Act (§ 75-7-101, MCA).
Open Space Land and Voluntary Conservation Easement Act (§ 76-6-101, MCA).
Solid and Hazardous Waste Disposal Act (75-10, MCA).
Montana Pesticide Act (§ 80-8-101, MCA).

E. VEGETATION

Noxious Weeds

Montana Noxious Weed Control Act: Every county is required to have a Weed District administered by a District Weed Board for the purpose of planning and implementing a noxious weed management program for the containment, suppression, and, where possible, eradication of noxious weeds (§ 7-22-2101--2103, MCA).

All state agencies controlling land within a weed district are required to enter into an agreement with the district which specifies mutual responsibilities for noxious weed management (§ 7-22-2151, MCA).

It is illegal for any landowner to allow the propagation of noxious weeds. The landowner's legal responsibility is met if they are in compliance with the district weed management plan or if they have entered into a weed management agreement with the district and is in compliance with that agreement (§ 7-22-2116, MCA). Where State lands are leased, the control of noxious weeds is assigned to the lease or licensed user. A lessee or licensee of State land shall keep the land free of noxious weeds and pests. The lessee shall perform these duties at their own cost and in the same manner as if they owned the land (ARM 26.3.117).

Any state agency approving a mine, roadway, powerline or any other significant disturbance of the land (e.g., timber sale) must notify the district weed board. The agency must submit a revegetation plan describing the method of seeding, timing of fertilization, recommended plant species, and weed management procedures to be used. Weed-free seeds must be specified. The plan must be revised as necessary to secure approval of the district weed board (§ 7-22-2152, MCA). DNRC currently has a revegetation plan for forestry related activities. Cooperative agreements have been made between DNRC and weed boards in counties where forest management activities occur. These agreements are on file in Area or Unit offices.

The County Noxious Weed Control Act (§ 7-22-2151, MCA, as amended in 1995 by HB 395) requires Cooperative Integrated Noxious Weed Management Agreements (CINW) between DNRC and Weed Districts. Integrated Weed Management shall include a single or combination of chemical, mechanical, biological, and cultural treatments and preventative measures. The CINW agreements between DNRC and Weed Districts will be completed in 1997 and will supersede current Revegetation Plan agreements.

Sensitive Plants

There are no laws explicitly for the protection of sensitive plants. Current direction comes from policies evolved from interpretation of MEPA, the Natural Areas Act, and the Montana Natural Heritage Program.

Timber

State Regulations:

Forest Land Classification: State lands are to be classified as to their principal use. Lands principally valuable for their current timber, for growing of timber, or for watershed protection are classified as state forests (§ 77-1-401 and § 77-5-101, MCA). The basis for classification is to ensure that lands are used in ways that best meet the land board's trust and multiple-use responsibilities, and that no lands are sold, leased or used under a different classification than that to which they belong (§ 77-1-402, MCA).

DNRC Responsibility for State Forests: DNRC is responsible for doing all fieldwork in the selection, location, examination and appraisal of state timberlands. It shall direct the protection and improvement of state forests (§ 77-5-103, MCA).

Sale of Timber: DNRC is required to supervise all timber management activities (§ 77-5-206, MCA). Timber sales in excess of 100 thousand board feet must be publicly advertised and sold by sealed bid (§ 77-5-201, MCA). All timber sales must be approved by the land board (§ 77-5-205, MCA). Volumes less than 100 thousand board feet may be sold by permit (200 thousand board feet in emergency situations), but repeated permits may not be used to avoid advertisement (§ 77-5-212, MCA).

For each sale of timber, the department is required to provide the land board with estimates of the amount and values of merchantable timber, and a statement of the situation of the timber. This statement must address the risk to the timber from fire or other damage, its distance from the nearest lake, stream or railroad, and its value for watershed protection (§ 77-5-204, MCA).

Brush Disposal and Timber Stand Improvement: Timber harvest shall be done in a way that provides for protection of standing timber and prevention of fires. The purchaser must be required to dispose of slash in an appropriate manner. The board is also authorized to set brush disposal and timber stand improvement fees to be charged to sale purchasers (§ 77-5-204, MCA).

The department is responsible to ensure completion of fire hazard reduction or management related to timber harvest, timber stand improvement and right-of-way clearing on private lands (§ 76-13-403, MCA). Rules for hazard reduction are under development.

Portable Sawmills: Operation of portable sawmills is prohibited on state forest lands without a license from DNRC (§ 76-13-501, MCA).

Fire Suppression: DNRC is responsible for protecting against the start or existence of fire, and suppressing the spread of fire, on state lands. The department may also provide fire protection and suppression on other ownerships at a cost to the landowner. (§ 76-13-201, MCA)

Forest Insect and Disease Control: DNRC is responsible, with land board approval, to declare a zone of infestation whenever there is an outbreak of forest insects or diseases that is a menace to the timber or forest growth of the state. The department has the authority to enter any land within such a zone and suppress, eradicate and destroy the infestation in whatever manner it approves (§ 76-13-303,304, MCA).

F. WATER

Federal Clean Water Act (as amended 1987): This act is designed to regulate discharges of all pollutants, including NPS (non-point source) pollution, and to achieve a national goal for water quality which provides for all waters to be "fishable and swimmable." The act calls for eliminating discharge of pollutants into the Waters of the United States.

Section 319: Addresses NPS pollution control. The act requires the states (in Montana, the Water Quality Division) to prepare a NPS Assessment Report to identify waters which cannot meet water quality standards because of NPS pollution. It requires the state to identify the source of pollutants, describe the process for identifying BMPs (Best Management Practices) to control NPS pollution, and identify programs for controlling NPS pollution. The act requires the states to set conditions for the use of BMPs. States may assist, encourage, or require BMPs. DNRC has been given responsibility by the state legislature for silvicultural BMP implementation monitoring (BMP audits) and coordinating the process for revising BMPs as necessary.

Section 402: Requires a permit for all point source pollutants. Certain forestry activities such as rock crushing, gravel washing, log sorting or log storage, with "any discernable, confined, and discreet conveyance" of water, are classified as point source pollutants. The permit system is administered by the Montana Department Environmental Quality - Water Quality Division under the Montana Pollution Discharge Elimination System (MPDES).

Section 404: Governs the program regulating dredge and fill of water bodies. This section is administered by the U.S. Army Corps of Engineers (COE). Section 404 does not have a large impact on silvicultural activities which include fill for basic culvert or bridge installation, because of a blanket nationwide permit granted by the COE.

The blanket permit applies to (1) "minor road crossing fills" that involve the discharge of less than 200 cubic yards of material below the plane of ordinary high water, and (2) "material discharged for bank stabilization, provided that the bank stabilization activity is less than 500 feet in length, is necessary for erosion prevention, and is limited to less than an average of one cubic yard per running foot along the bank (below normal high water line)...."

Section 404 applies only to areas below "headwaters". Headwaters means the point on a stream above which the average annual flow is less than five cubic feet per second. In Montana, COE personnel can be contacted through DNRC in Helena.

Montana Water Pollution Control Act (MWPCA): The MWPCA is the basic water pollution law for the state. It requires the establishment of water quality standards and provides for the enforcement of those standards. Contamination or other alteration of the physical, chemical, or biological properties of any state water, in excess of Montana Water Quality Standards, is prohibited.

Surface waters included under this law are "any waters on the earth's surface, including but not limited to, streams (intermittent and perennial), lakes, ponds, and reservoirs; and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoirs or other surface water...." It is also unlawful to place any wastes in any location where they are likely to cause pollution of state waters. Also included is a nondegradation clause, which protects the natural water quality if it is higher than the prescribed standard. The law is enforced through the Water Quality Division of the Department Environmental Quality (§ 75-5-101, MCA).

Water Quality Standards set specific protection criteria. They identify specific beneficial uses for all stream segments and establish the desired level of protection for each use. Standards for a given stream segment serve as a reference for determining the occurrence of water pollution.

Short-term Exemptions From Water Quality Standards: The Water Quality Division may authorize short-term exemptions for construction activity. Exemption is necessary only when required by the Montana Department of Fish, Wildlife and Parks (MDFWP) as a condition of a Stream Preservation Act permit (16.20.633 ARM). This authorization requires specific practices for sediment reduction.

Construction De-watering Discharge Permit: A permit from the Water Quality Division, under the MPDES, is required for discharging wastewater into a surface water body. For example, when pumping water from a coffer dam back into a creek during bridge abutment construction, water removed from the site is wastewater and subject to permit requirements. No permit is needed when water is pumped to an infiltration pond, or when the entire flow of the creek is routed around a construction site.

Public Water Supply Law: This law involves protection, maintenance, and improvement of the quality and potability of water for public water supplies and domestic use. Construction of logging roads and logging camps within the watershed of a public water supply is prohibited unless the Department of Environmental Quality has issued a permit. The permit is subject to the approval of detailed plans and specifications for protection of water quality. Application is made through the Water Quality Division (§ 75-6-101, MCA).

Lakeshore Protection Act: This act requires that every city, town, and county having jurisdiction over an area containing a lake of at least 160 acres adopt regulations governing issuance of permits for work which will alter the course, current, or cross-sectional area of the lake or its shores. Lakeshore is defined as the perimeter of the lake when the lake is at mean annual high water elevation. Land within 20 horizontal feet of the high water elevation is included under the jurisdiction of this law. No alteration may occur on the above described area without a permit from the governing body having jurisdiction (§ 75-7-201, MCA).

Montana Pesticides Act: This law provides for the administration of the Federal Fungicide and Rodenticide Act through the State Department of Agriculture. It is designed to reduce water pollution caused by intrusion of pesticides into surface water and groundwater, and to reduce harm to plant and animal life caused by the misuse of pesticides (§ 80-8-101, MCA).

Stream Preservation Act: Any county, state, or local government agency that proposes a project that will affect any fishing waters (such as a stream crossing) must obtain a permit before conducting the activity. The law applies to any stream. Permit applications are made through the MDFWP Regional Office.

Natural Streambed and Land Preservation Act: This law governs stream crossings on state land that are planned by private individuals or companies (such as when DNRC grants a right-of way for new construction). It is administered by local conservation districts through the 310 permit process and applies only to perennial streams. Rules governing the issuance of permits vary between conservation districts, but all must meet the minimum standards set from § 75-7-101, MCA.

Adjudication of Water Rights: The use of water is subject to laws and regulations requiring filing of water rights with DNRC. Adjudication of water rights is based on the principal of prior appropriations and beneficial use.

Local Jurisdictions:

Conservation Districts: Conservation districts have authority to regulate land use within their boundaries to conserve soil and water resources and to control erosion (§ 76-15-701, MCA). These regulations apply to publicly owned lands (§ 76-15-317, MCA).

Indian Reservations: State lands within Indian Reservations may be subject to additional regulation. The Flathead Reservation has established its own water quality law and associated standards. Activities on state lands within reservation boundaries are subject to such regulations.

G. WILDLIFE AND FISH

Federal Endangered Species Act: An act to provide a means whereby ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the (relevant) treaties and conventions ... (Endangered Species Act of 1973, PL 93-205; 87 Stat. 884)

Nongame and Endangered Species Conservation Act: Establishes the state's intent to protect endangered species and certain species of nongame wildlife, and charges MDFWP with making regulations to meet that intent (§ 87-5-103--105, MCA).

APPENDIX SCP

THE SCOPING PROCESS

Please note that recently the State Legislature instituted a reorganization of several state departments. As of July 1, 1995, the Department of State Lands (DSL) was merged with the Department of Natural Resources and Conservation (DNRC). In addition, the Forestry Division was transferred to the Trust Land Management Division and the Commissioner of State Lands became the Director of DNRC.

Since this chapter of the FEIS largely focuses on the planning activities that occurred *prior* to July 1, 1995, we have continued to use the names Department of State Lands and Forestry Division in discussing events of that time. For activities that occurred *after* July 1, 1995, we have changed the name to the Department of Natural Resources and Conservation and the Trust Land Management Division. We apologize for any confusion that may occur as a result.

PHASE I: IN-HOUSE SCOPING

We formally began our scoping process with a three-day retreat on December 11-13, 1990.[1] On the first day, members of the planning team, their supervisors, and Forestry and Lands Division Administrators discussed two questions: (1) Why are we proposing to undertake a State Forest Land Management Plan? and (2) How will we reconcile the need for planning time with other demands on planning team members' time?

The Administrators strongly supported the need for a comprehensive programmatic plan and agreed to give this effort high priority. The group agreed to proceed with the plan, subject to two conditions: (1) the planning team would prepare a Statement of Purpose which would enable readers to understand the objectives of such a plan, the kinds of issues it would address, and its geographic and administrative scope; this Statement would be presented to the Commissioner of State Lands for final approval before public announcement of the planning effort; and (2) members of the planning team would be given release time from other duties, with the specifics of time reallocation to be negotiated between planning team members and their individual supervisors.

After administrators and supervisors left the retreat and our planning team spent the next two days exploring how they would work together and start the actual planning process. We used the "brainstorming" technique to develop our own responses to the question, "What questions would a useful plan answer?" Next, we planned a series of small meetings with our own employees to get their responses to the same question we had asked ourselves.

Representatives from all Land and Unit Offices from each Forestry Division Bureau and from the Forestry Division and Lands Division headquarters in Helena, were surveyed in a total of thirteen in-house scoping meetings held between January 7th and February 5th, 1991. In many cases, a majority of members of a work unit were present at the meeting.

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1 A summary of the retreat is filed at page 100 of the Project Record. The complete Planning Record is available for public viewing at the DNRC State Forester's Office, 2705 Spurgin Road, in Missoula, Montana.

The planning team members who conducted those meetings summarized their findings in over 270 written comments. During its February 7th and 8th meeting, the planning team sorted those comments into the following seven categories:[2]

A) questions the Forest Management Plan should be expected to answer;
B) questions that are outside the scope of the Plan;
C) questions that are too specific for this level of planning;
D) questions that relate to the manner in which the Plan will be prepared;
E) general frustrations, comments, and advice;
F) questions that are addressed during the design and explanation of the planning framework; and
G) questions that are outside the planning team's sphere of responsibility, but of sufficient importance that they should be drawn to someone else's attention.

Next, planning team members assigned each of the Category A comments to a particular issue theme. A sub-committee was named to develop appropriate responses to comments in each of the other categories[3]. The Category A themes were combined with the planning team-generated issues to produce the list of Issues Raised by Our Own Employees.[4] These in-house issues were stated in question form to reflect the planning team's intent to create a plan that would be a useful information source to field people. Each issue is one response to the question, "What questions would a useful plan answer?"

Our Statement of Purpose was reviewed and approved by Area Managers and Division Administrators, and submitted to the State Lands Commissioner on May 20, 1991.[5] On August 28, 1991, the Commissioner gave approval to proceed with the plan.

PHASE II: INITIAL PUBLIC INVOLVEMENT

On September 23, 1991 we issued a press release to all daily newspapers in the state, the major weekly papers, and two news agencies announcing the plan and inviting public comment. Five papers are known to have run stories. We also mailed a two-page invitation to comment to 442 people and organizations on our mailing list. The announcement is included in this chapter as Exhibit A.

Our invitation asked people: (1) to identify their areas of concern with regard to our management of forest lands; (2) to indicate their level of interest in remaining involved in our planning process; and (3) to suggest other people or organizations that we should contact. Public response was excellent. We received over 250 written replies (20 percent of our original mailing list - a very high

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2 The original list of comments and notes on the category to which each was assigned are found on pages S57-S91 of the Project Record.

3 Our treatment of all comments raised during in-house scoping, including those that did not directly relate to the proposed plan, is documented in pages S-142 through S-188 of the Project Record.

4 Complete documentation of in-house issue development is found on page S-109 of the Project Record.

5 The Statement of Purpose is filed on page 227 of the Project Record.

response rate), plus about 160 additional replies from people and organizations that had not been on the original list.

PHASE III: IDENTIFICATION OF PUBLIC ISSUES

At our January 8-10, 1992 planning team meeting, we began the process of transforming nearly 250 sets of written comments into issues that we believed represented the full range of public concerns.[6] Three sub-groups worked independently at this task and then compared results. This gave us three separately derived lists of candidate issues which the planning team as a whole integrated into a single list.

We were still not fully comfortable with the integrated list of issues so the planning team leader undertook yet another independent approach which combined all four lists.[7] After further revisions, we agreed on a list of twelve issues.[8] We subsequently broke out Recreation Management as a separate, thirteenth issue. We have presented the complete list in narrative form in Chapter I. The narratives also include four issues that the planning team recognized as important, but outside the scope of this plan.

PHASE IV: FOCUS GROUP MEETINGS

We wanted more public input to help us build management alternatives that would meaningfully address the thirteen issues we had identified. We also wanted to check whether our issues were the right ones; that is, had we correctly understood what people were trying to tell us?

We approached this phase of planning by identifying a continuum of positions that our previous scoping led us to believe different people might take on each issue. We grouped the positions in what seemed like logical clusters; each cluster representing a different philosophy toward managing state forest lands. This proved to be a difficult exercise and we made a number of different attempts before arriving at position statements with which the planning team felt comfortable.[9]

We invited members of the public to participate in one of five focus group meetings. Each participant was asked to identify whichever position most closely reflected his or her concept of how state forest lands should be managed.[10] The position statements were intentionally written to reflect distinctly different, and often contrasting, approaches to forest land management. We wanted to create small groups of people who held similar beliefs about how we should manage our

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6 The planning team worked from a 35 page list of 520 separate comments that was also mailed to each respondent and is on file on page S-273 of the Project Record.

7 This approach is described in detail at page 296 of the Project Record.

8 The list of twelve issues is filed on page 296-a5 of the Project Record.

9 Our approach to this clustering problem is documented on page 312 of the Project Record.

10 A copy of the letter explaining the focus group process to potential participants is on file on page S-303 of the Project Record.

lands, and we wanted enough differences between groups to represent the full range of positions that the public as a whole might be expected to take.

Between May 19, 1992 and June 4, 1992, we held public focus group meetings in Missoula, Dillon, Bozeman, Kalispell, and Billings. Our objectives were: (1) to check the accuracy with which we had interpreted earlier public comments; and (2) to generate a range of new ideas that would help us develop alternatives for managing state forest lands.

We tried to focus the idea-generating process by asking these three questions:

1) Which resource uses or management programs should DSL emphasize?

2) What specific activities or methods should DSL use to implement your preferred uses and programs?

3) How should DSL respond to the issues you and other members of the public have raised?

A total of 120 people attended the meetings and provided nearly 30 small-group responses.[11] We did not get as many new ideas as we had expected, but the group input reflected a good understanding of the unique revenue-generating mission of DSL, and of the range of management problems the plan would have to address. We took the scarcity of new ideas as an indication that our issues and position statements had done an acceptable job of capturing public concerns.

PHASE V: DEVELOPMENT OF CORE CONCEPTS

Next, we used our scoping input to help develop draft alternatives for preliminary review by our own employees and the public. On June 16, 1992, we started this phase by examining each of the thirteen planning issues. Then, we documented the ways we respond to each issue under our current management. Aggregation of these responses to each issue represented the core of a No Action alternative. That is, it represented the way people could expect us to continue responding to the planning issues in the future if we were to select the alternative of maintaining our current management program.

Next, we developed a range of possible responses to each issue that we thought represented the range of positions reflected in our scoping input. This gave us an intimidating array of ten to twenty possible management actions for addressing each of thirteen issues. The challenge was to cluster possible management actions into logical groups that would begin to represent a reasonable range of draft alternatives.

At our July 13-15 meeting, we tried several different approaches to this difficult clustering process before finally settling on one that worked to everyone's satisfaction. We selected four issues that we believed represented fundamental dimensions of any management plan for state forest lands: Wildlife Management, Watershed Management, Timber Management, and Recreation Management. Working from our list of different possible actions for addressing each of the thirteen

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[11] A consolidation of all the focus group responses begins on page S-382 of the Project Record. We mailed a copy of this summary to each person who participated in the focus group process.

issues, we identified from two to five different management actions, each of which seemed to characterize a different approach to one of our four fundamental dimensions.[12]

For example, we identified these four different approaches to managing wildlife:

1) place primary emphasis on aggressive management of big game for the purpose of generating revenue;
2) treat management of wildlife as secondary to generating revenue from a variety of sources and in cases where impacts on wildlife were uncertain, we would err on the side of making money;
3) treat wildlife habitat as a by-product of a healthy ecosystem and emphasize ecosystem management as an alternative to standards and guidelines for individual species; and
4) shift primary emphasis from management of big game to management of threatened, endangered, sensitive, and interior dwelling, old-growth dependent species.

We assigned each of the remaining wildlife management options to one of these four approaches. In a similar fashion, we assigned the remaining timber, watershed, and recreation options to the primary theme categories identified for each of those fundamental issues.

Finally, we expanded these core concepts for managing wildlife, watersheds, timber, and recreation by assigning management actions relating to the remaining nine issues to the core concept with which each action was most compatible. We then transformed our lists of management actions into narrative form.

Before going further, we undertook a rigorous screening process in which we tested the core concepts against the following five criteria:

1) our in-house questions
2) the planning issues
3) the focus group input
4) the original public comments
5) the plan objectives

This screening led to many additions and changes that closed gaps and resolved contradictions and inconsistencies in the core concepts. Writing the core concept narratives and completing the screening process began in mid-July and was finished in early January, 1993.

PHASE VI: DEVELOPMENT AND REVIEW OF ALTERNATIVES

By spring of 1993, we had developed the core concepts into six draft alternatives. We incorporated the drafts, preliminary resource management standards, and other supporting materials into a

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[12] Our complete list of different possible approaches to each of the thirteen issues is filed on pages 342-358 of the Project Record.

"Management Team Draft" which we discussed with our Area Managers on May 10-11, 1993.[13] We made changes in response to input from the management team and presented the resulting "In- House Draft Alternatives" to our field employees. Two-day meetings were held in Kalispell on July 27-28, and in Helena, on August 3-4.[14]

On October 8, 1993, after making further changes in response to the meetings with our own employees, we mailed copies of our proposed alternatives to the roughly 600 people and organizations on our mailing list at that time. We reasoned that if there were major flaws in our work, this additional public review would help reveal them before we invested considerable time in effects assessment of incorrect alternatives.[15]

Less than ten percent of persons who received the proposed alternatives responded. However, the quality of the comments we did receive was exceptionally high. For the most part, the feedback was carefully thought out and well presented. Slightly less than half of the respondents were satisfied with our proposed range of alternatives. Many people identified their preferred alternative among the range presented, while quite a few others wanted to see a blend of what they considered to be the best features of several different alternatives. Support for the alternatives exactly as we proposed them was far from unanimous; yet neither was there any significant evidence that we should substantially change our path.[16] We decided to stay the course by further refining but maintaining the same range of alternatives (see Exhibit B later in this chapter).

PHASE VII: PUBLIC COMMENT ON THE DEIS

On June 19, 1995, we released the State Forest Land Management Plan Draft Environmental Impact Statement (DEIS) to the public for review. The comment period lasted for 45 days and closed on August 4, 1995. In addition, testimony was recorded at public hearings held in Billings, Bozeman, Kalispell and Missoula. One hundred seventy-four comments were received (145 letters, 3 phone calls, testimony from 13 people during public hearings, and an additional 13 comments came from those who both spoke at a public hearing and sent in a letter). Comments came from 98 individuals, 51 organizations, 12 agencies (federal, state, local government), 8 schools, and 3 legislators.

All the comments received were from within the state of Montana, except for one each from Madison, Wisconsin and Seattle, Washington. Responses came from the following counties: Beaverhead (2), Broadwater (1), Cascade (3), Fergus (1), Flathead (69), Gallatin (9), Granite (1), Lake (4), Lewis and Clark (13), Lincoln (5), Madison (2), Missoula (35), Park (2), Ravalli (8), Sanders (4), Silver Bow (3), Teton (1), and Yellowstone (9).

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13 The components of our "Management Team Draft" are filed on pages 761-852 of the Project Record. Summary comments by participants are filed on page 866 and a transcript of the meeting is filed on page 960.

14 Our summary of these two meetings is filed on page 1016 of the Project Record.

15 The package we mailed out for public review is filed on page 1115 of the Project Record.

16 Comments received in response to our October 8th mailing are in a separate field indexed on page 1725 of the Project Record.

Each letter, phone call and individual hearing testimony was assigned a three-digit comment number (see List of Commenters in Appendix RSP), primarily based on their order of receipt, with the hearings transcripts assigned numbers last. The letters, the text of the phone calls and the hearing transcripts were reviewed in two ways: 1) a database was compiled which included the comment author's name, title, affiliation, comment number, alternative preference, and issues of concern; and 2) a written summary was also compiled by resource area and distributed to the planning team, along with copies of individual comments relating specifically to their resource area. Both the database and the summary have been added to the project record.

Substantive comments were received regarding almost every resource area and issue category covered in the DEIS. Of particular concern were the method of our economic analysis, impacts of management activities on threatened and endangered wildlife and fisheries, protection of watersheds (particularly in Northwestern Montana) and riparian areas, road density, recreational access, forest health, old-growth, control of noxious weeds, and the merit of specific Resource Management Standards presented in the DEIS. A summary of the public comments and our responses are in Appendix RSP of this Final Environmental Impact Statement (FEIS).

After careful evaluation of the public comments and staff concerns, an additional alternative, named Omega, was developed for consideration. In an effort to keep the public informed on Plan developments after the formal DEIS comment period, on February 23, 1996, we mailed a Plan update to approximately the 400 people on our mailing list.[17] The update included a summary of the Omega alternative. Recipients were also offered a copy of the complete text of the Omega alternative if they contacted DNRC in Missoula. Over 30 people requested and were sent the expanded text.

This FEIS contains the original content of the DEIS, with modifications based on new information and response to comments. Several issues were identified by the public which precipitated changes, including categorical exclusions, road management and the resource management standards (RMS). We have dropped three categories of categorical exclusions from further consideration in this Plan: timber harvest, timber stand improvement and prescribed fire. The road management standards were amended to clarify policy on road closures under each alternative. Additions and amendments were also made to other resource management standards. For instance, the Fisheries RMS were expanded to include an explanation of Recommendation #17 of the Flathead Basin Forest Practices and Fisheries Cooperative Program for the protection of bull trout and westslope cutthroat trout, as well as the Immediate Actions developed by the Governor's Bull Trout Restoration Team. The Sensitive Species and Threatened and Endangered Species RMS were modified to further clarify our policy in these areas.

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[17] This list included those people who, when queried, asked to remain on the mailing list throughout this project.

EXHIBIT A

STATE FOREST LAND MANAGEMENT PLAN

Would you like to have a voice in the management of State Forest Land?

Timber Supply **Public School Funding** **Environmental Protection**

The Department of State Lands needs YOUR PARTICIPATION

WHAT ARE WE DOING?

The Montana Department of State Lands is developing a plan for the management of forested School Trust Lands. We need to know your concerns about how these lands should be managed, and learn how you would like to be involved in the planning.

PLEASE TAKE A FEW MINUTES TO COMPLETE THE ATTACHED FORM AND RETURN IT TO US.

Your response is important. It will help us decide the best ways to incorporate public input into the planning process. We will provide more opportunities for you to participate as the planning proceeds.

SCOPE OF THE STATE FOREST LAND MANAGEMENT PLAN:

The federal law which created the State of Montana placed certain lands in public trust for the purpose of generating income to help support the State's public schools. The Department of State Lands is legally obligated to manage those lands in ways that generate revenue for the School Trust Fund while also protecting the environment and assuring that long-term productivity of the lands will be maintained.

The Forest Land Management Plan will incorporate your concerns and our legal obligations into a way of making land management decisions. It will include standards and guidelines for management, but it will not make site-specific land use determinations. One of the ways you can help us most is by identifying land uses and management policies that both satisfy your concerns and are within our legal mandate to generate revenue from State lands.

YOUR INVOLVEMENT NOW IS IMPORTANT.

Our planning effort is just beginning. We are inviting public participation at the earliest possible stage to be sure that the plan considers both your concerns and our legal requirements. We believe we will make better decisions if we consider the perspectives of many citizens and groups. How well we satisfy your concerns about managing State Forest Lands will be an important factor in the success of this planning effort.

STATE FOREST LAND PLANNING RESPONSE FORM
(Attach extra page if necessary)

1. What issues relating to management of State-owned Forest Lands are most important to you? ______________________________

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2. How can we involve you in the planning process in ways that will build your confidence in our Forest Land Management decisions? Please check one of the following:

___ Keep me informed through newspaper articles and announcements, but I prefer not to receive future mailings.

___ I would like to receive only major mailings that are sent to everyone on your mailing list.

___ I would like to receive all mailings, including requests to review and comment on draft planning documents.

___ If possible, I would like to be involved in the following additional ways:

3. If you are responding on behalf of a company or organization, please give us the name and phone number of the individual you would like us to contact in the future.

   Name: ____________________________ Phone: ____________________

4. Can you think of any other person or organization that should be added to our mailing list? ______________________________

____

5. Is there anything else you would like to tell us at this time?

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Please fold, staple, and return to Gary G. Brown, State Forester, Department of State Lands, 2705 Spurgin Rd., Missoula, MT 59801.

(BE SURE YOUR RETURN ADDRESS IS CORRECTLY SHOWN.)

Thank you

CWS
12/28/93

EXHIBIT B

LBINFO.I

INFORMATION ITEM
(January Meeting)

Department of State Lands
State Forest Land Management Plan

I. INTRODUCTION

DSL Forestry Division is in the process of preparing a programmatic plan for management of forested State lands. Following are eight major steps in our planning process:

1. Statement of Purpose
2. Initial Scoping
3. Identification of Issues
4. Development of Alternatives
5. Effects Assessment
6. Draft EIS
7. Final EIS
8. Decision

We are now beginning step five. Our target for completing the effects assessment is early spring, with public release of a Draft EIS by late spring, and a Final EIS ready for decision by mid-summer.

We are here today:

1. to explain the role of the programmatic plan in our overall land management program,

2. to share our perspective on several key planning decisions, and

3. to develop a common understanding of our decision making process for the Plan.

II. ROLE OF THE PROGRAMMATIC PLAN

We will discuss this item through reference to the attached Figure 1.

III. KEY PLANNING DECISIONS

A. Do we have the right range of alternatives?

Our six alternatives have been developed through a systematic process of integrating employee and public involvement with our legal framework and management objectives. To date, we have engaged in two rounds of meetings with our own employees, two public comment periods, and a series of public meetings at five locations across the State. Public input helped us identify thirteen driving issues which, in turn, led us to six alternative approaches to managing State forest lands. The six alternatives have been refined through screening against 1) the original public comments, 2) questions raised by our own employees, 3) the thirteen driving issues, 4) input from the public meetings, and 5) our planning objectives.

Our most recent round of 54 letters, for the most part, supports these as a reasonable range of alternatives. A few people or groups argue in favor of additional alternatives that emphasize non-commodity/ amenity values, while a few others argue that some of these alternatives are already so non-commodity oriented as to be unconstitutional.

We have decided to keep this range, but to continue refining the alternatives to remedy inconsistencies and to be sure each alternative precisely reflects the intent of its overriding philosophy.

B. Should we offer different alternatives for different management situations?

We have decided not to do this. Instead, during our implementation training, we will concentrate on helping our people understand how to apply the selected alternative in a variety of different management situations.

Having different alternatives for different management situations would, in a sense, mean having no plan. It either leaves our managers in the position of having to decide which plan applies in which situation, or it requires us to very precisely prescribe which plan applies in which situations. The former choice would require application of some sort of management philosophy which, in effect, would be an implicit "plan". The latter course invites the pitfalls of making site-specific decisions at a programmatic level and it denies our managers the informed flexibility we believe they need to be effective. It also would require us to have extraordinary foresight and information in order to know exactly which plan should apply under what circumstances.

C. Should we develop a super alternative by blending the "best" features of all the others?

The alternatives have been carefully formulated through integration of public input with our own legal obligations. Attempting to blend alternatives creates several problems.

First, it presumes we know which features are the correct ones to blend, yet, if we knew that, much of the planning process would be unnecessary. Different interests have substantially different views as to which blend is the right one. We believe our current approach is best for approaching consensus among a wide range of public interests.

Second, blending to create one or more "super alternatives" would have the effect of devaluing the existing array of alternatives without full consideration. By presuming ahead of time that certain viable options were acceptable while others were not, we would have violated the intent of MEPA.

We are continuing to refine the alternatives to make each one clearly reflect a unique, implementable management philosophy. We feel strongly that any further blending of alternatives should take place during the decision making process and not before each alternative has been subjected to an unbiased assessment of its expected environmental effects.

IV. THE DECISION MAKING PROCESS

Our recommendation is that the selection of an alternative proceed something like this. The Forestry Division will identify its preferred alternative in the Draft EIS. Before public release of the DEIS we will explain our choice to the Commissioner and other members of the Land Board so that they can be prepared to respond to public inquiries.

Based on public response to the DEIS, we will make appropriate modifications and adopt the preferred alternative, choose a different alternative from the existing array , or develop one or more new alternatives. We would hope to draw on Land Board members and staff for consultation regarding our response to public feedback on the DEIS.

Forestry Division will make a final alternative selection and forward that selection to the Commissioner. The Commissioner, in consultation with ~~other~~ Board members will either approve our selection or direct us to make changes.

At this point, it may be appropriate for the Board to do a certain amount of blending; however, there would be associated risks as well as benefits. One benefit is that Land Board members represent a wider viewpoint than a single agency and may be able to use that broader perspective to create a "best" alternative. An associated risk is that, in blending features with the intent of creating an improved hybrid, we may lose other features whose importance had been underestimated and/or we may unwittingly introduce inconsistencies and contradictions.

To comply with MEPA, any new or substantially altered alternatives would have to be subjected to the same level of effects assessment as the original ones.

APPENDIX SCN

PLAUSIBLE OUTPUT SCENARIOS

INTRODUCTION

This appendix contains the output scenarios used as a basis for the environmental effects assessment contained in Chapter IV of the Final Environmental Impact Statement. These scenarios have been developed for the purpose of providing some tangible basis for our resource and economics effects assessments. <u>They are not accomplishment targets</u>. They are simply estimates of probable ranges of activity, given the management philosophy we would adopt under each alternative.

GRAZING SCENARIOS

The following pages present plausible grazing management scenarios under each of the alternatives. This section includes:

1) grazing narratives for each alternative;
2) an Animal Unit Month (AUM) summary for all alternatives; and
3) a table of <u>High</u> and <u>Low</u> AUMs for bracketing each alternative.

ALPHA ALTERNATIVE - GRAZING LEASES/LICENSES

The Department issues leases or licenses for grazing on its forested lands. By statute, these are for either five or ten year periods. Leases are used for classified grazing lands, while licenses are issued on classified forest lands. The terms contained in a lease and license are similar, with one primary difference: season or period of use is dictated on grazing licenses (typically July 1 through October 1), while on grazing leases, the lessee determines when the forage is used.

DNRC field personnel are responsible for setting the carrying capacity on state lands. This is accomplished using the "ecological site method" with guides developed by the Natural Resource Conservation Service (NRCS). This method uses geographical areas, existing plant composition, potential climax communities, range sites (soils), and precipitation to determine available forage in terms of AUMs. An AUM is defined as the amount of forage need by an "animal unit" grazing for one month. An "animal unit" is considered a 1000 pound cow with a calf less than four months old. Typical carrying capacities on forested lands would average from .05 to .1 AUM/Acre (20 to 10 Acres/AUM). On the 661,529 acres of classified forest and forested classified grazing state lands, an estimated 30,837 to 61,675 AUMs could be supported, with a potential income, at the $4.09 minimum lease rate, of approximately $126,133 to $252,250. However, there were only an estimated 26,776 AUMs leased on those forested lands in 1994, resulting in an approximate income of $109,515.

BETA ALTERNATIVE - GRAZING LEASES/LICENSES

On classified forest lands, DNRC would issue grazing licenses for five or ten year periods that specify the number of AUMs, season or period of use, and type of livestock. DNRC field personnel would evaluate each licensed tract every five years to determine streambank disturbance, measure the utilization of riparian vegetation, assess form class of riparian shrubs and ocularly assess the overall condition of each tract. Riparian areas would be used as a primary indicator of range condition. If riparian areas were not meeting prescribed standards because of livestock use, DNRC would require changes to the management of the tract. Those changes might include reduction of AUMs, reduced stocking levels, reduced length of use, or changing the season of use. Fencing or other management techniques might also be required to limit livestock use in riparian areas.

On forested classified grazing lands, DNRC would generally issue grazing leases for ten year periods. The carrying capacity would be determined by field personnel during an evaluation at the time of lease renewal. The "Ecological Site Method" and guides developed by the NRCS would be used. Grazing activities on forested classified grazing lands are not expected to substantially change under the Beta Alternative.

It is anticipated that the total number of AUMs licensed on classified forest lands would be reduced by approximately 35 percent due to the increased emphasis on riparian management. It is estimated that approximately 21,192 AUMs would be leased or licensed on classified forest lands and forested classified grazing lands. The potential income from the grazing program on those lands at the 1994 minimum grazing rate ($4.09) would be approximately $86,675.

GAMMA ALTERNATIVE - GRAZING LEASES/LICENSES

On classified forest lands, DNRC would issue grazing licenses for five or ten year periods that specify the number of AUMs, season or period of use, and type of livestock. DNRC field personnel would evaluate each licensed tract every two years to determine streambank disturbance, measure the utilization of riparian vegetation, assess form class of riparian shrubs, and ocularly assess the overall condition of each tract. Riparian areas would be used as a primary indicator of range condition. If riparian areas were not meeting prescribed standards because of livestock use, DNRC would require changes to the management of the tract. Those changes might include reduction of AUMs, reduced stocking levels, reduced length of use, or changing the season of use. Fencing or other management techniques might also be required to limit livestock use in riparian areas.

On forested classified grazing lands, DNRC would generally issue grazing leases for ten year periods. The carrying capacity would be determined by field personnel during an evaluation at the time of lease renewal. The "Ecological Site Method" and guides developed by the NRCS would be used. Grazing activities on forested classified grazing lands are not expected to substantially change under the Gamma Alternative.

It is anticipated that the total number of AUMs licensed on classified forest lands would be reduced by approximately 50 percent due to the increased emphasis on riparian management. We estimate that approximately 18,799 AUMs would be leased or licensed on classified forest lands and forested classified grazing lands. The potential income from the grazing program on those lands at the 1994 minimum grazing rate ($4.09) would be approximately $76,888.

DELTA ALTERNATIVE - GRAZING LEASES/LICENSES

On classified forest lands, grazing licenses would be issued for five or ten year periods and would specify the number of AUMs and period of use. DNRC field personnel would evaluate each licensed tract at the time of renewal to determine range condition. Riparian areas would be used as a primary indicator of overall range condition. If riparian areas were not meeting prescribed standards because of livestock use, DNRC would require changes to the management of the tract. Those changes might include reduction of AUMs, reduced stocking levels, reduced length of use, or changing the season of use. Fencing or other management techniques might also be required to limit livestock use in riparian areas.

On forested classified grazing lands, DNRC would generally issue grazing leases for ten year periods. The carrying capacity would be determined by DNRC field personnel at the time of renewal by using the "Ecological Site Method" and NRCS guides. Riparian sites would not be the primary indicator of range condition but would be considered equally with other range site conditions.

Leases and licenses would be modified as needed to accommodate other income producing activities, resulting in a decrease in leased AUMs. We anticipate that the total number of AUMs licensed on classified forest lands would be reduced due to the emphasis on riparian management. Additional reductions that might occur on forested classified grazing lands and classified forest lands as a result of conflicts with other uses are somewhat speculative. Grazing use is compatible with a variety of uses but conflicts may occur with commercial uses such as leased camping sites, cabinsites, intensive timber management and some leased recreational activities.

It is anticipated that the number of AUMs licensed on classified forest lands would be reduced by approximately 20 percent due to the increased emphasis on riparian management. Additional reductions of leased and licensed AUMs resulting from other conflicting commercial uses on forested classified grazing and classified forest lands would be approximately 20 percent. The estimated total AUMs leased and licensed on forested classified grazing and classified forest lands is approximately 18,230. The potential income at the 1994 minimum grazing rate would be $74,561.

EPSILON ALTERNATIVE - GRAZING LEASES/LICENSES

On classified forest lands, grazing licenses would be issued for five or ten year periods when grazing activities would not conflict with the timber management program. Licenses would generally be issued on non-commercial forest sites and primarily in the mid to later stages of the rotation of stands managed for timber. Grazing activities on sites that have had recent regeneration harvests might be restricted to protect tree seedlings. Licenses would specify the season or period of use (typically July 1 through October 1) and the type of livestock. Riparian areas would be used as the primary indicator of overall range condition. If riparian areas were not meeting prescribed standards because of livestock use, DNRC would require changes to the management of the tract. Those changes might include reduction of AUMs, reduced stocking levels, reduced length of use, or changing the season of use. Fencing or other management techniques might also be required to limit livestock use in riparian areas.

On forested classified grazing lands, DNRC would generally issue grazing leases for ten year periods. The carrying capacity would be determined by DNRC field personnel at the time of renewal by using the "Ecological Site Method" and NRCS guides. Riparian sites would not be the primary indicator of range condition but considered equally with other range site conditions. Grazing activities on classified grazing lands are not expected to change substantially under the Epsilon alternative.

It is anticipated that the total number of AUMs licensed on classified forest lands would be reduced by approximately 15 percent due to the increased emphasis on riparian management. Additional reductions in grazing licenses could result from conflicts with forest management activities. This is expected to reduce the licensed AUMs by an additional 15 percent. The estimated total AUMs leased and licensed on forested classified grazing and classified lands is approximately 21,990. The potential income at the 1994 minimum grazing rate would be $89,939.

ZETA ALTERNATIVE - GRAZING LEASES/LICENSES

On classified forest lands, grazing licenses would be issued for five or ten year periods when grazing activities would not conflict with wildlife or recreational management activities. Grazing would be restricted on sites that have substantial deer and elk use or that have been leased for conflicting uses such as campgrounds or cabinsites.

The Department's field personnel would be responsible for setting the carrying capacity on state lands. The Ecological Site method and Guides developed by the NRCS would be used; however, riparian areas would be the primary indicator of grazing condition on classified forest lands. If riparian areas were being over-utilized at the prescribed levels of use then the AUMs would be reduced or the lessee would be required to limit livestock use in the riparian areas by fencing or other management techniques.

On classified grazing lands, DNRC field personnel would monitor each tract every ten years, at the time of lease renewal. Riparian management concerns would be addressed on a case-by-case basis. Grazing activities on classified grazing lands would not be expected to substantially change under the Zeta alternative.

We anticipate that the number of AUMs licensed on classified forest lands would be reduced by approximately 20 percent due to the increased emphasis on riparian management. Additional reductions of leased and licensed AUMs resulting from conflicting recreational uses on forested classified grazing and classified forest lands would be approximately 20 percent. The estimated total AUMs leased and licensed on forested classified grazing and classified forest lands is approximately 18,230. The potential income at the 1994 minimum grazing rate would be $74,561.

OMEGA ALTERNATIVE - GRAZING LEASES/LICENSES

On classified forest lands, DNRC would issue grazing licenses for five or ten year periods that specify the number of AUMs, season or period of use, and type of livestock. DNRC field personnel would evaluate each licensed tract every five years to determine streambank disturbance, measure the utilization of riparian vegetation, assess form class of riparian shrubs and ocularly assess the overall condition of each tract. Riparian areas would be used as a primary indicator of range condition along with condition of upland areas. Where grazing leases do not meet grazing standards because of livestock use, DNRC would require changes to the management of the tract. Those changes might include reduction of AUMs, reduced stocking levels, reduced length of use, or changing the season of use. Fencing or other management techniques might also be required to limit livestock use in riparian areas.

On forested classified grazing lands, DNRC would generally issue grazing leases for ten year periods. The carrying capacity would be determined by field personnel during an evaluation at the time of lease renewal. The "Ecological Site Method" and guides developed by the NRCS would served as technical guides. Grazing activities on forested classified grazing lands are not expected to substantially change under the Omega Alternative.

It is anticipated that the total number of AUMs licensed on classified forest lands would be reduced by approximately 35 percent due to the increased emphasis on riparian management. It is estimated that approximately 21,192 AUMs would be leased or licensed on classified forest lands and forested classified grazing lands. The potential income from the grazing program on those lands at the 1994 minimum grazing rate ($4.09) would be approximately $86,675.

GRAZING SCENARIOS

POTENTIAL AUMS

Forested grazing:	162,334 acres ÷ 15 acres/AUM =		10,822 AUMs
Classified forest:	499,195 acres ÷ 15 acres/AUM =		33,280 AUMs
		TOTAL	44,102 AUMs

LEASED/LICENSED AUMS

ALPHA

Forested grazing lands =		10,822 AUMs
Classified forest lands =		15,954 AUMs
	TOTAL	26,776 AUMs

ESTIMATED LEASED/LICENSED AUMs BY ALTERNATIVE

BETA

Forested grazing lands =		10,822 AUMs
Classified forest lands =	15,954 x .65 =	10,370 AUMs
	TOTAL	21,192 AUMs

GAMMA

Forested grazing lands =		10,822 AUMs
Classified forest lands =	15,954 x .50 =	7,977 AUMs
	TOTAL	18,799 AUMs

DELTA

Forested grazing lands =	10,822 x .80 =	8,658 AUMs
Classified forest lands =	15,954 x .60 =	9,572 AUMs
	TOTAL	18,230 AUMs

EPSILON

Forested grazing lands =		10,822 AUMs
Classified forest lands =	15,954 x .70 =	11,168 AUMs
	TOTAL	21,990 AUMs

ZETA

Forested grazing lands =	10,822 x .80 =	8,658 AUMs
Classified forest lands =	15,954 x .60 =	9,572 AUMs
	TOTAL	18,230 AUMs

OMEGA

Forested grazing lands =		10,822 AUMs
Classified forest lands =	15,954 x .65 =	10,370 AUMs
	TOTAL	21,192 AUMs

ESTIMATED GRAZING USE SCHEDULE
(Max. adjustment from 1995 level = 1000 AUM/yr)

SCENARIO		1995	2000	2005	2010	2015	2020
HIGH	ALPHA	26,776	30,765	34,753	34,753	34,753	34,753
	BETA	26,776	26,577	26,377	26,377	26,377	26,377
	GAMMA	26,776	24,782	22,788	22,788	22,788	22,788
	DELTA	26,776	24,896	23,016	23,016	23,016	23,016
	EPSILON	26,776	27,175	27,574	27,574	27,574	27,574
	ZETA	26,776	24,896	23,016	23,016	23,016	23,016
	OMEGA	26,776	26,577	26,377	26,377	26,377	26,377
LOW	ALPHA	26,776	22,788	18,799	18,799	18,799	18,799
	BETA	26,776	21,392	16,007	16,007	16,007	16,007
	GAMMA	26,776	21,776	16,776	14,811	14,811	14,811
	DELTA	26,776	21,776	16,776	13,444	13,444	13,444
	EPSILON	26,776	21,591	16,406	16,406	16,406	16,406
	ZETA	26,776	21,776	16,776	13,444	13,444	13,444
	OMEGA	26,776	21,392	16,007	16,007	16,007	16,007

RECREATION AND NON-RECREATION SPECIAL USES SCENARIOS

The following pages present the basis for our plausible scenarios of recreation use and non-recreation special uses. This section should be looked at in concert with Appendix ECN which details the procedure used to develop estimates of current and future recreation use levels. This section includes:

1) a listing of three recreation use groups, one non-recreation special uses group, and associated activities within each group; and

2) profiles which describe the nature of environmental impacts associated with each group.

Those wishing to see more of the underlying data that support our recreation scenarios and economic analysis are referred to the Project Record, file page 1799, which includes:

1) a table of data on current recreation, and non-recreation special use, leases and licenses ("Jeanne's Table");

2) tables showing estimated current Group II and Group III dispersed recreation use levels;

3) a table showing our assumed growth trend rates for all four groups;

4) a table showing estimated current use levels, projected use, and trend rates, for each group, by Land Office and alternative; and

5) seven tables (one for each alternative) showing our estimated High and Low recreation use levels by Group, by Land Office, for each alternative. These brackets were created by going 50 percent above and 50 percent below the actual projections from the previous table.

RECREATION AND NON-RECREATION SPECIAL USE GROUPS

Recreation Use Groups

GROUP I
VISITING MUSEUMS, HISTORIC SITES, OR INFORMATION CENTERS
CAMPING IN DEVELOPED CAMPGROUNDS
DOWNHILL SKIING
ORGANIZATION CAMPS
HOME SITES AND CABINSITES
COMMERCIAL LODGES

GROUP II
CAMPING IN PRIMITIVE CAMPGROUNDS
BICYCLE RIDING
PICNICKING
COMMUNITY RECREATION SITES
HUNTING
COMMERCIAL OUTFITTER LICENSES
FISHING

GROUP II (continued)
FISHING ACCESS SITES
HORSEBACK RIDING
SHOOTING SPORT SITES
COLLECTING FIREWOOD
VISITING PREHISTORIC SITES
DRIVING VEHICLES OR MOTORCYCLES OFF-ROAD
SNOWMOBILING

GROUP III
WILDLIFE OBSERVATION, PHOTOGRAPHY, AND NATURE STUDY
WALKING, RUNNING
DAY HIKING
BACKPACKING
COLLECTING BERRIES OR MUSHROOMS
CANOEING, KAYAKING, OR RAFTING
CROSS-COUNTRY SKIING AND SNOWSHOEING
DRIVING FOR PLEASURE AND SIGHTSEEING

Non-Recreation Special Uses

GROUP IV
PRIVATE WATER, SEPTIC, AND OTHER UTILITY LEASES
PUBLIC COMMUNICATION SITES AND OTHER UTILITIES
COMMERCIAL RESTAURANTS, PARKING LOTS, AND MISCELLANEOUS

IMPACT PROFILES

The following Impact Profiles represent the environmental impacts of each of the four groups presented above. Our projections of future use, revenues, and environmental consequences are based on each Group as a whole, rather than on separate assessments for each individual activity.

Group I Profile

These activities tend to require well developed sites with permanent structures, and on-site managers during the season of use. They may require more than a half-mile of new road construction and repeated in-season road maintenance. Roads are open all season and are used, not only for site access, but also for additional pleasure driving connected with use of the site.

Use tends to be concentrated within a quarter-mile of the site, which may be the point of origin for a dense network of short trails which receive daily use in season. Sewage and garbage are removed from the site at least once weekly. Sites involving water require use-control and engineered facilities to protect riparian zones. Recovery of the site to near-natural conditions can be expected to take ten years or more from the time use is discontinued.

Group II Profile

Activities in this group tend to be dispersed, usually within one to two miles of distinct entry points. Either the activities themselves, or the facilities or equipment they require tend to have a noticeable impact on the environment. For example, bicycles leave tracks and move relatively fast;

snowmobiles make noise and travel fast; hunting and fishing directly deplete populations; horses leave heavy tracks; firewood cutting removes dead and down material; and off-road vehicle use causes noise, erosion, and human intrusion away from roads.

Recreation use may require up to a half-mile of new road construction and existing roads would be maintained, on average, once every one to two years. Roads might be seasonally closed. They would be used, on average, at least half the days they were open.

New trails would be built, and existing trails maintained, for distances up to three miles, usually as access to popular destinations. Trails would also be used on at least half the days of the normal use season.

Sewage and garbage removal or on-site processing would be done as needed, usually at least several times per season. Riparian damage would tend to be concentrated at entry points, stream crossings, wet places in trails, and small sites popular for waterside use, such as campsites or fishing spots. Adverse environmental effects from these activities could be expected to last from two to seven years after the use was discontinued.

Group III Profile

These uses tend to be more widely dispersed, usually along trail, road, or river corridors of three to ten miles on state ownership and continuing across adjoining non-state lands; and they tend to be quiet and light on the land. In the case of the activity, "Driving for Pleasure, and Sightseeing", the impacts are minimal to the degree that participants stay on established roads and do not get out of their vehicles.

These activities would not normally involve new road construction or additional road maintenance for their support. Roads would generally be closed, or used only to reach the activity entry point, or used for pleasure driving in which the participants did not leave their vehicles.

Existing trails would be maintained and would experience intermittent use spaced by long periods of relative quiet. Human waste and garbage would be user-managed with occasional state cleanup as necessary, perhaps every few years.

Riparian damage would tend to be concentrated at entry points, stream crossings, wet places in trails, and small sites popular for waterside use, such as campsites or fishing spots. Because of more widely dispersed use and a generally lighter impact on the ground of activities in this group, adverse environmental effects could be expected to be mitigated by one to three years of non-use.

Group IV Profile

This Group includes a mixture of public, private, and commercial uses. Public uses include communication sites look outs, county facilities, and landfills. Private uses include domestic sewer and water developments, and outbuilding sites. Commercial uses include restaurants, lumber mills, parking lots, and signs for advertising.

Public and commercial uses tend to require well-developed sites with permanent structures. All categories may require new road construction and repeated in-season and year-round road maintenance. Roads are open all season and are used in connection with use of the site.

Use tends to be concentrated within the perimeter of the actual lease/licensed site. Sewage and garbage are removed from the site at least once weekly. Sites involving water require use-control and engineered facilities to protect riparian zones. Recovery of the site to near natural conditions can be expected to take ten years or more from the time use is discontinued.

TIMBER SCENARIOS

The following section presents plausible timber management scenarios under each of the seven alternatives. Each alternative scenario is described in terms of the following four parameters:

1) timber harvest level;
2) spatial/temporal scheduling factors;
3) silvicultural treatment methods; and
4) level of silvicultural investment.

Our timber sale contract data summary is an important adjunct to these scenarios. It is compiled as a separate document.

TIMBER HARVEST LEVEL

Alpha: By reasoning that our recent past output probably represents a lower limit of probable future harvest levels, and that our recent six-year average probably approaches an upper limit, we assume that harvest levels under Alpha could range between 20 and 40 MMBF per year. These estimates are within a range that includes recent harvest levels and our managers' estimates of feasible harvest levels.

Beta: Under this alternative, we would use intensive management to create diversity of stand structures and patterns. Timber management would be instrumental in achieving this diversity and timber harvest would be an important output. This emphasis, plus a reduced emphasis on protection of big game habitat, would favor increased timber harvest levels.

However, higher levels of protection for old-growth, fisheries, water and riparian zone quality, and wildlife species other than big game, would put downward pressure on harvest levels. For purposes of analysis, we estimate a slight reduction from Alpha harvest levels to a low of 15 MMBF and a high of 35 MMBF.

Gamma: Our output emphasis under Gamma would be a diverse array of small annual yields harvested in ways intended to simulate conditions that would occur as a result of natural processes. We would expect a substantial reduction in old-growth harvest. Our commitments to mitigating adverse cumulative effects, even when the causal actions were taken by other landowners, and to modifying our own activities when they conflicted with uses on adjoining lands, would act to constrain timber harvest levels.

We would support recovery of threatened and endangered species, rather than simply avoid "takings". We would accept a lower level of risk to water quality than under Alpha. Clearcutting would seldom be used and timber salvage would be limited to volume in excess of that needed to simulate natural occurrences of dead and dying material. We would not attempt to maintain a steady annual offering of timber sales.

For purposes of analysis, we estimate that the net effect of these influences would be timber harvests averaging between 5 MMBF and 10 MMBF per year.

Delta: Because Delta would bring us a market-driven strategy, it is possible we would have a wide range of annual timber harvest levels. Our positions on cumulative effects mitigation, threatened and endangered species, other wildlife protection, old-growth protection, watersheds, SMZ protection, and biodiversity, would all favor a higher level of timber harvest than under Alpha.

However, market conditions may favor directing our budgets and staffing toward other activities beside timber management, such as fee hunting, cabinsite leasing, or other fee recreation. Consequently, timber harvest levels could be quite variable. We estimate a low level of 15 MMBF per year and a high level of 45 MMBF.

Epsilon: Under Epsilon, our environmental management policies would exert much of the same positive effect on timber harvest levels as under Delta. However, in this case, timber management would be our primary business, so annual harvests would be more stable and consistently high. We estimate a low average harvest of 35 MMBF, and a high level of 55 MMBF.

Zeta: Under Zeta, our primary focus would be on generating income from management of recreation and wildlife. Consequently, our environmental management policies would favor those resources and tend to constrain timber harvest to lower levels than under Alpha. Because of the substantially reduced role of timber harvest and a higher level of old-growth protection, as well as higher levels of protection for watershed, fisheries, and wildlife, we estimate that average harvests under this alternative will range from a low of 10 MMBF per year to a high of 20 MMBF.

Omega: Under this alternative, we would use intensive management to create or maintain an appropriate diversity of stand structures and patterns. Timber management would be instrumental in achieving this diversity and timber harvest would be an important output. This emphasis, plus a reduced emphasis on protection of single species (except protected Threatened and Endangered Species) would favor increased timber harvest levels. We anticipate that higher levels of protection for old-growth, fisheries, water and riparian zone quality, and wildlife species, may put downward pressure on harvest levels. For purposes of analysis, we estimate a range of sustainable harvest levels from a low of 30 MMBF to a high of 50 MMBF.

Table T-1
RANGE OF TIMBER HARVEST LEVELS FOR EFFECTS ASSESSMENT PURPOSES (MMBF)

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
HIGH	40	35	10	45	55	20	30
LOW	20	15	5	15	35	10	50

SPATIAL/TEMPORAL SCHEDULING FACTORS

Alpha: Selection of timber sale locations for three-year listings is based on a number of factors. Specific application of these factors depends on the judgement of Unit Managers, and varies considerably over time and from Unit to Unit. However, these factors generally include the following:

- The highest priorities for harvest are generally locations with high levels of mortality due to insects, disease, blowdown or other causes. High-risk stands with the highest volume and economic value are most likely to be targeted.

- Stands with slow growth are a high priority for harvest. This includes old stands where regeneration harvests are indicated, and overstocked younger stands which are generally thinned commercially.

- Harvests of the highest-priority stands are often constrained by access limitations. This includes physical inaccessibility, where considerable road construction expense would be necessary to access the stands and parcels; and difficulties obtaining rights-of-way for new or existing roads at reasonable costs.

- Selection of harvest locations is further constrained by resource concerns, including cumulative watershed effects, big-game standards and guidelines, grizzly bear standards, proximity to residential areas, visual considerations, and other local concerns.

- Because of various resource concerns, harvest locations are generally somewhat dispersed within a parcel or drainage, with only a limited acreage or basal area removed per entry.

- We generally harvest less in parcels where surrounding ownerships have been heavily harvested, because of watershed and wildlife habitat impacts.

- Harvest in streamside management zones (SMZs) and wetlands will meet BMPs, and will be more conservative than the maximum level of harvest allowed under the SMZ rules.

Beta: Under this alternative, harvest locations would be chosen primarily for their contribution toward maintaining a balance of structural stages and spatial patterns appropriate for the forest types involved. An appropriate balance of these factors would be determined in part from natural stand dynamics and disturbance regimes, but would also be based on maintenance of a sustainable timber harvest level.

Compared with Alpha, the following would characterize selection of harvest locations under Beta:

- We would retain or restore some proportion of old-growth stands, based on their size, spatial distribution, current or potential old-growth qualities, and the presence of other concerns that tend to preclude harvest.

- In drier forest types, we would place more emphasis on stocking reduction treatments over larger areas. This may include both commercial thinnings and selection harvests.

- Accessibility would continue to influence harvest locations, but priorities for obtaining or developing access may change based on the emphases of this alternative.

- We would place less emphasis on habitat suitability for featured species such as deer and elk.

- We would place less emphasis on dispersal of harvest locations within a parcel or drainage and try to emulate more closely the spatial patterns favored by natural processes. This would generally lead to maintenance of larger patches of relatively mature forest and less abrupt edge.

- We would continue to harvest less in areas where surrounding ownerships have been heavily harvested.

- Harvest in SMZs and wetlands would be more conservative than under Alpha.

Gamma: Under this alternative, harvest locations would be chosen primarily for their contribution to maintaining natural amounts and distribution of stand structures. Harvests would be further limited largely to locations that avoided public concern. Compared with Alpha, the following would characterize harvest locations under Gamma:

- We would tend to avoid harvest of any old-growth stands or likely replacements, unless there was broad public agreement that the existing condition of these stands was "unnatural" and should be modified.

- We would tend to avoid harvest in any area in which adjacent landowners had harvested their lands heavily, except under the circumstances described above for old-growth stands.

- We would place more emphasis on stocking reduction treatments over larger areas. This may include both commercial thinnings and selection harvests.

- Accessibility would continue to influence harvest locations. Areas requiring new road construction for harvest would generally be avoided.

- We would place less emphasis on habitat suitability for featured species such as deer and elk. Threatened, endangered and sensitive species would receive greater emphasis.

- The acreage or intensity of harvest in a particular parcel or drainage per entry would be strongly limited. We would attempt to emulate the spatial patterns favored by natural processes. This would generally lead to maintenance of larger patches of relatively mature forest and less abrupt edge.

- We would further reduce harvests in areas where surrounding ownerships have been heavily harvested.

- Harvest in SMZs and wetlands would be substantially more restrictive than under Alpha.

Delta: Under this alternative, we would tend to place the greatest emphasis on harvesting in areas with the largest existing net values, and where values at risk of imminent loss were greatest. However, we would compare these values against the values of other potential uses and avoid timber sales that would conflict with higher-value uses. The following would characterize selection of harvest locations under Delta:

- We would continue to place the highest priority on harvest in high-value stands with high levels of mortality, if other resources did not have greater trust income potential.
- Harvest and regeneration of slow-growing mature stands would continue to be a priority, but low-volume commercial thinnings would receive less emphasis.
- Accessibility would continue to influence harvest locations, although priorities may shift for access development to areas with high income potential.
- Resource concerns such as wildlife habitat would continue to influence harvest locations but to a lesser degree. We would do less harvesting in areas where other resources provided important sources of trust income, and more harvesting where these resources did not demonstrate major revenue potential.
- We would place less emphasis on dispersal of harvest units throughout a parcel or drainage. Existing values and values at risk in individual stands would have more influence than their spatial distribution in locating harvest units.
- Harvest levels on adjacent ownerships would have slightly less influence on our harvests.
- Harvest in SMZs and wetlands would be less restrictive than under Alpha, but will comply with BMPs and SMZ rules.

Epsilon: Under this alternative, harvests would be located to develop and maintain a regulated age class distribution that optimized sustainable timber production. The goal would be a balance of stand age classes, with stands managed on rotations or cutting cycles that provided a maximum sustained trust income from timber. The following would characterize selection of harvest locations under Epsilon:

- Stands with high rates of mortality would continue to be the highest priority for harvest.
- Mature stands with slow growth rates and younger overstocked stands would continue to be high priority for regeneration harvests and commercial thinnings, respectively.
- Accessibility would continue to constrain harvest locations, but a higher priority might be placed on developing or acquiring access in areas with high timber production potential.
- Resource concerns such as wildlife habitat would continue to influence harvest locations but to a lesser degree.
- We would place less emphasis on dispersal of harvest units throughout a parcel or drainage. The growth and mortality characteristics of individual stands would have more influence than their spatial distribution in locating harvest units.

- Harvest levels on adjacent ownerships would have slightly less influence on our harvests.

- Harvest in SMZs and wetlands would be less restrictive than under Alpha, but will comply with BMPs and SMZ rules.

Zeta: Under this alternative, timber harvests would be largely incidental to recreational uses. Because Zeta places a strong emphasis on wildlife-related recreational income, maintaining wildlife habitat for its trust income potential would be a major consideration when harvests are planned. The following would characterize selection of harvest locations under Zeta:

- We would retain or restore some proportion of old-growth stands, based on their size, spatial distribution, current or potential old-growth qualities, and the presence of other concerns that tend to preclude harvest.

- Harvests would generally be planned where they would improve wildlife habitat or recreational values. We may also plan timber harvests where there were substantial timber values at risk, such as stands with high levels of mortality, provided this did not adversely impact wildlife habitat values.

- Accessibility would continue to constrain harvest locations. We would seldom acquire or develop access specifically to provide for timber harvest.

- Specific resource concerns related to wildlife habitat and recreation would become the major consideration in determining harvest locations.

- We would continue to limit the acreage or intensity of harvest in a particular parcel or drainage per entry. We would generally avoid large openings, but would locate subsequent entries to maintain larger patches of relatively mature forest and reduce the amount of abrupt edge.

- We would further reduce harvests in areas where surrounding ownerships have been heavily harvested.

- Harvest in SMZs and wetlands would be more conservative than under Alpha.

Omega: Under this alternative, harvest locations would be chosen primarily for their contribution toward maintaining a balance of structural stages and spatial patterns appropriate for the forest and land types involved. An appropriate balance of these factors would be determined in part from natural stand dynamics and disturbance regimes, but would also be based on maintenance of a sustainable timber harvest level. Some other considerations that would characterize selection of harvest locations under Omega are:

- Where consistent with biodiversity goals, we will prioritize stands with high levels of mortality due to insects, disease, blowdown, or other causes. High-risk stands with the highest volume and economic value are most likely to be targeted.

- Where consistent with biodiversity goals, we will prioritize stands with slower growth rates.

- In drier forest types, we would place more emphasis on stocking reduction treatments over larger areas. This may include both commercial thinnings and selection harvests.

- Accessibility would continue to influence harvest locations, but priorities for obtaining or developing access may change based on the emphases of this alternative.
- We would rely on our biodiversity strategy to provide good habitat for native wildlife populations.
- Selection of harvest locations would be guided by biodiversity principles and resource concerns, including cumulative watershed effects, threatened and endangered species, sensitive species, visual considerations, and other local concerns.
- We would place less emphasis on dispersal of harvest locations within a parcel or drainage and try to emulate more closely the spatial patterns favored by natural processes. This would generally lead to maintenance of larger patch sizes of various stand size classes and less abrupt edge.
- Harvest in SMZs and wetlands would be more conservative than under Alpha.
- Within an appropriate landscape analysis area, we would retain or restore old-growth stands to roughly 50% of the historical proportion that would be expected to occur with natural processes on similar sites. Maintenance of specific old-growth stands would be based on their size, location, forest and land type, spatial distribution, current or potential old-growth qualities, and the presence of other concerns that tend to preclude harvest.
- Landscape level analysis would be conducted on blocked and scattered ownership as described in the Biodiversity RMS #3 and #4 for Omega.

SILVICULTURAL TREATMENT METHODS

The silvicultural treatment methods are separated into the following categories, based on the silvicultural objectives they are designed to achieve, the intensity of harvest, and visual objectives.

Treatment Methods

Clearcut: The entire stand is harvested in order to regenerate and grow a new stand. Some snags and reserve trees may be left to provide wildlife habitat, structural diversity or visual mitigation, but are not intended as a seed source and do not provide appreciable shelter. Regeneration may be established after harvest or may consist in part of advance regeneration.

Seed tree: A stand is harvested in order to regenerate and grow a new stand. Some live trees are left to provide a seed source but do not provide appreciable shelter. These trees may be removed when the new stand is established, or may be left as reserve trees to provide wildlife habitat, structural diversity or visual mitigation. If seed trees are subsequently removed, removal cuttings are included in this category.

Shelterwood: A stand is harvested in stages, in order to regenerate and grow a new stand. A substantial portion of the existing stand (overwood) is left to provide shelter for the regenerating stand as well as seed. The overwood may be removed when the new stand is established, or some of it may be left as reserve trees to provide wildlife habitat, structural diversity or visual mitigation. If overwood is subsequently removed, removal cuttings are included in this category.

Selection: A stand is partially cut in order to regenerate and grow new trees as well as manage the remaining stand. Harvests in the stand are generally made at regular intervals, and result in a stand with a number of age classes.

Intermediate cutting: A stand is partially cut to enhance the growth, quality, vigor or composition of the remaining stand. Regenerating new trees is not an objective. This category includes thinning, improvement cutting, sanitation and salvage.

Alternatives

Alpha: The choice of silvicultural treatments is a site-specific decision based on site attributes, stand conditions, and on treatment objectives. Depending on project issues and the nature of sites and stands chosen for harvest, the proportion of different methods used may vary considerably over time.

Data from DNRC (formerly DSL) timber sales from FY90 through FY94 were used to estimate the proportion of acres harvested by silvicultural treatment method. Estimates for Alpha were based on these proportions, rounded to the nearest five percent, shown in the table below.

	Actual FY 90-94	Alpha Estimates
Clearcut	9%	10%
Seed tree	30%	30%
Shelterwood	6%	5%
Selection	33%	35%
Immediate	22%	20%

Beta: The choice of silvicultural treatments would continue to be a site-specific decision based on site attributes, stand conditions, and treatment objectives. Changes from Alpha would probably be related primarily to changes in harvest locations rather than treatment philosophies. However, there would probably be less removal of overwood from seed tree and shelterwood cuts, and more tendency to leave some reserve trees in clearcuts.

Old-growth management would probably reduce slightly the proportion of regeneration cutting and salvage in mature stands. A proportionate increase would probably occur in thinning and selection harvests on drier sites. This would probably cause little net change in intermediate cutting, a slight increase in selection cutting, and a slight reduction in other regeneration harvests.

Gamma: While the choice of silvicultural treatments would continue to be a site-specific decision, visual appearance and public perceptions about harvest methods would have considerably more effect on the choice of treatments. Consequently, clearcutting would be avoided almost entirely, and seed tree cuts reduced in extent. Selection systems, and to a lesser extent shelterwood cuts with reserve trees, would increase proportionately. Thinning would increase proportionately as long-rotation management is favored, but this would be partially offset by a reduction in salvage cutting.

Delta: The choice of silvicultural treatments would continue to be a site specific decision. The strongly market-driven approach to management would probably result in some change in treatment methods. This would be related primarily to changes in how harvest locations are chosen.

A greater overall emphasis on recovering values at risk in high-volume, high-mortality stands would increase the amount of salvage and sanitation harvest. Commercial thinning in immature stands would be emphasized in order to generate current income and improve volume growth, in areas where timber management is the highest-value use.

Epsilon: The choice of silvicultural treatments would continue to be a site-specific decision. Efficiency in timber production would be the primary criterion in selection of treatments, and would be less influenced by non-timber objectives.

Harvesting would be concentrated where the greatest potential exists to improve growth, and in stands with the greatest mortality. Compared with Delta, there would be more emphasis on regenerating rather than salvaging older stands. Commercial thinning of immature stands would be emphasized in order to improve volume growth. There would be greater use of seed tree and shelterwood rather than selection methods in winter range areas, as timber production rather than big game habitat would be the primary consideration.

Zeta: As with the other alternatives, the choice of silvicultural treatments would be a site-specific decision. Aesthetics and wildlife habitat would be the primary objectives, rather than timber production. Consequently, a reduction in clearcut and seed tree harvests would be expected. The major harvest types would probably be intermediate treatments and some selection cutting in areas with high recreation value, and extensive group selection in big game winter ranges.

Omega: The choice of silvicultural treatments would be based on the landscape level conditions defined in the Biodiversity RMS, as well as site-specific decisions based on site attributes, stand conditions, and treatment objectives. Changes from there would probably be less removal of overwood from seed tree and shelterwood cuts, and more tendency to leave some reserve trees in clearcuts.

Old-growth management would probably slightly reduce the proportion of regeneration cutting and salvage in mature stands. A proportionate increase would probably occur in thinning and selection harvests on drier sites. This would probably cause little net change in intermediate cutting, a slight increase in selection cutting, and a slight reduction in other regeneration harvests.

The estimated percentages of acres harvested, by method and alternative, are as follows:

Table T-2
SILVICULTURAL TREATMENT METHODS

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Clearcut	10%	10%	0%	10%	10%	5%	10%
Seed tree	30%	25%	5%	25%	30%	15%	25%
Shelterwood	5%	5%	10%	5%	10%	5%	5%
Selection	35%	40%	55%	35%	30%	50%	40%
Intermediate	20%	20%	30%	25%	20%	25%	20%

LEVEL OF SILVICULTURAL INVESTMENT

Silvicultural investments are expenditures designed to enhance long-term trust income potential of forested state lands. These include, but are not necessarily limited to: site preparation by prescribed fire, mechanical or chemical means; planting; direct seeding; genetic tree improvement; and precommercial thinning. These investments are generally designed to increase the present value of stands for timber production, but other future income sources related to stand conditions could also be considerations.

Actual levels of investment are difficult to characterize because funding and/or spending authorization have been severely limiting in most recent years. Current procedures are designed to eliminate or at least reduce the extent of this problem. The following characterization is based on the assumption that funding will be adequate in the future to achieve our current objectives.

Alpha: Current objectives are to invest in treatments expected to produce a positive net present value by enhancing future timber yields and value. Future benefits may be achieved through greater merchantable timber volumes, shorter rotations, reduced risk of loss to insects, disease, wildfire or other disturbances, or reduced constraints on timber harvest from other resource concerns.

The currently-projected level of silvicultural investments can be characterized as follows:

Site preparation: Treat all regeneration harvests as needed to prepare site for reforestation, as soon as feasible after harvest. Methods are mechanical (90 percent of harvested acres) and prescribed fire (ten percent). In addition, treat all acres as needed prior to follow-up reforestation efforts, where initial reforestation attempts fail. This includes primarily mechanical, hand scalping or chemical methods.

Planting: Plant or interplant approximately 33 percent of regeneration harvest acres, the first spring or fall following site preparation. In addition, plant as soon as feasible all areas in which initial reforestation attempts (natural or planting) fail, unless it is determined not to be cost-effective and MEPA commitments would not be violated. Protect planted seedlings from animal browsing, as necessary to maintain survival and vigorous growth.

Genetic tree improvement: Participate in Inland Empire Tree Improvement Cooperative, including ponderosa pine, western larch, Douglas-fir and white pine species groups. Establish and manage seed orchards for western larch, ponderosa pine and Douglas-fir. Use surplus seed to trade for seed of other species as needed. Obtain adequate rust-resistant white pine seed to meet all prescribed objectives for white pine planting. Ultimately, most planting would be with genetically-improved stock.

Precommercial thinning: Thin all overstocked stands where predicted to be cost-effective, prior to reductions in diameter growth and vigor. In the near future, 2400 acres per year will need thinning.

Beta: There would be no essential change in the silvicultural investment philosophy from Alpha. Some aspects of the alternative, however, may affect future returns from investment and thereby affect investment decisions. Managing some stands for longer rotations or for structural diversity will reduce present values of stands, and thereby reduce the level of investment that would be cost-effective in these stands.

This would be offset in cases where increased non-timber values could be identified. Also, we may be more likely to accept a lower rate of investment return under this alternative. There is less risk that future changes in management regimes would lead to reductions from predicted timber output, because substantial non-timber values would already be incorporated.

Gamma: The sharp reduction in planned timber harvest would substantially reduce the range of cost-effective investments. Exceptions would occur primarily where sufficient non-timber financial values could be identified to justify investment. However, we may be more likely to accept a substantially lower rate of investment return under this alternative, as any future changes in management regimes would likely lead to higher-than-predicted timber output.

Delta: Prior to making silvicultural investments, market analyses would be done to determine whether timber or other uses are to be favored. Silvicultural investments would be limited primarily to sites where timber production was expected to be the primary long-term use. However, investments may also be used to enhance identified non-timber values such as recreation potential.

Epsilon: The overall investment philosophy would not change essentially from Alpha. The more straightforward timber-management objective would be expected to lead to a higher level of investment in treatments perceived as cost-effective.

We may need to require a higher rate of return on silvicultural investments under this alternative. Any future changes in management regimes would be likely to lead to reductions from predicted timber output, which increases the investment risk.

Zeta: The level of silvicultural investment would substantially decrease, as management of trust lands would be primarily for values not associated with timber. However, silvicultural investments may be used to enhance identified non-timber values associated with recreational opportunities. We may be more likely to accept a substantially lower rate of investment return under this alternative, as any future changes in management regimes would likely lead to higher-than-predicted timber output.

Omega: There would be no essential change in the silvicultural investment philosophy from Alpha. Some aspects of the alternative, however, may affect future returns from investment and thereby affect investment decisions. For example, managing some stands for longer rotations or for structural diversity will reduce present values of stands, and thereby reduce the level of investment that would be cost-effective in these stands.

This would be offset in cases where increased non-timber values could be identified. Also, we may be more likely to accept a lower rate of investment return under this alternative. There is less risk that future changes in management regimes would lead to reductions from predicted timber output, because substantial non-timber values would already be incorporated.

ROAD DENSITY SCENARIOS

The estimates of the probable ranges of road densities were developed in the following manner:

Information on the existing total and open road densities was derived from DNRC's inventory database and a sample of typical state-owned forested tracts. The estimated road densities in Table RD-1 all include existing road densities (miles/sq. mile): NWLO-2.7; SWLO-2.4; CLO-1.1; NELO, SLO and ELO-0.4; Total-2.0.

In order to predict the amount of road construction associated with timber harvest, we looked at the last 5 years of timber sales on state land. The amount of road built was averaged over the volume harvested. Based on this analysis, we assumed that timber harvest affects road construction at the following rates (miles/MMBF): NWLO-1; SWLO-1; CLO-2; NELO, SLO, ELO-3; Total-1. The "high" and "low" road density estimates are a function of the "high" and "low" timber harvest estimates for each alternative. The following factors were applied to the timber harvest-induced roads to account for the "roading philosophy" of each alternative: Alpha-1.0; Beta-0.75; Gamma-0.6; Delta-1.0; Epsilon-1.0; Zeta-0.75; Omega-0.75.

To determine the amount of road construction associated with recreation, we sampled typical cabinsites and other related developments on state land. Based on this analysis, we assumed that recreation affects road construction at the following rates (miles/site): Group I-0.0725; Group IV-0.0956.

Road density in the CLO and eastern land offices is based on all roads, including roads on the forested and non-forested portions of the tracts.

Table RD-1
ESTIMATED ROAD DENSITIES FOR ASSESSMENT PURPOSES
YEAR 2020

	NWLO		SWLO		CLO		SLO, ELO, NELO		TOTAL	
	TOTAL	OPEN	TOTAL	OPEN	TOTAL	OPEN	TOTAL	OPEN	TOTAL	OPEN
EXISTING	2.7	1.4	2.4	0.6	1.1	0.2	1.1	0.2	2.0	0.8
ALPHA										
High	4.1	2.1	3.6	0.9	1.5	0.2	1.8	0.4	3.0	1.2
Low	3.4	1.7	3.0	0.8	1.3	0.2	1.4	0.3	2.5	1.0
BETA										
High	3.7	1.4	3.3	0.6	1.3	0.1	1.6	0.2	2.8	0.8
Low	3.1	1.2	2.7	0.5	1.2	0.1	1.3	0.2	2.3	0.7
GAMMA										
High	2.9	0.9	2.6	0.4	1.2	0.1	1.2	0.1	2.1	0.5
Low	2.8	0.8	2.4	0.4	1.1	0.1	1.2	0.1	2.0	0.5
DELTA										
High	4.4	2.2	3.8	1.0	1.5	0.2	1.8	0.4	3.2	1.3
Low	3.2	1.6	2.8	0.7	1.2	0.2	1.4	0.3	2.4	1.0
EPSILON										
High	4.6	2.3	4.0	1.0	1.6	0.2	2.0	0.4	3.3	1.3
Low	3.9	2.0	3.4	0.9	1.4	0.2	1.7	0.3	2.9	1.1
ZETA										
High	3.3	1.2	3.1	0.6	1.3	0.1	1.3	0.2	2.5	0.7
Low	3.0	1.1	2.6	0.5	1.2	0.1	1.3	0.2	2.2	0.7
OMEGA										
High	4.0	1.6	3.6	0.7	1.5	0.2	1.7	0.3	2.9	0.9
Low	3.5	1.4	3.0	0.6	1.3	0.2	1.5	0.2	2.6	0.8

APPENDIX RMS

RESOURCE MANAGEMENT STANDARDS
(Organized by Resource)

CONTENTS

BIODIVERSITY

WE ADOPT THE FOLLOWING DEFINITION OF BIODIVERSITY (BIOLOGICAL DIVERSITY):

> In the simplest of terms, biological diversity is the variety of life, and its processes. It includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.[1]

ALPHA ALTERNATIVE

Standards

1) DNRC would normally use management practices that sustain site productivity and reduce the risk of losses to damaging agents. Some of these practices might help promote certain elements of biodiversity, but promoting biodiversity in itself would not be a primary goal.

2) On projects where elements of biodiversity were identified as issues, DNRC would evaluate these elements at a landscape level, such as a third-order drainage or other appropriate area. These evaluations would have to consider all ownerships and identify opportunities to mitigate impacts while meeting project objectives. Procedures such as those described in the Landscape Planning section of "Biological Diversity Strategies for Forest Type Groups" or other technical references would be used for these evaluations.

3) Where landscape evaluations identified opportunities to mitigate biodiversity impacts, DNRC might incorporate such measures into management activities if there were a known connection to long-term timber productivity, or if it would prevent significant environmental impacts.

4) DNRC would not initiate cooperative ecosystem management planning with adjoining landowners, but could participate in such planning when initiated by others where it promoted long-term trust revenue opportunities.

5) Interim old-growth standards for the Stillwater, Coal Creek, and Swan River State Forests would no longer be in force upon Plan adoption. In locations where old-growth is an environmental issue, retention of old-growth would be addressed on a case-by-case basis.

6) "Biological Diversity Strategies for Forest Type Groups" or other current references would be used for guidance to resolve biodiversity-related issues on a project-specific basis.

Monitoring

7,8,9) There would be no regular monitoring of timber sale areas after sale completion for effects on biological diversity.

10) Prospective old-growth stands identified using Stand-level Inventory criteria or other data would be field checked as needed to ensure accuracy.

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1 Biological Diversity on Federal Lands: Report of a Keystone Policy Dialogue. 1991. The Keystone Center, P.O. Box 606, Keystone, CO 80435.

References

Department of State Lands.[2] 1991. Interim old-growth standards for state lands.

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands, unpublished paper. (The text of this paper follows the Biodiversity RMS in this section).

[2] Please note that recently the State Legislature instituted a reorganization of several state departments. As of July 1, 1995, the Department of State Lands was merged with the Department of Natural Resources and Conservation. In this section, we have retained the use of the name Department of State Lands for publications and documents with dates prior to July 1, 1995.

BETA ALTERNATIVE

Standards

1) DNRC would promote biodiversity by favoring a variety of stand structures and patterns on state lands, thus maintaining representation of habitats for native plant and animal species. Appropriate stand structures and spatial arrangement would be based on the ecological characteristics of the forest types that are represented. This would be done with a goal of providing opportunities for a broad range of current and prospective trust revenue opportunities, and promoting long-term health and productivity of state forests.

2) When considering land management activities, DNRC would evaluate the distribution and arrangement of stand structures at a landscape level, such as a third-order drainage or other appropriate area. These evaluations would have to consider all ownerships and identify opportunities to promote a desirable distribution of stand structures and patterns. Procedures such as those described in the Landscape Planning section of "Biological Diversity Strategies for Forest Type Groups" or other technical references would be used for these evaluations.

3) DNRC would use information from landscape evaluations to design management activities so that they would maintain or promote a favorable distribution of stand conditions. Timber harvests would be designed to promote the long-term diversity and balanced representation of forest conditions across the landscape.

4) DNRC would make reasonable attempts to develop cooperative ecosystem management planning with major adjoining landowners. The objectives of cooperative planning would be to: (a) maintain appropriate amounts and distribution of stand structures and species mixtures to promote biodiversity at a landscape level; and (b) equitably maintain or promote trust revenue opportunities over the long term.

5) Within an appropriate ecosystem analysis area, DNRC would seek to maintain or restore old-growth forest in amounts of at least half the average proportion that would be expected to occur with natural processes in similar forest types. Old-growth conditions would be developed or maintained on enough additional acres to provide for replacement of existing old-growth over time. However, DNRC would not maintain additional old-growth to compensate for loss of old-growth on adjoining ownerships, unless this is agreed upon as part of a cooperative ecosystem management plan. Procedures such as those described in "Biological Diversity Strategies for Forest Type Groups" or other technical references would be used for designating and managing old-growth blocks and replacement areas.

6) "Biological Diversity Strategies for Forest Type Groups" or other current references would be used as guidance for landscape-level biodiversity evaluations, old-growth protection, and design of timber harvests to promote biodiversity. The Biological Diversity Strategies would be updated periodically, with professional review, as new information and concepts are developed.

6a) Additional guidance would be developed as needed for maintaining biodiversity in conjunction with major activities other than timber harvest, such as recreational development.

Monitoring

7) A subset of revenue-generating activities would be field reviewed by specialists after project completion, or every five years for ongoing projects, to evaluate the application and effectiveness of biological diversity measures at a stand and landscape level. This review would include all management activities done to maintain or develop old-growth values in old-growth retention and replacement blocks.

8) Landscape evaluations would be checked as needed, to compare actual effects of management activities and natural processes against desired or predicted effects. Trends in forest cover characteristics, habitat values, insect and disease activity, and other natural disturbances would be evaluated.

9) Cooperative ecosystem management plans would also be evaluated as needed, to monitor how successfully they are being implemented, and how effective they are at maintaining desired ecosystem features.

10) Prospective old-growth stands identified using Stand-level Inventory criteria or other data would be field checked as needed to ensure accuracy.

11) Results of monitoring would be used to help plan follow-up and future activities in the evaluation area, and to improve our ability to predict the effects of activities in similar situations elsewhere. Monitoring should be frequent enough to accomplish these purposes effectively.

12) Monitoring results would also be used to identify potential improvements in biological diversity strategies and cooperative ecosystem management plans.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands, unpublished paper. (The text of this paper follows the Biodiversity RMS in this section).

GAMMA ALTERNATIVE

Standards

1) DNRC would promote biodiversity by carrying out management activities that maintain and restore natural ecological characteristics.

2) When considering land management activities, DNRC would prepare biodiversity plans at a landscape level, such as a third-order drainage or other appropriate area. These plans would have to evaluate the distribution and arrangement of stand structures on all ownerships. Procedures such as those described in the Landscape Planning section of "Biological Diversity Strategies for Forest Type Groups" or other technical references should be used to develop these plans. The biodiversity plans would describe specific actions on state lands that would promote natural ecological characteristics that provide for biodiversity.

3) All management activities must be consistent with actions identified in the landscape-level biodiversity plans.

4) DNRC would attempt to develop cooperative ecosystem management planning with adjoining landowners. The objectives of cooperative planning would be to maintain appropriate amounts and distribution of stand structures and species mixtures to promote biodiversity at a landscape level.

5) DNRC would seek to maintain old-growth in the landscape in amounts consistent with natural processes in similar forest types. Old-growth conditions would be developed or maintained on enough additional acres to provide for replacement of existing old-growth over time. Procedures such as those described in "Biological Diversity Strategies for Forest Type Groups" or other technical references should be used for designating and managing old-growth blocks and replacement areas.

6) "Biological Diversity Strategies for Forest Type Groups" or other current references should be used as guidance for development of landscape-level biodiversity plans, old-growth protection, and design of timber harvests to promote biodiversity. The Biological Diversity Strategies would be updated periodically, with professional review, as new information and concepts are developed.

6a) Additional guidance would be developed as needed for maintaining biodiversity in conjunction with major activities other than timber harvest, such as recreational development.

Monitoring

7) A subset of revenue-generating activities would be field reviewed by specialists after project completion, or every five years for ongoing projects, to evaluate the application and effectiveness of biological diversity measures at a stand and landscape level. This review would include all management activities done to maintain or develop old-growth values in old-growth retention and replacement blocks.

8) Landscape-level biodiversity plans would be reviewed as needed, to evaluate the effectiveness of prescribed management activities at promoting natural ecological characteristics, as addressed in the biodiversity plan. Trends in forest cover characteristics, habitat values, insect and disease activity, and other natural disturbances would be evaluated.

9) Cooperative ecosystem management plans would also be evaluated as needed, to monitor how successfully they are being implemented, and how effective they are at maintaining desired ecosystem features.

10) Prospective old-growth stands identified using Stand-level Inventory criteria or other data would be field checked as needed to ensure accuracy.

11) Results of monitoring would be used to help plan follow-up and future activities in the evaluation area, and to improve our ability to predict the effects of comparable activities elsewhere. Monitoring should be frequent enough to accomplish these purposes effectively.

12) Monitoring results would also be used to identify potential improvements in biological diversity strategies, landscape-level biodiversity plans and cooperative ecosystem management plans.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands, unpublished paper. (The text of this paper follows the Biodiversity RMS in this section).

DELTA ALTERNATIVE

Standards

1) DNRC would normally use management practices that sustain site productivity and reduce the risk of losses to damaging agents. Some of these practices might help promote certain elements of biodiversity. However, promoting biodiversity in itself would not be a primary goal except where it provided direct trust income by means such as conservation easements or leases, wildlife viewing areas, or nature trail development.

2) On projects where elements of biodiversity are identified as issues, DNRC would evaluate these elements at a landscape level, such as a third-order drainage or other appropriate area. These evaluations would have to consider all ownerships and identify opportunities to mitigate impacts while meeting project objectives. Procedures such as those described in the Landscape Planning section of "Biological Diversity Strategies for Forest Type Groups" or other technical references should be used for these evaluations.

3) Where landscape evaluations identify opportunities to mitigate biodiversity impacts, DNRC may incorporate such measures into management activities if there were a known connection to trust revenue opportunities, or if trust revenue would not be diminished.

4) In situations where cumulative impacts to biodiversity limit DNRC's income-producing capability, DNRC would make reasonable attempts to develop cooperative ecosystem management planning with major adjoining landowners. The objectives of cooperative planning would be to: (a) maintain appropriate amounts and distribution of stand structures and species mixtures to promote biodiversity at a landscape level; and (b) equitably maintain or promote trust revenue opportunities over the long term.

5) Old-growth would not be specifically protected from harvest, unless the trust were compensated or protection were agreed upon as part of a cooperative ecosystem management plan. However, if trust revenue would not be reduced, DNRC would attempt to locate and design harvests or other activities to minimize impacts on old-growth.

6) "Biological Diversity Strategies for Forest Type Groups" or other current references should be used as guidance to resolve biodiversity-related issues on a project-specific basis, and to promote biodiversity where it would provide direct trust income. The Biological Diversity Strategies would be updated periodically, with professional review, as new information and concepts are developed.

6a) Additional guidance would be developed as needed for maintaining biodiversity in conjunction with major activities other than timber harvest. Such activities may include recreational development and hunting leases.

Monitoring

7) A subset of revenue-generating activities would be field reviewed by specialists after project completion, or every five years for ongoing projects, to evaluate the application and effectiveness of biological diversity measures applied to provide trust revenue or mitigate environmental impacts.

8) Landscape evaluations would be checked as needed, to compare actual effects of management activities and natural processes against desired or predicted effects. Trends in forest cover characteristics, habitat values, insect and disease activity, and other natural disturbances would be evaluated.

9) Cooperative ecosystem management plans would also be evaluated as needed, to monitor how successfully they are being implemented, and how effective they are at maintaining desired ecosystem features.

10) Prospective old-growth stands identified using Stand-level Inventory criteria or other data would be field checked as needed to ensure accuracy.

11) Results of monitoring would be used to help plan follow-up and future activities in the evaluation area, and to improve our ability to predict the effects of comparable activities elsewhere. Monitoring should be frequent enough to accomplish these purposes effectively.

12) Monitoring results would also be used to identify potential improvements in biological diversity strategies and cooperative ecosystem management plans.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands, unpublished paper. (The text of this paper follows the Biodiversity RMS in this section).

EPSILON ALTERNATIVE

Standards

1) DNRC would normally use management practices that sustain site productivity and reduce the risk of losses to damaging agents. Some of these practices might help promote certain elements of biodiversity. However, promoting biodiversity in itself would not be a primary goal except where it provided direct trust income by means such as conservation easements or leases.

2) On projects where elements of biodiversity were identified as issues, DNRC would evaluate these elements at a landscape level, such as a third-order drainage or other appropriate area. These evaluations would have to consider all ownerships and identify opportunities to mitigate impacts while meeting project objectives. Procedures such as those described in the Landscape Planning section of "Biological Diversity Strategies for Forest Type Groups" or other technical references should be used for these evaluations.

3) Where landscape evaluations identify opportunities to mitigate biodiversity impacts, DNRC may incorporate such measures into management activities if there were a known connection to trust revenue opportunities, or if trust revenue would not be diminished.

4) In situations where cumulative impacts to biodiversity limit DNRC's potential timber harvests, DNRC would make reasonable attempts to develop cooperative ecosystem management planning with major adjoining landowners. The objectives of cooperative planning would be to: (a) maintain appropriate amounts and distribution of stand structures and species mixtures to promote biodiversity at a landscape level; and (b) equitably maintain or promote trust revenue opportunities over the long term.

5) Old-growth would not be specifically protected from harvest, unless the trust is compensated or protection is agreed upon as part of a cooperative ecosystem management plan. However, if trust revenue would not be reduced, DNRC would attempt to locate and design harvests or other activities to minimize impacts on old-growth.

6) "Biological Diversity Strategies for Forest Type Groups" or other current references should be used as guidance to resolve biodiversity-related issues on a project-specific basis, and to promote biodiversity where it would provide direct trust income. The Biological Diversity Strategies would be updated periodically, with professional review, as new information and concepts are developed.

Monitoring

7) A subset of timber sale units would be field reviewed by specialists after sale completion, to evaluate the application and effectiveness of biological diversity measures applied to provide trust revenue or mitigate environmental impacts.

8) Landscape evaluations would be checked as needed, to compare actual effects of management activities and natural processes against desired or predicted effects. Trends in forest cover characteristics, habitat values, insect and disease activity, and other natural disturbances would be evaluated.

9) Cooperative ecosystem management plans would also be evaluated as needed, to monitor how successfully they are being implemented, and how effective they are at maintaining desired ecosystem features.

10) Prospective old-growth stands identified using Stand-level Inventory criteria or other data would be field checked as needed to ensure accuracy.

11) Results of monitoring would be used to help plan follow-up and future activities in the evaluation area, and to improve our ability to predict the effects of comparable activities elsewhere. Monitoring should be frequent enough to accomplish these purposes effectively.

12) Monitoring results would also be used to identify potential improvements in biological diversity strategies and cooperative ecosystem management plans.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands, unpublished paper. (The text of this paper follows the Biodiversity RMS in this section).

ZETA ALTERNATIVE

Standards

1) DNRC would promote biodiversity to the extent that it supported income opportunities based on wildlife and recreation, by providing diverse wildlife habitats and visual quality, and by minimizing impacts of recreational developments on riparian and aquatic ecosystems. Promoting biodiversity might also be a primary goal where it provided direct trust income by means such as conservation easements or leases, wildlife viewing areas, or nature trail development.

2) On projects where elements of biodiversity were identified as issues, DNRC would evaluate these elements at an appropriate spatial scale. These evaluations would have to consider all ownerships and identify opportunities to mitigate impacts while meeting project objectives. Procedures such as those described in the Landscape Planning section of "Biological Diversity Strategies for Forest Type Groups" or other technical references should be used for these evaluations.

3) Where landscape evaluations identify opportunities to mitigate biodiversity impacts, DNRC may incorporate such measures into management activities if they appear to promote or directly provide trust revenue opportunities.

4) In situations where cumulative impacts to biodiversity limit DNRC's income-producing opportunities, DNRC would make reasonable attempts to develop cooperative ecosystem management planning with major adjoining landowners. The objectives of cooperative planning would be to: (a) maintain appropriate amounts and distribution of stand structures and species mixtures to promote biodiversity at a landscape level; and (b) equitably maintain or promote trust revenue opportunities over the long term.

5) Within an appropriate ecosystem analysis area, DNRC would seek to maintain or restore old-growth forest in amounts of at least half the average proportion that would be expected to occur with natural processes in similar forest types. Old-growth conditions would be developed or maintained on enough additional acres to provide for replacement of existing old-growth over time. However, DNRC would not maintain additional old-growth to compensate for loss of old-growth on adjoining ownerships, unless this is agreed upon as part of a cooperative ecosystem management plan. Procedures such as those described in "Biological Diversity Strategies for Forest Type Groups" or other technical references should be used for designating and managing old-growth blocks and replacement areas.

6) "Biological Diversity Strategies for Forest Type Groups" or other current references should be used as guidance for landscape-level biodiversity evaluations, old-growth protection, and design of timber harvests to maintain biodiversity. The Biological Diversity Strategies would be updated periodically, with professional review, as new information and concepts are developed.

6a) Additional guidance would be developed for maintaining biodiversity in conjunction with major activities other than timber harvest, such as recreational development and hunting leases.

Monitoring

7) A subset of revenue-generating activities would be field reviewed by specialists after project completion, or every five years for ongoing projects, to evaluate the application and effectiveness of biological diversity measures on a stand and landscape level. This review would include all management activities done to maintain or develop old-growth values in old-growth retention and replacement blocks, and all intensive recreational developments.

8) Landscape evaluations would be checked as needed, to compare actual effects of management activities and natural processes against desired or predicted effects. Trends in forest cover characteristics, habitat values, insect and disease activity, and other natural disturbances would be evaluated.

9) Cooperative ecosystem management plans would also be evaluated as needed, to monitor how successfully they were being implemented, and how effective they were at maintaining desired ecosystem features.

10) Identification of prospective old-growth stands using Stand-level Inventory criteria or other data would be field checked as needed to ensure the accuracy of old-growth identification.

11) Results of monitoring would be used to help plan follow-up and future activities in the evaluation area, and to improve our ability to predict the effects of comparable activities elsewhere. Monitoring should be frequent enough to accomplish these purposes effectively.

12) Monitoring results would also be used to identify potential improvements in biological diversity strategies and cooperative ecosystem management plans.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands, unpublished paper. (The text of this paper follows the Biodiversity RMS in this section).

OMEGA ALTERNATIVE

Premise

A diversity of stand structures and compositions provides a broad range of current and prospective trust revenue opportunities including a sustained yield of timber, maintenance of forest health and biodiversity, and other outputs, while reducing risks of catastrophic fires, and insect or disease attacks.

Standards

Fundamental Approach

1) We would promote biodiversity by taking a 'coarse filter' approach thereby favoring an appropriate mix of stand structures and compositions on state lands. Appropriate stand structures and compositions would be based on ecological characteristics (e.g., land type, habitat type, disturbance regime, unique characteristics). A coarse filter approach "assumes that if landscape patterns and process (similar to those species evolved with) are maintained, then the full complement of species will persist and biodiversity will be maintained" (Jensen and Everett, 1993).

2) The coarse filter approach supports diverse wildlife habitat by managing for a variety of forest structures and compositions, instead of focusing on habitat needs for individual, selected species. Because we cannot assure that the course filter approach will adequately address the full range of biodiversity, we would also employ a 'fine filter' approach for threatened, endangered, and sensitive species (see T&E Species RMS, and Sensitive Species RMS). The fine filter approach focuses on a single species' habitat requirements.

Landscape Analyses

3) Within areas of large, blocked ownership, we would manage for a desired future condition characterized by the proportion and distribution of forest types and structures historically present on the landscape. Our typical analysis unit would be a third order drainage wherein we would focus on maintaining or restoring the forest conditions that would have naturally been present given topographic, edaphic and climatic characteristics of the area. Any particular combination of site, topography and climate has an associated disturbance regime and range of possible forest conditions. Among the forest conditions we will consider are successional stage, species composition, stand structure, patch size and shape, habitat connectivity and fragmentation, disturbance regime, old-growth distribution and composition, and habitat type. Timber harvests would be designed to promote long-term diversity and an appropriate representation of forest conditions across the landscape. Where our ownership contained forest structures made rare on adjacent lands due to others' management activities, we would not necessarily maintain those structures in amounts sufficient to compensate for their loss when assessed over the broader landscape. However, if our ownership contained rare or unique habitat elements occurring naturally (e.g, bog, patches of a rare plant), we would manage so as to retain those elements.

4) On areas of smaller, and/or scattered ownership we would not frequently be in a position to provide for appropriate representation of forest conditions across the broader landscape level. Our activities would still be based on restoring a semblance of historic conditions within our ownership. Where our ownership contained forest structures made rare on adjacent lands due to others' management activities, we would not necessarily maintain those structures in amounts sufficient to compensate for their loss when assessed over the broader landscape. However, if our ownership contained rare or unique habitat elements occurring naturally (e.g, bog, patches of a rare plant), we would manage so as to retain those elements.

5) We would make reasonable attempts to pursue cooperative planning with major adjoining landowners. The objectives of cooperative planning would be to: (a) maintain appropriate amounts and distribution of stand structures and species mixtures to promote biodiversity at a landscape level; and (b) equitably maintain or promote trust revenue opportunities over the long term.

6) Within an appropriate analysis area, DNRC would seek to maintain or restore old-growth forest in amounts of at least half the average proportion that would be expected to occur with natural processes on similar sites. We would maintain sufficient replacement old-growth to meet this goal given that old-growth does not live forever. However, DNRC would not maintain additional old-growth to compensate for loss of old-growth on adjoining ownerships. Procedures such as those described in "Biological Diversity Strategies for Forest Type Groups" or other technical references would be used for designating and managing old-growth blocks and replacement areas.

7) "Biological Diversity Strategies for Forest Type Groups" or other current references would be used as guidance for landscape-level biodiversity evaluations, old-growth protection, and design of timber harvests to promote biodiversity. The Biological Diversity Strategies would be updated periodically, with professional review, as new information and concepts are developed.

Monitoring

8) A subset of revenue-generating activities would be field reviewed by specialists after project completion, or every five years for ongoing projects, to evaluate the application of biological diversity measures at a stand and landscape level.

9) Landscape evaluations would be checked to compare actual effects of management activities and natural processes against desired or predicted effects. Trends in forest cover characteristics, habitat values, insect and disease activity, and other natural disturbances would be evaluated.

10) Cooperative plans would be evaluated as needed, to monitor how successfully they are being implemented.

11) Results of monitoring would be used to help plan follow-up and future activities in the evaluation area, and to improve our ability to predict the effects of activities in similar situations elsewhere. Monitoring would be frequent enough to accomplish these purposes effectively.

References

Jensen, M.E. and R. Everett. 1993. An overview of ecosystem management principles. In: Eastside Forest Ecosystem Health Assessment. Vol II. Ecosystem Management: Principles and Applications. M.E. Jensen and P.S. Bourgeron, editors. USDA, National Forest System, Forest Service Research, pp. 9-18.

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands, unpublished paper. (The text of this paper follows on the next page).

BIOLOGICAL DIVERSITY STRATEGIES FOR FOREST TYPE GROUPS

This paper was written by Dave Remington, former Supervisor, Forest Development Section of the Trust Land Management Division, Department of Natural Resources and Conservation (formerly DSL) in November 1993. Dave was a member of the interdisciplinary planning team that developed the SFLMP until he left the agency to pursue additional educational opportunities. We have included this paper in the FEIS to assist our readers in an understanding of the biological diversity presented in this Plan.

INTRODUCTION

The purpose of these strategies is to help DNRC forest managers maintain biological diversity in connection with producing trust income from State forest lands. Application of these strategies to forest management practices will be as directed in the State Forest Land Management Plan.

Biological diversity (biodiversity) can be defined as follows:

> "Biological diversity is the variety of life, and its processes. It includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur."
>
> (Keystone Center 1991)

Providing for biological diversity, then, involves maintaining viable populations of plant and animal species, including those sensitive to human activities. Sustaining ecosystems that support viable populations of all species is widely regarded as more effective than attempting to recover species that are already threatened or endangered.

However, the definition of biological diversity also includes the ecological processes in which various plant and animal species function. Some of these processes help sustain productivity of forests and their long-term resilience to disturbances, or what is commonly described as "forest health." Maintaining productivity and resilience is important to ensure that forest conditions can be managed to produce desired objectives. These may include timber production, watershed protection, wildlife habitats, quality recreational environments, and possibly-changing future uses.

Key ecosystem features that benefit biological diversity include:

- the importance of large down woody material for nitrogen fixation and mycorrhizae, which are important to tree growth;
- the interdependence of mycorrhizal fungi and small mammals, many of which are also dependent on down woody material for habitat;
- the importance of snags to cavity-nesting birds, which feed upon damaging insects such as bark beetles;
- the effect of wildfires on stand density, canopy structure and species composition in many forests, which regulates stress levels, insects, dwarf mistletoe and root diseases.

Strategies to maintain complete and healthy ecosystems rely on information from modern studies of ecological processes, as well as identification of ecosystem characteristics that existed before European settlement brought about major changes. The latter can be understood in part from records of early observers (e.g. Ayres 1900a,b, Whitford 1905), and from studies of fire ecology and stand development processes.

This paper is organized into several parts. The first part describes six major groups of forest cover types, based on habitat type groups, species composition and ecological characteristics. The discussion of each cover type group contains:

- a description of ecological characteristics, with emphasis on those that appear to be important to ecosystem health and diversity;
- an interpretation of human effects on ecological features and processes; and
- recommended management strategies for maintaining or restoring biologically diverse and healthy ecosystems.

The second part describes a process for analyzing and managing for biodiversity at a landscape level. Maintaining a range of forest stand characteristics, in suitable amounts and spatial distribution in the landscape, is important for maintaining a full complement of species. There is no single, ideal stand structure that will provide habitats for all species (Oliver 1992a).

Finally, procedures to maintain old-growth on State lands are described. All forest management activities are likely to cause some changes in ecosystems, and old-growth conditions may be the most vulnerable. State lands can play a role in protection of existing old-growth and providing for its long-term replacement.

Throughout this paper, timber harvests receive primary attention. This is in part because timber harvest has been the primary source of trust income from State forests. However, timber harvest is also a powerful and financially profitable tool for managing the structure of forests. Other silvicultural practices are also addressed where applicable. In many cases these practices, especially prescribed fire, can be used instead of timber harvest where harvest is not desirable.

This paper is not intended to supply cookbook prescriptions. DNRC forest managers will be responsible to plan and design treatments to meet requirements of the State Forest Land Management Plan. Specific silvicultural practices must be tailored to the unique conditions of each site and landscape situation to maintain biological diversity or achieve other goals effectively.

This paper also is not intended to address aspects of biodiversity that are not related to managing forest structure. Road management, recreational development and genetic improvement programs will also have important effects on biological diversity of State forests. DNRC's role in these areas has been, or will be, addressed elsewhere and is not repeated here.

STRATEGIES FOR SPECIFIC COVER TYPE GROUPS

A. PONDEROSA PINE COVER TYPES ON HOT TO WARM, DRY TO MODERATELY MOIST HABITAT TYPES (see Table 1 - Habitat Type Groupings)

Description: This group includes all areas typically dominated by ponderosa pine, often in association with western larch. Douglas-fir is generally the climax species and now dominates many stands. Terrain varies from gentle to steep.

Ecological characteristics: Evidence indicates that pre-settlement stands tended to be open and parklike, dominated by large old ponderosa pine. Western larch was an associate on many wetter sites within this group in northwestern Montana. Small to large openings were frequent and often contained scattered trees of younger age classes.

These conditions were perpetuated by frequent, low-intensity ground fires. These fires seldom killed mature trees, but thinned out the reproduction and favored ponderosa pine over the less fire-resistant Douglas-fir. By regulating stocking, structure and species composition, the frequent fires favored forest characteristics well-adapted to high-stress environments.

Stands were typically uneven-aged, but mature patches often had a single-storied appearance. Fuel loadings and duff were generally light due to the frequent fires. Habeck (1990) has characterized this cover type in considerable detail.

Human effects: Exclusion of the frequent fires has allowed patchy dense understories to develop in these stands. Understories are often dominated by Douglas-fir, and may contain considerable lodgepole pine where light and moisture conditions allow.

Selective harvests have partially removed the large ponderosa pine from many stands, hastening their conversion to Douglas-fir cover types. The result in many cases is multi-storied stands with heavy spruce budworm infestations and high levels of root disease in the Douglas-fir, and greatly elevated hazard of catastrophic wildfire.

Turn-of-the-century railroad logging in Western Montana valleys generally involved heavier harvests, and resulted in dense even-aged ponderosa pine stands that are now 80 to 100 years old. Frequent outbreaks of mountain pine beetle have posed management problems in many of these stands. Modern attempts at even-aged management using seed-tree and shelterwood cutting have met with mixed success.

Recommended management strategies: Ponderosa pine cover types used for timber production should be managed to restore important structural characteristics, including dominance of large mature pine, open stocking and fine-textured mosaics. This may lead to more dependable regeneration, reduce levels of mountain pine beetle, spruce budworm, root diseases and fire hazard, and maintain wildlife habitat diversity.

Management activities should favor a high proportion of multiple-aged stands dominated by mature large trees, including large snags. Stocking of older age classes should be sufficient to provide partial shading for regeneration, but not so dense as to favor establishment of Douglas-fir. These stand structures can be achieved with uneven-age management, or with a modified shelterwood system in which considerable overwood is retained after regeneration is achieved.

Ponderosa pine should be favored over Douglas-fir in all age classes. Occasional precommercial thinning should be used to retain pine dominance and open spacing. Periodic prescribed burning is encouraged wherever feasible, to control understory stocking and rejuvenate fire-dependent vegetation. While natural fuel loadings would be light because of the frequent wildfires, retaining 10 to 15 tons/acre of large down woody material should still benefit productivity and habitat diversity.

Where maintaining or restoring old-growth characteristics is an important management goal, a combination of cutting and prescribed fire, as discussed by Habeck (1990), will probably be necessary. Simply leaving stands alone will eventually lead to Douglas-fir dominance and threaten old-growth maintenance, as long as wildfires are being suppressed.

B. WESTERN LARCH/DOUGLAS-FIR COVER TYPES ON WARM TO COOL, MODERATELY MOIST HABITAT TYPES

Description: These types are generally more moist and/or cooler than the previous group, and western larch is generally a seral dominant. However, lodgepole pine and ponderosa pine may be well-represented, and Douglas-fir is now the predominant species in most stands. Landscapes dominated by these types generally have inclusions of moist sites and riparian areas with spruce/true fir or cedar stands. Terrain varies from gentle to steep. They often occur on north aspects in areas where south slopes are dominated by ponderosa pine. These are the most common cover types on State lands in Northwestern Montana.

Ecological characteristics: Fires were a dominant natural feature, but tended to be less frequent and more intense than in ponderosa pine cover types (Freedman and Habeck 1984). Descriptions and photographs by Ayres (1900a,b) and Whitford (1905), clearly indicate that stands tended to be dominated by mature overstories open enough to permit shade-intolerant western larch and lodgepole pine to regenerate. Denser but still savanna-like old-growth stands developed on some areas (Habeck 1990).

Fires of variable frequency and intensity maintained a mosaic of understory patches of various ages. Seedling-sapling patches were common, and were generally open enough to permit easy access on horseback. The fires also ensured that fire-resistant western larch was the primary species to achieve maturity. If fires were infrequent and intense enough to eliminate a sapling or pole-size understory, lodgepole pine tended to predominate in the regeneration. More frequent, low-intensity fires tended to thin the understory and favor larch over lodgepole pine in the surviving understory.

By regulating species composition and stocking, fire also probably helped keep damage from defoliating insects and root diseases at low levels. These agents tend to be most active in forests that are stressed by overstocking, and dominated by shade-tolerant, fire-susceptible species.

Understory mosaics were variable in patch size. Small patches of a few acres were probably most common, but large replacement fires periodically created large openings many square miles in size. Wetter areas along stream courses and other sheltered areas tended to escape intense fires and develop heavier stocking (Habeck 1988). Thus, even large fires resulted in a mosaic structure.

Human effects: Fire exclusion has favored the development of dense understories dominated by Douglas-fir, lodgepole pine, true firs and spruce, depending on conditions. Partial cutting has tended to remove the mature larch, hastening conversion to shade-tolerant species. This combination of influences is probably contributing to greatly-increased levels of damage from defoliating insects and root diseases, and an elevated hazard of intense wildfires (Johnson et al. 1991; Mutch et al. 1992).

Even-age management has predominated in recent years, largely as an attempt to perpetuate seral species such as larch. Seed tree cuts have been used commonly, but seed trees have generally been removed once regeneration is achieved, eliminating the mature larch component. This may also be eliminating habitat for cavity-nesting birds. Harvest unit sizes and shapes have often been designed for management efficiency, and therefore have not tended to mimic natural fire mosaics. Policies emphasizing dispersal of harvest units among mature timber have increased the amount of abrupt edge. This may lead to increased blowdown, and to habitat fragmentation for many wildlife species.

Recommended management strategies: Important features to maintain include a mature overstory, including snags and large cull trees, well-spaced understories dominated by seral species, a diverse understory mosaic, and down woody material. A high proportion of stands with two-storied structures is desirable.

Mature overstory trees can be distributed uniformly, similar to a seed-tree spacing, or in clusters and patches. A combination of these patterns is desirable to maintain a diverse mosaic and associated wildlife habitats. However, overall overstory densities should be low enough to allow regeneration and vigorous growth of shade-intolerant species in the understory.

Understory mosaics can be maintained by leaving healthy patches of advance regeneration or poletimber where they occur, feathering unit edges, and using mostly small cutting units. Irregular unit shapes should be favored, using natural terrain features and changes in stand types for unit boundaries. It is preferable to "stair-step" new harvests next to old harvests rather than disperse them among mature timber, to reduce the amount of abrupt edge.

A mixture of species should be favored in reforestation. Western larch should generally be a major component of stands in order to ensure its long-term dominance in overstories. Planting at relatively wide spacings or doing early thinnings will help maintain open stands.

Retaining overstory trees may represent a considerable loss of potentially harvestable mature timber. Many of these trees will eventually die and never be harvested. However, this process is essential to maintaining snags and woody debris, and the habitats and ecological functions they provide. Other aspects of this strategy, such as retaining healthy immature trees rather than slashing them, could increase long-term yields. Stair-stepping harvest units and feathering edges may reduce blowdown. Locating units to match existing type changes rather than in neat blocks may reduce the amount of immature timber included in harvest units, and thus increase efficiency.

C. WESTERN LARCH/DOUGLAS-FIR AND MIXED-CONIFER COVER TYPES ON WARM TO COOL, MOIST HABITAT TYPES

Description: These types are on moister, lower-stress sites than the previous group. Douglas-fir and western white pine often share dominance of seral stands with western larch. Grand fir, subalpine fir, western redcedar and spruce are common associates, especially in understories.

Ecological characteristics: Fires were less frequent and more intense in these cover types, with average intervals of 100 to 200 years (Antos and Habeck 1981; Habeck 1988). The fires that did occur tended to be stand-replacing, although lighter ground fires sometimes occurred also (Glacier National Park 1991). This resulted in new stands that were predominantly even-aged. These forests have tended to be more densely stocked than other cover types because of their high productivity and infrequent fires. Ayres' observations in the lower Swan Valley and the Upper Whitefish Basin (1900a,b) describe scattered large, mature western larch and western white pine over well-stocked mixed understories. Multiple burns may have resulted in brushfields that slowly regenerated to stands dominated by Douglas-fir and white pine rather than larch. Antos and Habeck (1981) describe the rather complex successional paths by which various fire cycles resulted in different stand structures.

Because fires were infrequent, root diseases had a significant effect on stocking and species composition. These fungi tend to infect and kill Douglas-fir and true firs, and favor dominance of western larch and western white pine in stands (Monnig and Byler 1992).

Average stand area was relatively large because of the relative infrequency and high intensity of fires (Antos and Habeck 1981). Intense burns often encompassed hundreds or even thousands of acres. However, sheltered areas and stream corridors often escaped intense fires, resulting in a complex stand mosaic. Given the right conditions, impressive old-growth stands often developed due to prolonged fire intervals.

Human effects: Because of the relatively infrequent natural fire occurrence, fire exclusion has probably had little effect on the character of stands. However, fire suppression has probably postponed the occurrence of stand-replacing fires and allowed more stands to develop or maintain late stages of stand development.

Partial cutting has selectively removed the large, high-value larch and white pine in many forests. The introduced white pine blister rust has also greatly reduced the natural representation of white pine over time. This has resulted in forests dominated by Douglas-fir and shade-tolerant species, which are highly susceptible to disruption by root disease and various insects (Monnig and Byler 1992).

Even-aged harvests have probably mimicked many, but not all, aspects of natural fires. Seed tree removal has simplified stand structures and may be detrimental to cavity-nesters. Cutting units tend to have more abrupt edges than burns, and to be more blocky in shape. This simpler and "cleaner" mosaic probably reduces overall wildlife habitat diversity. Managing on short rotations with dispersed harvest units is accelerating the rate of stand replacement, and is progressively reducing the amount and continuity of old-growth. It may also favor lodgepole pine in places where long fire intervals previously limited its representation.

Recommended management strategies: Important features to maintain in this type include relatively intense disturbances leading primarily to establishment of even-aged stands, a continuing supply of snags and large down woody material, good representation of western larch and/or white pine, well-stocked stands, a fairly coarse stand mosaic, and areas of old-growth.

Leaving a scattered to patchy mature overstory in cutting units, including snags and large cull trees, would ensure long-term replacement of snags and large woody debris. This may be important for providing habitats for species that use these features, but also for maintaining site productivity and regulating insect populations.

Cutting units should follow terrain features and cover-type changes as much as possible to maintain landscape mosaics. Locating new cutting units adjacent to old harvests can reduce fragmentation of mature forest. Feathering edges will simulate typical fire patterns, and will also soften visual impacts and reduce the amount of abrupt edge.

A diversity of tree species should be favored in regeneration, including a large proportion of western larch and/or rust-resistant western white pine. Retaining patches of healthy immature trees for understory diversity may be difficult in these types because of the heavy fuels and the need for slash disposal. However, regenerating stands of mixed species with different growth rates can provide vertical diversity.

Maintaining a fairly coarse stand mosaic and a component of intact old-growth may be especially important in this type if all habitats and ecological functions are to be sustained. Typical timber rotations of 80 to 100 years are shorter than the average replacement fire frequency of 100 to 200 years, so old-growth conditions are vulnerable to loss. Old-growth conditions can be perpetuated by managing some areas on long rotations, or possibly by managing for two-storied stands with substantial overstory stocking. Retained old-growth along streams and in other areas of poor operability can contribute significantly, but only if it is well-connected to other closed-canopy stands containing mature trees to maintain a greater effective area of old-growth.

D. LODGEPOLE PINE COVER TYPES ON COOL TO COLD, DRY TO MOIST HABITAT TYPES

Description: These types feature nearly pure lodgepole pine, generally in extensive even-aged stands. They occur at higher elevations near and east of the Continental Divide, and also in cold valley bottoms in northwestern Montana. In northwestern Montana, western larch is a common associate, and this type grades into cover type groups B or C described above.

Ecological characteristics: These stands generally originated from stand-replacing fires that occurred at moderate to long intervals. Fires often encompassed large areas. However, some lodgepole pine forests on drier sites were subject to fairly frequent ground fires, perpetuating relatively open stands. These stands often have several age classes, and older trees tend to be extensively fire-scarred.

On somewhat moist sites where underburns were less common, very dense stands developed. Partial stand breakup would allow regeneration of more shade-tolerant associates such as Douglas-fir, spruce and subalpine fir. The resulting ladder fuels and heavy down fuels set the stage for the next replacement fire.

In landscapes dominated by these types, drainages and sheltered areas tend to be partially sheltered from stand-replacement fires. These areas are often dominated by spruce-fir stands or other shade-tolerant species.

Human effects: Exclusion of fires has often prolonged the period between replacement fires. This has resulted in a surplus of mature stands subject to mountain pine beetle epidemics, with heavy fuel loadings and encroachment of shade-tolerant species. Exclusion of lighter ground fires where they occurred naturally has resulted in dense lodgepole pine understories which are now vulnerable to replacement fires.

Clearcutting has been the predominant harvest method in lodgepole stands, as partial cuts are susceptible to windthrow and snow damage, and the serotinous cone habit eliminates the need for seed trees in most situations. Clearcuts generally result in a "cleaner" mosaic than wildfires, and do not contain the "dead shade" from standing dead trees that are prevalent for some time following a wildfire. Personal observations suggest that clearcutting may not be as reliable for regenerating stands that were maintained by ground fires, because of the low level of cone serotiny in these stands.

Recommended management strategies: Even-aged stands should predominate in areas that were subject to infrequent replacement burns. Even-aged methods should be applied in ways that simulate natural mosaics more closely, in order to maintain better visual appearance and habitat diversity. One method of doing this is to leave inclusions of other species where they occur, such as spruce-fir stands in swales, and Douglas-fir and western larch along ridges. Snags and replacement snags should be left where possible.

Unit boundaries should follow natural breaks such as ridges, draws and cover type changes where possible. Some feathering of edges will lend a more natural appearance and reduce the amount of abrupt edge. This may only be feasible where windfirm trees are present, such as scattered mature Douglas-fir and western larch or open-grown trees. To simulate the typical coarse mosaics, locating new harvests next to old regenerated harvest units is desirable. This will further minimize the amount of abrupt edge, reduce fragmentation and soften visual impacts without requiring the use of large cutting units.

Stands that have multiple age classes of lodgepole pine, fire scars on the older trees, and mostly nonserotinous cones probably had a history of frequent ground fires. Uneven-aged methods that maintain somewhat open-canopied stands may be the most successful way to manage and regenerate these areas.

Commercial thinning has been shown to maintain stand vigor and reduce losses to mountain pine beetle (Gibson 1989). In this way, rotations can be prolonged in areas where maintaining cover is important. In some cases it will be possible to regenerate a new stand under the thinned overstory, and avoid the use of clearcutting for regeneration. However, clearcutting may be the only feasible harvest option where dwarf mistletoe is extensive.

E. DOUGLAS-FIR COVER TYPES ON WARM TO COOL, DRY TO MODERATELY MOIST HABITAT TYPES

Description: Douglas-fir cover types are those in which Douglas-fir is the major seral dominant, as well as climax dominant in most cases. They are prevalent in Southwestern and Central Montana, and in the drier portions of Western Montana. They tend to occur in mountainous terrain on northerly slopes at ~~low~~ elevations, and on southerly slopes at higher elevations. They also occur commonly on limestone-derived soils on sites that would otherwise be occupied by lodgepole pine or spruce-fir types.

Ecological characteristics: Prior to fire suppression, a large proportion of the area now consisting of Douglas-fir cover types was grassland, shrubland or aspen stands. Areas that were forested had a high proportion of early stand development stages because of frequent fires. Gruell's (1983) comparison of early and recent photographs reveals extensive trends from grass-shrub to forest cover over the past century.

On drier sites, stands tended to be open and uneven-aged, dominated by scattered mature trees. Small to large nonstocked openings were common. Overall, these sites appear to have been more open than those with ponderosa pine cover types, possibly because Douglas-fir are less fire-resistant than ponderosa pine. Open stand structures may have helped regulate levels of root disease (S. Hagle, personal communication).

Moister sites, especially those on northerly aspects, were more likely to have replacement fires and relatively even-aged stand structures. Old photos (Gruell 1983) indicate rather coarse mosaics, with even-aged patches of timber interspersed with nonforested areas and recent burns.

Human effects: Perhaps the major impact of fire suppression has been to allow Douglas-fir forests to expand into areas that were previously maintained as nonforest land or aspen stands by frequent fires. In addition, open, patchy uneven-aged stands have become more densely stocked, with dense patches of regeneration in openings and underneath mature trees.

One consequence has been intensification of root disease, dwarf mistletoe and western spruce budworm infestations. These conditions are favored by long-term continuous coverage of Douglas-fir, especially in uneven-aged stands. The role of fire in periodically thinning stands and eliminating forest cover in patches may have been essential in keeping these pests at low levels.

Both even-aged and uneven-aged silvicultural systems have been used for timber harvest. Even-aged methods have been favored in order to reduce levels of dwarf mistletoe and budworm damage. Achieving prompt and well-stocked regeneration has tended to be difficult. Except for sites where prescribed burning has been done, fire-dependent browse species have not been as prevalent in harvest units as they were after fires.

Recommended management strategies: On drier sites, especially south slopes, open multi-storied stands should be favored. Mature trees should be represented mostly in patches to reduce the potential for budworm damage. Many of these sites were predominantly grassland before fire exclusion. In these cases, achieving prompt regeneration will be difficult and may not be economically or ecologically desirable. Management of these areas as open timber-grassland sites may be the best goal. Group selection systems may be especially appropriate, provided that the stands are periodically thinned to maintain open spacing and reduce budworm problems. Even-aged methods, modified to leave some overstory trees throughout the rotation, may also be used.

Moister sites should be managed for a mosaic consisting mostly of even-aged stands. Irregular boundaries, feathered edges and retention of patches of mature trees will create a more natural appearance and structure. The use of prescribed fire is especially desirable in these types to stimulate fire-dependent browse species, many of which are highly palatable to wildlife.

Where maintaining old-growth characteristics is a goal, some combination of periodic cutting and prescribed fire may be needed to simulate the role of natural wildfire. In all cases, maintaining snags and down woody material, and providing for their replacement, should enhance productivity and habitat diversity.

On sites that appear to have been dominated by ponderosa pine or western larch at one time, it is important to restore dominance of these species. Recommendations for cover type groups A and B are more appropriate for these sites.

F. SPRUCE, SPRUCE-FIR AND WESTERN REDCEDAR/GRAND FIR COVER TYPES ON WARM TO COLD, MOIST HABITAT TYPES

Description: This is a rather diverse combination of types which are typically found along stream courses and other wet environments at low to high elevations. Spruce-fir types are also found on moist upland sites at higher elevations, generally in basins that provide shelter from wildfires. While seral species may be present, most stands have developed late-successional conditions due to the prolonged absence of intense wildfires.

Ecological characteristics: The prolonged absence of intense wildfire in these moist, protected environments has allowed the development of uneven-aged stands of shade-tolerant species. While wildfire is seldom a significant factor, other disturbances such as windstorms and insect outbreaks periodically create openings. In such cases, brush species may occupy sites until climax conifers again regain dominance. This has sometimes resulted in sites with poor stocking of trees and patchy stand structures for some time following disturbance.

Light ground fires, or even replacement fires, did occur occasionally. Fires were probably essential to the establishment of seral species where they are present in these environments. Fire was probably important as well for establishment of western redcedar, which regenerates best on mineral soil (Antos and Habeck 1981).

On non-riparian sites, if intense wildfires occurred, the result was probably conversion to lodgepole pine or western larch/Douglas-fir cover types in most cases. If sites were again free from fire for extended periods of time, the shade-tolerant species would eventually become dominant again. However, many old-growth climax stands show no evidence at all of past wildfires (Glacier National Park 1991).

Sites along stream courses have been especially valuable for stream protection and for the unique wildlife habitat they provide, including old-growth habitats and wildlife travel routes.

Human effects: Impacts from fire suppression have been minimal on sites that were already comprised of these cover types, because fires were naturally very infrequent. However, some nonriparian sites have probably advanced from early to late-successional cover types with the help of fire suppression.

Both partial cuts and even-aged harvest methods have been used adjacent to streams and wet areas, with impacts on old-growth conditions, cover and stream protection in many cases. Sheltered upland sites have commonly been harvested by even-aged methods in order to reestablish seral species. The difficulty of site preparation and frosty climates have sometimes resulted in brushfields and very slow reestablishment of trees.

Recommended management strategies: Uneven-aged stand structures and a high degree of canopy cover should be maintained adjacent to streams and wet areas. This will help maintain watershed protection and wildlife habitat. Montana's streamside management law now prohibits clearcutting, broadcast burning and equipment operation in streamside management zones, unless approved as alternative practices.

Partial cutting methods that create some small openings may be appropriate for stands that are undergoing rapid breakup, in order to establish a component of seral species. However, routine sanitation and salvage cutting are likely to impact old-growth characteristics such as snags and decadence, in areas that are especially valuable as old-growth habitat.

Sheltered upland sites with these types may simply be a late successional stage of Groups C or D, described above. In many cases, however, sheltered topography or frost-pocket conditions still warrant treating these sites as separate cover types. Frost-pocket conditions or high water tables may hinder attempts to regenerate a seral stand. In such cases, group selection may be useful to reestablish a mixture of species, while maintaining shelter and a multi-storied structure.

The option of preserving stands along streams and wet areas from any harvest should be carefully considered. This may provide opportunities to preserve significant old-growth areas, closed-canopy connecting corridors and unique cover types. This may not involve a significant financial loss, because of the high costs of harvesting and management activities in and near streamside areas. Even a narrow stream corridor may provide significant old-growth values, if it is adjacent to closed-canopy stands with a component of large mature trees. However, leaving wider areas may be economically as well as ecologically favorable in many cases.

LANDSCAPE PLANNING

Maintaining complete ecosystems will require keeping some balance of stand conditions and patterns within forest landscapes. This will require a landscape-level evaluation of current conditions and trends in the vicinity of a proposed project. This evaluation can be done as part of the planning for a specific project, or on a more comprehensive basis as time and resources allow.

Most features should be evaluated over an identifiable landscape area such as a third-order drainage. Some items, such as rare cover types and linkages between landscapes or regional ecosystems, may require evaluation at a larger scale. The evaluation should take into account all intermingled ownerships, not just State land.

Where available, Stand-level Inventories provide a source of quantified information on forest conditions on State land. Geographic Information Systems (GIS) being developed will be useful for displaying the spatial distribution of conditions. These kinds of information may or may not be available for other landowners. Without this type of information, a more qualitative analysis of conditions can and should still be done. Even where sophisticated tools are available, the value of a recent set of aerial photos, supplemented with field checking, should not be discounted.

Conditions to be considered in an evaluation include:

- Predominant cover types.
- Amounts and distribution of stand size classes and development stages. Oliver and Larson's (1990) stand development stages (stand initiation, stem exclusion, understory re-initiation and old-growth) may be especially useful for this purpose.
- Species composition of stands (predominant species).
- Stand stocking levels.
- Spatial arrangement, type and acreage of harvests over the last few decades.
- Spatial arrangement and contiguous acreage of late successional stages (mature, old-growth and other late successional).
- Locations of other stands containing large trees (such as harvest units with retained overwood).

The current conditions can be compared to the ecological characteristics of the cover types represented, as described in the previous section of this paper. Any attempt to quantify the desirable amounts of various conditions may be somewhat arbitrary. However, a qualitative comparison can still be made, noting the effects of past and present human activities on forest qualities.

If the management objective is to restore some desired balance of conditions, this information can be used to develop landscape-level biodiversity plans. These biodiversity plans would specify activities that may help produce the preferred range of conditions. Because of the scattered nature of most State lands, cooperative landscape-level plans will be much more effective than plans that apply only to the State ownership.

On the other hand, if the objective is to harvest a certain amount of timber as part of a sustained-yield goal, the evaluation can be used to locate and design harvests to promote a more favorable distribution of conditions. In either case, the recommended management strategies for the cover types represented should be used as a guide in designing treatments that will help achieve the objectives.

Careful attention must be given to closed-canopy corridors, and streamside areas in particular, when planning activities. Closed-canopy conditions and old-growth were naturally most abundant along streams, and in topographically-sheltered areas such as basins and on north slopes beneath ridges. It is important to use riparian areas and other sheltered areas as a network to connect other closed-canopy and mature stands. The matrix of such stands will inevitably change over time, but maintaining its connectivity is important.

Management decisions may involve trade-offs between two or more critical features, especially in landscapes that have already been heavily impacted. For example, the choice may be between harvesting in a dense stand to reduce stress levels and improve the species mixture, and maintaining closed-canopy stands that are in short supply in the larger landscape. There may be no "correct" answers to this dilemma, but several ecological questions should be considered in evaluating the impacts of each choice on biological diversity:

- How would each choice affect populations of species that are particularly vulnerable to habitat loss?
- How common are various stand structures at a broader regional scale?
- What risks are involved in maintaining a potentially-maladapted condition, and how large are those risks?

- What is the likelihood that the action would indeed produce the intended results?
- How will each choice affect development of desired features in the long term?
- Which choice meets overall management goals the best?

Landscape evaluation example: A timber sale is being considered for three State sections intermingled with other ownerships. The primary cover type is ponderosa pine (Group A). The adjacent ownerships have had heavy partial cutting, with few mature trees remaining, and residual stands are mostly patches of Douglas-fir. The State parcels were heavily cut around the turn of the century, and have even-aged mixed-species sawtimber about 90 years old.

The evaluation identifies: (a) a scarcity of old-growth conditions and large old trees; (b) a high proportion of even-aged stands, especially on the State land; (c) a high proportion of open, understocked stands (even for this fire-dependent type) on the adjacent ownerships; and (d) an undesirably high representation of Douglas-fir.

Harvesting may further decrease the proportion of fully-stocked stands, with impacts on some cover-dependent species. However, harvests could be used to restore more typical stocking levels and structural characteristics for ponderosa pine cover types, which would favor species that inhabit these forests.

In response to this, the State may propose: (a) to use uneven-aged management to redevelop multi-storied conditions; (b) to harvest mostly Douglas-fir and increase the proportion of ponderosa pine; (c) to leave old ponderosa pine where any are present; and (d) avoid harvest along north slopes and draws, in order to retain some areas with denser stocking levels.

OLD-GROWTH PROTECTION

Perhaps the most important biological diversity concern regarding timber harvest in this region is loss of old-growth forests. This is because efficient timber management typically involves rotations much shorter than the time required to develop old-growth qualities. Efficient timber management also tends to conflict directly with providing old-growth characteristics such as diverse stand structures and large snags.

The strategies described previously include maintaining old-growth elements in managed stands. Many of these elements are not only important for old-growth-dependent species, but may also be important for forest health. However, there is no assurance that these practices will maintain all the habitats and ecological functions associated with old-growth.

The following measures will help ensure that a network of intact old-growth is maintained on State lands now and provided in the future. The effectiveness of this network will depend in part on actions adjacent landowners take to protect old-growth on their lands.

These measures would reduce the potential timber harvest levels from State lands. However, the benefits provided by retaining old-growth may offset this by reducing the overall level of conflict between environmental protection and forest management activities. Areas designated for old-growth protection would provide several functions, including:

- habitats for plant and animal species dependent on old-growth;
- associated benefits, which may include stream protection, thermal and hiding cover, and other wildlife habitat features;

- possible unique opportunities to produce trust income from non-timber-related uses; and
- gene pool reserves for tree and other plant species, which would be relatively uninfluenced by human activities.

Remaining forest areas would still have important roles to play in maintaining biological diversity, as described elsewhere in this paper. However, they would have only a minor role in providing these old-growth functions. Managing some stands primarily for old-growth values and other stands primarily for timber production and other sources of trust income may simultaneously provide more effectively for income production and biological diversity (Oliver 1992a,b).

The old-growth protection measures are as follows:

Old-growth identification: Old-growth may be briefly defined as follows:

> Old-growth represents the later stages of natural development of forest stands. These are generally not climax forests, but rather are subclimax conditions related in part to the natural role of wildfire in the Northern Rockies. Old-growth stands are generally understood as being dominated by relatively large old trees, containing wide variation in tree sizes, exhibiting some degree of multi-storied structure, having signs of decadence such as rot and spike-topped trees, and containing standing large snags and large down logs.

The USDA Forest Service (1989) has developed a more detailed "generic" definition of old-growth, which was intended to guide the development of criteria to identify old-growth in specific forest types.

The U.S. Forest Service, Northern Region (1991a) has developed draft ~~old~~-growth definitions and identification criteria for various types in Western Montana. Table 2 summarizes the identification criteria. (Note that the habitat type groupings are not identical to those used with the biological diversity strategies.) DNRC's Stand-level Inventory may also be useful to help identify old-growth stands. However, field checking is necessary to ensure that identification criteria are indeed selecting for stands that have the ecological characteristics of old-growth as described above.

Retention amounts: At least ten percent of the forested State ownership would be maintained as old-growth, unless different amounts are specified in landscape-level biodiversity plans. On areas of blocked State ownership, or in areas with cooperative landscape-level plans, specified amounts of old-growth would be retained within identified management units of 5,000 to 15,000 acres. Elsewhere, this amount would be maintained within identified groups of State parcels, with a total of 5,000 to 15,000 acres of State lands within a group.

Size of old-growth areas: Retained old-growth blocks should be at least 50 acres. Approximately equal areas should be in small and large old-growth blocks, ranging from 50 to 500-plus acres, in order to favor a balance between interior conditions and dispersal distances for dependent species. Blocks should generally be fairly regular in shape to minimize the proportion of edge.

Spatial arrangement: Old-growth blocks should be distributed across the landscape, spatially and elevationally, to the extent permitted by existing old-growth distribution and locations of State parcels. Corridors should be provided between old-growth blocks, to the extent this is within the State's control. Corridors may be streamside areas, closed-canopy stands, or other relatively well-stocked stands with a mature component. The specific locations of these corridors may change over time as stands grow and are harvested. Streamside areas are especially desirable as corridors. At least 50 percent of the perimeter of the old-growth block should be pole-size or larger stands, to reduce the amount of edge condition.

Block selection: Old-growth blocks to be retained must be representative of the various cover types present in an area. A range of developmental stages should be maintained within the overall old-growth criteria. Stands that are rapidly breaking up should be avoided if they are likely to lose most of their old-growth qualities in the next few decades. It is acceptable to use areas that are protected or deferred for other reasons, such as SMZs and areas with limited operability, if the sites meet old-growth criteria and are representative.

Blocks with some non-old-growth inclusions are acceptable if they have overall high quality as old-growth. The acreage of these inclusions is not to be counted toward the overall old-growth acreage for meeting the minimum amount or minimum block size requirements.

If a management unit currently has less than ten percent old-growth, then non-old-growth blocks should be selected that are likely to develop into old-growth in the future. Stands that are already mature are preferred.

Replacement stands: Additional stands will need to be managed to replace designated old-growth blocks, as these stands may be lost to fire or rapid breakup. This will require an additional five to twenty percent of the State ownership to be managed for old-growth replacement, depending on the ages and structures of the replacement stands. Replacement areas should be contiguous to the current old-growth blocks, unless a better spatial distribution can be obtained eventually by locating them elsewhere.

Substitutions: Retained old-growth blocks may be harvested and replaced with substitute old-growth blocks of similar acreage in certain situations. Substitute blocks need to have comparable old-growth value, and provide comparable spatial distribution, cover-type representation and developmental-stage representation.

Management activities: These areas are being retained to provide intact old-growth characteristics, so partial cutting should not be done except as described below. Sanitation and salvage cutting are inappropriate because they remove snags and decadent trees, which are key old-growth components. However, if stands are breaking up rapidly with heavy fuel accumulations, then some salvage cutting may be appropriate to reduce the risk of the stand being lost to wildfire. If stands are in a state of rapid breakup, and suitable substitute blocks are available, then harvest may be considered.

Periodic prescribed burning is encouraged in ponderosa pine, western larch and Douglas-fir old-growth blocks and replacement stands (cover types A, B and E) to replace the frequent natural fires and maintain open conditions. In these types, partial cutting may be needed along with burning to remove excessively dense understories. This needs to be considered carefully, and mature trees should not be removed.

In immature replacement stands, thinning may be desirable to favor development of large trees and establishment of an understory. Thinning should not be uniform, as variability is a characteristic of old-growth. Thinning young stands to relatively wide spacings will probably hasten development of old-growth characteristics. As replacement stands reach maturity, any cutting becomes less appropriate. The exceptions to this are stands where stagnation is likely to prevent development of large trees, and in fire-dependent forest types as described above.

Coordination with other landowners: In areas of mixed ownership, DNRC should attempt to coordinate old-growth retention area location and connectivity with the other landowners. This will help ensure effective distribution and connectivity of old-growth. However, failure to achieve cooperation with other landowners will not eliminate DNRC's responsibility to comply with the remainder of these provisions.

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The following publications have had some influence, directly or indirectly, on the development of these strategies. In some cases, information they contain has been directly incorporated, and is cited. In other instances, they have formed a background for a broader understanding of management for biological diversity, or have served as a source of ideas and approaches to consider.

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SILVICULTURE

ALPHA, BETA, DELTA, ZETA & OMEGA ALTERNATIVES

Standards

Biological

1) All prescribed silvicultural treatments would maintain the long-term productivity of the soil and site in order to ensure the long-term capability to produce trust revenue and maintain soil hydrologic function.

2) Ecological characteristics of the site would be evaluated and used to develop stand management regimes that are compatible with the site. Management regimes would address stand structures and development, species mixtures, silvicultural systems, and time periods for reforestation. Suitable management regimes are those which can be expected to realize the productive capability of the site for producing desired products and benefits. They also minimize the risk of losses to biotic or abiotic agents (e.g., wind-throw, micro-climate changes, etc.) which would prevent achievement of these benefits.

3) The long-term quality of the genetic base would be maintained or improved in terms of growth, form and adaptation of tree species.

4) Diversity of species, ages, and structure would be maintained within or between stands, in order to maintain a complex and stable ecosystem that would be buffered against losses to insects, disease, wildfire, and climatic elements.

Silvicultural Prescriptions

5) Silvicultural prescriptions would be prepared for all planned treatments. These prescriptions would be written to accomplish the following objectives in a clear and organized manner:

    a) Guide DNRC personnel in the correct implementation of the prescribed treatments.

    b) Provide a record of the objectives and details of prescribed treatments for future reference.

    c) Document conformity of the prescribed silvicultural treatments with requirements of the State Forest Land Management Plan and relevant DNRC Resource Management Standards.

Financial

6) A financial evaluation would be done for all proposed silvicultural treatment(s) using an appropriate combination of the following procedures:

   a) The use of FAST or similar software approved by the Forest Management Bureau to estimate the treatment net present value (NPV) and land expectation value (LEV). This would be done on at least one stand per administrative Unit per year, and when proposed activities represent a questionable investment.

   b) The foresters use their best professional judgement to rank the financial merit of treatment alternatives.

7) All recommended silvicultural treatment regimes would have to produce a net return for the combined current and future stands (i.e., LEV) that was higher than the net return for the "no action" alternative. These financial comparisons would need to consider effects of the prescribed treatments on future harvest opportunities in other stands in the vicinity, as well as discounted costs and returns at the stand level.

8) The discount rate for evaluating silvicultural treatment investments would be based on the returns from AAA corporate bonds and an estimate of risk. The discount rate is currently 3.75 percent, and would be updated periodically.

Integration with Other Resource Management Standards

9) Prescribed silvicultural treatments would meet other resource management standards and comply with all appropriate statutes and regulations, in a manner consistent with the above standards. This would require coordination of treatments between stands in order to achieve parcel or drainage-wide goals for distribution of age, size, stocking, and structure characteristics.

10) Until updated references are developed, the guidelines from DNRC Silvicultural Treatment Standards and Guidelines (draft dated 2/91), or other appropriate technical references, would be used as needed for guidance to implement these standards.

Monitoring

11) Monitoring procedures and information would be used to:
   - monitor the effectiveness of completed silvicultural treatments at meeting treatment objectives;
   - identify promptly the need for follow-up treatments in order to meet treatment objectives and environmental commitments;
   - provide information for improving the effectiveness of future silvicultural practices; and
   - identify potential improvements to the Silvicultural Treatment Guidelines.

12) A regeneration survey would be completed promptly enough to ensure that treatment objectives and environmental commitments were met, in all stands where a regeneration cut has been applied.

13) In all planted stands, a survival survey would be completed the first fall after planting.

14) Stand evaluations would be scheduled and conducted prior to each scheduled entry and after each completed treatment. Evaluation methods and intensity would be sufficient to provide information necessary for developing appropriate silvicultural prescriptions and for determining treatment results in terms of the prescribed objectives.

15) Information on the dates and types of completed treatments and activities would be maintained for each stand.

16) Information on revenues and costs would be maintained for all treatments.

17) A record would be maintained of all conditions and events that occur during the course of treatment that have a significant potential to affect the treatment outcome.

18) On selected sites, soils effects would be monitored for implementation of mitigation measures and effectiveness to guide future harvest practices.

GAMMA ALTERNATIVE

Standards

Biological

1) All prescribed silvicultural treatments would maintain the long-term productivity of the soil and site in order to ensure the long-term capability to produce trust revenue and maintain soil hydrologic function.

2) Ecological characteristics of the site would be evaluated and used to develop stand management regimes that are compatible with the site. Management regimes would address stand structures and development, species mixtures, silvicultural systems, and time periods for reforestation. Suitable management regimes are those which can be expected to realize the productive capability of the site for producing desired products and benefits. They also minimize the risk of losses to biotic or abiotic agents (e.g., wind-throw, micro-climate changes, etc.) which would prevent achievement of these benefits.

3) The long-term quality of the genetic base would be maintained or improved in terms of growth, form, and adaptation of tree species.

4) Diversity of species, ages, and structure would be maintained within or between stands, in order to maintain a complex and stable ecosystem that would be buffered against losses to insects, disease, wildfire, and climatic elements.

Silvicultural Prescriptions

5) Silvicultural prescriptions would be prepared for all planned treatments. These prescriptions would be written to accomplish the following objectives in a clear and organized manner:

   a) Guide DNRC personnel in the correct implementation of the prescribed treatments.

   b) Provide a record of the objectives and details of prescribed treatments for future reference.

   c) Document conformity of the prescribed silvicultural treatments with requirements of the State Forest Land Management Plan and relevant DNRC Resource Management Standards.

Financial

6) A financial evaluation would be done for all proposed silvicultural treatment(s) using an appropriate combination of the following procedures:

   a) The use of FAST or similar software approved by the Forest Management Bureau to estimate the treatment net present value (NPV) and land expectation value (LEV). This would be done on at least one stand per administrative Unit per year, and when proposed activities represent a questionable investment.

b) The foresters use their best professional judgement to rank the financial merit of treatment alternatives.

7) All recommended silvicultural treatment regimes, except those done specifically for ecosystem rehabilitation, would have to produce a net return for the combined current and future stands (i.e., LEV) that was higher than the net return for the "no action" alternative. Projects whose specific purpose was rehabilitation of impacted ecosystems would be exempt from this requirement. These financial comparisons would need to consider effects of the prescribed treatments on future harvest opportunities in other stands in the vicinity, as well as discounted costs and returns at the stand level.

8) The discount rate for evaluating silvicultural treatment investments would be based on the returns from AAA corporate bonds and an estimate of risk. The discount rate is currently 3.75 percent, and would be updated periodically.

Integration with Other Resource Management Standards

9) Prescribed silvicultural treatments would have to meet other resource management standards and comply with all appropriate statutes and regulations, in a manner consistent with the above standards. This would require coordination of treatments between stands in order to achieve parcel or drainage-wide goals for distribution of age, size, stocking, and structure characteristics.

10) Until updated references are developed, the guidelines from DSL Silvicultural Treatment Standards and Guidelines (draft dated 2/91), or other appropriate technical references, would be used as needed for guidance to implement these standards.

Monitoring

11) Monitoring procedures and information would be used to:
- monitor the effectiveness of completed silvicultural treatments at meeting treatment objectives;
- identify promptly the need for follow-up treatments in order to meet treatment objectives and environmental commitments;
- provide information for improving the effectiveness of future silvicultural practices; and
- identify potential improvements to the Silvicultural Treatment Guidelines.

12) A regeneration survey would be completed promptly enough to ensure that treatment objectives and environmental commitments were met, in all stands where a regeneration cut has been applied.

13) In all planted stands, a survival survey would be completed the first fall after planting.

14) Stand evaluations would be scheduled and conducted prior to each scheduled entry and after each completed treatment. Evaluation methods and intensity would be sufficient to provide information necessary for developing appropriate silvicultural prescriptions and for determining treatment results in terms of the prescribed objectives.

15) Information on the dates and types of completed treatments and activities would be maintained for each stand.

16) Information on revenues and costs would be maintained for all treatments.

17) A record would be maintained of all conditions and events that occur during the course of treatment that have a significant potential to affect the treatment outcome.

18) On selected sites, soils effects would be monitored for implementation of mitigation measures and effectiveness to guide future harvest practices.

EPSILON ALTERNATIVE

Standards

Biological

1) All prescribed silvicultural treatments would maintain the long-term productivity of the soil and site in order to ensure the long-term capability to produce trust revenue and maintain soil hydrologic function.

2) Ecological characteristics of the site would be evaluated and used to develop stand management regimes that are compatible with the site. Management regimes would address stand structures and development, species mixtures, and silvicultural systems. Suitable management regimes are those which can be expected to realize the productive capability of the site for producing desired products and benefits. They also minimize the risk of losses to biotic or abiotic agents (e.g., wind-throw, micro-climate changes, etc.) which would prevent achievement of these benefits.

2a) All regeneration harvest units would be reforested to prescribed stocking levels as rapidly as site conditions allow.

3) The long-term quality of the genetic base would be maintained or improved in terms of growth, form, and adaptation of tree species.

4) Diversity of species, ages, and structure would be maintained within or between stands, in order to maintain a complex and stable ecosystem that would be buffered against losses to insects, disease, wildfire and climatic elements.

Silvicultural Prescriptions

5) Silvicultural prescriptions would be prepared for all planned treatments. These prescriptions would be written to accomplish the following objectives in a clear and organized manner:

   a) Guide DNRC personnel in the correct implementation of the prescribed treatments.

   b) Provide a record of the objectives and details of prescribed treatments for future reference.

   c) Document conformity of the prescribed silvicultural treatments with requirements of the State Forest Land Management Plan and relevant DNRC Resource Management Standards.

Financial

6) A financial evaluation would be done for all proposed silvicultural treatment(s) using an appropriate combination of the following procedures:

   a) The use of FAST or similar software approved by the Forest Management Bureau to estimate the treatment net present value (NPV) and land expectation value (LEV). This would be done on at least one stand per administrative Unit per year, and when proposed activities represent a questionable investment.

   b) The foresters use their best professional judgement to rank the financial merit of treatment alternatives.

7) All recommended silvicultural treatment regimes would have to produce a net return for the combined current and future stands (i.e., LEV) that is higher than the net return for the "no action" alternative. These financial comparisons would need to consider effects of the prescribed treatments on future harvest opportunities in other stands in the vicinity, as well as discounted costs and returns at the stand level.

8) The discount rate for evaluating silvicultural treatment investments would be based on the returns from AAA corporate bonds and an estimate of risk. The discount rate is currently 3.75 percent, and would be updated periodically.

Integration with Other Resource Management Standards

9) Prescribed silvicultural treatments would meet other resource management standards and comply with all appropriate statutes and regulations, in a manner consistent with the above standards. This would require coordination of treatments between stands in order to achieve parcel or drainage-wide goals for distribution of age, size, stocking and structure characteristics.

10) Until updated references are developed, the guidelines from DNRC Silvicultural Treatment Standards and Guidelines (draft dated 2/91), or other appropriate technical references, would be used as needed for guidance to implement these standards.

Monitoring

11) Monitoring procedures and information would be used to:
   - monitor the effectiveness of completed silvicultural treatments at meeting treatment objectives;
   - identify promptly the need for follow-up treatments in order to meet treatment objectives and environmental commitments;
   - provide information for improving the effectiveness of future silvicultural practices; and
   - identify potential improvements to the Silvicultural Treatment Guidelines.

12) A regeneration survey would be completed promptly enough to ensure that treatment objectives and environmental commitments were met, in all stands where a regeneration cut has been applied.

13) In all planted stands, a survival survey would be completed the first fall after planting.

14) Stand evaluations would be scheduled and conducted prior to each scheduled entry and after each completed treatment. Evaluation methods and intensity would be sufficient to provide information necessary for developing appropriate silvicultural prescriptions and for determining treatment results in terms of the prescribed objectives.

15) Information on the dates and types of completed treatments and activities would be maintained for each stand.

16) Information on revenues and costs would be maintained for all treatments.

17) A record would be maintained of all conditions and events that occur during the course of treatment that have a significant potential to affect the treatment outcome.

18) On selected sites, soils effects would be monitored for implementation of mitigation measures and effectiveness to guide future harvest practices.

References for All Alternatives

Department of State Lands. 1991. Silvicultural treatment standards and guidelines. Draft Feb. 1991.

ROAD MANAGEMENT

ALPHA ALTERNATIVE

Standards

General

1) The location, design, construction and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules, Watershed Standards, other State Land Resource Standards, and the conditions of all appropriate permits.

2) Road management activities would comply with applicable DNRC weed management plans for prevention, revegetation, and management.

Transportation Planning

3) Transportation planning would be conducted in the early stages of project level planning. An evaluation of existing and possible future transportation systems would be conducted prior to road location and design. These items would be considered:

   a) The relationship of access routes and road systems on adjacent sections (regardless of ownership). Managers should plan systems cooperatively with adjacent landowners to minimize road construction.

   b) Existing and probable future management needs of the tributary area, such as coordination of state needs with adjacent ownership needs, public access, cable vs. tractor logging, TSI activities, fire protection, and wildlife habitat protection.

   c) Value(s) of resources being accessed for the proposed project as well as resources to be accessed from future roading or extension of transportation system.

4) DNRC would plan the transportation system to minimize road miles and associated adverse impacts and to best meet current and future management needs and objectives.

Road Location and Design

5) For roads outside Streamside Management Zones, we would locate and design new roads if reconstruction and use of existing roads would produce greater undesirable impacts than new construction. For roads inside SMZs, we would refer to the Watershed Resource Management Standards.

6) DNRC would locate and design roads to minimize maintenance needs.

Road Construction

7) Contract specifications and administration of construction projects would be sufficient to ensure roads are built to meet resource protection requirements.

Road Maintenance

8) Maintenance would be adequate to ensure continued road use and resource protection.

9) Adequate maintenance requirements, proportional to road use, would be included in all agreements for granting and acquiring right-of-way, and those requirements would be enforced on the ground.

Road Closures

10) DNRC would determine road density at the Unit or Land Office level to meet Threatened and Endangered Species, Big Game, Sensitive Species, and Biodiversity Resource Management Standards, as well as road surface protection and other resource needs. In the Swan River State Forest, road closures would be planned in accordance with terms of the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Co., L.P.

Monitoring

11) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments would be incorporated into contracts and enforced by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions.

12) Qualitative assessments, such as BMP audits, would include an assessment of roads, and would be conducted as time allows and appropriate sites were available. Findings of the audits would be incorporated into future project planning and contracting.

13) Road maintenance would be monitored by contract administrators in connection with timber sales or repair contracts. Deficiencies would be corrected using standard contract enforcement provisions.

14) Existing road systems would be inspected by DNRC specialists when they review proposed timber sales and other projects. This would provide monitoring for road planning, construction and maintenance and give an opportunity for correction of problem areas by incorporating corrective measures into future project plans.

15) Road closure structures, such as gates and kelly humps, would be inspected as part of on-going administrative duties and in response to notice of road closure violations received from the public. Repairs would be made as needed and as time and budget allowed.

BETA ALTERNATIVE

Standards

General

1) The location, design, construction and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules, Watershed Standards, other State Land Resource Standards, and the conditions of all appropriate permits.

2) Road management activities would comply with applicable DNRC weed management plans for prevention, revegetation, and management.

Transportation Planning

3) Transportation planning would be conducted as part of comprehensive landscape-level ecosystem planning. An evaluation of existing and possible future transportation systems would be conducted prior to road location and design. These items would be considered:

    a) The relationship of access routes and road systems on adjacent sections (regardless of ownership). Managers would plan systems cooperatively with adjacent landowners to minimize road construction.

    b) Existing and probable future management needs of the tributary area, such as coordination of state needs with adjacent ownership needs, public access, cable vs. tractor logging, TSI activities, fire protection, and wildlife habitat protection.

    c) Value(s) of resources being accessed for the proposed project as well as resources to be accessed from future roading or extension of transportation system.

4) DNRC would plan the transportation system for the minimum number of road miles with minimum associated adverse impacts that would best meet current and future management needs and objectives. We would evaluate and use alternative transportation systems that do not require roads whenever possible.

Road Location and Design

5) For roads outside Streamside Management Zones, we would locate and design new roads if reconstruction and use of existing roads would produce greater undesirable impacts than new construction. For roads inside SMZs, we would refer to the Watershed Resource Management Standards.

6) DNRC would locate and design roads to minimize maintenance needs.

Road Construction

7) Contract specifications and administration of construction projects would be sufficient to ensure roads were built to meet resource protection requirements.

Road Maintenance

8) Maintenance would be scheduled and funded to ensure continued road use and resource protection. Drainage structures and other resource protection measures would be maintained on restricted as well as open roads.

9) Adequate maintenance requirements, proportional to road use, would be included in all agreements for granting and acquiring right-of-way, and those requirements would be enforced on the ground.

Road Closures

10) DNRC would plan road density to meet landscape level ecosystem plans and other Resource Management Standards. DNRC would determine road density to meet Threatened and Endangered Species, Big Game, Sensitive Species, and Biodiversity Resource Management Standards, as well as road surface protection and other resource needs.

11) On roads which are deemed non-essential to near-term future management plans, DNRC would emphasize revegetation and slash obstruction, to minimize maintenance costs, erosion, and enhance road closure and effectiveness while leaving the capital investment intact. Determination of which roads to obstruct would be determined during project level analysis. In the Swan River State Forest, road closures would be planned in accordance with terms of the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Co., L.P.

Monitoring

12) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments would be incorporated into contracts and enforced by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions.

13) Qualitative assessments, such as BMP audits, would include an assessment of roads, and would be conducted as time allowed and appropriate sites were available. Findings of the audits would be incorporated into future project planning and contracting.

14) Road maintenance would be monitored by contract administrators in connection with timber sales or repair contracts. Deficiencies would be corrected using standard contract enforcement provisions.

15) Road maintenance would be monitored by direct inspections of road and drainage condition of both open and closed roads every five years. Maintenance operations would be scheduled based on the results of the inspections.

16) Existing road systems would be inspected by DNRC specialists when they review proposed timber sales and other projects. This would provide monitoring for road planning, construction, and maintenance, and give an opportunity for correction of problem areas by incorporating corrective measures into future project plans.

17) Road closure structures, such as gates and kelly humps, would be inspected as part of on-going administrative duties and in response to notice of road closure violations received from the public. If road closures are violated in sensitive areas (as defined by the Resource Management Standards for Threatened and Endangered Species, Big Game, Sensitive Species and Biodiversity), DNRC would evaluate and consider alternative methods of closure. Repairs would be a high priority when allocating time and budget.

GAMMA ALTERNATIVE

Standards

General

1) The location, design, construction and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules, Watershed Standards, other State Land Resource Standards, and the conditions of all appropriate permits.

2) Road management activities would comply with applicable DNRC weed management plans for prevention, revegetation, and management.

Transportation Planning

3) Transportation planning would be conducted as a part of comprehensive landscape-level ecosystem planning. An evaluation of existing transportation systems would be conducted to determine which roads could be closed or obliterated to restore more natural conditions. Any new proposals for expanding or replacing roads would consider the following elements:

   a) The relationship of access routes and transportation systems on adjacent sections, regardless of ownership. Managers would plan systems cooperatively with adjacent landowners to minimize road construction and remove existing roads.

   b) Existing and probable future management needs of the tributary area, such as consideration of state needs versus adjacent ownership needs, public access, recreation trail and biking routes, cable versus tractor logging, TSI activities, fire protection, and wildlife habitat protection.

   c) Value(s) of resources being accessed by the overall system.

4) DNRC would plan the transportation system to reduce current road miles, obliterate and rehabilitate unnecessary roads, and develop a more balanced transportation system that meets a variety of current and future management needs and objectives.

Road Location and Design

5) For roads outside Streamside Management Zones, we would locate and design new roads if reconstruction and use of existing roads would produce greater undesirable impacts than new construction. For roads inside SMZs, we would refer to the Watershed Resource Management Standards.

6) DNRC would locate and design roads to limit the amount of required maintenance.

Road Construction

7) Contract specifications and administration of construction projects would be sufficient to ensure roads were built to meet resource protection requirements.

Road Maintenance

8) Maintenance would be scheduled and funded to ensure continued road use and resource protection. Drainage structures and other resource protection measures would be maintained on restricted as well as open roads.

9) Adequate maintenance requirements, proportional to road use, would be included in all agreements for granting and acquiring right-of-way, and those requirements would be enforced on the ground.

Road Closures

10) DNRC would plan road density to minimize open roads on state land. Only those roads that could be regularly maintained and provided planned public or permanent administrative access would remain open. Road closure effectiveness would be enhanced with revegetation, slash, obstruction and obliteration. Threatened and Endangered Species, Big Game, Sensitive Species, and Biodiversity Resource Management Standards, as well as road surface protection and other resource needs would be used to determine which system roads should remain open. In the Swan River State Forest, road closures would be planned in accordance with terms of the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Co., L.P.

Monitoring

11) Contract administration would be an important form of monitoring. Stipulations and requirements contained in Environmental Assessments would be incorporated into contracts and enforced by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions.

12) BMP audits would be conducted by DNRC resource specialists annually, covering all new road construction projects completed each year. Identified deficiencies would be corrected using maintenance funds and recommendations would be incorporated into future project planning and contracting.

13) Required road maintenance would be monitored by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions. Unit managers would be responsible for monitoring state maintenance crews.

14) Road maintenance would be monitored by direct inspections of road and drainage condition of both open and closed roads every year. Maintenance operations would be based on inspection results.

15) Existing road systems would be inspected by DNRC specialists when they review proposed timber sales and other projects. This would provide monitoring for road planning, construction and maintenance and give an opportunity for correction of problem areas by incorporating corrective measures into project plans.

16 Road closure structures, such as gates and kelly humps, would be inspected as part of on-going administrative duties and in response to notice of road closure violations received from

the public. If road closures are violated in sensitive areas (as defined by the Resource Management Standards for Threatened and Endangered Species, Big Game, Sensitive Species and Biodiversity), DNRC would evaluate and consider alternative methods of closures. Inspections would occur every year. Repairs would be a high priority when allocating time and budget.

DELTA ALTERNATIVE

Standards

General

1) The location, design, construction, and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules, Watershed Standards, other State Land Resource Standards, and the conditions of all appropriate permits.

2) Road management activities would comply with applicable DNRC weed management plans for prevention, revegetation, and management.

Transportation Planning

3) Transportation planning would be conducted to provide for efficient access for the variety of uses proposed for each tract. An evaluation of existing and possible future transportation systems would be conducted prior to road location and design. These items would be considered:

   a) The relationship of access routes and road systems on adjacent sections (regardless of ownership). Managers would plan systems cooperatively with adjacent landowners to minimize road construction and capitalize on cooperative use and maintenance.

   b) Existing and probable future management needs of the tributary area, such as coordinating state needs with adjacent ownership needs, providing for a variety of paying uses, public access, cable vs. tractor logging, TSI activities, fire protection, and wildlife habitat protection.

   c) Value(s) of resources being accessed for the current planning period as well as resources to be accessed from future roading or extension of transportation system.

4) DNRC would plan the transportation system to minimize road miles and associated adverse impacts and to best meet current and future management needs and objectives.

Road Location and Design

5) For roads outside Streamside Management Zones, we would locate and design new roads if reconstruction and use of existing roads would produce greater undesirable impacts than new construction. For roads inside SMZs, we would refer to the Watershed Resource Management Standards.

6) DNRC would locate and design roads to minimize maintenance needs.

Road Construction

7) The contract specifications and administration of construction projects would be sufficient to ensure roads were built to meet resource protection requirements.

Road Maintenance

8) Maintenance would be scheduled and funded to ensure continued road use and resource protection. Drainage structures and other resource protection measures must be maintained on restricted as well as open roads.

9) Adequate maintenance requirements, proportional to road use, would be included in all agreements for granting and acquiring right-of-way, and those requirements would be enforced on the ground.

Road Closures

10) DNRC would determine road density to meet Threatened and Endangered Species, Big Game, Sensitive Species and Biodiversity Resource Management Standards, as well as road surface protection and other resource needs. In the Swan River State Forest, road closures would be planned in accordance with terms of the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Co., L.P.

Monitoring

11) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments would be incorporated into contracts and enforced by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions.

12) Qualitative assessments, such as BMP audits, would include an assessment of roads, and would be conducted as time allowed and appropriate sites were available. Findings of the audits would be incorporated into future project planning and contracting.

13) Required road maintenance would be monitored by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions. Unit managers would be responsible for monitoring state maintenance crews.

14) Existing road systems would be inspected by DNRC specialists when they review proposed timber sales and other projects. This would provide monitoring for road planning, construction, and maintenance, and give an opportunity for correction of problem areas by incorporating corrective measures into project plans.

15) Road closure structures, such as gates and kelly humps, would be inspected as part of on-going administrative duties and in response to notice of road closure violations received from the public. Repairs would be made as needed and as time and budget allowed.

EPSILON ALTERNATIVE

Standards

General

1) The location, design, construction and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules, Watershed Standards, other State Land Resource Standards, and the conditions of all appropriate permits.

2) Road management activities would comply with applicable DNRC weed management plans for prevention, revegetation, and management.

Transportation Planning

3) Transportation planning would be conducted in the early stages of project level planning. An evaluation of existing and possible future transportation systems would be conducted prior to road location and design. These items would be considered:

   a) The relationship of access routes and road systems on adjacent sections, regardless of ownership. Managers would plan systems cooperatively with adjacent landowners to minimize road construction.

   b) Existing and probable future management needs of the tributary area, such as coordinating state needs with adjacent ownership needs, public access, cable vs. tractor logging, TSI activities, fire protection, and wildlife habitat protection.

   c) Value(s) of resources being accessed for the proposed project as well as resources to be accessed from future roading or extension of transportation system.

4) DNRC would plan the transportation system to minimize road miles and associated adverse impacts and to best meet current and future management needs and objectives.

Road Location and Design

5) For roads outside Streamside Management Zones, we would locate and design new roads if reconstruction and use of existing roads would produce greater undesirable impacts than new construction. For roads inside SMZs, we would refer to the Watershed Resource Management Standards.

6) DNRC would locate and design roads to minimize maintenance needs.

Road Construction

7) The contract specifications and administration of construction projects would be sufficient to ensure roads were built to meet resource protection requirements.

Road Maintenance

8) Maintenance would be scheduled and funded to ensure continued road use and resource protection. Drainage structures and other resource protection measures would be maintained on restricted as well as open roads.

9) Adequate maintenance requirements, proportional to road use, would be included in all agreements for granting and acquiring right-of-way, and those requirements would be enforced on the ground.

Road Closures

10) DNRC would plan road density to meet timber harvesting schedules. DNRC would determine maximum allowable road densities to meet Threatened and Endangered Species, Big Game, Sensitive Species, and Biodiversity Resource Management Standards, as well as road surface and other resource needs. In the Swan River State Forest, road closures would be planned in accordance with the terms of the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service and Plum Creek Timber Co., L.P. Closure locations and the choice of roads to be opened and closed would be adjusted to facilitate timber harvesting plans.

Monitoring

11) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments would be incorporated into contracts and enforced by contract administrators. Deficiencies would be corrected as they were observed using standard contract enforcement provisions.

12) Qualitative assessments, such as BMP audits, would include an assessment of roads, and would be conducted as time allowed and appropriate sites were available. Findings of the audits would be incorporated into future project planning and contracting.

13) Required road maintenance would be monitored by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions.

14) Existing road systems would be inspected by DNRC specialists when they review proposed timber sales and other projects. This would provide monitoring for road planning, construction, and maintenance, and give an opportunity for correction of problem areas by incorporating corrective measures into project plans.

15) Road closure structures, such as gates and kelly humps, would be inspected as part of on-going administrative duties and in response to notice of road closure violations received from the public. Repairs would be made as needed and as time and budget allowed.

ZETA ALTERNATIVE

Standards

General

1) The location, design, construction, and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules, Watershed Standards, other State Land Resource Standards, and the conditions of all appropriate permits.

2) Road management activities would comply with applicable DNRC weed management plans for prevention, revegetation, and management.

Transportation Planning

3) Transportation planning would be conducted in connection with wildlife and recreational value inventories. An evaluation of existing and possible future transportation systems and how they relate to accessing recreational and wildlife values would be conducted. These items would be considered:

    a) The relationship of access routes and road systems on adjacent sections, regardless of ownership. Managers would plan systems cooperatively with adjacent landowners to minimize road construction.

    b) Existing and probable future management needs of the tributary area, such as access to existing and potential recreation areas, state needs vs. adjacent ownership needs, public access, fire protection, and wildlife habitat protection.

    c) Value(s) of resources being accessed for the proposed project as well as resources to be accessed from future roading or extension of transportation system.

4) DNRC would plan the transportation system to minimize road miles, close and rehabilitate unnecessary roads, and develop a more balanced transportation system that focuses on access for recreation and wildlife management needs and objectives.

Road Location and Design

5) For roads outside Streamside Management Zones, we would locate and design new roads if reconstruction and use of existing roads would produce greater undesirable impacts than new construction. For roads inside SMZs, we would refer to the Watershed Resource Management Standards.

6) DNRC would locate and design roads to minimize maintenance needs.

7) DNRC would locate and design roads and other transportation systems to take advantage of scenic views, properly approach wildlife areas, and provide recreational opportunities consistent with inventory results.

Road Construction

8) Contract specifications and administration of construction projects would be sufficient to ensure roads are built to meet resource protection requirements.

Road Maintenance

9) Maintenance would be scheduled and funded to ensure continued road use and resource protection. Drainage structures and other resource protection measures would be maintained on restricted as well as open roads.

10) Adequate maintenance requirements, proportional to road use, would be included in all agreements for granting and acquiring right-of-way, and those requirements would be enforced on the ground.

Road Closures

11) DNRC would plan road density to meet recreation and wildlife management needs and other Resource Management Standards. DNRC would determine road densities to meet Threatened and Endangered Species, Big Game, Sensitive Species and Biodiversity Resource Management Standards, as well as recreational plans, road surface protection and other resource needs. In the Swan River State Forest, road closures would be planned in accordance with terms of the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service and Plum Creek Timber Co., L.P.

Monitoring

12) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments would be incorporated into contracts and enforced by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions.

13) Qualitative assessments, such as BMP audits, would include an assessment of roads, and would be conducted as time allowed and appropriate sites were available. Findings of the audits would be incorporated into future project planning and contracting.

14) Required road maintenance would be monitored by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions. Unit managers would be responsible for monitoring state maintenance crews.

15) Road maintenance would be monitored by direct inspections of road and drainage condition of both open and closed roads every five years. Maintenance operations would be based on inspection results.

16) Existing road systems would be inspected by DNRC specialists when they review proposed timber sales and other projects. This would provide monitoring for road planning, construction, and maintenance, and give an opportunity for correction of problem areas by incorporating corrective measures into future project plans.

17) Road closure structures, such as gates and kelly humps, would be inspected as part of on-going administrative duties and in response to notice of road closure violations received from the public. Inspections would occur at least every five years. Repairs would be made as needed and as time and budget allowed.

OMEGA ALTERNATIVE

Standards

Transportation Planning

1) DNRC would plan the transportation system for the minimum number of road miles. DNRC will only build necessary roads, that is, those needed for current and near-term management objectives, as consistent with the other resource management standards. Roads would be built to the minimum standard necessary to avoid unacceptable adverse impacts, and best meet current and future management needs and objectives. We would evaluate and use alternative transportation systems that do not require roads whenever possible.

2) Transportation planning would be conducted as part of landscape-level evaluations. An evaluation of existing and possible future transportation systems would be conducted prior to road location and design. These items would be considered:

    a) The relationship of access routes and road systems on adjacent sections (regardless of ownership). Managers would plan systems cooperatively with adjacent landowners to minimize road construction.

    b) Existing and probable future management needs of the tributary area, such as coordination of state needs with adjacent ownership needs, public access, cable vs. tractor logging, TSI activities, fire protection, and wildlife habitat protection.

    c) Value(s) of resources being accessed for the proposed project as well as resources to be accessed from future roading or extension of transportation system.

Road Location and Design

3) The location, design, construction and maintenance of all roads would be consistent with Best Management Practices (BMPs), Streamside Management Zone (SMZ) rules, Watershed Standards, other State Land Resource Standards, and the conditions of all appropriate permits.

4) For roads outside Streamside Management Zones, we would locate and design new roads if reconstruction and use of existing roads would produce greater undesirable impacts than new construction. For roads inside SMZs, we would refer to the Watershed Resource Management Standards.

5) Road management activities would comply with applicable DNRC weed management plans for prevention, revegetation, and management.

6) DNRC would locate and design roads to require a relatively low level of maintenance.

Road Construction

7) Contract specifications and administration of construction projects would be sufficient to ensure roads were built as designed to meet resource protection requirements.

Road Maintenance

8) Maintenance would be scheduled and funded commensurate with expected continued road use and appropriate resource protection. Drainage structures and other resource protection measures would be maintained on restricted as well as open roads.

9) Adequate maintenance requirements, proportional to road use, would be included in all agreements for granting and acquiring right-of-way, and those requirements would be enforced on the ground.

Road Closures

10) DNRC would plan road density to meet landscape level ecosystem plans and other Resource Management Standards. DNRC would determine road density to meet Threatened and Endangered Species, Big Game, Sensitive Species, and Biodiversity Resource Management Standards, as well as road surface protection and other resource needs.

11) On roads which are deemed non-essential to near-term future management plans, DNRC would emphasize obliteration through revegetation and slash obstruction. This would minimize maintenance costs and erosion and to enhance road closure and effectiveness, while leaving the capital investment intact. Determination of which roads to obstruct would be made during project level analysis. In the Swan River State Forest, road closures would be planned in accordance with terms of the February 23, 1995 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

12) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments would be incorporated into contracts and enforced by contract administrators. Deficiencies would be corrected using standard contract enforcement provisions.

13) Qualitative assessments, such as BMP audits, would include an assessment of roads, and would be conducted as time allowed and appropriate sites were available. Findings of the audits would be incorporated into future project planning and contracting.

14) Road maintenance would be monitored by contract administrators in connection with timber sales or repair contracts. Deficiencies would be corrected using standard contract enforcement provisions.

15) Road maintenance would be monitored by direct inspections of road and drainage condition of both open and closed roads every five years. Maintenance operations would be scheduled based on the results of the inspections.

16) Existing road systems would be inspected by DNRC specialists when they review proposed timber sales and other projects. This would provide monitoring for road planning, construction, and maintenance, and give an opportunity for correction of problem areas by incorporating corrective measures into future project plans.

17) Road closure structures, such as gates and kelly humps, would be inspected as part of on-going administrative duties and in response to notice of road closure violations received from the public. If road closures are violated in sensitive areas (as defined by the Resource Management Standards for Threatened and Endangered Species, Big Game, and Sensitive Species), DNRC would evaluate and consider alternative methods of closure. Inspections would occur at least every five years. Repairs would be a high priority when allocating time and budget.

References for All Alternatives

Road Management Standards and Guidelines, review draft #5, provides guidelines for meeting these standards and the specifications for road activities.

Streamside Management Zone Law and Rules, and Best Management Practices for Forestry in Montana provide the primary resource protection information for implementation of these standards.

WATERSHED

ALPHA ALTERNATIVE

Standards

General

1) DNRC would manage watersheds, soil resources, and streams, lakes, wetlands, and other bodies of water to maintain high quality water that meets or exceeds state water quality standards, and to protect designated beneficial water uses.

2) DNRC would comply with all laws and regulations pertaining to water resources when conducting or permitting activities on state-owned forest lands.

Best Management Practices

3) Forest management activities would incorporate Best Management Practices (BMPs) into project design and implementation. BMPs appropriate for a given project or situation would be determined during project development and environmental analysis. The source document for minimum standard BMPs would be "Best Management Practices For Forestry In Montana".

Cumulative Watershed Effects

4) Projects involving substantial vegetation removal or ground disturbance would require an assessment of cumulative watershed effects. The analysis would ensure that the project, considered with other existing and proposed activities, would not increase impacts beyond the physical limits imposed by the stream ecosystem for supporting its most restrictive beneficial use. The analysis would identify opportunities, if any existed, for mitigating adverse effects on beneficial water uses.

5) The level of cumulative watershed effects analysis would depend on the extent of the proposal, the level of past activity, and the watershed values at risk. Watersheds would be screened in a step-wise process, which would include three levels.

   Level 1 -- Screening is a broad evaluation of physical parameters, beneficial uses, and potential for impacts. Based on the information assembled, the analysis would stop at the first level, or proceed to the next level. Except for small-scale projects with very low potential for impacts, additional analysis would be required.

   Level 2 -- Preliminary Watershed Analysis would involve documenting history of past activities through the use of maps, aerial photography, and harvest records; developing indices of watershed disturbance, such as area harvested, length of road, and number of stream crossings; and conducting field evaluations of stream channels and watershed condition. Based on these results and the values at risk, the analysis might stop or proceed to the third level.

Level 3 -- A Detailed Watershed Analysis would be needed when screening or preliminary analysis predict or indicate the existence of unacceptable cumulative watershed effects. The type of watershed analysis varies and would be determined on a case-by-case basis. The detailed analysis might include comprehensive field evaluations, model simulations of watershed response to disturbance, and other indicators of cause and effect relationships. The methods used will attempt to quantify the potential effects of the proposed activity on downstream water resource values.

6) Threshold values for cumulative effects would be established by DNRC on a watershed basis, taking into account such items as stream channel stability, beneficial water uses, and watershed condition. Threshold values would be set at a level to ensure protection of beneficial water uses with a low to moderate degree of risk.

7) DNRC would cooperate with other landowners in watersheds with mixed ownership to manage cumulative watershed effects within prescribed thresholds.

Streamside and Riparian Management Standards

8) DNRC would manage Streamside Management Zones (SMZs), riparian areas, and wetlands in a manner that complies with appropriate laws and regulations and protects and maintains water quality and beneficial water uses. Adequate measures for protecting water values would be of primary importance.

9) SMZ width would depend on erosion potential, level of disturbance proposed, and beneficial uses of the stream. One hundred feet would be the maximum width SMZ in all but exceptional cases of steep slopes, erosive soils, and sensitive streams.

10) Trees would be retained in the SMZ as prescribed in the SMZ rules. Multiple entries that would result in less than 50 percent of the pre-harvest stand would not be allowed except in salvage situations.

11) DNRC would use plant species composition, soil characteristics, or depth of water table to identify wetlands. A 25 ft. wide SMZ would be maintained around isolated wetlands greater than one-half acre. Equipment would not be operated in wetlands unless the operation would not cause rutting or displacement of soil and shrubs, and submerchantable trees would be protected.

12) Existing roads in SMZs would be used if potential water quality impacts were adequately mitigated. The economic and watershed implications of relocating roads outside the SMZ would be primary considerations.

Rehabilitation

13) DNRC would rehabilitate or mitigate the adverse effects of fire, flood, and other natural or management-related events, as funds were available. We would apply erosion control to damage incurred as a part of fire suppression. The DNRC Wildfire Rehabilitation Policy would provide guidance.

Monitoring

14) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected as they were observed by the contractor, under supervision of DNRC.

15) Qualitative assessments, such as BMP audits, would be conducted as time allowed and appropriate sites were available. Problems noted would be remedied by DNRC. BMPs that fail to provide adequate protection would be revised for future application.

16) Water quality monitoring would be conducted on a representative sample of streams in areas of contiguous ownership to track trends in water quality. The data collected is generally not of adequate resolution to be used for cause and effect relationships of specific land management activities. As suitable projects became available, monitoring of individual projects would be considered. If monitoring indicated watershed impacts from management activities, problems would be corrected.

17) The impacts of timber management on the physical soil properties would be evaluated using quantitative methods on a limited number of sites as time allowed. The information collected would be used to identify the need for mitigation measures and the need to modify future activities to avoid similar impacts.

BETA ALTERNATIVE

Standards

General

1) DNRC would manage watersheds, soil resources, and streams, lakes, wetlands, and other bodies of water to maintain high quality water that meets or exceeds state water quality standards, and to protect designated beneficial water uses.

2) DNRC would comply with all laws and regulations pertaining to water resources when conducting or permitting activities on state-owned forest lands.

3) An inventory and analysis of watershed impacts would be conducted on state-owned forest land as funding allowed. The analysis would be sufficient to identify causes of watershed degradation and set priorities for watershed restoration. DNRC would emphasize mitigation of existing water quality impacts in order to provide greater opportunities to produce trust income while maintaining beneficial uses.

Best Management Practices

4) All management activities would incorporate Best Management Practices (BMPs) into the project design and implementation. BMPs appropriate for a given project or situation would be determined during project development and environmental analysis. The source document for minimum standard BMPs would be "Best Management Practices For Forestry In Montana".

Cumulative Watershed Effects

5) Projects involving substantial vegetation removal or ground disturbance would require an assessment of cumulative watershed effects. The analysis would ensure that the project, considered with other existing and proposed activities, would not increase impacts beyond the physical limits imposed by the stream system for supporting its most restrictive beneficial use. The analysis would identify opportunities, if any existed, for mitigating adverse effects on beneficial water uses.

6) The level of cumulative watershed effects analysis would be dependent on the extent of the proposal, the level of past activity, and the watershed values at risk. Watersheds would be screened in a step-wise process, which would include three levels.

   Level 1 -- Screening is a broad evaluation of physical parameters, beneficial uses, and potential for impacts. Based on the information assembled, the analysis would stop at the first level, or proceed to the next level. Except for small-scale projects with very low potential for impacts, additional analysis would be required.

Level 2 -- Preliminary Watershed Analysis would involve documenting history of past activities through the use of maps, aerial photography, and harvest records; developing indices of watershed disturbance, such as area harvested, length of road, and number of stream crossings; and conducting field evaluations of stream channels and watershed condition. Based on these results and the values at risk, the analysis might stop or proceed to the third level.

Level 3 -- A Detailed Watershed Analysis would be needed when screening or preliminary analysis predict or indicate the existence of unacceptable cumulative watershed effects. The type of watershed analysis varies and would be determined on a case-by-case basis. The detailed analysis might include comprehensive field evaluations, model simulations of watershed response to disturbance, and other indicators of cause and effect relationships. The methods used will attempt to quantify the potential effects of the proposed activity on downstream water resource values.

7) Threshold values for cumulative effects would be established by DNRC on a watershed basis, taking into account such items as stream channel stability, beneficial water uses, and watershed condition. Threshold values would be set at a level to ensure protection of beneficial water uses with a low to moderate degree of risk.

8) DNRC would cooperate with other landowners in watersheds with mixed ownership to manage cumulative watershed effects within prescribed thresholds.

Streamside and Riparian Management Standards

9) DNRC would manage Streamside Management Zones (SMZs), riparian areas, and wetlands in a manner that complied with appropriate laws and regulations and protected and maintained water quality and beneficial water uses. Adequate measures for protecting water values would be of primary importance.

10) SMZ width would be dependent on erosion potential, level of disturbance proposed, and beneficial uses of the stream. We would use the following table as a guide for determining SMZ width.

TABLE 1
Guide For Minimum Recommended SMZ Width
(slope distance each side of stream)

SLOPE	SOIL ERODIBILITY CLASS		
	HIGH (4X)	MEDIUM (3X)	LOW (2X)
5%	50 FT.*	50 FT.*	50 FT.*
15%	60 FT.	50 FT.*	50 FT.*
30%	120 FT.	90 FT.	60 FT.
> 50%	200 FT.	150 FT.	100 FT.

*Use minimum width when formula results equal < 50 ft.

Modify SMZ width based on topographic breaks.

11) Trees would be retained in the SMZ as prescribed in the SMZ rules. Multiple entries that would result in less than 50 percent of the pre-harvest stand would not be allowed except in salvage situations.

12) DNRC would use plant species composition, soil characteristics, or depth of water table to identify wetlands. A 50 ft. wide SMZ would be maintained around isolated wetlands greater than one-quarter acre. Equipment would not be operated in wetlands unless the operation would not cause rutting or displacement of soil and shrubs and submerchantable trees would be protected.

13) Existing roads in SMZs would be used if potential water quality impacts are adequately mitigated. The economic and watershed implications of relocating roads outside the SMZ would be primary considerations.

Rehabilitation

14) DNRC would rehabilitate or mitigate the adverse effects of fire, flood, and other natural or management-related events, as funds were available. We would apply erosion control to damage incurred as a part of fire suppression. The DNRC Wildfire Rehabilitation Policy would provide guidance.

15) For development activities, DNRC would ensure that adequate reclamation plans and bonds are included in approved plans of operation. Such plans and bonds would have to address the costs of removing facilities, equipment, and materials; recontouring disturbed areas to near pre-disturbance topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvaging and replacing topsoil; and preparing seedbed and revegetating.

Fire Management

16) DNRC would locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of the SMZ.

17) DNRC would use suppression methods that result in the least disturbance possible in the SMZ. We would consider the potential adverse effects of fire suppression and the potential adverse effects of wildfire damage to determine appropriate suppression activities.

Monitoring

18) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected as they were observed by the contractor, under supervision of DNRC.

19) Qualitative assessments, such as BMP audits, would be conducted on most projects with a substantial amount of soil disturbance. Problems noted would be remedied by DNRC. BMPs that failed to provide adequate protection would be revised for future application.

20) Water quality monitoring would be conducted on a representative sample of streams in areas of contiguous ownership to track trends in water quality. The data collected is generally not of adequate resolution to be used for cause and effect relationships of specific land management activities. As suitable projects became available, monitoring of individual projects would be considered. If monitoring indicated watershed impacts from management activities, problems would be corrected.

21) The impacts of land management on the physical soil properties would be evaluated using quantitative methods on a representative sample of sites. The information collected would be used to identify the need for mitigation measures and the need to modify future activities to avoid similar impacts.

22) Qualitative and quantitative monitoring would be extended to other land uses, such as grazing, mining, cabinsites, and other uses of state lands. If problems were identified, they would be remedied by the lessee, contractor, or DNRC.

GAMMA ALTERNATIVE

Standards

General

1) DNRC would manage watersheds, soil resources, and streams, lakes, wetlands, and other bodies of water to maintain high quality water that meets or exceeds state water quality standards, and to protect designated beneficial water uses.

2) DNRC would comply with all laws and regulations pertaining to water resources when conducting or permitting activities on state-owned forest lands.

3) An inventory and analysis of watershed impacts would be conducted on state-owned forest land as funding allowed. The analysis would be sufficient to identify causes of watershed degradation and set priorities for watershed restoration. DNRC would emphasize an aggressive program of mitigation to remedy water quality impacts caused by past activities. DNRC would use restoration methods that promote long-term ecological integrity of the restored ecosystem.

Best Management Practices

4) All management activities would incorporate Best Management Practices (BMPs) into the project design and implementation. BMPs appropriate for a given project or situation would be determined during project development and environmental analysis. The source document for minimum standard BMPs would be "Best Management Practices For Forestry In Montana".

Cumulative Watershed Effects

5) Projects involving substantial vegetation removal or ground disturbance would require an assessment of cumulative watershed effects. The analysis would ensure that the project, considered with other existing and proposed activities, would not increase impacts beyond the physical limits imposed by the stream system for supporting its most restrictive beneficial use. The analysis would identify opportunities, if any existed, for mitigating adverse effects on beneficial water uses.

6) The level of cumulative watershed effects analysis would be dependent on the extent of the proposal, the level of past activity, and the watershed values at risk. Watersheds would be screened in a step-wise process, which would include three levels.

   Level 1 -- Screening is a broad evaluation of physical parameters, beneficial uses, and potential for impacts. Based on the information assembled, the analysis would stop at the first level, or proceed to the next level. Except for small-scale projects with very low potential for impacts, additional analysis would be required.

Level 2 -- Preliminary Watershed Analysis would involve documenting history of past activities through the use of maps, aerial photography, and harvest records; developing indices of watershed disturbance, such as area harvested, length of road, and number of stream crossings; and conducting field evaluations of stream channels and watershed condition. Based on these results and the values at risk, the analysis might stop or proceed to the third level.

Level 3 -- A Detailed Watershed Analysis would be needed when screening or preliminary analysis predict or indicate the existence of unacceptable cumulative watershed effects. The type of watershed analysis varies and would be determined on a case-by-case basis. The detailed analysis might include comprehensive field evaluations, model simulations of watershed response to disturbance, and other indicators of cause and effect relationships. The methods used will attempt to quantify the potential effects of the proposed activity on downstream water resource values.

7) Threshold values for cumulative effects would be established by DNRC on a watershed basis, taking into account such items as stream channel stability, beneficial water uses, and watershed condition. Threshold values would be set at a level to ensure protection of beneficial water uses with a low degree of risk.

8) DNRC would cooperate with other landowners in watersheds with mixed ownership to manage cumulative watershed effects within prescribed thresholds.

Streamside and Riparian Management Standards

9) DNRC would manage Streamside Management Zones (SMZs), riparian areas, and wetlands in a manner that complied with appropriate laws and regulations and protected and maintained water quality and beneficial water uses. Timber harvest in the SMZ would be conducted only for salvage of timber that is not essential to SMZ function. Adequate measures for protecting water values would be of primary importance.

10) SMZ width would depend on type of waterbody.

Fish-bearing streams would have an SMZ 300 feet horizontal distance in width on each side of the stream.

Permanently flowing non-fish-bearing streams would have an SMZ 150 feet horizontal distance in width on each side of the stream.

Lakes would have an SMZ 300 feet horizontal distance in width.

Seasonally flowing or intermittent streams would have an SMZ 100 feet horizontal distance in width on each side of the stream.

11) Trees would be retained in the SMZ as prescribed in the SMZ rules. Multiple entries that would result in less than 50 percent of the pre-harvest stand would not be allowed.

12) DNRC would use plant species composition, soil characteristics, or depth of water table to identify wetlands. A 100 ft. wide SMZ would be maintained around isolated wetlands greater than one-quarter acre. Equipment would not be operated in wetlands unless the operation would not cause rutting or displacement of soil and shrubs and submerchantable trees would be protected.

13) Existing roads in SMZs would be abandoned and rehabilitated where possible. Where there are no reasonable alternative routes, we would apply the most effective mitigation measures possible.

Rehabilitation

14) DNRC would rehabilitate or mitigate the adverse effects of fire, flood, and other natural or management-related events, as funds were available. We would apply erosion control to damage incurred as a part of fire suppression. The DNRC Wildfire Rehabilitation Policy would provide guidance.

15) For development activities, DNRC would ensure that adequate reclamation plans and bonds are included in approved plans of operation. Such plans and bonds would have to address the costs of removing facilities, equipment, and materials; recontouring disturbed areas to near pre-disturbance topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvaging and replacing topsoil; and preparing seedbed and revegetating.

Fire Management

16) DNRC would locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of the SMZ.

17) DNRC would use suppression methods that would result in the least soil disturbance possible in the SMZ. We would consider the potential adverse effects of fire suppression and the potential adverse effects of wildfire damage to determine appropriate suppression activities.

Monitoring

18) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected as they were observed by the contractor, under supervision of DNRC.

19) Qualitative assessments, such as BMP audits, would be conducted on most projects with a substantial amount of soil disturbance. Problems noted would be remedied by DNRC. BMPs that failed to provide adequate protection would be revised for future application.

20) Water quality monitoring would be conducted on a limited number of streams in areas of contiguous ownership to track trends in water quality. The data collected is generally not of adequate resolution to be used for cause and effect relationships of specific land management activities. As suitable projects became available, monitoring of individual projects would be considered. If monitoring indicated watershed impacts from management activities, problems would be corrected.

21) The impacts of land management on the physical soil properties would be evaluated using quantitative methods on most sites. The information collected would be used to identify the need for mitigation measures and the need to modify future activities to avoid similar impacts.

22) Qualitative and quantitative monitoring would be extended to other land uses, such as grazing, mining, cabinsites, and other uses of state lands. If problems were identified, they would be remedied by the lessee, contractor, or DNRC.

EPSILON AND DELTA ALTERNATIVES

Standards

General

1) DNRC would manage watersheds, soil resources, and streams, lakes, wetlands, and other bodies of water to maintain high quality water that meets or exceeds state water quality standards, and to protect designated beneficial water uses.

2) DNRC would comply with all laws and regulations pertaining to water resources when conducting or permitting activities on state-owned forest lands.

3) An inventory and analysis of watershed impacts would be conducted on state-owned forest land as funding allowed. The analysis would be sufficient to identify causes of watershed degradation and set priorities for watershed restoration. DNRC would emphasize mitigation of existing water quality impacts in order to provide greater opportunities to produce trust income.

Best Management Practices

4) All management activities would incorporate Best Management Practices (BMPs) into the project design and implementation. BMPs appropriate for a given project or situation would be determined during project development and environmental analysis. The source document for minimum standard BMPs would be "Best Management Practices For Forestry In Montana".

Cumulative Watershed Effects

5) Projects involving substantial vegetation removal or ground disturbance would require an assessment of cumulative watershed effects. The analysis would ensure that the project, considered with other existing and proposed activities, would not increase impacts beyond the physical limits imposed by the stream system for supporting its most restrictive beneficial use. The analysis would identify opportunities, if any existed, for mitigating adverse effects on beneficial water uses.

6) The level of cumulative watershed effects analysis would be dependent on the extent of the proposal, the level of past activity, and the watershed values at risk. Watersheds would be screened in a step-wise process, which would include three levels.

    Level 1 -- Screening is a broad evaluation of physical parameters, beneficial uses, and potential for impacts. Based on the information assembled, the analysis would stop at the first level, or proceed to the next level. Except for small-scale projects with very low potential for impacts, additional analysis would be required.

Level 2 -- Preliminary Watershed Analysis would involve documenting history of past activities through the use of maps, aerial photography, and harvest records; developing indices of watershed disturbance, such as area harvested, length of road, and number of stream crossings; and conducting field evaluations of stream channels and watershed condition. Based on these results and the values at risk, the analysis might stop or proceed to the third level.

Level 3 -- A Detailed Watershed Analysis would be needed when screening or preliminary analysis predict or indicate the existence of unacceptable cumulative watershed effects. The type of watershed analysis varies and would be determined on a case-by-case basis. The detailed analysis might include comprehensive field evaluations, model simulations of watershed response to disturbance, and other indicators of cause and effect relationships. The methods used will attempt to quantify the potential effects of the proposed activity on downstream water resource values.

7) Threshold values for cumulative effects would be established by DNRC on a watershed basis, taking into account such items as stream channel stability, beneficial water uses, and watershed condition. Threshold values would be set at a level to ensure protection of beneficial water uses with a moderate to high degree of risk.

8) DNRC would cooperate with other landowners in watersheds with mixed ownership to manage cumulative watershed effects within prescribed thresholds. DNRC would mitigate for other owners' current and past activities, as well as our own, only to the extent necessary to comply with requirements for water quality protection.

Streamside and Riparian Management Standards

9) DNRC would manage Streamside Management Zones (SMZs), riparian areas, and wetlands in a manner that complied with appropriate laws and regulations and protected and maintained water quality and beneficial water uses.

10) SMZ width would be set according to SMZ rules, with exceptions for wider SMZs in sensitive locations.

11) Trees would be retained in the SMZ as prescribed in the SMZ rules.

12) DNRC would use plant species composition, soil characteristics, or depth of water table to identify wetlands. A 25 ft. wide SMZ would be maintained around isolated wetlands greater than one-half acre. Equipment would not be operated in wetlands unless the operation would not cause rutting or displacement of soil and shrubs and submerchantable trees would be protected.

13) Existing roads in SMZs would be used if potential water quality impacts were adequately mitigated. The economic and watershed implications of relocating roads outside the SMZ would be primary considerations.

Rehabilitation

14) DNRC would rehabilitate or mitigate the adverse effects of fire, flood, and other natural or management-related events, as funds were available. We would apply erosion control to damage incurred as a part of fire suppression. The DNRC Wildfire Rehabilitation Policy would provide guidance.

15) For development activities, DNRC would ensure that adequate reclamation plans and bonds were included in approved plans of operation. Such plans and bonds would have to address the costs of removing facilities, equipment, and materials; recontouring disturbed areas to near pre-disturbance topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvaging and replacing topsoil; and preparing seedbed and revegetating.

Fire Management

16) DNRC would locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of the SMZ.

17) DNRC would use suppression methods that resulted in the least soil disturbance possible in the SMZ. We would consider the potential adverse effects of fire suppression and the potential adverse effects of wildfire damage to determine appropriate suppression activities.

Monitoring

18) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected as they were observed by the contractor, under supervision of DNRC.

19) Qualitative assessments, such as BMP audits, would be conducted as time allowed and appropriate sites were available. Problems noted would be remedied by DNRC. BMPs that did not provide adequate protection would be revised for future application.

20) Water quality monitoring would be conducted on a limited number of streams in areas of contiguous ownership to track trends in water quality. The data collected is generally not of adequate resolution to be used for cause and effect relationships of specific land management activities. As suitable projects became available, monitoring of individual projects would be considered. If monitoring indicates watershed impacts from management activities, problems would be corrected.

21) The impacts of land management on the physical soil properties would be evaluated using quantitative methods on a limited number of sites as time allows. The information collected would be used to identify the need for mitigation measures and the need to modify future activities to avoid similar impacts.

22) Qualitative and quantitative monitoring would be extended to other land uses, such as grazing, mining, cabinsites, and other uses of state lands. If problems were identified, they would be remedied by the lessee, contractor, or DNRC.

ZETA ALTERNATIVE

Standards

General

1) DNRC would manage watersheds, soil resources, and streams, lakes, wetlands, and other bodies of water to maintain high quality water that meets or exceeds state water quality standards, and to protect designated beneficial water uses.

2) DNRC would comply with all laws and regulations pertaining to water resources when conducting or permitting activities on state-owned forest lands.

3) An inventory and analysis of watershed impacts would be conducted on state-owned forest land as funding allowed. The analysis would be sufficient to identify causes of watershed degradation and set priorities for watershed restoration. DNRC would emphasize an aggressive program of mitigation to remedy water quality impacts caused by past activities. Rehabilitation efforts that enhance fisheries or recreation would be given priority.

Best Management Practices

4) All management activities would incorporate Best Management Practices (BMPs) into the project design and implementation. BMPs appropriate for a given project or situation would be determined during project development and environmental analysis. The source document for minimum standard BMPs would be "Best Management Practices For Forestry In Montana".

Cumulative Watershed Effects

5) Projects involving substantial vegetation removal or ground disturbance would require an assessment of cumulative watershed effects. The analysis would ensure that the project, considered with other existing and proposed activities, would not increase impacts beyond the physical limits imposed by the stream system for supporting its most restrictive beneficial use. The analysis would identify opportunities, if any existed, for mitigating adverse effects on beneficial water uses.

6) The level of cumulative watershed effects analysis would be dependent on the extent of the proposal, the level of past activity, and the watershed values at risk. Watersheds would be screened in a step-wise process, which would include three levels.

   Level 1 -- Screening is a broad evaluation of physical parameters, beneficial uses, and potential for impacts. Based on the information assembled, the analysis would stop at the first level, or proceed to the next level. Except for small-scale projects with very low potential for impacts, additional analysis would be required.

Level 2 -- Preliminary Watershed Analysis would involve documenting history of past activities through the use of maps, aerial photography, and harvest records; developing indices of watershed disturbance, such as area harvested, length of road, and number of stream crossings; and conducting field evaluations of stream channels and watershed condition. Based on these results and the values at risk, the analysis might stop or proceed to the third level.

Level 3 -- A Detailed Watershed Analysis would be needed when screening or preliminary analysis predict or indicate the existence of unacceptable cumulative watershed effects. The type of watershed analysis varies and would be determined on a case-by-case basis. The detailed analysis might include comprehensive field evaluations, model simulations of watershed response to disturbance, and other indicators of cause and effect relationships. The methods used will attempt to quantify the potential effects of the proposed activity on downstream water resource values.

7) Threshold values for cumulative effects would be established by DNRC on a watershed basis, taking into account such items as stream channel stability, beneficial water uses, and watershed condition. Threshold values would be set at a level to ensure protection of beneficial water uses with a low to moderate degree of risk.

8) DNRC would cooperate with other landowners in watersheds with mixed ownership to manage cumulative watershed effects within prescribed thresholds.

Streamside and Riparian Management Standards

9) DNRC would manage Streamside Management Zones (SMZs), riparian areas, and wetlands in a manner that complied with appropriate laws and regulations and protected and maintained water quality and beneficial water uses. Adequate measures for protecting water values would be of primary importance.

10) SMZ width would be dependent on erosion potential, level of disturbance proposed, and beneficial uses of the stream. The following table would be used as a guide for determining SMZ width.

TABLE 1
Guide For Minimum Recommended SMZ Width
(slope distance each side of stream)

SLOPE	SOIL ERODIBILITY CLASS		
	HIGH (4X)	MEDIUM (3X)	LOW (2X)
5%	50 FT.*	50 FT.*	50 FT.*
15%	60 FT.	50 FT.*	50 FT.*
30%	120 FT.	90 FT.	60 FT.
> 50%	200 FT.	150 FT.	100 FT.

*Use minimum width when formula results equal < 50 ft.

Modify SMZ width based on topographic breaks.

11) Trees would be retained in the SMZ as prescribed in the SMZ rules. Multiple entries that would result in less than 50 percent of the pre-harvest stand would not be allowed except in salvage situations. Re-entry into SMZs would be evaluated with an interdisciplinary approach.

12) DNRC would use plant species composition, soil characteristics, or depth of water table to identify wetlands. A 50 ft. wide SMZ would be maintained around isolated wetlands greater than one-quarter acre. Equipment would not be operated in wetlands unless the operation would not cause rutting or displacement of soil and shrubs and submerchantable trees would be protected.

13) Existing roads in SMZs would be used if potential water quality impacts were adequately mitigated. The economic and watershed implications of relocating roads outside the SMZ would be primary considerations.

Rehabilitation

14) DNRC would rehabilitate or mitigate the adverse effects of fire, flood, and other natural or management-related events, as funds were available. We would apply erosion control to damage incurred as a part of fire suppression. The DNRC Wildfire Rehabilitation Policy would provide guidance.

15) For development activities, DNRC would ensure that adequate reclamation plans and bonds were included in approved plans of operation. Such plans and bonds would have to address the costs of removing facilities, equipment, and materials; recontouring disturbed areas to near pre-disturbance topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvaging and replacing topsoil; and preparing seedbed and revegetating.

Fire Management

16) DNRC would locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of the SMZ.

17) DNRC would use suppression methods that resulted in the least soil disturbance possible in the SMZ. We would consider the potential adverse effects of fire suppression and the potential adverse effects of wildfire damage to determine appropriate suppression activities.

Monitoring

18) Contract administration would be the primary form of monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected as they were observed by the contractor, under supervision of DNRC.

19) Qualitative assessments, such as BMP audits, would be conducted on most projects with a substantial amount of soil disturbance. Problems noted would be remedied by DNRC. BMPs that failed to provide adequate protection would be revised for future application.

20) Water quality monitoring would be conducted on a representative number of streams in areas of contiguous ownership to track trends in water quality. The data collected is generally not of adequate resolution to be used for cause and effect relationships of specific land management activities. As suitable projects became available, monitoring of individual projects would be considered. If monitoring indicated watershed impacts from management activities, problems would be corrected.

21) The impacts of land management on the physical soil properties would be evaluated using quantitative methods on a representative number of sites as time allowed. The information collected would be used to identify the need for mitigation measures and the need to modify future activities to avoid similar impacts.

22) Qualitative and quantitative monitoring would be extended to other land uses, such as grazing, mining, cabinsites, and other uses of state lands. If problems were identified, they would be remedied by the lessee, contractor, or DNRC.

OMEGA ALTERNATIVE

Standards

General

1) DNRC would manage watersheds, soil resources, and streams, lakes, wetlands, and other bodies of water to maintain high quality water that meets or exceeds state water quality standards, and to protect designated beneficial water uses.

2) DNRC would comply with all laws and regulations pertaining to water resources when conducting or permitting activities on state-owned forest lands.

3) An inventory and analysis of watershed impacts would be conducted on state-owned forest land as funding allowed. The analysis would be sufficient to identify causes of watershed degradation and set priorities for watershed restoration. DNRC would emphasize mitigation of existing water quality impacts in order to provide greater opportunities to produce trust income while maintaining beneficial uses.

Best Management Practices

4) All management activities would incorporate Best Management Practices (BMPs) into the project design and implementation. BMPs appropriate for a given project or situation would be determined during project development and environmental analysis. The source document for minimum standard BMPs would be "Best Management Practices For Forestry In Montana".

Cumulative Watershed Effects

5) Projects involving substantial vegetation removal or ground disturbance would require an assessment of cumulative watershed effects. The analysis would ensure that the project, considered with other existing and proposed activities, would not increase impacts beyond the physical limits imposed by the stream system for supporting its most restrictive beneficial use. The analysis would identify opportunities, if any existed, for mitigating adverse effects on beneficial water uses.

6) The level of cumulative watershed effects analysis would be dependent on the extent of the proposal, the level of past activity, and the watershed values at risk. Watersheds would be screened in a step-wise process, which would include three levels.

   Level 1 -- Screening is a broad evaluation of physical parameters, beneficial uses, and potential for impacts. Based on the information assembled, the analysis would stop at the first level, or proceed to the next level. Except for small-scale projects with very low potential for impacts, additional analysis would be required.

Level 2 -- Preliminary Watershed Analysis would involve documenting history of past activities through the use of maps, aerial photography, and harvest records; developing indices of watershed disturbance, such as area harvested, length of road, and number of stream crossings; and conducting field evaluations of stream channels and watershed condition. Based on these results and the values at risk, the analysis might stop or proceed to the third level.

Level 3 -- Detailed Watershed Analysis A detailed watershed analysis would be needed when screening or preliminary analysis predict or indicate the existence of unacceptable cumulative watershed effects. The type of watershed analysis varies and would be determined on a case-by-case basis. The detailed analysis might include comprehensive field evaluations, model simulations of watershed response to disturbance, and other indicators of cause and effect relationships. The methods used will attempt to quantify the potential effects of the proposed activity on downstream water resource values.

7) Threshold values for cumulative effects would be established by DNRC on a watershed basis, taking into account such items as stream channel stability, beneficial water uses, and watershed condition. Threshold values would be set at a level to ensure protection of beneficial water uses with a low to moderate degree of risk. On the Stillwater, Coal Creek, and Swan River State Forests, we will establish thresholds at a level to ensure protection of beneficial water uses with a low degree of risk due to the blocked ownership, sensitive watershed values and past commitments.

8) DNRC would cooperate with other landowners in watersheds with mixed ownership to manage cumulative watershed effects within prescribed thresholds.

Streamside and Riparian Management Standards

9) DNRC would manage Streamside Management Zones (SMZs), riparian areas, and wetlands in a manner that complied with appropriate laws and regulations and protected and maintained water quality and beneficial water uses. Adequate measures for protecting water values would be of primary importance.

10) SMZ width would be dependent on erosion potential, level of disturbance proposed, and beneficial uses of the stream. We would use the following table as a guide for determining SMZ width.

TABLE 1
Guide For Minimum Recommended SMZ Width
(slope distance each side of stream)

SLOPE	SOIL ERODIBILITY CLASS		
	HIGH (4X)	MEDIUM (3X)	LOW (2X)
5%	50 FT.*	50 FT.*	50 FT.*
15%	60 FT.	50 FT.*	50 FT.*
30%	120 FT.	90 FT.	60 FT.
>50%	200 FT.	150 FT.	100 FT.

*Use minimum width when formula results equal < 50 ft.

Modify SMZ width based on topographic breaks.

11) Timber harvest in SMZs along streams containing bull trout will be prohibited, unless approved by a fisheries biologist (see Fisheries RMS #8). Trees would be retained in the SMZ as prescribed in the SMZ rules. Multiple entries that would result in less than 50 percent of the pre-harvest stand would not be allowed except in salvage situations.

12) DNRC would use plant species composition, soil characteristics, or depth of water table to identify wetlands. A 50 ft. wide equipment restriction would be applied around isolated wetlands greater than one-quarter acre. Equipment would not be operated in wetlands unless the operation would not cause rutting or displacement of soil and shrubs and submerchantable trees would be protected.

13) Existing roads in SMZs would be used if potential water quality impacts are adequately mitigated. The economic and watershed implications of relocating roads outside the SMZ would be primary considerations.

Rehabilitation

14) DNRC would rehabilitate or mitigate the adverse effects of fire, flood, and other natural or management-related events, as funds were available. We would apply erosion control to damage incurred as a part of fire suppression. The DNRC Wildfire Rehabilitation Policy would provide guidance.

15) For development activities, DNRC would ensure that adequate reclamation plans and bonds are included in approved plans of operation. Such plans and bonds would have to address the costs of removing facilities, equipment, and materials; recontouring disturbed areas to near pre-disturbance topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvaging and replacing topsoil; and preparing seedbed and revegetating.

Fire Management

16) DNRC would locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of the SMZ.

17) DNRC would use suppression methods that result in the least disturbance possible in the SMZ. We would consider the potential adverse effects of fire suppression and the potential adverse effects of wildfire damage to determine appropriate suppression activities.

Monitoring

18) Contract administration would be the primary form of compliance monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected as they were observed by the contractor, under supervision of DNRC.

19) Qualitative assessments, such as BMP audits, would be conducted on most projects with a substantial amount of soil disturbance. Problems noted would be remedied by DNRC. BMPs that failed to provide adequate protection would be revised for future application.

20) DNRC will develop a monitoring strategy to assess watershed impacts of land use activities and the effectiveness of mitigation measures. The protocol will be distributed for external peer review followed by Land Board review.

21) If monitoring indicates watershed impacts from management activities, or other activities such as grazing, mining, cabinsites or recreation, problems would be corrected. The information collected would be used to identify the need for mitigation measures and the need to modify future activities to avoid similar impacts.

22) The impacts of land management on the physical soil properties would be evaluated using quantitative methods on a representative sample of sites. The information collected would be used to identify the need for mitigation measures and the need to modify future activities to avoid similar impacts.

23) DNRC would continue to participate in cooperative monitoring efforts, such as the Flathead Basin Commission's Monitoring Plan and the Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report recommendations (see Fisheries RMS #2).

24) Upon request, monitoring data will be made available to the public. DNRC will compile the results of monitoring into a report for the Land Board by October 2000 and every 5 years thereafter.

References for all Alternatives

Cline, Richard, G.Cole, W.Megahan, R.Patton, J.Potyondy. 1980. Guidelines for predicting sediment yields. USFS R-1 & R-4.

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Hansen, Paul L.,R.D. Pfister, K. Boggs, B.J. Cook, J. Joy, and D.K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Station, School of Forestry, University of Montana, Missoula, MT. Miscellaneous Publication No. 54.

Kootenai National Forest Plan. 1991. Riparian area guidelines - timber harvest guidelines within streamside management zones. USDA Forest Service Kootenai National Forest Appendix 26. Libby, MT.

Montana Department of State Lands. 1991. Wildfire rehabilitation policy. Revised June 1991.

Montana Environmental Quality Council. 1989. Best management practices for forestry in Montana. July 1989.

Pfister, Robert D., K.Sherwood, D.F.Potts, and P.L.Hansen. 1991. Delineating streamside management zones for Montana forests. In: Flathead Basin forest practices water quality and fisheries study cooperative. Flathead Basin Commission. Kalispell, MT.

Thomas, Jack W., M.G. Raphael, et al. 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forest of the Pacific Northwest. The Scientific Analysis Team Report.

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FISHERIES

ALPHA ALTERNATIVE

Standards

1) DNRC would coordinate with MDFWP in the design and implementation of projects that might affect fisheries resources through compliance with the Stream Protection Act (§ 87-5-501, MCA).

2) Land management activities in the Flathead Basin would be designed to protect bull trout and westslope cutthroat trout habitat by meeting the fisheries recommendations of the Flathead Basin Cooperative Study. See "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report" Recommendation #17[3].

3) Impacts to fisheries habitat would be minimized by implementing Resource Management Standards and Forestry Best Management Practices (BMPs), and by complying with the Streamside Management Zone Law and other laws and regulations.

4) DNRC would implement the Immediate Actions described in Pat Flowers' memo of 12/5/94 to NWLO and SWLO area managers as interim measures to protect bull trout habitat, as recommended by the Governor's Bull Trout Restoration Team[4].

Monitoring

5) In conjunction with land management activities, DNRC would monitor fisheries habitat conditions in areas identified as critical bull trout and westslope cutthroat trout habitat in the Flathead Basin as prescribed in the "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report," Recommendation #17.

6) Contract administration would be the primary form of project monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected by the contractor, as they are observed, under supervision of DNRC.

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[3] See summary of Recommendation #17 under References for all alternatives for Fisheries RMS.

[4] See summary of Bull Trout Immediate Actions after References for all alternatives for Fisheries RMS.

BETA, ZETA & OMEGA ALTERNATIVES

Standards

1) DNRC would coordinate with MDFWP in the design and implementation of projects that might affect fisheries resources through compliance with the Stream Preservation Act (§ 87-5-501, MCA).

2) Land management activities in the Flathead Basin would be designed to protect bull trout and westslope cutthroat trout habitat by meeting the recommendations of the Flathead Basin Cooperative Study. See "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report" Recommendation #17[5]. Land management activities in areas outside of the Flathead Basin would be managed to sustain and enhance bull trout, westslope and Yellowstone cutthroat trout, and all other designated "sensitive" species and Species of Special Concern, where applicable.

3) Impacts to fisheries habitat would be minimized by implementing Resource Management Standards and Forestry Best Management Practices (BMPs), and by complying with the Streamside Management Zone Law and other laws and regulations.

4) DNRC would construct, reconstruct, and maintain road crossing structures on existing and historic fish-bearing streams to provide for fish passage.

5) Silvicultural treatments adjacent to fish bearing streams would prescribe for steady entry of pool-forming trees into the stream system. The number and type of trees would depend on specific site conditions and the needs of the individual fisheries.

6) Fisheries designated as "sensitive" or Species of Special Concern (SOSC) would be managed so as to comply with any additional, and possibly more restrictive, direction as specified in the Sensitive Species Resource Management Standards.

7) DNRC would cooperate with other agencies to eliminate non-native fish stocking, over fishing, and poaching.

8) DNRC would implement the Immediate Actions described in Pat Flowers' memo of 12/5/94 to NWLO and SWLO area managers as interim measures to protect bull trout habitat, as recommended by the Governor's Bull Trout Restoration Team[6].

Monitoring

9) In conjunction with land management activities, DNRC would monitor fisheries habitat conditions in areas identified as critical bull trout and westslope cutthroat trout habitat in the Flathead Basin as prescribed in the "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report," Recommendation #17.

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[5] See summary of Recommendation #17 after References for all Alternatives in Fisheries RMS.

[6] See summary of Bull Trout Immediate Actions after References for all Alternatives in Fisheries RMS.

10) Contract administration would be the primary form of project monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected by the contractor, as they are observed, under supervision of DNRC.

11) Compliance with Watershed and Grazing RMS would be treated as important indicators of fisheries protection.

GAMMA ALTERNATIVE

Standards

1) DNRC would coordinate with MDFWP in the design and implementation of projects that might affect fisheries resources through compliance with the Stream Protection Act (§ 87-5-501, MCA).

2) Land management activities in the Flathead Basin would be designed to protect bull trout and westslope cutthroat trout habitat by meeting the recommendations of the Flathead Basin Cooperative Study. See "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report" Recommendation #17[7]. Land management activities in areas outside of the Flathead Basin would be managed to sustain and enhance bull trout, westslope and Yellowstone cutthroat trout, and all other designated "sensitive" species and Species of Special Concern, where applicable.

3) Impacts to fisheries habitat would be minimized by implementing Resource Management Standards and Forestry Best Management Practices (BMPs), and by complying with the Streamside Management Zone Law and other laws and regulations.

4) DNRC would construct, reconstruct, and maintain road crossing structures on existing and historic fish- bearing streams to provide for fish passage.

5) Silvicultural treatments adjacent to fish bearing streams would prescribe for steady entry of pool-forming trees into the stream system. The number and type of trees would depend on specific site conditions and the needs of the individual fisheries.

6) Fisheries designated as "sensitive" or Species of Special Concern (SOSC) would be managed so as to comply with any additional, and possibly more restrictive, direction specified in the Sensitive Species Resource Management Standards.

7) DNRC would cooperate with other agencies to prevent stocking of non-native fish species, over-fishing, and poaching.

8) DNRC would implement the Immediate Actions described in Pat Flowers' memo of 12/5/94 to NWLO and SWLO area managers as interim measures to protect bull trout habitat, as recommended by the Governor's Bull Trout Restoration Team[8].

Monitoring

9) In conjunction with land management activities, DNRC would monitor fisheries habitat conditions in areas identified as bull trout and westslope cutthroat trout habitat and habitat for other "sensitive species" or Species of Special Concern, using appropriate parameters for the area and fisheries.

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[7] See summary of Recommendation #17 after References for all Alternatives for Fisheries RMS.

[8] See summary of Bull Trout Immediate Actions after References for all Alternatives for Fisheries RMS.

10) Contract administration would be an important form of project monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected, by the contractor, as they are observed, under supervision of DNRC.

11) Compliance with Watershed and Grazing RMS would be treated as important indicators of fisheries protection.

DELTA AND EPSILON ALTERNATIVES

Standards

1) DNRC would coordinate with MDFWP in the design and implementation of projects that might affect fisheries resources through compliance with the Stream Protection Act (§ 87-5-501, MCA).

2) Land management activities in the Flathead Basin would be designed to protect bull trout and westslope cutthroat trout by meeting the recommendations of the Flathead Basin Cooperative Study. See "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report" Recommendation #17[9].

3) Impacts to fisheries habitat would be minimized by implementing Resource Management Standards and Forestry Best Management Practices (BMPs), and by complying with the Streamside Management Zone Law and other laws and regulations.

4) DNRC would construct and maintain road crossing structures on existing and historic fish-bearing streams to provide for fish passage.

5) Fisheries designated as Species of Special Concern (SOSC) would be managed so as to comply with any additional, and possibly more restrictive, direction as specified in Sensitive Species Resource Management Standards.

6) DNRC would implement the Immediate Actions described in Pat Flowers' memo of 12/5/94 to NWLO and SWLO area managers as interim measures to protect bull trout habitat, as recommended by the Governor's Bull Trout Restoration Team[10].

Monitoring

7) In conjunction with land management activities, DNRC would monitor fisheries habitat conditions in areas identified as critical bull trout and westslope cutthroat trout habitat in the Flathead Basin, as prescribed in the "Flathead Basin Forest Practices and Fisheries Cooperative Program Final Report," Recommendation #17.

8) Contract administration would be the primary form of project monitoring. The stipulations and requirements contained in Environmental Assessments and project contracts would be periodically evaluated by contract administrators. Deficiencies would be corrected by the contractor, as they were observed, under supervision of DNRC.

9) Compliance with Watershed and Grazing RMS would be treated as important indicators of fisheries protection.

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[9] See summary of Recommendation #17 after References for all Alternatives for Fisheries RMS.

[10] See summary of Bull Trout Immediate Actions after References for all Alternatives for Fisheries RMS.

References for all Alternatives

Flathead Basin Commission. 1991. Flathead Basin forest practices water quality and fisheries cooperative program final report. Kalispell, MT.

Montana Department of Fish, Wildlife and Parks. 1994. Internal Memo, September 9. Immediate Actions (for Bull Trout Restoration). Larry Peterman, Administrator, Fisheries Division.

Montana Department of State Lands. 1994. Internal Memo, December 5. Immediate Actions for Bull Trout Restoration. Pat Flowers, Chief, Forest Management Bureau.

Thomas, Jack W., M.G. Raphael, et al. 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forest of the Pacific Northwest. In: The scientific analysis team report.

Summary of Flathead Basin Forest Practices and Fisheries Cooperative Program Recommendation #17.

Recommendation #17 provides for protection of bull trout (BT) and westslope cutthroat trout (WSCT). Protection measures include:

- Cooperate in obtaining more complete information on fish species composition in drainages where management activities are planned.
- Management recommendations for bull trout spawning and rearing areas and migratory westslope cutthroat trout spawning areas:
- For "threatened" streams, take active precautions to minimize new sediment loading, and ameliorate past disturbances contributing sediment.
- "Threatened" stream criteria: fine material in spawning gravel >35% (BT & WSCT) or substrate score (measure of embeddedness) <10 (BT only).
- For "impaired" streams, assure that no additional sediment loading occurs as a result of new land disturbance, and stabilize all sediment sources from past activities.
- "Impaired" stream criteria: fine material in spawning gravel >40% (BT & WSCT) or substrate score <9 (BT only).

Summary of Bull Trout Immediate Actions

The Governor's Bull Trout Restoration Team has developed interim recommendations for protection of bull trout. These "Immediate Actions" will eventually be replaced by basin-level plans. DNRC has committed to the following:

- Conduct surveys to determine presence/absence of bull trout in streams adjacent to proposed management activities, where existing information is lacking.
- As part of our pre-sale analysis in drainages containing bull trout, conduct sediment source surveys and initiate remedial measures for identified sources.
- Discontinue timber harvest and cattle grazing in SMZs along streams containing bull trout, unless specifically approved by a fisheries biologist.
- Carefully conduct road maintenance activities to keep wastes from entering waters containing bull trout.

- All proposed fisheries and land management activities in drainages containing bull trout should be reviewed and modified as necessary to have no negative impact to bull trout. This is done through implementation of the Immediate Actions, BMPs, SMZ law, 124 permits, MEPA analysis and interdisciplinary design.
- All land management entities should have fisheries biologists and hydrologists involved in the development and review of proposed management actions. Hydrologists and soil scientists review and help design management practices. Fisheries biologists will be consulted as needed.

THREATENED AND ENDANGERED SPECIES

ALPHA ALTERNATIVE

Standards

1) The Department of Natural Resources and Conservation would implement the DSL 1988 grizzly bear management standards and guidelines for the west side of the Northern Continental Divide. These would be regularly updated to reflect the latest scientific information.

2) DNRC would participate on interagency working groups that have been established to develop guidelines and implement recovery plans for grizzly bear, bald eagle, and wolf (there are no such working groups for Peregrine falcons). We might participate in new working groups if additional plant or animal species with habitat on state forest land were declared threatened or endangered.

3) DNRC might modify activities to promote the recovery of threatened and endangered plant or animal species, when consistent with producing revenue through sustained harvest of forest products. DNRC would comply with Section 9 of the Endangered Species Act, which prohibits any actions that may be considered a "taking", but would not unilaterally promote recovery.

   In the Swan River State Forest, DNRC would adhere to the set of Management Guidelines contained in the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

4) Contract administrators would monitor compliance with all standards and guidelines indicated in project environmental analyses. Deficiencies would be corrected by the contractor, under DNRC supervision.

5) DNRC specialists and field staff would report all sightings of T&E species, except bald eagles, to the DNRC wildlife biologist, who then would forward the information to the respective working groups for inclusion in a cooperative data base. For bald eagles, only new nest locations would be reported because the Montana Bald Eagle Working Group monitors nesting success of all nests in the state each year.

6) DNRC would participate in annual monitoring and reporting of implementation of the Management Guidelines contained in the Swan Valley Grizzly Bear Conservation Agreement.

References

Department of State Lands. 1993. Grizzly bear management standards and guidelines for the west side of the Northern Continental Divide.

The following guidelines developed by interagency working groups or Federal agencies, in coordination with the U.S. Fish and Wildlife Service, would serve as the primary references for complying with recovery plans. The Trust Land Management Division Wildlife Biologist would provide any additional guidance needed to implement these guidelines.

Montana Bald Eagle Working Group. 1986. Montana bald eagle management plan. BLM-MT-GI-86-001-4352.

U.S. Fish and Wildlife Service. 1990. Grizzly bear recovery plan. Missoula, MT.

Paige, C., B. Madden, and B. Ruediger. 1991. Habitat management guide for bald eagles in Northwestern Montana. Montana Bald Eagle Working Group.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. Fish and Wildlife Enhancement Office, Helena, MT.

U.S. Fish and Wildlife Service. 1984. American peregrine falcon recovery plan (Rocky Mountain/Southwest populations). Prepared in cooperation with the American peregrine falcon recovery team. U.S. Fish and Wildlife Service, Denver, CO.

U.S. Forest Service standards and guidelines detailed in various Forest Plans would be used as appropriate for site-specific guidance.

BETA ALTERNATIVE

Standards

1) DNRC would either adopt and implement Federal and working group standards and guidelines for grizzly bear management in each recovery area, or develop our own standards for application on state lands. Our own standards would be developed through conferring with the U.S. Fish and Wildlife Service. They might differ from Federal management guidelines, but would be equivalent in their conservation effect.

   DNRC would work with the U.S. Fish and Wildlife Service to develop or amend our standards when, in the judgement of the State Forester, they were inconsistent with trust management obligations. Management standards would be periodically updated to implement new biological information and legal interpretations as warranted.

2) DNRC would participate on interagency working groups that have been established to develop guidelines and implement recovery plans for grizzly bear, bald eagle, and wolf (there are no such working groups for Peregrine falcons). If additional plant and animal species with habitat on state forest land were declared threatened or endangered, we would participate in working groups for those species as well.

3) DNRC would promote recovery of threatened and endangered plant and animal species by implementing Federal standards and guidelines and recovery plans, or by developing our own standards through conferring with the U.S. Fish and Wildlife Service. Our own standards might differ from Federal management guidelines, but would be equivalent in their conservation effect.

   DNRC would work with the U.S. Fish and Wildlife Service to develop or amend our standards when, in the judgement of the State Forester, they were inconsistent with trust management obligations. Management standards would be periodically updated to implement new biological information and legal interpretations as warranted.

   In the Swan River State Forest, DNRC would adhere to the set of Management Guidelines contained in the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

4) Contract administrators would monitor compliance with all requirements all standards and guidelines indicated in project environmental analyses. Deficiencies would be corrected by the contractor, under DNRC supervision.

5) DNRC specialists and field staff would report all sightings of T&E species, except bald eagles, to the DNRC wildlife biologist, who would then forward the information to the respective working groups for inclusion in a cooperative data base. For bald eagles, only new nest locations need be reported because the Montana Bald Eagle Working Group monitors nesting success of all nests in the state each year.

6) DNRC would participate in annual monitoring and reporting of implementation of the Management Guidelines contained in the Swan Valley Grizzly Bear Conservation Agreement.

References

The following guidelines developed by interagency working groups or Federal agencies, in coordination with the U.S. Fish and Wildlife Service, would serve as the primary references for protecting threatened and endangered species. The Trust Land Management Division Wildlife Biologist would provide any additional guidance needed to implement these guidelines.

U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT.

Montana Bald Eagle Working Group. 1986. Montana bald eagle management plan. BLM-MT-GI-86-001-4352.

Paige, C., B. Madden, and B. Ruediger. 1991. Habitat management guide for bald eagles in Northwestern Montana. Montana Bald Eagle Working Group.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. Fish and Wildlife Enhancement Office, Helena, MT.

U.S. Fish and Wildlife Service. 1984. American peregrine falcon recovery plan (Rocky Mountain/Southwest populations). Prepared in cooperation with the American peregrine falcon recovery team. U.S. Fish and Wildlife Service, Denver, CO.

U.S. Forest Service standards and guidelines detailed in various Forest Plans would be used as appropriate for site-specific guidance.

GAMMA ALTERNATIVE

Standards

1) We would promote recovery of grizzly bears on state lands. DNRC would adopt and implement Federal and working group standards and guidelines for grizzly bear management on state lands in each designated recovery area. We would incorporate revisions of these guidelines into our management as they occur.

2) DNRC would participate on interagency working groups that have been established to develop guidelines and implement recovery plans for grizzly bear, bald eagle, and wolf (there are no such working groups for Peregrine falcons). If additional plant or animal species with habitat on state forest land were declared threatened or endangered, we would participate in working groups for those species as well.

3) DNRC would promote recovery of all threatened and endangered plant and animal species on state lands by fully implementing recommendations from Federal standards and guidelines, recovery plans, and the latest scientific information that would most rapidly result in species recovery.

   In the Swan River State Forest, DNRC would adhere to the set of Management Guidelines contained in the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

4) Contract administrators would monitor compliance with all standards and guidelines indicated in environmental analyses completed for each project proposal. Deficiencies would be corrected by the contractor, under DNRC's supervision.

5) DNRC specialists and field staff would report all sightings of T&E species, except bald eagles, to the DNRC wildlife biologist, who would then forward the information to the respective working groups for inclusion in a cooperative data base. For bald eagles, only new nest locations need be reported because the Montana Bald Eagle Working Group monitors nesting success of all nests in the state each year.

6) DNRC would participate in annual monitoring and reporting of implementation of the Management Guidelines contained in the Swan Valley Grizzly Bear Conservation Agreement.

References

The following guidelines developed by interagency working groups or Federal agencies, in coordination with the U.S. Fish and Wildlife Service, would serve as the primary references for complying with recovery plans. The Trust Land Management Division Wildlife Biologist would provide any additional guidance needed to implement these guidelines.

U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT.

Montana Bald Eagle Working Group. 1986. Montana bald eagle management plan. BLM-MT-GI-86-001-4352.

Paige, C., B. Madden, and B. Ruediger. 1991. Habitat management guide for bald eagles in Northwestern Montana. Montana Bald Eagle Working Group.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. Fish and Wildlife Enhancement Office, Helena, MT.

U.S. Fish and Wildlife Service. 1984. American peregrine falcon recovery plan (Rocky Mountain/Southwest populations). Prepared in cooperation with the American peregrine falcon recovery team. U.S. Fish and Wildlife Service, Denver, CO.

U.S. Forest Service standards and guidelines detailed in various Forest Plans would be used as appropriate for site-specific guidance.

DELTA ALTERNATIVE

Standards

1) The Department of Natural Resources and Conservation would no longer implement the 1988 DNRC interim grizzly bear management standards and guidelines for the west side of the Northern Continental Divide.

2) DNRC would review information from interagency working groups established to develop guidelines and implement recovery plans for threatened and endangered plant and animal species to remain current on their management.

3) DNRC would comply with Section 9 of the Endangered Species Act, which prohibits any actions that may be considered a "taking". We would adopt and implement all U.S. Fish and Wildlife Service guidelines that are designed to avoid "taking" of threatened or endangered species or their habitat. However, DNRC would not routinely implement Federal and working group guidelines to promote recovery of threatened and endangered species.

   In the Swan River State Forest, DNRC would adhere to the set of Management Guidelines contained in the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

4) Contract administrators would monitor compliance with standards and guidelines. Deficiencies would be corrected by the contractor, under DNRC supervision.

5) DNRC specialists and field staff would report all sightings of T&E species, except bald eagles, to the DNRC wildlife biologist, who would then forward the information to the respective working groups for inclusion in a cooperative data base. For bald eagles, only new nest locations need be reported because the Montana Bald Eagle Working Group monitors nesting success of all nests in the state each year.

6) DNRC would participate in annual monitoring and reporting of implementation of the Management Guidelines contained in the Swan Valley Grizzly Bear Conservation Agreement.

References

Guidelines developed by interagency working groups or Federal agencies, in coordination with the U.S. Fish and Wildlife Service, would serve as references for assessing impacts of proposed actions to the extent required by MEPA. The Trust Land Management Division Wildlife Biologist would provide any additional guidance needed to use these guidelines in environmental evaluations.

Plum Creek Timber Company, L.P. 1993. Grizzly bear best management practices.

EPSILON ALTERNATIVE

Standards

1) The Department of Natural Resources and Conservation would no longer implement the 1988 DNRC interim grizzly bear management standards and guidelines for the west side of the Northern Continental Divide.

2) DNRC would review information from interagency working groups established to develop guidelines and implement recovery plans for threatened and endangered plant and animal species to remain current on their management.

3) DNRC would comply with Section 9 of the Endangered Species Act, which prohibits any actions that may be considered a "taking". We would adopt and implement all U.S. Fish and Wildlife Service guidelines that are designed to avoid "taking" of threatened or endangered species or their habitat. However, DNRC would not routinely implement Federal and working group guidelines to promote recovery of threatened and endangered species.

   In the Swan River State Forest, DNRC would adhere to the set of Management Guidelines contained in the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

4) Contract administrators would monitor compliance with standards and guidelines. Deficiencies would be corrected by the contractor, under DNRC supervision.

5) DNRC specialists and field staff would report all sightings of T&E species, except bald eagles, to the DNRC wildlife biologist, who would then forward the information to the respective working groups for inclusion in a cooperative data base. For bald eagles, only new nest locations need be reported because the Montana Bald Eagle Working Group monitors nesting success of all nests in the state each year.

6) DNRC would participate in annual monitoring and reporting of implementation of the Management Guidelines contained in the Swan Valley Grizzly Bear Conservation Agreement.

References

Guidelines developed by interagency working groups or Federal agencies, in coordination with the U.S. Fish and Wildlife Service, would serve as references for assessing impacts of proposed actions to the extent required by MEPA. The Trust Land Management Division Wildlife Biologist would provide any additional guidance needed to use these guidelines in environmental evaluations.

Plum Creek Timber Company, L.P. 1993. Grizzly bear best management practices.

ZETA ALTERNATIVE

Standards

1) DNRC would either adopt and implement Federal and working group standards and guidelines for grizzly bear management, or develop our own standards for application on state lands in each designated recovery area, to the extent that doing so would not conflict with trust management policy. We would incorporate revisions of these guidelines into our management as they occur.

2) DNRC would participate on interagency working groups that have been established to develop guidelines and implement recovery plans for grizzly bear, bald eagle, and wolf (there are no such working groups for Peregrine falcons). If additional plant or animal species with habitat on state forest land were declared threatened or endangered, we would participate in working groups for those species as well.

3) DNRC might modify activities to promote the recovery of threatened and endangered plant and animal species, when doing so was consistent with producing trust revenue. We would comply with Section 9 of the Endangered Species Act, which prohibits any actions that may be considered a "taking", but we would not unilaterally promote recovery.

   In the Swan River State Forest, DNRC would adhere to the set of Management Guidelines contained in the February 23, 1994 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

4) Contract administrators would monitor compliance with all requirements, standards, and guidelines indicated in project environmental analyses. Deficiencies would be corrected by the contractor, under DNRC supervision.

5) DNRC specialists and field staff would report all sightings of T&E species, except bald eagles, to the DNRC wildlife biologist, who would then forward the information to the respective working groups for inclusion in a cooperative data base. For bald eagles, only new nest locations need be reported because the Montana Bald Eagle Working Group monitors nesting success of all nests in the state each year.

6) DNRC would participate in annual monitoring and reporting of implementation of the Management Guidelines contained in the Swan Valley Grizzly Bear Conservation Agreement.

References

The following guidelines developed by interagency working groups or Federal agencies, in coordination with the U.S. Fish and Wildlife Service, would serve as the primary references for protecting threatened and endangered species. The Trust Land Management Division Wildlife Biologist would provide any additional guidance needed to implement these guidelines.

U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT.

Montana Bald Eagle Working Group. 1986. Montana bald eagle management plan. BLM-MT-GI-86-001-4352.

Paige, C., B. Madden, and B. Ruediger. 1991. Habitat management guide for bald eagles in Northwestern Montana. Montana Bald Eagle Working Group.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. Fish and Wildlife Enhancement Office, Helena, MT.

U.S. Fish and Wildlife Service. 1984. American peregrine falcon recovery plan (Rocky Mountain/Southwest populations). Prepared in cooperation with the American peregrine falcon recovery team. U.S. Fish and Wildlife Service, Denver, CO.

U.S. Forest Service standards and guidelines detailed in various Forest Plans would be used as appropriate for site-specific guidance.

OMEGA ALTERNATIVE

Standards

1) DNRC would participate in recovery efforts of threatened and endangered plant and animal species. We would confer with the U.S. Fish and Wildlife Service to develop habitat mitigation measures. These measures might differ from Federal management guidelines because we play a subsidiary role to Federal agencies in species recovery. However, in all cases, measures to support recovery would be consistent with our responsibilities under the Endangered Species Act and under Trust Law.

   DNRC would work with the U.S. Fish and Wildlife Service to amend such measures when, in the judgement of the Chief of the Forest Management Bureau, they were inconsistent with trust management obligations. Measures to support species recovery would be periodically updated to implement new biological information and legal interpretations as warranted.

2) DNRC would participate on interagency working groups that have been established to develop guidelines and implement recovery plans for grizzly bears, bald eagles, and wolves. If additional plant or animal species with habitat on state forest land were listed as threatened or endangered, we would participate in working groups for those species as well. DNRC would also participate in interagency groups that may be formed to oversee management of any recently delisted species.

   In the Swan River State Forest, DNRC would adhere to the set of Management Guidelines contained in the February 23, 1995 Swan Valley Grizzly Bear Conservation Agreement with the U.S. Fish and Wildlife Service, the U.S. Forest Service, and Plum Creek Timber Company, L.P.

Monitoring

3) Contract administrators would monitor compliance with all requirements indicated in project environmental analyses. If contract requirements were not being met, they would be corrected by the contractor, under DNRC supervision.

4) DNRC specialists and field staff would report all sightings of T&E species, except bald eagles, to DNRC wildlife biologists, who would then forward the information to the respective working groups for inclusion in a cooperative data base. For bald eagles, only new nest locations need be reported because the Montana Bald Eagle Working Group monitors nesting success of all nests in the state each year.

5) DNRC would participate in annual monitoring and reporting of implementation of the Management Guidelines in the Swan Valley Grizzly Bear Conservation Agreement.

References

The following guidelines developed by interagency working groups or Federal agencies, in coordination with the U.S. Fish and Wildlife Service, would serve as the primary references for protecting threatened and endangered species. The Forest Management Bureau Wildlife Biologist would provide any additional guidance needed to implement these guidelines.

Forest Management Bureau. 1995. Interim Grizzly Bear Guidance. Northern Continental Divide Ecosystem Project Mitigation and Analysis. Missoula, MT.

Conservation Agreement among Plum Creek Timber Company, L.P., and Montana Department of Natural Resources and Conservation, U.S.D.A. Forest Service, Flathead National Forest, and U.S. Fish and Wildlife Service, February 23, 1995 ("Swan Valley Grizzly Bear Conservation Agreement").

U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT.

Montana Bald Eagle Working Group. 1986. Montana bald eagle management plan. BLM-MT-GI-86-001-4352.

Paige, C., B. Madden, and B. Ruediger. 1991. Habitat management guide for bald eagles in Northwestern Montana. Montana Bald Eagle Working Group.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. Fish and Wildlife Enhancement Office, Helena, MT.

U.S. Fish and Wildlife Service. 1984. American peregrine falcon recovery plan (Rocky Mountain/Southwest populations). Prepared in cooperation with the American peregrine falcon recovery team. U.S. Fish and Wildlife Service, Denver, CO.

SENSITIVE SPECIES

ALPHA, DELTA, EPSILON & ZETA ALTERNATIVES

Standards

1) DNRC recognizes sensitive plant and animal species, both terrestrial and aquatic, may be adversely impacted by land management practices which may lead to their listing as threatened or endangered. Consequently, DNRC would consider sensitive species in project planning through the MEPA process in an attempt to identify and mitigate project effects to sensitive species.

2) For proposed actions, DNRC would refer to databases of the Montana Natural Heritage Program or Forest Service for information on species of special concern within the project area. Sensitive species and their habitats identified in the project area would be given consideration during project planning in an attempt to mitigate potential adverse impacts.

3) Sensitive species and their habitats would not be a primary consideration in management decisions. Measures to protect sensitive species would be implemented if they can be reconciled with other management goals as determined by the decision-maker.

4) Where management of sensitive species is deemed compatible with other management goals, we would maintain site characteristics generally recognized as important so long as this would not substantially reduce trust revenue. Efforts could include limitations on activity, buffer areas of no action, special precautions to limit disturbance, seasonal restrictions, or other measures suggested by specialists.

5) In areas where sensitive plant species are suspected to occur and may be impacted by project actions, a field survey by qualified professionals might be required to determine the presence and mitigation measures for sensitive species. In addition, existing site conditions that might affect the continued maintenance of the local population would be documented.

Monitoring

6) DNRC specialists and field staff would continue to report all sightings of sensitive species to the Montana Heritage Program.

7) On DNRC projects, selected sites would be monitored for implementation of the mitigation measures for protection of sensitive species. Deficiencies would be corrected and used to guide future management actions and mitigation efforts.

BETA AND GAMMA ALTERNATIVES

Standards

1) DNRC recognizes sensitive plant and animal species, both terrestrial and aquatic, may be adversely impacted by land management practices which may lead to their listing as threatened or endangered. Consequently, DNRC would manage so as to support, and enhance where appropriate, populations of sensitive species on state land.

2) For proposed actions, DNRC would refer to data bases of the Montana Natural Heritage Program or Forest Service for information on species of special concern within the project area. Sensitive species and their habitats identified in the project area would be conserved.

3) Sensitive species would be protected by maintaining the site characteristics generally recognized as important to their survival. Localized impacts may be allowed only to promote conditions that sustain long-term viability of plant communities and animal populations.

   A landscape-level analysis would be used to identify critical forest cover conditions that might be impacted by a proposed activity. These conditions would be compared against the habitat needs of sensitive species. Other elements, such as human disturbance, soil disturbance, and road density and use patterns, also would be considered in the protection of sensitive species and their habitats. Appropriate measures would be taken to ensure adequate conditions to support these species or contribute to their habitats.

4) If sensitive plant species were suspected to occur in the project area, then a field survey would be required by qualified specialists to determine the presence and location of sensitive species. In addition, existing site conditions that might affect the continued maintenance of the local populations would be documented.

Monitoring

5) DNRC specialists and field staff would continue to report all sightings of sensitive species to the Montana Heritage Program.

6) On DNRC projects, all sites where sensitive species have been identified would be monitored for implementation of protective measures for sensitive species. Deficiencies would be corrected and used to guide future management actions and mitigation efforts. The goal would be to monitor trends in species coverage on selected sites to guide management.

OMEGA ALTERNATIVE

Premise

We recognize that certain plant and animal species, both terrestrial and aquatic, are particularly sensitive to human activities in managed forests. Populations of such species are usually small and/or declining, and thus continued adverse impacts from land management activities may lead to their being Federally listed as threatened or endangered. Further, because sensitive species usually have specific habitat requirements (tending to be ecological specialists rather than generalists), consideration of their needs is recognized as a useful and prudent "fine filter" for ensuring that we meet our primary goal, namely maintenance of diverse and healthy forests. By considering sensitive species in our management actions, we help to ensure that: 1) we are making decisions appropriate to our fundamental philosophy; and 2) additional Federal listings will not be necessary.

Standards

Fundamental Approach

1) We would manage so as to generally support populations of sensitive species on state land. This policy would be pursued by managing for site characteristics generally recognized as important for ensuring long-term persistence. Localized adverse impacts could be accepted, but only within the context of an overall strategy of supporting habitat capability for these species.

2) For sensitive plant species, important sites and/or site characteristics would be protected with mitigation measures applied to management activities that would likely have substantial long-term impacts.

3) For sensitive animal species, we would provide habitat characteristics recognized as suitable for individuals to survive and reproduce in situations where land ownership patterns and the underlying biological and geographical conditions allow for them. Our contribution toward conservation of wide-ranging animal species that occur in low densities and require very large areas to support self-sustaining populations would be supportive of, albeit subsidiary to, the principal role played by Federal agencies with larger land holdings.

4) For sensitive animal species, we would, for all proposed projects, look for opportunities to provide for habitat needs primarily though managing for the range of historically occurring conditions appropriate to the sites. In blocked ownerships, in addition to considering habitat needs generally, we would consider such issues as connectivity and corridors. In scattered ownerships, we would not necessarily commit to providing all the life-requisites of individual members of sensitive species, particularly if adjacent land-owners managed in ways to limit the potential for individuals on our lands to be part of functional populations.

5) For sensitive animal species, the Forest Management Bureau would provide guidance for managing so as to support these populations. Such guidance would use a hierarchical procedure to identify lands by their appropriateness for providing habitat needs of each listed sensitive species.

6) We would refer to databases maintained by the Montana Natural Heritage Program (MNHP) or the U.S. Forest Service for information on occurrence of plant species of special concern prior to conducting planned land management activities. Where lists or other information indicate potential for sensitive plant species and their habitat to occur within the project area field surveys and/or consultation with qualified professionals may be required to determine the presence, location, and mitigation measures for the sensitive plant species.

7) The Forest Management Bureau Chief would maintain a list of sensitive animal species, which would be specific to each Land Office. To generate and modify this list, we would rely principally on information and classification systems developed by the USDA Forest Service, the MNHP, and the Montana Department of Fish, Wildlife and Parks (for fish species only). Listing by Land Office would be based on the general geographic distribution and habitat affinities of the animal species, and would not require site-specific evidence of presence on state land. Additions to, or deletions from this list, of any animal species not already categorized as "sensitive" by Forest Service Region 1, or as "fish species of special concern" by MDFWP, would require written justification. We would not routinely conduct site-specific surveys for the presence of sensitive animal species.

Monitoring

8) DNRC specialists and field staff would continue to report all observations of sensitive plant and animal species to the MNHP.

9) On DNRC projects with identified sensitive plant species, sites identified as important would be monitored to assess implementation of mitigation measures. On selected DNRC projects with listed sensitive animal species, periodic follow-up surveys would be conducted to assess how well management actions have provided for site conditions needed to support those populations. In both cases, deficiencies would be documented and used to guide future management actions and mitigations.

References for all Alternatives

Project field staff may reference the Montana Heritage Program, and other agency botanists for information on plant occupance, life cycle and habitat requirements.

Remington, D. 1993. Biological diversity strategies for forest type groups, landscape planning process. Montana Department of State Lands.

USDA Forest Service. 1989. Caring for the land. USDA Forest Service Region One Threatened, Endangered, and Sensitive Species Program.

BIG GAME

ALPHA ALTERNATIVE

Standards

1) DNRC would manage big game habitats as a potential source of income to the school trust. To accomplish this, DNRC would keep winter ranges, and all other seasonally important big game habitats (such as summer ranges, calving areas, hiding cover, security areas, etc.), in a condition capable of supporting big game populations, unless the decision-maker determines such measures are not compatible with annual program objectives. In such cases of conflict, the State Forester would determine appropriate levels of habitat protection.

2) DNRC would implement the elk winter habitat management standards and guidelines and the white-tailed deer winter range management standards and guidelines drafted November 1989. Elk standards and guidelines apply to forested bunchgrass winter ranges typical of East-side conifer forests. White-tailed deer standards and guidelines apply to deep snow winter ranges typical of Western Montana conifer forests.

3) DNRC would consult with the Montana Department of Fish, Wildlife and Parks (MDFWP) to determine if seasonally important big game habitat exists within each proposed project area and, if so, to determine which habitat values may be affected by the proposed action. More detailed analyses would be necessary if MDFWP determines that a proposed action might conflict with maintenance of big game habitat. When big game needs are not compatible with other management objectives, conflicts would be addressed by the decision maker on a case-by-case basis.

Monitoring

4) Mitigation efforts described in the project MEPA document, or other record, would be incorporated in sale or lease contracts. Contract administrators would monitor compliance with contract requirements. Deficiencies would be corrected or mitigated by the contractor, under DNRC's supervision.

References

Department of State Lands. 1989. Interim elk winter habitat management standards and guidelines.

Department of State Lands. 1989. Interim white-tailed deer winter range management standards and guidelines.

DNRC, MDFWP and other wildlife biologists, along with other forest management guidelines, would be used as sources of information when determining mitigation measures or when analyzing existing habitat conditions and consequences of management proposals not covered above.

BETA ALTERNATIVE

Standards

1) DNRC would promote a diversity of stand structures and landscape patterns, and rely on them to provide good habitat for native wildlife populations.

2) Big game habitat needs would not be a primary consideration in management decisions. However, measures to mitigate potential impacts would be implemented if they are consistent with overall management objectives, and with the Biodiversity Resource Management Standards.

3) The current elk and white-tailed deer management standards and guidelines drafted November 1989 would no longer be adopted as Department policy.

4) DNRC would consult with MDFWP to determine which big game habitat values are most likely to be affected by proposed management actions.

Monitoring

5) Mitigation efforts described in the project MEPA document, or other record, would be incorporated in sale or lease contracts. Contract administrators would monitor compliance with contract requirements related to big game habitats. as described in environmental documents. Deficiencies would be corrected or mitigated by the contractor, under DNRC supervision.

6) Biodiversity monitoring procedures, described in the Biodiversity Resource Management Standards, would be used to track the health of forest ecosystems. This process would be used as the primary indicator of the health of wildlife populations using these ecosystems. When necessary, corrective actions would be taken as described in the monitoring section of the Biodiversity Resource Management Standards.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands unpublished paper.

GAMMA ALTERNATIVE

Standards

1) DNRC would promote a diversity of stand structures and landscape patterns, and rely on them to provide good habitat for native wildlife populations.

2) Big game habitat needs would not be a primary consideration in management decisions. However, measures to mitigate potential impacts would be implemented if they are consistent with overall management objectives, and with the Biodiversity Resource Management Standards.

3) The current elk and white-tailed deer management standards and guidelines drafted November 1989 would no longer be adopted as Department policy.

4) DNRC would consult with MDFWP to determine which big game habitat values are most likely to be affected by proposed management actions.

Monitoring

5) Mitigation efforts described in the project MEPA document, or other record, would be incorporated in sale or lease contracts. Contract administrators would monitor compliance with contract requirements related to big game habitats as described in environmental documents. Deficiencies would be corrected or mitigated by the contractor, under DNRC supervision.

6) Biodiversity monitoring procedures, described in the Biodiversity Resource Management Standards, would be used to track the health of forest ecosystems. This process would be used as the primary indicator of the health of wildlife populations using these ecosystems. When necessary, corrective actions would be taken as described in the monitoring section of the Biodiversity Resource Management Standards.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands unpublished paper.

DELTA ALTERNATIVE

Standards

1) DNRC would manage aggressively to produce revenue from available forest resources. On some lands, management of big game species, either exclusively or in combination with other resources, would represent the best way to maximize trust income. In these situations, management of other resources would only be used to complement that combination of big game and other resource management that maximizes trust income. Habitat manipulations could be designed to maintain or improve current and future revenue opportunities from fee-based hunting, wildlife viewing, conservation leases or easements to interested parties.

2) Big game habitat needs would be given low priority in situations where revenue potential is greater from management of other resources. Mitigation measures would be implemented to insure that big game species and their essential habitats are likely to remain in each third-order watershed following any proposed DNRC action.

3) The current elk and white-tailed deer management standards and guidelines drafted November 1989 would no longer be adopted as Department policy.

4) DNRC would consult with MDFWP to determine which big game habitat values are most likely to be affected by proposed management actions.

Monitoring

5) Contract administrators would monitor compliance with contract requirements related to big game habitats. Deficiencies would be corrected or mitigated by the contractor, under DNRC supervision.

References

DNRC, MDFWP and other wildlife biologists, along with other forest management guidelines, would be used as sources of information when determining mitigation measures or when analyzing existing habitat conditions and consequences of management proposals not covered above.

EPSILON ALTERNATIVE

Standards

1) DNRC would manage forest lands to produce trust income through a sustained annual timber sale level, while attempting to incorporate big game habitat needs consistent with primary timber management objectives. To accomplish this, DNRC would keep winter ranges and all other seasonal ranges (such as summer ranges, calving areas, hiding cover, security areas, etc.) in a condition capable of supporting big game populations, unless the decision maker determines this is not compatible with timber harvest objectives.

2) DNRC would implement the elk winter habitat management standards and guidelines and the white-tailed deer winter range management standards and guidelines drafted November 1989, where they are compatible with timber management goals. The elk standards and guidelines apply specifically to forested bunchgrass winter ranges typical of East-side conifer forests. The white-tailed deer standards and guidelines apply specifically to deep snow winter ranges typical of Western Montana conifer forests.

3) DNRC would consult with the MDFWP to determine if important big game habitat exists within each proposed timber sale and, if so, to determine which habitat values are most likely to be affected by the proposed harvest. More detailed analyses would be done if MDFWP determines that a proposed sale might conflict with maintenance of big game habitat. Mitigation measures would be implemented to insure that big game species and their essential habitats are likely to remain in each third-order watershed following any proposed DNRC action.

Monitoring

4) Mitigation efforts described in the project MEPA document, or other decision record, would be incorporated in sale or lease contracts. Contract administrators would monitor compliance with contract requirements related to big game habitats. Deficiencies would be corrected or mitigated by the contractor, under DNRC supervision.

References

Department of State Lands. 1989. Interim elk winter habitat management standards and guidelines.

Department of State Lands. 1989. Interim white-tailed deer winter range management standards and guidelines.

DNRC, MDFWP and other wildlife biologists, along with other forest management guidelines, would be used as sources of information when determining mitigation measures or when analyzing existing habitat conditions and consequences of management proposals not covered above.

ZETA ALTERNATIVE

Standards

1) DNRC would emphasize revenue production from recreational development and wildlife management. On some lands, big game management would represent the best way to maximize trust income. In these situations, other resource uses would be limited to that combination of big game and other uses that would maximize trust income. Big game habitat manipulations could be designed to maintain or improve current and future revenue opportunities from fee-based hunting, wildlife viewing, conservation leases or easements.

2) Big game habitat needs would be secondary in situations where revenue potential from management of recreation developments or other resources is clearly higher. When managing other resources, wildlife mitigation measures would be designed to maintain at least 50 to 60 percent of the potential wildlife habitat value.

3) The current elk and white-tailed deer management standards and guidelines drafted November 1989 would no longer be adopted as Department policy.

4) DNRC would consult with MDFWP to determine how best to enhance big game and other wildlife habitat values in situations where big game management is a priority. In areas managed for recreation developments or other resources, consultations with wildlife biologists would be used to develop appropriate mitigation measures.

Monitoring

5) Contract administrators would monitor compliance with contract requirements related to big game habitats. Deficiencies would be corrected or mitigated by the contractor, under DNRC supervision.

References

DNRC, MDFWP and other wildlife biologists, along with other forest management guidelines, would be used as sources of information when determining mitigation measures or when analyzing existing habitat conditions and consequences of management proposals not covered above.

OMEGA ALTERNATIVE

Standards

1) DNRC would promote a diversity of stand structures and landscape patterns, and rely on them to provide good habitat for native wildlife populations.

2) To the extent possible, we would manage to provide for big game habitat. Measures to mitigate potential impacts would be implemented if they are consistent with overall management objectives, and with the Biodiversity Resource Management Standards.

3) The current elk and white-tailed deer management standards and guidelines drafted November 1989 would no longer be adopted as Department policy.

4) DNRC would consult with MDFWP to determine which big game habitat values are most likely to be affected by proposed management actions and would cooperate with MDFWP to limit detrimental impacts to big game.

Monitoring

5) Mitigation efforts described in the project MEPA document, or other record, would be incorporated in sale or lease contracts. Contract administrators would monitor compliance with contract requirements related to big game habitats. as described in environmental documents. Deficiencies would be corrected or mitigated by the contractor, under DNRC supervision.

6) Biodiversity monitoring procedures, described in the Biodiversity Resource Management Standards, would be used to track the health of forest ecosystems. This process would be used as the primary indicator of the health of wildlife populations using these ecosystems. When necessary, corrective actions would be taken as described in the monitoring section of the Biodiversity Resource Management Standards.

References

Remington, D. 1993. Biological diversity strategies for forest type groups. Montana Department of State Lands unpublished paper.

GRAZING ON CLASSIFIED FOREST LANDS

ALPHA ALTERNATIVE

Standards

1) State Forest Land Use Authorization for a grazing license on classified Forest lands would indicate the number of animal unit months (AUMs) and grazing period of use. Grazing leases (forested classified Grazing lands) would specify the number of AUMs but not the grazing period of use.

2) Lessees and licensees would have primary responsibility for developing and maintaining rangeland improvements. They would also be responsible for maintaining or improving range condition by managing livestock grazing in a manner that produces a stable or upward trend in existing range condition.

3) Stocking rates would be estimated by visual assessment of existing vegetative plant species composition. Estimated species composition by weight per range site would be compared to potential (climax range condition) for a specific range sites. The following references, published by the USDA Soil Conservation Service, would serve as technical guides: "Guides for Determining Range Condition and Initial Stocking Rates"; Range Site Criteria; and "Guides to Determine Forest Understory Vegetation Condition and Recommended Stocking Rates". Range site would be determined by soil characteristics, topography, climate, and professional judgement.

4) Riparian management concerns, such as utilization of riparian vegetation and mechanical damage to stream channels, would be given consideration only in isolated instances, primarily in conjunction with mixed ownership allotments.

Monitoring

5) Grazing leases and licenses would be evaluated by DNRC field personnel once within the 10 year lease/license term. This evaluation could be supplemented by other on-site reviews to address management concerns, requests to place improvements on state land, or during scheduled reviews by the lessee or licensee.

6) During the once-every-ten-year review a stocking rate for each lease or license scheduled for renewal in the upcoming calendar year would be determined. Improvements, livestock distribution patterns, management concerns, and range condition would be documented on a field evaluation form.

7) Follow-up contact with the lessee or licensee would be accomplished, if deemed appropriate due to management concerns noted during on-site review. Contacts would vary in depth from a simple letter that would notify the lessee/licensee of the problem, problem location, lessee/licensee contract responsibilities, and required action to address the problem. More difficult problems might involve development and agreement to a written long-term management plan and a Supplemental Lease Agreement (SLA).

BETA AND OMEGA ALTERNATIVES

Standards

1) Grazing licenses (classified Forest lands) and grazing leases (forested classified Grazing lands) would specify the number of animal unit months (AUMs), kinds of livestock, and grazing period of use. Lease/license stipulations would be set at the time of lease/license renewal.

2) Lessees and licensees would have primary responsibility for developing and maintaining range land improvements. They would also be responsible for maintaining or improving range sites by managing livestock grazing and utilization in a manner that would produce a stable or upward trend in range condition. DNRC would support rangeland improvements through technical and financial assistance, as workload and budget allowed. Rangeland improvements could include riparian management, weed control, prescribed burning, water developments, grazing management systems, fencing, and conversion of forest edge ecotones to grassland. Cost-sharing for improvements between the lessee/licensee and the state would be accomplished through an addendum to the lease/license. The addendum would stipulate terms and conditions by which the lessee/licensee may be required to reimburse the state for improvement expenses incurred.

3) Stocking rates would be estimated by visual assessment of existing vegetative plant species composition. Estimated species composition by weight per range site would be compared to potential (climax range condition) for a specific range sites. The following references, published by the USDA Soil Conservation Service, would serve as technical guides: "Guides for Determining Range Condition and Initial Stocking Rates"; Range Site Criteria; and "Guides to Determine Forest Understory Vegetation Condition and Recommended Stocking Rates". Range site would be determined by soil characteristics, topography, climate, and professional judgement.

4) Livestock management practices would be designed to prevent unacceptable loss of streambank vegetation and structural damage to streambanks that results in nonpoint source pollution. Practices would be designed to: (1) improve or restore both herbaceous and woody species to a healthy and vigorous condition and facilitate the ability of vegetation to reproduce and maintain different age classes in the desired riparian-wetland plant communities; and (2) leave sufficient vegetation biomass and plant residue (including woody debris) to provide for adequate sediment filtering and dissipation of stream energy for bank protection.

5) Mineral, protein, and other supplements would be placed so as to maximize animal distribution away from riparian areas. Holding facilities would be placed outside of riparian areas.

6) Continuous season-long grazing would be authorized with the level of forage utilization not to exceed 60 percent and healthy riparian function maintained.

Monitoring

7) a) At renewal (every 10 years), leases/licenses would be evaluated for the following: range condition; plant species composition; riparian browse utilization; and streambank disturbance.

b) Leases/licenses would be evaluated at mid-term (every 5th year) for the following: riparian browse utilization; streambank disturbance; and an ocular assessment of tract condition with notations for potential concerns or problems.

c) Range condition would be evaluated using standard USDA Soil Conservation Service methods and recorded on a DNRC Field Evaluation Form. Browse utilization would be measured using standardized survey methods, such as the Cole Browse Survey Method (Patton and Hall, 1966) or a modified version of Evaluating Health of Riparian Areas on the Charles M. Russell National Wildlife Refuge (Cook, et al., 1993) to measure form class of shrubs or percent riparian vegetation utilization, respectively. No shrubs would be in the heavily hedged form class and less than 25 percent of the shrubs would be in the moderately hedged form class. In addition, streambank disturbance induced by livestock trampling would be limited to less than 10 percent alteration per 500 feet of streambank.

d) Areas that showed resource damage greater than the prescribed limits would be mitigated or rehabilitated by the lessee, with technical assistance from DNRC. If improved management did not resolve the damage, adjustments in the license or lease would be used to facilitate rehabilitation efforts.

GAMMA ALTERNATIVE

Standards

1) Grazing licenses (classified Forest lands) and grazing leases (forested classified Grazing lands) would specify the number of animal unit months (AUMs), kinds of livestock, and grazing period of use. Lease/license stipulations would be set at the time of lease/license renewal.

2) Lessees and licensees would have primary responsibility for developing and maintaining range land improvements. They would also be responsible for maintaining or improving range sites by managing livestock grazing and utilization in a manner that produces a stable or upward trend in range condition. DNRC would support rangeland improvements through technical and financial assistance, as workload and budget allowed. Rangeland improvements might include riparian management, weed control, prescribed burning, water developments, grazing management systems, fencing, and conversion of forest edge ecotones to grassland. Cost-sharing for improvements between the lessee/licensee and the state would be accomplished through an addendum to the lease/license. The addendum would stipulate terms and conditions by which the lessee/licensee may be required to reimburse the state for improvement expenses incurred.

3) Stocking rates would be estimated by visual assessment of existing vegetative plant species composition. Estimated species composition by weight per range site would be compared to potential (climax range condition) for specific range sites. The following references, published by the USDA Soil Conservation Service, would serve as technical guides: "Guides for Determining Range Condition and Initial Stocking Rates"; Range Site Criteria; and "Guides to Determine Forest Understory Vegetation Condition and Recommended Stocking Rates". Range site would be determined by soil characteristics, topography, climate, and professional judgement.

4) Livestock management practices would be designed to prevent unacceptable loss of streambank vegetation and structural damage to streambanks that results in nonpoint source pollution. Practices would be designed to: (1) improve or restore both herbaceous and woody species to a healthy and vigorous condition and facilitate the ability of vegetation to reproduce and maintain different age classes in the desired riparian-wetland plant communities; and (2) leave sufficient vegetation biomass and plant residue (including woody debris) to provide for adequate sediment filtering and dissipation of stream energy for bank protection.

5) Mineral, protein, and other supplements would be placed so as to maximize animal distribution away from riparian areas. Holding facilities would be placed outside of riparian areas.

6) Continuous season-long grazing would not be allowed. A grazing system would be developed by the lessee/licensee.

Monitoring

7) a) At renewal (every 10 years), leases/licenses would be evaluated for the following: range condition; plant species composition; riparian browse utilization; and streambank disturbance.

b) Leases/licenses would also be evaluated every two years for the following: riparian browse utilization; streambank disturbance; and an ocular assessment of tract condition with notations for potential concerns or problems.

c) Range condition would be evaluated using standard USDA Soil Conservation Service methods and recorded on a DNRC Field Evaluation Form. Browse utilization would be measured using standardized survey methods, such as the Cole Browse Survey Method (Patton and Hall, 1966) or a modified version of Evaluating Health of Riparian Areas on the Charles M. Russell National Wildlife Refuge (Cook, et al., 1993) to measure form class of shrubs or percent riparian vegetation utilization, respectively. No shrubs would be in the heavily hedged form class and less than 10 percent of the shrubs would be in the moderately hedged form class. In addition, streambank disturbance induced by livestock trampling would be limited to less than five percent alteration per 500 feet of streambank.

d) Areas that show resource damage due to livestock greater than the prescribed limits would be mitigated or rehabilitated by the lessee, with technical assistance from DNRC. If improved management did not resolve the damage, adjustments in the license or lease would be used to facilitate rehabilitation efforts.

DELTA AND EPSILON ALTERNATIVES

Standards

1) Grazing licenses (classified Forest lands) and grazing leases (forested classified Grazing lands) would specify the number of animal unit months (AUMs), and grazing period of use. Lease/license stipulations would be set at the time of lease/license renewal.

2) Lessees and licensees would have primary responsibility for developing and maintaining range land improvements. They would also be responsible for maintaining or improving range sites by managing livestock grazing and utilization in a manner that produces a stable or upward trend in range condition. DNRC would support rangeland improvements through technical assistance, as workload and budget allowed. Rangeland improvements may include riparian management, weed control, prescribed burning, water developments, grazing management systems, fencing, and conversion of forest edge ecotones to grassland. Cost-sharing for improvements between the lessee/licensee and the state would be accomplished through an addendum to the lease/license. The addendum would stipulate terms and conditions by which the lessee/licensee may be required to reimburse the state for improvement expenses incurred.

3) Stocking rates would be estimated by visual assessment of existing vegetative plant species composition. Estimated species composition by weight per range site would be compared to potential (climax range condition) for specific range sites. The following references, published by the USDA Soil Conservation Service, would serve as technical guides: "Guides for Determining Range Condition and Initial Stocking Rates"; Range Site Criteria; and "Guides to Determine Forest Understory Vegetation Condition and Recommended Stocking Rates". Range site would be determined by soil characteristics, topography, climate, and professional judgement.

4) Livestock management practices would be designed to prevent unacceptable loss of streambank vegetation and structural damage to streambanks that results in nonpoint source pollution. Practices would be designed to: (1) improve or restore both herbaceous and woody species to a healthy and vigorous condition and facilitate the ability of vegetation to reproduce and maintain different age classes in the desired riparian-wetland plant communities; and (2) leave sufficient vegetation biomass and plant residue (including woody debris) to provide for adequate sediment filtering and dissipation of stream energy for bank protection.

5) Mineral, protein, and other supplements would be placed so as to maximize animal distribution away from riparian areas. Holding facilities would be placed outside of riparian areas.

6) Continuous season-long grazing would be authorized only when it has been demonstrated to be consistent with achieving properly functioning range condition, including healthy riparian areas.

Monitoring

7) a) At renewal (every 10 years), leases/licenses would be evaluated for the following: range condition; plant species composition; riparian browse utilization; and streambank disturbance.

b) Leases/licenses would be evaluated at mid-term (every 5th year) for the following: riparian browse utilization; streambank disturbance; and an ocular assessment of tract condition with notations for potential concerns or problems.

c) Range condition would be evaluated using standard USDA Soil Conservation Service methods and recorded on a DNRC Field Evaluation Form. Browse utilization would be measured using standardized survey methods, such as the Cole Browse Survey Method (Patton and Hall, 1966) or a modified version of Evaluating Health of Riparian Areas on the Charles M. Russell National Wildlife Refuge (Cook, et al., 1993) to measure form class of shrubs or percent riparian vegetation utilization, respectively. No shrubs would be in the heavily hedged form class and less than 50 percent of the shrubs would be in the moderately hedged form class. In addition, streambank disturbance induced by livestock trampling would be limited to less than 20 percent alteration per 500 feet of streambank.

d) Areas that show resource damage greater than the prescribed limits would be mitigated or rehabilitated by the lessee, with technical assistance from DNRC. If improved management did not resolve the damage, adjustments in the license or lease would be used to facilitate rehabilitation efforts.

ZETA ALTERNATIVE

Standards

1) Grazing licenses (classified Forest lands) and grazing leases (forested classified Grazing lands) would specify the number of animal unit months (AUMs), kinds of livestock, and grazing period of use. Lease/license stipulations would be set at the time of lease/license renewal.

2) Lessees and licensees would have primary responsibility for developing and maintaining range land improvements. They would also be responsible for maintaining or improving range sites by managing livestock grazing and utilization in a manner that produces a stable or upward trend in range condition. DNRC would support rangeland improvements through technical and financial assistance, as workload and budget allowed. Rangeland improvements might include riparian management, weed control, prescribed burning, water developments, grazing management systems, fencing, and conversion of forest edge ecotones to grassland. Cost-sharing for improvements between the lessee/licensee and the state would be accomplished through an addendum to the lease/license. The addendum would stipulate terms and conditions by which the lessee/licensee may be required to reimburse the state for improvement expenses incurred.

3) Stocking rates would be estimated by visual assessment of existing vegetative plant species composition. Estimated species composition by weight per range site would be compared to potential (climax range condition) for a specific range sites. The following references, published by the USDA Soil Conservation Service, would serve as technical guides: "Guides for Determining Range Condition and Initial Stocking Rates"; Range Site Criteria; and "Guides to Determine Forest Understory Vegetation Condition and Recommended Stocking Rates". Range site would be determined by soil characteristics, topography, climate, and professional judgement.

4) Livestock management practices would be designed to prevent unacceptable loss of streambank vegetation and structural damage to streambanks that results in nonpoint source pollution. Practices would be designed to: (1) improve or restore both herbaceous and woody species to a healthy and vigorous condition and facilitate the ability of vegetation to reproduce and maintain different age classes in the desired riparian-wetland plant communities; (2) leave sufficient vegetation biomass and plant residue (including woody debris) to provide for adequate sediment filtering and dissipation of stream energy for bank protection; (3) develop grazing management systems; and (4) manage water developments to distribute livestock grazing outside of riparian areas.

5) Mineral, protein, and other supplements would be placed so as to maximize animal distribution away from riparian areas. Holding facilities would be placed outside of riparian areas.

6) Continuous season-long grazing would be authorized with the level of forage utilization not to exceed 30 percent and riparian function maintained.

Monitoring

7) a) At renewal (every 10 years), leases/licenses would be evaluated for the following: range condition; plant species composition; riparian browse utilization; and streambank disturbance.

b) Leases/licenses would be evaluated at mid-term (every 5th year) for the following: riparian browse utilization; streambank disturbance; and an ocular assessment of tract condition with notations for potential concerns or problems.

c) Range condition would be evaluated using standard USDA Soil Conservation Service methods and recorded on a DNRC Field Evaluation Form. Browse utilization would be measured using standardized survey methods, such as the Cole Browse Survey Method (Patton and Hall, 1966) or a modified version of Evaluating Health of Riparian Areas on the Charles M. Russell National Wildlife Refuge (Cook, et al., 1993) to measure form class of shrubs or percent riparian vegetation utilization, respectively. No shrubs would be in the heavily hedged form class and less than 25 percent of the shrubs would be in the moderately hedged form class. In addition, streambank disturbance induced by livestock trampling would be limited to less than 10 percent alteration per 500 feet of streambank.

d) Areas that showed resource damage greater than the prescribed limits would be mitigated or rehabilitated by the lessee, with technical assistance from DNRC. If improved management did not resolve the damage, adjustments in the license or lease would be used to facilitate rehabilitation efforts.

References for all Alternatives

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Kinch, Gene. 1989. Riparian area management -- grazing management in riparian areas. USDI-Bureau of Land Management Technical Reference 1734-4.

Lacey, J. and J. E. Taylor. 1985. Montana guide to range site, condition and initial stocking rates. MSU Cooperative Extension Service, MT 8515 A.

Patton, David R. and Hall, John M. 1966. Evaluating key areas by browse age and form class. Journal of Wildlife Management 30(3):476-480.

USDA Forest Service. Wildlife Survey Handbook 2609.

Zacek, J. C. Date Unknown. Montana grazing guide. USDA Soil Conservation Service.

WEED MANAGEMENT

ALPHA ALTERNATIVE

Standards

1) Forested state lands would be managed to prevent or control the spread of noxious weeds. We would comply with the weed management law, through revegetation plans and agreements with county weed boards.

2) DNRC would submit general revegetation plans to county weed boards for their review of land-disturbing projects such as road construction associated with timber harvest.

3) In areas where weeds are widespread across state and adjacent ownerships DNRC would cooperate with weed districts for control projects across all ownerships.

3a) We would use an integrated pest management approach for noxious weed control in accordance with HB 395 (§ 2-22-2151, MCA, as amended 1995) including cultural, biological and chemical methods as appropriate.

4) We would promote prevention of weed spread by requiring a combination of measures such as cleaning road construction and harvest equipment, prompt revegetation of roads, and reducing ground disturbance.

5) Stipulations and control measures to limit the spread of weeds would be included in timber sale contracts.

6) Herbicide treatments would be limited to areas where herbicides offer the most cost effective means of control and funds were available. New outbreaks of noxious weeds would have first priority for control. Weed management of large areas of weed infestation might be limited to perimeter weed containment.

7) On unleased and unlicensed state lands, DNRC would be responsible for weed control and would implement control as funds were available.

8) A lessee or licensee of state land would be responsible for weed control as outlined in Surface Management Rules 26.3.156. The lessee or licensee must provide weed control at their cost and must comply with the Montana County Weed Management Act.

9) All right of way agreements would require the permittee to control weed problems along the right of way associated with the permittee's use.

10) On sites where weeds are introduced by recreation use, a portion of recreational access fees would be used, as available, for weed control.

Monitoring

11) On selected DNRC projects, field staff and specialists would review implementation of noxious weed control and mitigation measures. Deficiencies would be remedied if project contract is not completed.

BETA, ZETA & OMEGA ALTERNATIVES

Standards

1) Forested state lands would be managed to prevent or control the spread of noxious weed. We would comply with the weed management law by inventorying noxious weed occurrences, developing management plans, and allocating funds for weed control projects.

2) DNRC would submit general revegetation plans to county weed boards for their review of land-disturbing projects such as road construction associated with timber harvest. We would promptly revegetate with site-adapted grasses that emphasize native species.

3) In areas where weeds are widespread across state and adjacent ownerships DNRC would cooperate with weed districts for control projects across all ownerships.

3a) We would use an integrated pest management approach for noxious weed control in accordance with HB 395 (§ 2-22-2151, MCA, as amended 1995) including cultural, biological and chemical methods as appropriate.

4) We would promote prevention of weed spread by requiring a combination of measures such as, use of weed-free equipment, prompt revegetation of roads, and reduction of ground disturbance.

5) Stipulations and control measures to limit the spread of weeds would be attached to timber sale contracts. Where specified, weed control efforts would continue for two years following land disturbance.

6) Herbicide treatments would be limited to areas where herbicide offers the most cost effective means of control, and where biological and mechanical control measures are ineffective. New outbreaks of noxious weeds and locations where native plant communities are threatened by noxious weed encroachment would have first priority for control. Large areas of weed infestation may be limited to perimeter weed containment.

7) On unleased lands, DNRC would be responsible for weed control.

8) A lessee or licensee of state land would be responsible for weed control as outlined in Surface Management Rules 26.3.156. The lessee or licensee must provide weed control at his cost and must comply with the Montana County Weed Management Act.

9) All right of way and special use agreements would require the permittee to control weeds in association with the permittee's use. This may include fees charged for weed control.

10) On sites where weeds are introduced by recreation use, a portion of recreational access fees would be available for weed control.

Monitoring

11) On DNRC projects where weeds were a concern, field staff and specialists would review implementation of noxious weed control and mitigation measures. Deficiencies would be remedied.

12) Whenever field reviews were made, DNRC staff would inventory and map all infestations of noxious weeds on grazing leases/licenses. Lessees/ Licensees would be notified of the weeds and could be required to enter into a supplemental lease agreement (SLA) which outlines specific control measures. In order to ensure an integrated approach, county weed staff may be contacted to assist in developing these weed control measures.

13) On sites where a SLA outlines weed control remedies, DNRC would make follow-up reviews as necessary, to ensure the control measures are completed. Failure by the lessee to perform any of the terms stipulated in the SLA would result in cancellation of the lease.

GAMMA ALTERNATIVE

Standards

1) Forested state lands would be managed to prevent or control the spread of noxious weeds and action taken to re-establish natural plant communities. We would comply with the weed management law by inventorying noxious weed occurrences, developing management plans, and allocating funds for weed control projects.

2) DNRC would submit revegetation plans to county weed boards for their review of land-disturbing projects such as road construction associated with timber harvest.

2a) We would promptly revegetate roads, landings, and disturbed areas with site adapted grasses that emphasize native species.

3) In areas where weeds are widespread across state and adjacent ownerships, DNRC would cooperate with weed districts for control projects across all ownerships.

3a) We would use an integrated pest management approach for noxious weed control in accordance with HB 395 (§ 2-22-2151, MCA, as amended 1995) including cultural, biological and chemical methods as appropriate.

4) We would promote prevention of weed spread by requiring road construction and harvest equipment to be cleaned prior to moving equipment into a project area.

5) Stipulations and control measures to limit the spread of weeds would be attached to timber sale contracts. On weed free areas, contractors would be responsible for weed control for two years following land disturbance.

6) Herbicide treatments would be very limited, to areas where herbicide control is most effective, and native plant communities are threatened by noxious weed encroachment. Herbicide treatments would focus on narrow spectrum/site specific applications.

7) On unleased or unlicensed lands, DNRC would be responsible for weed control and would fund control measures.

8) A lessee or licensee of state land would be responsible for weed control as outlined in Surface Management Rules 26.3.156. The lessee or licensee must provide weed control at his cost and must comply with the Montana County Weed Management Act.

9) All right of way and special use agreements would require the permittee to control weed problems along the right of way associated with the permittee's use. This may include fees charged for weed control. Vehicle restrictions to reduce the spread of weeds would be integrated into road management plans and right of ways.

10) On sites where weeds are introduced by recreation use, a portion of recreational access fees would be used for weed control. If recreational use funds were not available, and weeds increased, then DNRC would supplement weed control.

Monitoring

11) On DNRC projects where weeds are a concern, field staff and specialists would review implementation of noxious weed control and mitigation measures. Deficiencies would be remedied.

12) Whenever field reviews were made, DNRC staff would inventory and map all infestations of noxious weeds on grazing leases/licenses. Lessees/ Licensees would be notified of the weeds and could be required to enter into a Supplemental Lease Agreement (SLA) which outlines specific control measures. In order to ensure an integrated approach, county weed staff may be contacted to assist in developing these weed control measures.

13) On sites where a SLA outlined weed control remedies, DNRC would make follow-up reviews as necessary to ensure the control measures are completed. Failure by the lessee to perform any of the terms stipulated in the SLA would result in cancellation of the lease, or fees would be charged for contract weed control.

DELTA ALTERNATIVE

Standards

1) Forested state lands would be managed to prevent or control the spread of noxious weeds and improve the economic return from those lands. We would comply with the weed management law through revegetation plans and agreements with county weed boards.

2) DNRC would submit general revegetation plans to county weed boards for their review of land-disturbing projects such as road construction associated with timber harvest.

3) In areas where weeds are widespread across state and adjacent ownerships DNRC would cooperate with weed districts for control projects across all ownerships.

3a) We would use an integrated pest management approach for noxious weed control in accordance with HB 395 (§ 2-22-2151, MCA, as amended 1995) including cultural, biological and chemical methods as appropriate.

4) We would promote prevention of weed spread by requiring road construction and harvest equipment to be cleaned prior to moving equipment into a project area.

5) Stipulations and control measures to limit the spread of weeds would be attached to timber sale contracts.

6) Herbicide treatments would be limited to areas where herbicide control is most effective, where biological and mechanical control measures are less effective, and where improved forage would increase income potential. New outbreaks of noxious weeds would have first priority for control. Weed management of large areas of weed infestation may be limited to perimeter weed containment.

7) On unleased state lands, DNRC would be responsible for weed control.

8) A lessee or licensee of state land would be responsible for weed control as outlined in Surface Management Rules 26.3.156. The lessee or licensee must provide weed control at his cost and must comply with the Montana County Weed Management Act.

9) All right of way and special use agreements would require the permittee to control weeds in association with the permittee's use. This may include fees charged for weed control.

10) On sites where weeds were introduced by recreation use, a portion of recreational access fees would be used as available for weed control.

Monitoring

11) On selected DNRC projects where weeds were a concern, field staff and specialists would review implementation of noxious weed control and mitigation measures.

12) Whenever field reviews were made, DNRC staff would inventory and map all infestations of noxious weeds on grazing leases/licenses. Lessees/ Licensees would be notified of the weeds and could be required to enter into a supplemental lease agreement (SLA) which outlines specific control measures. To ensure an integrated approach, county weed staff may be contacted to assist in developing these weed control measures.

13) On sites where a SLA outlined weed control remedies, DNRC would make follow-up reviews as necessary, to ensure the control measures are completed. Failure by the lessee to perform any of the terms stipulated in the SLA would result in cancellation of the lease or fees would be charged to contract weed control.

EPSILON ALTERNATIVE

Standards

1) Forested state lands would be managed to prevent or control the spread of noxious weeds. We would comply with the weed management law, through revegetation plans and agreements with county weed boards.

2) DNRC would submit general revegetation plans to county weed boards for their review of land-disturbing projects such as road construction associated with timber harvest.

3) In areas where weeds were widespread across state and adjacent ownerships DNRC would cooperate with weed districts for control projects across all ownerships.

3a) We would use an integrated pest management approach for noxious weed control in accordance with HB 395 (§ 2-22-2151, MCA, as amended 1995) including cultural, biological and chemical methods as appropriate.

4) We would promote prevention of weed spread by requiring road construction and harvest equipment to be cleaned prior to moving equipment into a project area.

5) Stipulations and control measures to limit the spread of weeds would be attached to timber sale contracts.

6) Herbicide treatments would be limited to areas where herbicide offer the most cost effective means of control, and where biological and mechanical control measures are ineffective. New outbreaks of noxious weeds would have first priority for control. Large areas of weed infestation may be limited to perimeter weed containment.

7) On unleased or unlicensed lands, DNRC would be responsible for weed control.

8) A lessee or licensee of state land would be responsible for weed control as outlined in Surface Management Rules 26.3.156. The lessee or licensee must provide weed control at his cost and must comply with the Montana County Weed Management Act.

9) All right of way agreements require the permittee to control weeds along the right of way in association with the permittee's use. This may include fees charged for weed control.

10) On sites where weeds are introduced by recreation use, a portion of recreational access fees would be used as available for weed control.

Monitoring

11) On selected DNRC projects, field staff and specialists would review implementation of noxious weed control and mitigation measures. Deficiencies could be remedied if project contract is not completed.

12) Whenever field reviews were made, DNRC staff would inventory and map all infestations of noxious weeds on grazing leases/licenses. Lessees/ Licensees would be notified of the weeds and could be required to enter into a supplemental lease agreement (SLA) which outlines specific control measures. In order to ensure an integrated approach, county weed staff may be contacted to assist in developing these weed control measures.

13) On sites where a SLA outlines weed control remedies, DNRC would make follow-up reviews as necessary, to ensure the control measures are completed. Failure by the lessee to perform any of the terms stipulated in the SLA would result in cancellation of the lease.

APPENDIX VEG

FOREST VEGETATION APPENDIX

INTRODUCTION

In the DEIS, this appendix included supporting documentation for the Forest Vegetation discussion contained in Chapters III and IV. In an effort to reduce duplication, this information has been incorporated into the text of Chapter IV. We are hopeful that providing all of the methodology in one location, it will be easier to understand the Forest Vegetation assessment. This appendix now includes a discussion of the concept of "forest health."

VIEW OF THE FOREST HEALTH ISSUE AND OPPORTUNITIES FOR ECOLOGICAL RESTORATION

INTRODUCTION

The effects of fire suppression and forest management on "forest health" have received a great deal of scientific and public attention in recent years. The record-setting 1994 fire season has drawn further attention to these issues, and there has been a great deal of public debate over the causes of and suggested solutions to the problems. Some forest industry spokespersons have seemed to imply that our forests would be virtually free of wildfires and insect outbreaks if they were healthy. Meanwhile, some environmental groups have charged that the whole forest health issue is just another excuse to continue unsustainable logging practices.

The forest vegetation analysis for the Department of Natural Resources and Conservation' State Forest Land Management Plan attempts to describe predicted future forest characteristics in terms of forest health. The visibility of the forest health issue and public debate make it especially important to describe thoroughly what is meant by "forest health" in this context. A credible analysis must be based on current scientific understanding of forest ecology, and not on common misunderstandings surrounding the subject.

It must be understood from the outset that our state of knowledge about forest ecosystems is not complete or perfect. Conceptual models and theories are always subject to further testing, and to substantial refinement as new findings are made. In the meantime, a number of concepts remain subjects of considerable scientific debate. In order to treat the emerging understanding of Inland West forest ecology in a reasonably balanced fashion, a number of sources have been used that address various facets of the forest health issue.

Where appropriate, interpretations have been made of ecological processes, based on observations and ecological understanding. Interpretations of forest inventory data have been made with extensive consultation with Brian Long, DNRC Inventory Section Supervisor. Much of this interpretation of the forest ecology of the Inland West is summarized in an unpublished manuscript (Remington 1993), of which earlier drafts have received substantial expert review.

NATURAL ECOLOGICAL PROCESSES

Forest ecosystems are not static, unchanging entities. Plant communities undergo somewhat predictable patterns of development and disturbance over time, and form rather predictable patterns of distribution in the overall landscape. These patterns, along with the composition of plant communities, are shaped by their physical environment of soil characteristics, moisture and temperature, and the interactions between individuals and species (Oliver and Larson 1990).

It can be useful to view these ecosystem patterns in terms of the cycles in which carbon and other elements accumulate and move. As plants grow, carbon from the atmosphere accumulates in their tissues; when they die, it is released through decomposition or combustion. In dry temperate forests such as those of the Inland West, microbial decomposition cannot keep pace with accumulation of dead material, and fire becomes essential for release of this stored carbon to the atmosphere (Harvey et al. 1992, Oliver et al. 1994).

In addition to recycling carbon from dead plant material, wildfire, insects and microbes have important functions in limiting the amount of live plant material as well. In harsh environments especially, densely-stocked trees compete excessively for limited moisture and nutrients and are under considerable stress. Fire and pathogens often serve to reduce stocking, or the amount of carbon stored in live biomass, and thus maintain lower levels of stress in these environments (Harvey et al 1992).

The cycle of carbon accumulation and loss in forest ecosystem provides an overall framework for understanding the critical functions of wildfires, insects and pathogens in Inland Northwest forests.

Wildfires: Wildfire has been a potent natural force in shaping Inland West ecosystems (Arno 1976, Arno and Brown 1989, Agee 1990, Habeck 1990, Mutch et al. 1993, Covington et al. 1994). Scientific observations of the extent of fire in western Montana forests date back at least to those of Whitford (1905), who noted both the pervasiveness of wildfire in forests in the Flathead River basin and the great variation in fire intensity. Whitford noted that "there is scarcely a section of land that has not been more or less burned over." He also put much of the blame on early white settlers, stating, "It is also very evident that the fires are more numerous since the settling of the country by civilized man than before." Ayres, in his reconnaissance of the turn-of-the-century Flathead and the Lewis and Clarke Forest Reserves (1900 a,b) made similar comments.

More recent studies have attempted to quantify the frequency of fire, using analysis of fire scars (e.g. Arno 1976, Freedman and Habeck 1985, Habeck 1990) and stand age distributions (Antos 1977, Antos and Habeck 1981). These methodologies allow evaluation of fire intervals going back as far as the 1500s in some cases (Arno 1976, Habeck 1990), thus minimizing the confounding influence of early white settlers on estimated fire frequencies.

Fire intervals and patterns vary substantially by forest type and moisture regime. These intervals are shaped by the frequency of conditions favorable to fire ignition and spread, and by the relative rates of carbon accumulation, decomposition, and stress levels as described above. Because of these factors, wildfires tend to occur most frequently in severe environments (Harvey et al. 1992, Mutch et al. 1993). Agee (1990) provides an excellent overview, dividing fire regimes into three broad groups and giving a few examples of each.

Fires in warm, dry forest types such as ponderosa pine were very frequent. Arno (1976) reported average intervals of 6 to 19 years in the Bitterroot drainage, Freedman and Habeck (1985) found 17-year average intervals in the upper Swan Valley, and Habeck (1990) reported 7-year intervals near Missoula. Native Americans as well as lightning may have been responsible for many of these ignitions (Arno 1976, Habeck 1990, Mutch et al. 1993, Covington et al. 1994). These fires were typically of low intensity because of the lack of time for fuels to accumulate.

In slightly moister forests, fire intervals tended to be somewhat longer. Arno (1976) found fire intervals of 17 to 28 years in warm moist to lower subalpine habitat types in the Bitterroot National Forest. Freedman and Habeck (1985) reported intervals averaging 30 years for the moister portion of their Swan Valley study area.

According to Agee (1990), these moderate fire regimes are the most complex to typify. Areas of low-intensity underburns are commonly interspersed with patches of high-severity replacement burning, resulting in a patchy forest mosaic (Freedman and Habeck 1985, Agee 1990, Mutch et al. 1993, Harvey et al. in press). A number of early photos in Ayres (1900b) and Whitford (1905) taken in these environments appear to suggest two-storied stands, typically with scattered overstories dominated by fire-resistant larch over mixed-species understory patches of various ages.

Still moister environments experienced fire only infrequently, and fires were typically intense and stand-replacing when they did occur (Agee 1990). Studies by Antos in humid environments in the Swan Valley suggest that stand-replacing fires occurred on an average interval of 100-200 years. Some of Antos' study sites showed evidence of understory fires in the intervening periods as well (Antos 1977, Antos and Habeck 1981). Many lodgepole pine forests also experience infrequent intense fires at intervals of less than 100 years to as long as 350 years (Monnig and Byler 1992).

Wildfires have had major impacts on tree species composition. Fire-resistant species such as ponderosa pine and western larch will persist and generally dominate forests when wildfires are frequent (Habeck 1990, Mutch et al. 1993). Western larch, lodgepole pine and western white pine are especially able to regenerate and grow rapidly following disturbances, and tend to dominate forests with less frequent and more intense fires. Later-successional species do not usually predominate except in the prolonged absence of fire, or in cases where fire-adapted species fail to reestablish themselves promptly (Antos and Habeck 1981, Moeur 1992).

Different fire regimes had contrasting effects on ecological "stability." Agee (1990) describes frequent low-intensity fire regimes as agents of stability, while infrequent intense fires caused great instability over vast areas. Ponderosa pine forests were often maintained in a stable open, park-like condition by frequent fires (Arno 1976, Freedman and Habeck 1985, Habeck 1988, 1990, Mutch et al. 1993). On the other hand, lodgepole pine forests (Monnig and Byler 1992), and mixed-conifer forests on grand fir, western redcedar and hemlock climax sites (Antos and Habeck 1981, Habeck 1988, 1990) experienced major fluctuations in forest cover over large areas due to large intense fires.

The different fire regimes also resulted in substantially different amounts of old-growth forest in different environments. Losensky (1993) used early-twentieth-century forest inventory data to estimate the percentage of forest acreage in different age classes in 1900. He estimated that more than half of the area in ponderosa pine forest types in western Montana was in age classes typical of old-growth. These old-growth forests would have been maintained in that state by the frequent low-intensity fires (Habeck 1990). Losensky estimated that white pine and larch/Douglas-fir forest types averaged 20 to 30 percent old-growth age classes. In contrast with the ponderosa pine type, these mesic old-growth forests were commonly a function of a prolonged absence of fires (Habeck 1988).

Losensky's data suggests that old-growth in lodgepole pine forests and pure Douglas-fir forest types was rare, with old-growth age classes occupying only 3 to 7 percent of the area in these types. Perhaps wildfires in these forests were too intense to maintain savanna-like old-growth stands, given the lower fire resistance of these species, while intervals were too short to allow old-growth to develop in the absence of fire. The relatively short lifespan of lodgepole pine and its susceptibility to bark beetle attacks are also major factors (Monnig and Byler 1992).

Insects and pathogens: Various insects and pathogens are likewise natural forces in Inland Northwest forests. Their functions in forest ecosystems include accelerating decomposition, regulation of stand dynamics, creation and maintenance of habitats, and maintenance of landscape diversity (Covington et al. 1994, Harvey 1994a).

Outbreaks of bark beetles such as mountain pine beetle occurred naturally when favored by an abundance of host tree species and stress conditions (Covington et al. 1994). At the turn of the century, Ayres (1900a) noted high levels of mortality in western white pine stands along the north side of the Flathead Valley, apparently caused by mountain pine beetle. Epidemics of mountain pine beetle are an important natural force in the dynamics of lodgepole pine forests as well. Outbreaks occur when trees reach a large enough diameter, creating fuels that help set the stage for the next stand-replacement wildfire (Monnig and Byler 1992).

Periodic defoliation by insects such as the western spruce budworm is a natural occurrence in Inland Northwest forests as well. Evidence exists for periodic budworm outbreaks in pre-settlement forests (Covington et al. 1994).

Root diseases tended historically to be present at endemic levels. Root pathogens may serve to thin forests in moist environments, helping maintain dominance of less-susceptible species such as western white pine and western larch (Byler and Zimmer-Grove 1991, Monnig and Byler 1992). Patches of root disease infection also helped maintain structural and species diversity within stands (Covington et al. 1994, Harvey 1994a). Pathogens may regulate stress levels in severe environments by selectively killing weaker trees. As a consequence, one of their functions may be to select against genotypes poorly adapted to local environments, contributing to development of local genetic adaptation in populations in susceptible species (Harvey et al. 1992).

EFFECTS OF FIRE SUPPRESSION AND FOREST MANAGEMENT

Conservation efforts in western forests began in the late nineteenth and early twentieth centuries. Comments by Ayres (1900b) probably typify early attitudes toward the protection and management of Montana forests. Ayres decried the pervasive evidence of wildfire and the associated waste of resources, which he probably blamed too much on human carelessness. He also articulated a management philosophy under which the scattered large overstory pine and larch would be harvested, and replaced by the ready-made understories present in many forested areas.

Covington et al. (1994) summarize the history of timber harvest in the Inland West. The first major demands for timber were related to the explosion in mining in the late 1800s. Shortly thereafter, timber harvest for building materials became extensive, much of it for export to other regions. Railroads were constructed into accessible forest areas, and logs were yarded to rail lines with oxen, horses and flumes. Early harvests tended to remove the large pines and western larch, leaving behind the true firs, Douglas-fir and spruce.

Examples of turn-of-the-century logging can be seen in extensive second-growth forests and old railroad grades in the lower Clark Fork and Blackfoot valleys west and east of Missoula. Old cruise information in DSL (now DNRC) files indicates that less than 1,000 board feet per acre were left after logging in some old-growth ponderosa pine forests in the lower Blackfoot. An interesting set of photos in the University of Montana Library Archives documents extensive logging in the French Gulch area near Deer Lodge, in which lengthy flumes were constructed to yard logs to massive landings and portable mill sites.

Wildfire suppression began in earnest in the early 1900s, and became increasingly effective after the 1930s (Antos and Habeck 1981, Freedman and Habeck 1985, Mutch et al. 1993). With fire suppression, the major function of wildfire in regulating carbon accumulation in both live and dead vegetation has been interrupted. This results in an increase in stand densities and associated stress levels, as well as a buildup of dead fuels including litter and down logs (Oliver et al. 1994, Harvey et al. in press). Major changes in tree species composition have also occurred as more poorly fire-adapted species have increased in abundance (Habeck 1990, Monnig and Byler 1992).

Much of the responsibility for fire-exclusion policies falls on natural resource professionals, whose European attitudes toward fire were, unfortunately, ill-suited to the Inland West (Mutch et al. 1993). In a broader sense, however, the disdain for fire has been a feature of the overall American culture. Evidence for this ranges from the unsurpassed success of the Smokey Bear advertising campaign to the portrayal of fire as an evil menace in the movie, "Bambi" (Hackett 1989). It is hard to say whether the early foresters shaped or merely reflected public attitudes toward fire.

The shifts in species composition toward dominance of late-successional species have been exacerbated by the selective logging of valuable early-successional species. The combined influences of fire suppression and selective logging have also converted the naturally patchy mosaics favored by moderate fire regimes into much more homogeneous forests, reducing landscape diversity (Harvey et al. in press). The introduction of the white pine blister rust fungus from Europe has led to drastic reductions in the extent of white pine forests in northern Idaho and northwest Montana, also helping to increase the dominance of late-successional species (Byler and Zimmer-Grove 1991, Monnig and Byler 1992).

The advent of even-age timber management in the 1940s and 1950s is typically attributed to a shift to an agricultural model of forest management (see Covington et al. 1994, for example), and the postwar economic boom (Flowers et al. 1993). However, there was a strong ecological basis for this change as well that should not be overlooked. The selective harvests being practiced with species such as western larch were producing stand conditions that prevented their replacement. Even-age management was instituted in large measure to ensure perpetuation of shade-intolerant species (Schmidt et al. 1976). Hall and Thomas (1979) had similar concerns related to the wildlife habitat values of early successional stages, and expressed the opinion that uneven-age management was unlikely to meet goals for species richness.

Nevertheless, concerns about the adverse effects of even-age management have become increasingly strident. Many young even-age stands have not been thinned, and contribute further to unnaturally dense stand conditions (Covington et al. 1994). The typical sizes and homogeneity of even-age harvest units also interrupt natural landscapes, both in areas where fine-textured mosaics naturally prevailed (Freedman and Habeck 1985), and where vast continuous areas of mature "forest interior" habitats used to predominate (Harris 1984, Hansen et al. 1991).

In evaluating the effects of fire suppression and forest management practices, it is important to consider the historic frequency and intensity of wildfires in different environments. Where fire intervals were naturally long, existing conditions may still be within the natural range of variability (Oliver et al. 1994). The effect of fire suppression in these forests has been to delay some occurrences of stand-replacement fires, rather than to make major changes in stand structure.

Nevertheless, the effects of partial cutting and the introduction of white pine blister rust are still having major effects in these environments (Schmidt et al. 1976, Byler and Zimmer-Grove 1991, Monnig and Byler 1992). For example, a comparison of Montana forest inventory data from 1949 (Hutchison and Kemp 1952) and 1989 (Conner and O'Brien 1993) indicates that the acreage in western larch forest types may have declined by as much as seventy percent in the intervening time period. Similar trends can be seen for western white pine forests in Idaho (O'Laughlin et al. 1993).

More profound changes in composition and structure within stands have occurred throughout forests with historically frequent fires. With fire exclusion, populations of later-successional tree species have exploded (Covington et al. 1994, Harvey et al. in press). This has resulted in amounts of living and dead biomass that are clearly outside the range of natural variability (Oliver et al. 1994, Harvey et al. in press).

These changes in Inland West forests have resulted in heightened levels of insect and pathogen activity. In the absence of wildfire, increased tree densities have predisposed stands to large outbreaks of stress-sensitive insects and pathogens. Furthermore, late-successional tree species tend to be more susceptible to many of these agents (Harvey et al. 1992, Harvey et al. in press). These effects are particularly evident in drier forests, where dramatic losses have occurred in eastern Oregon and Washington (Johnson et al. 1991, Mutch et al. 1993), and in southwest Idaho (O'Laughlin et al. 1993).

In moister forests, insect and pathogen activity is also showing signs of increasing (Monnig and Byler 1992, O'Laughlin et al. 1993). In particular, north Idaho forests are showing greatly elevated losses to root disease since the mid-1980s, related to the shift from white pine and other early-successional forest types to dominance of late-successional species (Byler and Zimmer-Grove 1991, Monnig and Byler 1992). Similar increases should probably be expected in selectively harvested western larch forests in western Montana, as the relatively insect- and disease-resistant larch is replaced by more susceptible late-successional species (Harvey et al. 1992, Harvey 1994a).

Stress-related forest mortality can be worsened by genetic degradation of tree species. Degradation can be caused by the use of seed sources poorly adapted to local environments in reforestation, or by "high-grading" cutting methods that remove the most successfully growing trees (Millar and Libby 1989, Harvey et al. 1992).

Increases in dead fuels, exacerbated by mortality from insects and diseases, and density of tree crowns, are resulting in wildfires of increasing severity (Mutch et al. 1993, Harvey 1994a). Covington et al. (1994) summarize these changes as follows: (a) forests formerly typified by infrequent, high-intensity fires are experiencing increasingly large crown fires; and (b) forests that formerly experienced frequent low-intensity fires are now experiencing more stand-replacement fires as well as larger fires.

This increasingly severe fire behavior is likely to have a number of adverse environmental effects. Excess carbon accumulations may be rapidly reversed with extreme wildfires, resulting in excessive loss of carbon from forests (Oliver et al. 1994a). Nutrients that have been excessively tied up in organic material would be lost from the site, productivity would be reduced, and soil erosion may increase (Oliver et al. 1994a, Harvey et al. in press). Net accumulation of carbon in northern forests already appears to have been reversed due to increases in wildfire extent, and these carbon releases could contribute to global climate changes (Harvey 1994b). Severe fires could threaten remnant old-growth forests which already have been greatly depleted by timber harvest (Habeck 1990). Valuable timber, ranches, and homes are also increasingly at risk (Arno and Brown 1989, Mutch et al. 1993).

THE "FOREST HEALTH" CONCEPT

Over the past several years, the concept of "forest health" has been widely used to describe the effects of human activities on forest ecosystems. The concept dates back at least to Aldo Leopold (1949), who stated, "Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity."

Attempts to define forest health have proved elusive. O'Laughlin et al. (1993) observe, "As is true in other health contexts, it may be easier to identify when a forest is unhealthy than it is to define exactly what healthy means." They go on to suggest that judgments about forest health are inevitably at least somewhat subjective. Not surprisingly, the concept has drawn fire from some environmentalists and politicians who perceive it as just another excuse to harvest trees. Nevertheless, according to O'Laughlin et al., the concept persists and the health analogy has proved useful if less than perfect for diagnosing forest ecosystems.

Monnig and Byler (1992) suggest two alternate but complementary approaches for judging forest health. One is based on management objectives. In this context, a healthy forest is one in which physical or biological factors do not threaten achievement of reasonable current or potential future objectives. Such objectives may include commodity production as well as amenities such as wildlife habitat or clean water.

The other set of criteria suggested by Monnig and Byler is based on ecological function. A healthy forest in this context is one in which the ecosystem (i.e. the community of plants and animals along with their physical environment) retains all of its functions. This concept appears to be close to what Leopold (1949) iterated, as quoted above.

O'Laughlin et al. (1993) used both of these approaches to develop their definition: "Forest health is a condition of forest ecosystems that sustains their complexity while providing for human needs." They further characterize a healthy forest as "resilient" (able to respond to disturbances and recover in a characteristic time period), and "sustainable" (capable of meeting current societal needs and desires without jeopardizing those of the future).

Harvey et al. (in press) have described healthy forests as follows:

1) Biophysical environments with predictable site potentials, plant assemblages, and climate and disturbance regimes;

2) Having structure and composition patterned by disturbances and environmental conditions;

3) Moderately productive and diverse, with productivity and diversity varying predictably according to the pattern of successional (structural) stages and disturbance regimes;

4) Resilient within normal climatic and disturbance regimes.

O'Laughlin et al. (1993) suggest that measurable criteria need to be developed to measure forest health, but arriving at the most suitable criteria is not a simple process. Pre-settlement ranges of variability may be a useful baseline where they can be determined, and where deviations can be associated with undesirable results.

Norris et al. (1993) suggested that "forests can be considered healthy when there is an appropriate balance between growth and mortality." O'Laughlin et al. (1993) used this concept in their forest health evaluation for Idaho, and reported dramatic increases in mortality levels in much of the state in recent years. They report that annual mortality levels have actually exceeded total annual growth on the Boise and Payette National Forests.

Similar comparisons of Montana forest inventory data shows that total mortality as a percentage of gross growth increased only slightly, from 18 percent to 23 percent (Conner and O'Brien 1993). Interpreting these changes to reflect any real trends in forest health would be highly questionable; they may simply reflect cycles in bark beetle activity (B. Long, personal communication).

Other measurable indicators of poor forest health used in Idaho include major shifts in tree species composition (O'Laughlin et al. 1993). A comparison of forest inventory data from 1949 (Hutchison and Kemp 1952) and 1989 (Conner and O'Brien 1993) shows very similar changes in Montana's forests. Thus, while accelerated mortality has not been documented yet for Montana's forests, the changes in forest condition that may be its precursor are ample cause for concern, as described by Monnig and Byler (1992) and Covington et al. (1994).

Comparisons of the 1949 and 1989 inventory data for Montana also indicate increased stocking levels. In spite of heavy timber harvesting of high-volume old-growth forests in this time period, overall cubic-foot growing stock has remained steady or increased (Flowers et al. 1993). This indicates substantial increases in the density and stocking levels of young and immature stands, and in associated levels of stress and fire hazard.

In using the concept of forest health, some caveats are in order. First of all, forest health is expressly not a state in which trees never die of natural causes. In fact, the relatively high levels of snags and decadence associated with old-growth forests may be integral facets of complete forest ecosystems (Habeck 1988, Crow 1990). In a more general sense, dead organic material on the forest floor, in various forms, serves a number of functions such as nutrient cycling, providing mycorrhizal substrate, and moisture retention, which may have major implications for the long-term productivity of the forest (Harvey et al. 1986, Jurgensen et al. 1992, Graham et al. 1994).

A second warning is that a healthy forest should not be portrayed as fireproof. In fact, such a notion would be completely inconsistent with the conclusion that wildfire suppression is a major cause of the decline in forest health in the first place. As described above, the increased fire hazards are related to increased fire intensity, and to attendant changes in fire effects, difficulty of control, and threats to values such as formerly fire-maintained old-growth forests, timber, and homes (Arno and Brown 1989, Habeck 1990, Mutch et al. 1993). Moreover, recent harvest areas may burn with a higher, rather than lower, intensity if an appropriate level of slash disposal is not done.

A final caution relates to the notion of ecosystem stability. It is common, even in recent literature, to find nature interpreted as inherently stable, and to see the changes wrought by disturbance as being mere cycles in a greater "balance of nature" (e.g. Byler and Zimmer-Grove 1991). Natural ecosystems are described as "shifting-mosaic steady-state" (Freedman and Habeck 1985, Habeck 1988), and there is often an implicit sense that entire plant and animal communities are largely symbiotic and mutually-dependent entities. These concepts have been long-standing in ecological theory, and may derive in part from philosophies of nature dating back to the 18th century (Oliver and Larson 1990, Oliver et al. 1992).

However, these concepts are being called into question by a number of scientists, based in part on studies of vegetation dynamics (Oliver and Larson 1990), genetics (Namkoong 1991, Fins 1993) and paleoecology (Hunter et al. 1988). Research in forest stand dynamics suggests that forests do not develop toward a single, deterministic climax condition following disturbance. Rather, the nature of a natural or man-made disturbance, and its timing in the development of the previous stand, may direct stand development in very different directions from those of the previous stand. Change due to large natural disturbances is the predominant characteristic of forest ecosystems, and the notion of a stable climax is seldom relevant (Oliver et al. 1992).

Competition, rather than mutual dependency, is now seen as the major factor in interaction among tree species. Evidence for this is seen in the resilient behavior of disturbed forests, the response of plant communities to elimination of species and introduction of exotics, and detailed study of stand development (Oliver and Larson 1990).

From a genetic standpoint, trees in particular do not usually possess a finely-tuned adaptation to their local environment. Adaptations tend to occur across a broad scale, and may represent a buffering against environmental variation rather than an optimal adaptation to local conditions (Fins 1993). Genetic diversity is not typically a simple and consistent response to environmental gradients. Genetic variation is often the result of a combination of past migrations, fluctuations in population size, and interactions among species. Instability and constant change may be natural features of evolution, and stability may be unnatural (Namkoong 1992, Stettler and Bradshaw 1994).

Finally, studies of paleoecology indicate that plant species have responded to climatic changes in a very individualistic fashion. As a result, present communities are not merely relocations of past communities, but represent assemblages of species different from any that are known to have existed in the past. Major changes have occurred even in the past 6,000 years or so. This means that relationships within plant communities are not significantly coevolved or interdependent (Hunter et al. 1988, Oliver and Larson 1990).

All of this should probably be taken to suggest that a single optimum set of natural conditions, or even processes and cycles, does not exist for any forest environment (Oliver et al. 1992). Current ecosystems are as much the result of historical accident as they are of stabilizing adaptations. However, this should not lead us to an "anything goes" approach to nature either, in which forest management becomes a mere exercise in engineering genes and forests to suit our economic wishes (Namkoong 1992). Rather, it requires that we see forest management as an active choice between various options. We need to use our best understanding of natural processes to develop these options, but must also acknowledge that any return to past "pristine" conditions is impossible and probably not even desirable (Monnig and Byler 1992, Oliver et al. 1992, O'Laughlin et al. 1993).

THE USE OF SILVICULTURE IN ECOLOGICAL RESTORATION

This all leads inevitably to a consideration of the available options, whether or not we find the concept of forest health compelling or even valid. Oliver et al. (1992, 1994) suggest that there are two overall approaches to forest landscape management: natural regulation, where natural processes are allowed to operate unimpeded by human intervention; or actively managing ecosystems to regulate disturbance frequency and intensity, carbon accumulation, and forest structure. While intense debate often revolves around these two approaches, they are not mutually exclusive and both may play an important role in maintaining biodiversity (Oliver 1992, Hutto et al. 1993).

Many people strongly believe that only preservation and natural regulation of ecosystems can maintain ecological integrity. In some cases this is due to the notion, discussed above, that nature is inherently stable and precisely balanced. In this view, human interventions are inevitably harmful because they upset this balance (Namkoong 1992, Oliver et al. 1992). Others point to the mistakes of the past - many of them made by supposedly-knowledgeable professionals - as evidence that proposed actions to "cure" forest health may be worse than the disease (Mutch et al. 1993, O'Laughlin et al. 1993).

Some conservation biologists also hold the conviction that only extensive reserves can maintain biodiversity. For example, Noss (1993) reasons that cumulative effects on wildlife viability include not only vegetative changes, but also roads and direct contact with humans. He suggests that an average of as much as 50 percent of a region must be protected in reserves to maintain complete ecosystems that include large carnivores and other species sensitive to human disturbance. Noss does not exclude the use of active restoration in the reserve system he proposes for the Oregon Coast Range, but reestablishment of natural regulation would be the primary focus.

In Yellowstone National Park, a natural-regulation philosophy began to arise with the 1963 "Leopold Report," which advocated the "maintenance of naturalness" as the overriding goal of Park management. A prescribed natural wildfire policy was adopted in 1972. In this context, while the 1988 Yellowstone fires provoked controversy, they were viewed by Park Service ecologists as both inevitable and ecologically beneficial (Hackett 1989).

Other scientists, however, identify problems with the concept of natural regulation, even when applied to preserves such as National Parks and wilderness areas. Catastrophic fires even in remote areas often end up threatening ranches, homes and towns; fire does not stay within human-established boundaries where it is deemed acceptable (Mutch et al. 1993).

Ecologist Thomas Bonnicksen (1989) issued a scathing denunciation of the natural regulation philosophies that have been applied in Yellowstone and other National Parks. He insists that the 1988 Yellowstone fires were no more "natural" than the decades of fire suppression that led up to them. Furthermore, he argued, Native Americans had made extensive and active use of fire in the area for millennia; eliminating this use is in itself artificial.

Arno and Brown (1989) argue the futility of ever expecting "prescribed natural fires" to function in their former role even in wilderness. Such fires can only be allowed under relatively low fire-danger conditions; otherwise they threaten human developments outside the wilderness, as happened in Montana in 1988. Furthermore, fires that naturally would have started outside wilderness areas and burned into the wilderness are suppressed before they ever get there. They recommend active use of prescribed fire in these environments. O'Laughlin et al. (1993) similarly argue for active intervention to restore forest health in wilderness areas.

Arno and Brown go on to suggest the use of appropriately-designed timber harvest as the primary tool to reduce fuels in forests managed for multiple uses or timber production, and in forested residential areas. As discussed above, the intent is not to fireproof the forest but rather to ensure that fires will be controllable surface fires rather than high-intensity crown fires.

Arno and Brown's advocacy of silvicultural practices and prescribed fire to fill the role of natural wildfire is shared by other fire ecologists in the West (Habeck 1990, Mutch et al. 1993, Covington et al. 1994). Habeck (1990), and Oliver et al. (1994) each declare that we cannot afford to wait for the results of further research before inaugurating such management. They assert that we already have ample knowledge to begin carrying out these practices, and need to do so for both public-safety and ecological reasons. In addition, human demands on ecosystems for forest products are seen as inevitable. Active management involving timber harvest may be more environmentally friendly than alternatives that involve substitutes for wood products (Bowyer 1991, Oliver 1992). Implementing such a strategy, however, requires that we address two questions. First, what kinds of silvicultural practices are appropriate? Secondly, how do these practices compare with the natural processes they are designed to replace?

We have attempted elsewhere to describe silvicultural practices that can be used to promote ecological diversity and health in various environments (Remington 1993), and will not elaborate here in detail. However, several major points should be borne in mind:

- There is not a single set of "correct" practices in any particular environment. Reestablishing natural variability at a landscape level will require a variety of practices in individual stands (Oliver et al. 1994).

- While public sentiment favors the use of "selective" logging to enhance forest health, such practices need to be completely different from the kinds of partial cutting that have been practiced in the past. As discussed above, past selective logging has helped create many of the conditions that contribute to poor forest health in the first place, in both frequent-fire and infrequent-fire environments (Schmidt et al. 1976, Byler and Zimmer-Grove 1991, Monnig and Byler 1992, Mutch et al. 1993, Covington et al. 1994).

  At a minimum, partial cutting practices to improve forest health must increase the proportion of early-successional species, both in the residual stand and in regeneration, and maintain more open forest conditions where fires were naturally frequent (Habeck 1990, Monnig and Byler 1992, Mutch et al. 1993). This will generally require removal of the smaller, rather than the larger, trees from stands.

- In evaluating the use of clearcutting and even-age management it is necessary to consider the reasons for their adoption in the first place, which included perpetuation of early-successional species (Smith 1962, Schmidt et al. 1976). It is also essential to address the long-term as well as short-term effects of clearcutting. Avian biologists Hutto et al. (1993) emphasize that, in spite of the severe short-term impacts of clearcutting, it may come the closest to emulating natural patterns and processes in many environments over the long term. They recommend using management practices that have harsh short-term effects if that is what natural processes did in analogous circumstances.

- Greater use of prescribed fire may be an important adjunct to silvicultural practices. While it may be possible and in some cases necessary to avoid the use of fire completely, there are some risks involved. We cannot be sure that silvicultural techniques alone can fulfill all the essential functions of fire, including nutrient cycling and maintenance of fire-associated plant species (Mutch et al. 1993).

- It may be necessary to use prescribed fire without silvicultural treatments in situations where harvesting is not allowable or is infeasible. However, the unnatural buildups of fuel that are present in many areas must be considered. It will be difficult if not impossible to use fire alone to achieve its previously-characteristic effects in these situations (Mutch et al. 1993).

- Increased use of prescribed fire will tend to have adverse impacts on air quality. This creates a dilemma if we are to provide both clean air and ecosystem integrity, which are both key public environmental concerns. However, as fire hazards in Inland West forests increase, episodes of poor air quality may be inevitable anyway (Mutch et al. 1993, Covington et al. 1994).

The comparability of silvicultural methods and natural disturbances is a complex issue. It is a truism among foresters that clearcutting imitates the results of stand-replacing fires. Antos and Shearer (1980) discussed some of the differences as well as similarities they observed in studies in the Swan Valley. In both situations the live above-ground vegetation is largely eliminated and mineral soil is usually exposed. However, harvests are substantially different from wildfires in the lack of large numbers of snags, the effects of mechanical scarification on root systems, and the extreme intensity of fires in slash piles.

Freedman and Habeck (1985), and Franklin et al. (1986) emphasize the tendency of forest management practices to homogenize the environment, in contrast with the diversity of disturbance intensity and forest structure that typically result from natural disturbances. Changes in landscape patterns, such as the size distribution of openings and the location and abruptness of boundaries, need to be considered as well as the level of within-stand variation.

The differences in post-fire and post-harvest habitats are especially important to a number of bird species. Many of these species make extensive use of the snags in recent stand-replacement burns, and are virtually absent in recent harvests as well as low-intensity burns (Hutto et al. 1993). The authors suggest that natural disturbance regimes need to be maintained in some areas to provide the habitats that cannot be maintained by silvicultural methods.

In their comprehensive text on forest stand dynamics, Oliver and Larson (1990) discuss in detail the various disturbance types that shape forests worldwide (pp. 89-139). Differences among kinds of natural disturbances, or within a particular type of disturbance in terms of intensity and pre-disturbance stand characteristics, may be greater than their differences from human-caused disturbances. They conclude that it is necessary for the forest manager to predict the effects of various disturbances on the composition and structure of forest stands, in order to manage in ways that will achieve desired effects.

Hutto et al. (1993) articulate a similar principle in their discussion of the effects of silvicultural treatments on forest birds. They warn that relatively benign harvest methods that reduce the likelihood of natural disturbances may be more harmful than severe treatments such as clearcuts, which may simulate at least some of the long-term effects of stand-replacement fires.

Finally, from the standpoint of carbon cycling, timber harvest within appropriate parameters is a useful means for restoring a more desirable balance between carbon fixation and release. Excess carbon accumulation can be removed in the form of wood products, in which form it can remain sequestered as organic material rather than released into the atmosphere (Harvey 1994a, Oliver et al. 1994). It is still important to maintain adequate organic reserves in the forest to provide for its ecological functions (Harvey 1994a).

In contrast, "natural regulation" is likely to result in a continued net release of carbon into the atmosphere as wildfires become more extensive and intense, contributing to the potential for global climate change (Harvey 1994b). Furthermore, the lost wood production would ultimately involve shifting timber harvest and associated environmental impacts to other parts of the world, and substitution of other materials for wood. Production of substitute materials such as metals, plastics, and concrete requires more energy, and thus releases more carbon dioxide into the atmosphere, than manufacture of wood products (Bowyer 1991, Oliver 1992, Oliver et al. 1994).

In summary, from the standpoint of vegetation ecology and its implications, it appears that a "natural regulation" strategy poses greater ecological risks than appropriately-designed active management. At the same time, the potential ecological benefits of active ecosystem management come with their own adverse consequences such as increased roading and reduction in early post-fire habitats. However, practices are available for reducing the level of these impacts (Oliver et al. 1994).

This is not to say that the impacts of active forest management on biodiversity addressed by conservation biologists such as Noss (1993) should be dismissed. Nevertheless, it is essential to consider the ecological impacts involved in a "hands-off" strategy as well. In the words of ecologist Daniel Botkin (quoted in O'Laughlin et al. 1993), "When you do nothing, you'll get something you didn't expect."

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APPENDIX WLD

WILDLIFE

This appendix includes three parts. Part one is a detailed explanation of the procedure we used to analyze the effects of each alternative on the nine wildlife habitat descriptors. Part II contains the complete lists of projected effects on wildlife species under each alternative for each descriptor. Part III contains lists of wildlife species used in the Chapter III and IV wildlife analyses. These lists describe the existing environment of various species in Montana (Tables WLD-10 through WLD-20).

The wildlife discussion presented in Chapters III and IV was based on wildlife-habitat matrices developed by the U.S. Forest Service, and databases maintained by the Montana Natural Heritage Program (MNHP), a joint effort of The Nature Conservancy and Montana State Library. The MNHP data provided current information on wildlife species found in the state, seasonal residency, migratory status, special or legal designations, general habitat associations, use of specialized habitat features, and presence in each DNRC Land Office area. The U.S. Forest Service data provided older, but more detailed information associating wildlife species with specific vegetative communities and structural attributes of plant communities.

PART I: METHODS USED IN ANALYSIS OF ENVIRONMENTAL CONSEQUENCES ON WILDLIFE

DETAILED METHODOLOGY: ENVIRONMENTAL CONSEQUENCES FOR EACH DESCRIPTOR

Descriptor Successional Stage

The list of species associated with six successional stages (grass/forb, seedling/sapling, pole timber, young, mature, old-growth) was based on information from Prather and Burbridge (1979), manipulated by SAS programs into file SUCC.LST, as described in the description of computer files, found in the Project File.

Projected successional stages for each alternative were based on Tables IV-V6, IV-V9, IV-V21, and IV-V22 from the vegetation section. Table IV-V6 projected stand sizes in four classes (nonstocked, seedling/sapling, poletimber, and sawtimber). Our data on wildlife habitat affinities distinguished six classes: the first three above, plus "young sawtimber", "mature sawtimber", and "old-growth". We used the following algorithm to sub-divide the existing "sawtimber" class (from Table IV-V6) into "young", "mature", and "old-growth":

1) We first projected proportions in the old-growth class. Tables IV-V21 and IV-V22 project old-growth amounts using two independent methods; V21 probably underestimates old-growth amounts, V22 probably overestimates old-growth amounts. We selected the coefficient 0.4 as most nearly representing the likely compromise between the two, and used the following algorithm to project a single old-growth estimate:

$OG_i = V21_i + (0.4 * (V22_i - OG_c))$, where:

- OG_i = best estimate of proportion old-growth in 2020 for alternative I (I = Alpha...Omega)
- OG_c = estimate of existing (current) old-growth proportion, Table IV-V19
- $V21_i$ = projection of old-growth from Table IV-V21 for alternative I (I = Alpha...Omega)
- $V22_i$ = projection of old-growth from Table IV-V22 for alternative I (I = Alpha...Omega)

2) We assumed that "young sawtimber" would be less than 100 years old. Thus we subtracted the proportions in age-classes 100+ (from Table IV-V9) from the sawtimber proportions (from Table IV-V6) for each alternative to generate the class "sawtimber, but less than 100 years age-class".

3) The "mature sawtimber" class was then calculated as the remainder of the proportion in sawtimber (from Table IV-V6) after old-growth and "young sawtimber" had been subtracted.

Having thus apportioned the sawtimber class into "young", "mature", and "old-growth", the resulting high and low harvest projections in the year 2020, by successional stage, were as follows:

	Cur-rent	ALPHA		BETA		GAMMA		DELTA		EPSILON		ZETA		OMEGA	
		HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
Nonstocked	2.5	2.5	1.3	2.2	1.0	0.6	0.3	2.8	1.0	3.5	2.2	1.3	0.6	3.2	1.9
Seed/Sap.	10.7	17.8	11.4	16.7	9.8	8.2	6.6	19.4	9.8	22.8	16.7	11.4	8.2	21.1	11.1
Poletimber	15.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
Young	30.6	12.2	12.1	11.9	12.0	12.1	12.0	12.5	12.0	12.4	11.9	12.1	12.2	8.6	11.3
Mature	25.7	50.3	51.9	50.6	52.3	52.6	53.0	49.8	52.3	49.2	50.6	51.9	52.5	47.9	51.1
Old- Growth	14.6	10.2	16.5	11.7	18.1	19.6	21.2	8.6	18.1	5.3	11.7	16.5	19.6	8.6	13.1

These proportions, expressed as percent change from current conditions, were as follows:

	ALPHA		BETA		GAMMA		DELTA		EPSILON		ZETA		OMEGA	
	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
Nonstocked	0	-48	-12	-60	-76	-88	12	-60	40	-12	-48	-76	28	-24
Seed/Sap.	66	7	56	-8	-23	-38	81	-8	113	56	7	-23	97	4
Poletimber	-57	-57	-57	-57	-57	-57	-57	-57	-57	-57	-57	-57	-57	-57
Young	-60	-60	-61	-61	-60	-61	-59	-61	-59	-61	-60	-60	-72	-63
Mature	96	102	97	104	105	106	94	104	91	97	102	104	86	99
Old- Growth	-30	13	-20	24	34	45	-41	24	-64	-20	13	34	-41	-9

The resulting matrix of projected directional changes appears in the text as Table IV-W5, and is reprinted here.

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Successional Stage							
Grass/Forb	?	?	-	?	?	-	?
Seedling/Sapling	?	?	-	?	+	?	+
Poletimber	-	-	-	-	-	-	-
Young	-	-	-	-	-	-	-
Mature	+	+	+	+	+	+	+
Old-Growth	?	?	+	?	-	+	-

To categorize each species as being beneficially affected, adversely affected, or affected in an uncertain way, we applied the following logical rules:

1) IF a primary feeding association is with a stage projected to increase, AND a primary breeding association is with a stage projected to increase, AND there is no primary feeding or breeding association with a stage projected to decrease, THEN categorize as BENEFICIALLY AFFECTED (+).

2) IF a primary feeding association is with a stage projected to decrease, AND a primary breeding association is with a stage projected to decrease, AND there is no primary feeding or breeding association with a stage projected to increase, THEN categorize as ADVERSELY AFFECTED (-).

3) IF none of the above conditions hold (i.e., primary associations exist with stages of opposite signs, or are only with those categorized as uncertain), THEN categorize as UNCERTAIN (?).

Here are three examples:

I) Species A has primary feeding affinity for the grass/forb stage and primary breeding habitat affinity for the seedling/sapling stage. Under alternative GAMMA, the species is categorized ADVERSELY affected; it is categorized UNCERTAIN under all other alternatives.

ii) Species B has both primary feeding and breeding habitat affinities for the sawtimber: old-growth stage. Under alternative GAMMA, the species is categorized as BENEFICIALLY affected; under alternative EPSILON it is categorized as ADVERSELY affected; and under all others, it is categorized as UNCERTAIN.

iii) Species C has primary feeding affinity for the grass/forb stage and primary breeding affinity for the sawtimber: mature stage. It is categorized as UNCERTAIN under all alternatives.

Descriptor Forest Type

The list of species associated with seven forest types (hardwoods, Douglas-fir, ponderosa pine/western larch, grand fir, lodgepole pine, spruce/subalpine fir, cedar/hemlock) was based on information obtained from Prather and Burbridge (1979), manipulated by SAS programs into file TREE.LST, as described in the description of computer files found in the Project File.

As described in the wildlife section of Chapter IV, we used Table IV-V14 as the basis for projecting changes in individual forest types. We categorized forest types as increasing and decreasing only if the entire range of projections from Table IV-V14 suggested increases or decrease (i.e., did not overlap 'no change'). When projections for changes in acreage of forest type were symmetrical about the center line, we categorized that type as either unchanging (if the range was narrow, e.g., lodgepole pine under alternative Alpha, Table IV-V14), or uncertain (if the range was wide, e.g., ponderosa pine under alternative Alpha, Table IV-V14). We included two additional categories to most nearly reflect our projections of forest type: "uncertain as to direction, but somewhat more likely to increase than decrease" (which we denote with the symbol "?+"), and "uncertain, but somewhat more likely to decrease than increase" ("?-"). The resulting matrix of projected directional changes in forest types is presented here:

Forest Type	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Hardwood	-	-	-	-	-	-	?
Douglas Fir	?	?-	+	?-	-	+	-
Ponderosa/Larch	?	?+	-	?+	+	-	+
Grand Fir	+	+	+	?+	?-	+	-
Lodgepole Pine	0	0	-	0	+	-	+
Spruce/Fir	+	+	+	?+	?-	+	-
Cedar/Hemlock	?+	?+	?+	?+	0	?+	+

To categorize each species, we applied the following logical rules, similar in structure to those used for successional stages:

1) IF a primary feeding association is with a forest type projected to increase, AND a primary breeding association is with a forest type projected to increase, AND there is no primary feeding or breeding association with a type projected to decrease, THEN categorize as BENEFICIALLY AFFECTED (+).

2) IF a primary feeding association is with a forest type projected to decrease, AND a primary breeding association is with a type projected to decrease, AND there is no primary feeding or breeding association with a type projected to increase, THEN categorize as ADVERSELY AFFECTED (-).

3) IF a primary feeding association is with a forest type projected to be uncertain but somewhat more likely to increase than to decrease, AND a primary breeding association is with a forest type projected to be uncertain but somewhat more likely to increase than to decrease, AND there is no primary feeding or breeding association with any other type, THEN categorize as LIKELY TO BE BENEFICIALLY AFFECTED (?+).

4) IF a primary feeding association is with a forest type projected to be uncertain but somewhat more likely to decrease than to increase, AND a primary breeding association is with a forest type projected to be uncertain but somewhat more likely to decrease than to increase, AND there is no primary feeding or breeding association with any other type, THEN categorize as LIKELY TO BE ADVERSELY AFFECTED (?-).

5) IF a primary foraging association is with a type projected to be unchanged, AND a primary breeding association is with a forest type projected to be unchanged, AND there are no other primary habitat affinities, THEN categorizes as NEUTRAL EFFECT (0).

6) IF none of the above conditions hold (i.e., primary associations exist with types of opposite signs, or are only with those categorized as uncertain), THEN categorize as UNCERTAIN (?).

Descriptor Stocking Level (Canopy Density)

The list of species associated with three stocking rates (closed [>70 percent], moderate [30-70 percent], and open [<30 percent]) was based on information obtained from Prather and Burbridge (1979), manipulated by SAS programs into file VEG_CC.LST, as described in the description of computer files found in the Project File.

As described in the wildlife section of Chapter IV, we used Table IV-V18 as the basis for projecting changes in stocking level. We categorized stocking level as increasing and decreasing only if the entire range of projections from Table IV-V18 suggested increases or decrease (i.e., did not overlap both zones). When projections for changes in acreage of stocking level were symmetrical about the center line, we categorized that rate as unchanging (e.g., "Medium stocked" under alternative Epsilon, Table IV-V18). As in the Forest Types descriptor, we included two categories to most nearly reflect our projections of stocking rate: "uncertain as to direction, but somewhat more likely to increase than decrease" (which we denote with the symbol "?+"), and "uncertain, but somewhat more likely to decrease than increase" ("?-").

The resulting matrix of projected directional changes in stocking rates is presented here:

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Stocking Rate							
Well stocked	+	?+	+	?+	?-	+	?+
Medium stocked	-	?-	-	?-	0	-	?
Poorly stocked	-	-	-	?	?+	-	?-

To categorize each species, we applied the following logical rules, similar in structure to those used for successional stages and forest types:

1) IF a primary feeding association is with a stocking rate projected to increase, AND a primary breeding association is with a stocking rate projected to increase, AND there is no primary feeding or breeding association with a rate projected to decrease, THEN categorize as BENEFICIALLY AFFECTED (+).

2) IF a primary feeding association is with a stocking rate projected to decrease, AND a primary breeding association is with a rate projected to decrease, AND there is no primary feeding or breeding association with a rate projected to increase, THEN categorize as ADVERSELY AFFECTED (-).

3) IF a primary feeding association is with a stocking rate projected to be uncertain but somewhat more likely to increase than to decrease, AND a primary breeding association is with a stocking rate projected to be uncertain but somewhat more likely to increase than to decrease, AND there is no primary feeding or breeding association with any other rate, THEN categorize as LIKELY TO BE BENEFICIALLY AFFECTED (?+).

4) IF a primary feeding association is with a stocking rate projected to be uncertain but somewhat more likely to decrease than to increase, AND a primary breeding association is with a stocking rate projected to be uncertain but somewhat more likely to decrease than to increase, AND there is no primary feeding or breeding association with any other rate, THEN categorize as LIKELY TO BE ADVERSELY AFFECTED (?-).

5) IF a primary foraging association is with a rate projected to be unchanged, AND a primary breeding association is with a stocking rate projected to be unchanged, AND there are no other primary habitat affinities, THEN categorizes as NEUTRAL EFFECT (0).

6) IF none of the above conditions hold (i.e., primary associations exist with rates of opposite signs, or are only with those categorized as uncertain), THEN categorize as UNCERTAIN (?).

Descriptor Snag Abundance

The list of species associated with two types of snags (< 15" diameter, > 15" diameter) was based on information obtained from Prather and Burbridge (1979), manipulated by SAS programs into file SPEC_HAB.LST, as described in the description of computer files found in the Project File.

As described in the the wildlife section of Chapter IV, this analysis followed Table IV-V23 in the Vegetation section. Species associated with snags were projected to be beneficially affected when arrows in Table IV-V23 showed increases in snag abundance; they were assumed to be adversely affected when arrows showed declines.

Descriptor Large Woody Debris

The list of species associated with logs on the ground was based on information obtained from Prather and Burbridge (1979), manipulated by SAS programs into file SNAG.LST, as described in the description of computer files found in the Project File.

Analysis for this descriptor largely followed that for snags (with the rationale that most large woody debris originates as snags), except that we could not confidently project effects for log-associated species in cases where trends in small and large snag abundance were in opposite directions.

Descriptor Riparian And Wetland Areas Conditions

The list of species associated with riparian and wetland habitat types was based on information (classified as river, lacustrine, and palustrine) obtained from Prather and Burbridge (1979), manipulated by SAS programs into file HABITAT.LST, as described in the description of computer files found in the Project File.

As described in the wildlife section of Chapter IV, this analysis was based primarily on results of the Environmental Consequences - Watershed section (Chapter IV), in which grazing standards were discussed. Riparian conditions were assumed to continue worsening under current standards, but were assumed to improve under standards applied in western land offices under all alternatives except Alpha.

Descriptor Recreation Use Levels

The list of species associated with seclusion from human activity was based on information obtained from Prather and Burbridge (1979), manipulated by SAS programs into file SECL.LST, as described in the description of computer files found in the Project File.

As an initial assessment, we reviewed trends in recreational use on forest lands for each of the alternatives projected in Appendix ECN. With the exception of recreation Groups I, II, and IV under alternative Gamma, use by all recreation groups under all alternatives was projected to increase. For alternative Gamma, recreation Group III was projected to increase substantially over current levels (2.92 percent per annum), and recreation Group II (which includes hunting) was projected to decrease by only 0.5 percent per annum. Thus, based solely on projected increases in recreational use (with attendant disturbance), sensitive species should be adversely affected under all alternatives. However, in addition to projections of recreational use, we believed it appropriate to consider Resource Management Standards for Big Game, Sensitive Species, and Biodiversity. Standards for Beta, Gamma and Omega specify that "...human disturbance...must be considered in the protection of sensitive species and their habitats. Appropriate measures will be taken to ensure adequate conditions to support these species...". Thus, despite increasing recreational use, these alternatives were assumed to benefit species of special concern that require seclusion from humans (i.e., humans will be managed effectively so that disturbance will be reduced, rather than increased). However, it could not be assumed that species given no particular priority would similarly benefit; instead, increased recreational use was assumed to adversely affect these.

Because alternative Zeta prioritizes revenue production from wildlife management (of which big game management will often represent the best way to maximize trust income), we assumed that the Standards calling for "...appropriate mitigation measures" would ensure that disturbance to big game is reduced, despite overall increasing recreational use. However, it could not be assumed that species given no particular priority would similarly benefit; instead, increased recreational use was assumed to adversely affect these species.

Descriptor Road Density

Species selected for consideration under the effects of road density included those associated with seclusion from human activity (SECL.LST, above), those requiring snags or down woody debris (SNAG.LST, LOG.LST), and those currently categorized as game, upland bird, migratory bird, and/or fur-bearing species (GAME.LST), as described in the description of computer files found in the Project File.

Thus, for this analysis, road density was assumed to affect equally species that: (1) are shot or trapped (game/upland bird/migratory bird/furbearer species); (2) are dependent on snags; (3) are dependent on down, woody material; or (4) are otherwise sensitive to human disturbance.

As an initial assessment, we reviewed densities of total and open roads under high and low harvest scenarios for each of the alternatives, projected in Appendix SCN. These projections used 40 percent of estimates of total road densities to project open road densities. We then further modified our projections of open road density under the various alternatives to reflect "road philosophies" implied by each. To do this, we multiplied projected open road densities by the following coefficients to obtain a projection of "effectively open" roads:

Alpha	1.00
Beta	0.75
Gamma	0.60
Delta	1.00
Epsilon	1.00
Zeta	0.75
Omega	0.75

The resulting matrix of projected percent changes from current conditions in road density was as follows:

	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Omega
Total Roads							
High	+50	+40	+5	+60	+65	+25	+45
Low	+25	+15	0	+20	+45	+10	+30
Open Roads							
High	+50	0	-37	+62	+62	-12	-12
Low	+25	-12	-37	+25	+37	-12	0

Thus, assessed from proportional change in road densities alone, alternatives Alpha, Delta, Epsilon and Omega should adversely affect wildlife sensitive to roads, alternative Gamma should beneficially affect such wildlife, and the effects of alternatives Beta and Zeta should be unclear.

However, in addition to projections of road densities, we believed it appropriate to consider Resource Management Standards for Big Game, Sensitive Species, and Biodiversity. RMS for Alpha and Epsilon do not prioritize wildlife in considering roads, thus no adjustments from projected road densities were necessary. Alternative Gamma prioritizes sensitive wildlife, so the RMS reinforce the largely positive effect of reduced open road density. Alternatives Beta and Omega include standards to protect sensitive species, although not to protect big game. Thus, species of special concern should be benefitted by Beta and Omega, and other adverse effects of roading possibly also mitigated (resulting in the "?-" categorization). Standards under alternative Delta may or may not prioritize security for big game, depending on economic values, thus the effects of roads are uncertain. Alternative Zeta prioritizes big game security, thus it should benefit big game, even if the overall road density projected remains unclear.

PART II: EFFECTS ANALYSIS ON WILDLIFE SPECIES BY DESCRIPTOR

Table WLD-1
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	?	?	?	?	?	?	?
TIGER SALAMANDER	?	?	?	?	?	?	?
COEUR D'ALENE SALAMANDER (VD)	?	?	?	?	?	?	?
ROUGHSKIN NEWT	?	?	?	?	?	?	?
IDAHO GIANT SALAMANDER	?	?	?	?	?	?	?
TAILED FROG	?	?	?	?	?	?	?
WESTERN TOAD	?	?	?	?	?	?	?
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	?	?	?	?	?	?	?
PACIFIC CHORUS FROG	?	?	?	?	?	?	?
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	?	?	?	?	?	?	?
LEOPARD FROG	?	?	?	?	?	?	?
SPOTTED FROG	?	?	?	?	?	?	?
WOOD FROG	?	?	?	?	?	?	?
COMMON LOON	?	?	?	?	?	?	?
PIED-BILLED GREBE	?	?	?	?	?	?	?
HORNED GREBE	?	?	?	?	?	?	?
RED-NECKED GREBE	?	?	?	?	?	?	?
EARED GREBE	?	?	?	?	?	?	?
WESTERN GREBE (CLARK'S)	?	?	?	?	?	?	?
WHITE PELICAN	?	?	?	?	?	?	?
DOUBLE-CRESTED CORMORANT	?	?	?	?	?	?	?
AMERICAN BITTERN	?	?	?	?	?	?	?
GREAT BLUE HERON	?	?	?	?	?	?	?
BLACK-CROWNED NIGHT HERON	?	?	?	?	?	?	?
WHITE-FACED IBIS	?	?	?	?	?	?	?
TUNDRA SWAN	?	?	?	?	?	?	?
TRUMPETER SWAN	?	?	?	?	?	?	?
MUTE SWAN	?	?	?	?	?	?	?
GREATER WHITE-FRONTED GOOSE	?	?	?	?	?	?	?
SNOW GOOSE	?	?	?	?	?	?	?
ROSS' GOOSE	?	?	?	?	?	?	?
CANADA GOOSE	?	?	?	?	?	?	?
WOOD DUCK	?	?	?	?	?	?	?
GREEN-WINGED TEAL	?	?	?	?	?	?	?
MALLARD	?	?	?	?	?	?	?
NORTHERN PINTAIL	?	?	?	?	?	?	?
BLUE-WINGED TEAL	?	?	?	?	?	?	?
CINNAMON TEAL	?	?	?	?	?	?	?
NORTHERN SHOVELER	?	?	?	?	?	?	?
GADWALL	?	?	?	?	?	?	?
EURASIAN WIGEON	?	?	?	?	?	?	?
AMERICAN WIGEON	?	?	?	?	?	?	?
CANVASBACK	?	?	?	?	?	?	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
REDHEAD	?	?	?	?	?	?	?
RING-NECKED DUCK	?	?	?	?	?	?	?
LESSER SCAUP	?	?	?	?	?	?	?
HARLEQUIN DUCK	?	?	?	?	?	?	?
COMMON GOLDENEYE	?	?	?	?	?	?	?
BARROW'S GOLDENEYE	?	?	?	?	?	?	?
BUFFLEHEAD	?	?	?	?	?	?	?
HOODED MERGANSER	?	?	?	?	?	?	?
COMMON MERGANSER	?	?	?	?	?	?	?
RED-BREASTED MERGANSER	?	?	?	?	?	?	?
RUDDY DUCK	?	?	?	?	?	?	?
TURKEY VULTURE	?	?	?	?	?	?	?
OSPREY	?	?	?	?	?	?	?
BALD EAGLE	?	?	?	?	?	?	?
NORTHERN HARRIER (MARSH HAWK)	?	?	?	?	?	?	?
SHARP-SHINNED HAWK	?	?	?	?	?	?	?
COOPER'S HAWK	?	?	?	?	?	?	?
NORTHERN GOSHAWK	+	+	+	+	?	+	?
BROAD-WINGED HAWK	?	?	?	?	?	?	?
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	?	?	?	?	?	?	?
FERRUGINOUS HAWK	?	?	?	?	?	?	?
ROUGH-LEGGED HAWK	?	?	?	?	?	?	?
GOLDEN EAGLE	?	?	?	?	?	?	?
AMERICAN KESTREL	?	?	?	?	?	?	?
MERLIN	?	?	?	?	?	?	?
PEREGRINE FALCON	?	?	?	?	?	?	?
GYRFALCON	?	?	?	?	?	?	?
PRAIRIE FALCON	?	?	?	?	?	?	?
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	?	?	?	?	?	?
RING-NECKED PHEASANT	?	?	?	?	?	?	?
SPRUCE GROUSE	?	?	?	?	?	?	?
BLUE GROUSE	?	?	?	?	?	?	?
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	?	?	?	?	?	?	?
SAGE GROUSE	?	?	?	?	?	?	?
SHARP-TAILED GROUSE (COL.)	?	?	?	?	?	?	?
WILD TURKEY	?	?	?	?	?	?	?
NORTHERN BOBWHITE	?	?	?	?	?	?	?
VIRGINIA RAIL	?	?	?	?	?	?	?
SORA	?	?	?	?	?	?	?
AMERICAN COOT	?	?	?	?	?	?	?
SANDHILL CRANE	?	?	?	?	?	?	?
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	?	?	?	?	?	?	?
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	?	?	?	?	?	?	?
PIPING PLOVER	?	?	?	?	?	?	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
KILLDEER	?	?	?	?	?	?	?
MOUNTAIN PLOVER	?	?	?	?	?	?	?
BLACK-NECKED STILT	?	?	?	?	?	?	?
AMERICAN AVOCET	?	?	?	?	?	?	?
GREATER YELLOWLEGS	?	?	?	?	?	?	?
LESSER YELLOWLEGS	?	?	?	?	?	?	?
SOLITARY SANDPIPER	?	?	?	?	?	?	?
WILLET	?	?	?	?	?	?	?
SPOTTED SANDPIPER	?	?	?	?	?	?	?
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	?	?	?	?	?	?	?
LONG-BILLED CURLEW	?	?	?	?	?	?	?
MARBLED GODWIT	?	?	?	?	?	?	?
RUDDY TURNSTONE	?	?	?	?	?	?	?
SANDERLING	?	?	?	?	?	?	?
SEMIPALMATED SANDPIPER	?	?	?	?	?	?	?
WESTERN SANDPIPER	?	?	?	?	?	?	?
LEAST SANDPIPER	?	?	?	?	?	?	?
BAIRD'S SANDPIPER	?	?	?	?	?	?	?
PECTORAL SANDPIPER	?	?	?	?	?	?	?
DUNLIN	?	?	?	?	?	?	?
STILT SANDPIPER	?	?	?	?	?	?	?
LONG-BILLED DOWITCHER	?	?	?	?	?	?	?
COMMON SNIPE	?	?	?	?	?	?	?
WILSON'S PHALAROPE	?	?	?	?	?	?	?
RED-NECKED PHALAROPE	?	?	?	?	?	?	?
FRANKLIN'S GULL	?	?	?	?	?	?	?
BONAPARTE'S GULL	?	?	?	?	?	?	?
RING-BILLED GULL	?	?	?	?	?	?	?
CALIFORNIA GULL	?	?	?	?	?	?	?
CASPIAN TERN	?	?	?	?	?	?	?
COMMON TERN	?	?	?	?	?	?	?
FORSTER'S TERN	?	?	?	?	?	?	?
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	?	?	?	?	?	?	?
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	?	?	?	?	?	?	?
BLACK-BILLED CUCKOO	-	-	-	-	?	-	?
YELLOW-BILLED CUCKOO	-	-	-	-	?	-	?
FLAMMULATED OWL	?	?	?	?	?	?	?
EASTERN SCREECH-OWL	?	?	?	?	?	?	?
WESTERN SCREECH-OWL	?	?	?	?	?	?	?
GREAT HORNED OWL	?	?	?	?	?	?	?
SNOWY OWL	?	?	?	?	?	?	?
NORTHERN PYGMY OWL	?	?	+	?	-	+	-
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	?	?	?	?	?	?	?
GREAT GRAY OWL	?	?	?	?	?	?	?
LONG-EARED OWL	?	?	-	?	?	-	?
SHORT-EARED OWL	?	?	?	?	?	?	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BOREAL OWL	?	?	?	?	?	?	?
SAW-WHET OWL	?	?	?	?	?	?	?
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	?	?	?	?	?	?	?
VAUX'S SWIFT	?	?	?	?	?	?	?
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	?	?	?	?	?	?	?
CALLIOPE HUMMINGBIRD	?	?	?	?	?	?	?
RUFOUS HUMMINGBIRD	?	?	-	?	+	?	+
BELTED KINGFISHER	?	?	?	?	?	?	?
LEWIS' WOODPECKER	?	?	?	?	?	?	?
RED-HEADED WOODPECKER	?	?	?	?	?	?	?
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	?	?	?	?	?	?	?
WILLIAMSON'S SAPSUCKER	+	+	+	+	?	+	?
DOWNY WOODPECKER	+	+	+	+	?	+	?
HAIRY WOODPECKER	+	+	+	+	?	+	?
THREE-TOED WOODPECKER	?	?	+	?	-	+	-
BLACK-BACKED WOODPECKER	+	+	+	+	?	+	?
NORTHERN FLICKER	?	?	?	?	?	?	?
PILEATED WOODPECKER	?	?	+	?	-	+	-
OLIVE-SIDED FLYCATCHER	?	?	?	?	?	?	?
WESTERN WOOD PEWEE	+	+	+	+	?	+	?
WILLOW FLYCATCHER	?	?	?	?	?	?	?
LEAST FLYCATCHER	?	?	?	?	?	?	?
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	?	?	-	?	+	?	+
CORDILLERAN FLYCATCHER	?	?	?	?	?	?	?
SAY'S PHOEBE	?	?	-	?	+	-	+
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	?	?	?	?	?	?	?
EASTERN KINGBIRD	?	?	?	?	?	?	?
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	?	?	?	?	?	?	?
VIOLET-GREEN SWALLOW	?	?	?	?	?	?	?
ROUGH-WINGED SWALLOW	?	?	?	?	?	?	?
BANK SWALLOW	?	?	?	?	?	?	?
CLIFF SWALLOW	?	?	?	?	?	?	?
BARN SWALLOW	?	?	?	?	?	?	?
GRAY JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	+	+	+	+	?	+	?
BLACK-BILLED MAGPIE	?	?	?	?	?	?	?
COMMON CROW	?	?	?	?	?	?	?
COMMON RAVEN	?	?	?	?	?	?	?
BLACK-CAPPED CHICKADEE	?	?	?	?	?	?	?
MOUNTAIN CHICKADEE	+	+	+	+	?	+	?
BOREAL CHICKADEE	?	?	?	?	?	?	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
CHESTNUT-BACKED CHICKADEE	?	?	?	?	?	?	?
RED-BREASTED NUTHATCH	?	?	+	?	-	+	-
WHITE-BREASTED NUTHATCH	+	+	+	+	?	+	?
PYGMY NUTHATCH	+	+	+	+	?	+	?
BROWN CREEPER	+	+	+	+	?	+	?
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	+	+	+	+	?	+	?
RUBY-CROWNED KINGLET	?	?	?	?	?	?	?
WINTER WREN	?	?	?	?	?	?	?
MARSH WREN	?	?	?	?	?	?	?
DIPPER	?	?	?	?	?	?	?
GOLDEN-CROWNED KINGLET	+	+	+	+	?	+	?
EASTERN BLUEBIRD	?	?	?	?	?	?	?
WESTERN BLUEBIRD	?	?	?	?	?	?	?
MOUNTAIN BLUEBIRD	?	?	?	?	?	?	?
TOWNSEND'S SOLITAIRE	?	?	+	?	-	+	-
VEERY	?	?	?	?	?	?	?
SWAINSON'S THRUSH	+	+	+	+	?	+	?
HERMIT THRUSH	?	?	?	?	?	?	?
AMERICAN ROBIN	?	?	-	?	+	?	+
VARIED THRUSH	?	?	?	?	?	?	?
GRAY CATBIRD	?	?	?	?	?	?	?
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	?	?	?	?	?	?	?
WATER PIPIT	?	?	?	?	?	?	?
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	?	?	?	?	?	?	?
CEDAR WAXWING	?	?	?	?	?	?	?
NORTHERN SHRIKE	?	?	?	?	?	?	?
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	?	?	?	?	?	?	?
SOLITARY VIREO	+	+	+	+	?	+	?
WARBLING VIREO	?	?	?	?	?	?	?
RED-EYED VIREO	?	?	?	?	?	?	?
TENNESSEE WARBLER	?	?	?	?	?	?	?
ORANGE-CROWNED WARBLER	?	?	-	?	+	?	+
NASHVILLE WARBLER	?	?	?	?	?	?	?
YELLOW WARBLER	?	?	?	?	?	?	?
YELLOW-RUMPED WARBLER	?	?	-	?	+	?	+
TOWNSEND'S WARBLER	+	+	+	+	?	+	?
BLACKPOLL WARBLER	?	?	?	?	?	?	?
BLACK-AND-WHITE WARBLER	?	?	?	?	?	?	?
AMERICAN REDSTART	-	-	-	-	?	-	?
OVENBIRD	+	+	?	+	?	+	?
NORTHERN WATERTHRUSH	?	?	?	?	?	?	?
MACGILLIVRAY'S WARBLER	?	?	?	?	?	?	?
COMMON YELLOWTHROAT	?	?	-	?	+	-	+
WILSON'S WARBLER	-	-	-	-	?	-	?
YELLOW-BREASTED CHAT	?	?	?	?	?	?	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
WESTERN TANAGER	?	?	?	?	?	?	?
NORTHERN CARDINAL	?	?	?	?	?	?	?
BLACK-HEADED GROSBEAK	?	?	?	?	?	?	?
LAZULI BUNTING	?	?	?	?	?	?	?
INDIGO BUNTING	?	?	?	?	?	?	?
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	?	?	?	?	?	?	?
RUFOUS-SIDED TOWHEE	?	?	?	?	?	?	?
TREE SPARROW	?	?	?	?	?	?	?
CHIPPING SPARROW	?	?	?	?	?	?	?
CLAY-COLORED SPARROW	?	?	?	?	?	?	?
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	?	?	?	?	?	?	?
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	?	?	?	?	?	?	?
FOX SPARROW	?	?	?	?	?	?	?
SONG SPARROW	?	?	?	?	?	?	?
LINCOLN'S SPARROW	?	?	?	?	?	?	?
WHITE-THROATED SPARROW	-	-	-	-	?	-	?
WHITE-CROWNED SPARROW	?	?	?	?	?	?	?
HARRIS' SPARROW	?	?	?	?	?	?	?
DARK-EYED JUNCO	?	?	-	?	+	?	+
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	?	?	?	?	?	?	?
BOBOLINK	?	?	?	?	?	?	?
RED-WINGED BLACKBIRD	?	?	?	?	?	?	?
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	?	?	?	?	?	?	?
RUSTY BLACKBIRD	?	?	?	?	?	?	?
BREWER'S BLACKBIRD	?	?	?	?	?	?	?
COMMON GRACKLE	?	?	?	?	?	?	?
BROWN-HEADED COWBIRD	?	?	?	?	?	?	?
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	?	?	?	?	?	?	?
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	+	+	+	+	?	+	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	+	+	+	+	?	+	?
WHITE-WINGED CROSSBILL	+	+	+	+	?	+	?
COMMON REDPOLL	?	?	-	?	+	?	+
HOARY REDPOLL	?	?	?	?	?	?	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
PINE SISKIN	?	?	?	?	?	?	?
AMERICAN GOLDFINCH	?	?	?	?	?	?	?
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	?	?	?	?	?	?	?
MASKED SHREW	?	?	?	?	?	?	?
PREBLE'S SHREW	?	?	?	?	?	?	?
VAGRANT SHREW	?	?	?	?	?	?	?
DWARF SHREW	?	?	?	?	?	?	?
WATER SHREW	?	?	?	?	?	?	?
MERRIAM'S SHREW	?	?	-	?	+	-	+
PYGMY SHREW	?	?	?	?	?	?	?
LITTLE BROWN MYOTIS	?	?	?	?	?	?	?
YUMA MYOTIS	?	?	?	?	?	?	?
LONG-EARED MYOTIS	?	?	?	?	?	?	?
LONG-LEGGED MYOTIS	?	?	?	?	?	?	?
CALIFORNIA MYOTIS	?	?	?	?	?	?	?
WESTERN SMALL-FOOTED MYOTIS	?	?	?	?	?	?	?
NORTHERN MYOTIS (KEEN'S)	?	?	?	?	?	?	?
SILVER-HAIRED BAT	?	?	?	?	?	?	?
BIG BROWN BAT	?	?	?	?	?	?	?
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	?	?	?	?	?	?	?
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	?	?	?	?	?	?	?
MOUNTAIN COTTONTAIL	?	?	?	?	?	?	?
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	?	?	-	?	+	?	+
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	?	?	-	?	+	-	+
YELLOW-PINE CHIPMUNK	?	?	-	?	+	?	+
RED-TAILED CHIPMUNK	?	?	-	?	+	?	+
UINTA CHIPMUNK	?	?	-	?	+	?	+
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	?	?	?	?	?	?
COLUMBIAN GROUND SQUIRREL	?	?	?	?	?	?	?
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	+	+	+	+	?	+	?
EASTERN FOX SQUIRREL	?	?	+	?	?	+	?
RED SQUIRREL	+	+	+	+	?	+	?
NORTHERN FLYING SQUIRREL	+	+	+	+	?	+	?
NORTHERN POCKET GOPHER	?	?	?	?	?	?	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
IDAHO POCKET GOPHER	?	?	?	?	?	?	?
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	?	?	?	?	?	?	?
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	?	?	?	?	?	?	?
WHITE-FOOTED MOUSE	?	?	-	?	+	?	+
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	?	?	?	?	?	?
SOUTHERN RED-BACKED VOLE	+	+	+	+	?	+	?
HEATHER VOLE	?	?	?	?	?	?	?
MEADOW VOLE	?	?	-	?	?	-	?
MONTANE VOLE	?	?	?	?	?	?	?
LONG-TAILED VOLE	?	?	-	?	?	-	?
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	?	?	?	?	?	?	?
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	?	?	?	?	?	?	?
NORTHERN BOG LEMMING	?	?	-	?	?	-	?
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	-	?	?	-	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	?	?	?	?	?	?	?
PORCUPINE	+	+	+	+	?	+	?
COYOTE	?	?	?	?	?	?	?
GRAY WOLF	?	?	?	?	?	?	?
RED FOX	?	?	-	?	+	?	+
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	?	?	?	?	?	?	?
GRIZZLY BEAR	?	?	?	?	?	?	?
RACCOON	?	?	?	?	?	?	?
MARTEN	+	+	+	+	?	+	?
FISHER	+	+	+	+	?	+	?
ERMINE	?	?	?	?	?	?	?
LEAST WEASEL	?	?	?	?	?	?	?
LONG-TAILED WEASEL	?	?	?	?	?	?	?
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	?	?	?	?	?	?	?
WOLVERINE	?	?	?	?	?	?	?
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	?	?	-	?	+	?	+
STRIPED SKUNK	?	?	-	?	+	?	+
RIVER OTTER	?	?	?	?	?	?	?
MOUNTAIN LION	?	?	?	?	?	?	?
LYNX	+	+	+	+	?	+	?
BOBCAT	?	?	?	?	?	?	?
WAPITI OR ELK	?	?	?	?	?	?	?
MULE DEER	?	?	-	?	?	-	?

Table WLD-1 (continued)
DESCRIPTOR SUCCESSIONAL STAGE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
WHITE-TAILED DEER	?	?	?	?	?	?	?
MOOSE	?	?	?	?	?	?	?
WOODLAND CARIBOU	+	+	+	+	?	+	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	?	?	?	?	?	?	?
SNAPPING TURTLE	?	?	?	?	?	?	?
PAINTED TURTLE	?	?	?	?	?	?	?
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	?	?	?	?	?	?	?
SHORT-HORNED LIZARD	?	?	-	?	+	-	+
SAGEBRUSH LIZARD	?	?	-	?	+	?	+
WESTERN SKINK	?	?	?	?	?	?	?
RUBBER BOA	?	?	?	?	?	?	?
RACER	?	?	-	?	?	-	?
WESTERN HOGNOSE SNAKE	?	?	?	?	?	?	?
MILK SNAKE	?	?	-	?	+	-	+
PINE OR GOPHER SNAKE	?	?	-	?	+	-	+
W. TERRESTRIAL GARTER SNAKE	?	?	-	?	?	-	?
PLAINS GARTER SNAKE	?	?	?	?	?	?	?
COMMON GARTER SNAKE	?	?	?	?	?	?	?
WESTERN RATTLESNAKE	?	?	-	?	+	-	+

Table WLD-2
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	?	?	?	?	?	?	?
TIGER SALAMANDER	?	?	?	?	?	?	?
COEUR D'ALENE SALAMANDER (VD)	?	?	?	?	?	?	?
ROUGHSKIN NEWT	?	?	?	?	?	?	?
IDAHO GIANT SALAMANDER	?	?	?	?	?	?	?
TAILED FROG	?	?	?	?	?	?	?
WESTERN TOAD	?	?	?	?	?	?	?
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	?	?	?	?	?	?	?
PACIFIC CHORUS FROG	?	?	?	?	?	?	?
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	?	?	?	?	?	?	?
LEOPARD FROG	?	?	?	?	?	?	?
SPOTTED FROG	?	?	?	?	?	?	?
WOOD FROG	?	?	?	?	?	?	?
COMMON LOON	?	?	?	?	?	?	?
PIED-BILLED GREBE	?	?	?	?	?	?	?
HORNED GREBE	?	?	?	?	?	?	?
RED-NECKED GREBE	?	?	?	?	?	?	?
EARED GREBE	?	?	?	?	?	?	?
WESTERN GREBE (CLARK'S)	?	?	?	?	?	?	?
WHITE PELICAN	?	?	?	?	?	?	?
DOUBLE-CRESTED CORMORANT	?	?	?	?	?	?	?
AMERICAN BITTERN	?	?	?	?	?	?	?
GREAT BLUE HERON	?	?	?	?	?	?	?
BLACK-CROWNED NIGHT HERON	?	?	?	?	?	?	?
WHITE-FACED IBIS	?	?	?	?	?	?	?
TUNDRA SWAN	?	?	?	?	?	?	?
TRUMPETER SWAN	?	?	?	?	?	?	?
MUTE SWAN	?	?	?	?	?	?	?
GREATER WHITE-FRONTED GOOSE	?	?	?	?	?	?	?
SNOW GOOSE	?	?	?	?	?	?	?
ROSS' GOOSE	?	?	?	?	?	?	?
CANADA GOOSE	?	?	?	?	?	?	?
WOOD DUCK	?	?	?	?	?	?	?
GREEN-WINGED TEAL	?	?	?	?	?	?	?
MALLARD	?	?	?	?	?	?	?
NORTHERN PINTAIL	?	?	?	?	?	?	?
BLUE-WINGED TEAL	?	?	?	?	?	?	?
CINNAMON TEAL	?	?	?	?	?	?	?
NORTHERN SHOVELER	?	?	?	?	?	?	?
GADWALL	?	?	?	?	?	?	?
EURASIAN WIGEON	?	?	?	?	?	?	?
AMERICAN WIGEON	?	?	?	?	?	?	?
CANVASBACK	?	?	?	?	?	?	?
REDHEAD	?	?	?	?	?	?	?
RING-NECKED DUCK	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	?	?	?	?	?	?	?
HARLEQUIN DUCK	?	?	?	?	?	?	?
COMMON GOLDENEYE	?	?	?	?	?	?	?
BARROW'S GOLDENEYE	?	?	?	?	?	?	?
BUFFLEHEAD	?	?	?	?	?	?	?
HOODED MERGANSER	?	?	?	?	?	?	?
COMMON MERGANSER	?	?	?	?	?	?	?
RED-BREASTED MERGANSER	?	?	?	?	?	?	?
RUDDY DUCK	?	?	?	?	?	?	?
TURKEY VULTURE	?	?	?	?	?	?	?
OSPREY	?	?	?	?	?	?	?
BALD EAGLE	?	?	?	?	?	?	?
NORTHERN HARRIER (MARSH HAWK)	?	?	?	?	?	?	?
SHARP-SHINNED HAWK	?	?	?	?	?	?	?
COOPER'S HAWK	?	?	?	?	?	?	?
NORTHERN GOSHAWK	?	?	-	?	?	-	?
BROAD-WINGED HAWK	?	?	?	?	?	?	?
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	?	?	?	?	?	?	?
FERRUGINOUS HAWK	?	?	?	?	?	?	?
ROUGH-LEGGED HAWK	?	?	?	?	?	?	?
GOLDEN EAGLE	?	?	?	?	?	?	?
AMERICAN KESTREL	-	-	-	-	-	-	?
MERLIN	?	?	?	?	?	?	?
PEREGRINE FALCON	?	?	?	?	?	?	?
GYRFALCON	?	?	?	?	?	?	?
PRAIRIE FALCON	?	?	?	?	?	?	?
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	?	?	?	?	?	?
RING-NECKED PHEASANT	?	?	?	?	?	?	?
SPRUCE GROUSE	+	+	?	+	?	?	?
BLUE GROUSE	?	?-	+	?-	-	+	-
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	-	-	-	-	-	-	?
SAGE GROUSE	?	?	?	?	?	?	?
SHARP-TAILED GROUSE (COL.)	?	?	?	?	?	?	?
WILD TURKEY	?	?+	?+	+	+	?+	+
NORTHERN BOBWHITE	?	?	?	?	?	?	?
VIRGINIA RAIL	?	?	?	?	?	?	?
SORA	?	?	?	?	?	?	?
AMERICAN COOT	?	?	?	?	?	?	?
SANDHILL CRANE	?	?	?	?	?	?	?
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	?	?	?	?	?	?	?
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	?	?	?	?	?	?	?
PIPING PLOVER	?	?	?	?	?	?	?
KILLDEER	?	?	?	?	?	?	?
MOUNTAIN PLOVER	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	?	?	?	?	?	?	?
AMERICAN AVOCET	?	?	?	?	?	?	?
GREATER YELLOWLEGS	?	?	?	?	?	?	?
LESSER YELLOWLEGS	?	?	?	?	?	?	?
SOLITARY SANDPIPER	?	?	?	?	?	?	?
WILLET	?	?	?	?	?	?	?
SPOTTED SANDPIPER	?	?	?	?	?	?	?
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	?	?	?	?	?	?	?
LONG-BILLED CURLEW	?	?	?	?	?	?	?
MARBLED GODWIT	?	?	?	?	?	?	?
RUDDY TURNSTONE	?	?	?	?	?	?	?
SANDERLING	?	?	?	?	?	?	?
SEMIPALMATED SANDPIPER	?	?	?	?	?	?	?
WESTERN SANDPIPER	?	?	?	?	?	?	?
LEAST SANDPIPER	?	?	?	?	?	?	?
BAIRD'S SANDPIPER	?	?	?	?	?	?	?
PECTORAL SANDPIPER	?	?	?	?	?	?	?
DUNLIN	?	?	?	?	?	?	?
STILT SANDPIPER	?	?	?	?	?	?	?
LONG-BILLED DOWITCHER	?	?	?	?	?	?	?
COMMON SNIPE	?	?	?	?	?	?	?
WILSON'S PHALAROPE	?	?	?	?	?	?	?
RED-NECKED PHALAROPE	?	?	?	?	?	?	?
FRANKLIN'S GULL	?	?	?	?	?	?	?
BONAPARTE'S GULL	?	?	?	?	?	?	?
RING-BILLED GULL	?	?	?	?	?	?	?
CALIFORNIA GULL	?	?	?	?	?	?	?
CASPIAN TERN	?	?	?	?	?	?	?
COMMON TERN	?	?	?	?	?	?	?
FORSTER'S TERN	?	?	?	?	?	?	?
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	?	?	?	?	?	?	?
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	?	?	?	?	?	?	?
BLACK-BILLED CUCKOO	-	-	-	-	-	-	?
YELLOW-BILLED CUCKOO	-	-	-	-	-	-	?
FLAMMULATED OWL	?	?	?	?	?	?	?
EASTERN SCREECH-OWL	-	-	-	-	-	-	?
WESTERN SCREECH-OWL	-	-	-	-	-	-	?
GREAT HORNED OWL	-	-	-	?	?	-	+
SNOWY OWL	?	?	?	?	?	?	?
NORTHERN PYGMY OWL	?	?	?	?	?	?	?
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	?	?	?	?	?	?	?
GREAT GRAY OWL	?	+	?+	+	+	?+	+
LONG-EARED OWL	-	-	-	-	-	-	?
SHORT-EARED OWL	?	?	?	?	?	?	?
BOREAL OWL	?	?	?	?	?	?	?
SAW-WHET OWL	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	?	?	?	?	?	?	?
VAUX'S SWIFT	?	?	?	?	?	?	?
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	?	?	?	?	?	?	?
CALLIOPE HUMMINGBIRD	?	?	?	?	?	?	?
RUFOUS HUMMINGBIRD	?	?	?	?	?	?	?
BELTED KINGFISHER	?	?	?	?	?	?	?
LEWIS' WOODPECKER	-	-	-	-	-	-	?
RED-HEADED WOODPECKER	-	-	-	-	-	-	?
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	?	?	?	?	?	?	?
WILLIAMSON'S SAPSUCKER	?	?	?	?	?	?	?
DOWNY WOODPECKER	-	-	-	-	-	-	?
HAIRY WOODPECKER	?	?	?	?	?	?	?
THREE-TOED WOODPECKER	+	+	+	+	-	+	-
BLACK-BACKED WOODPECKER	?	?	-	?	?	-	?
NORTHERN FLICKER	+	+	?	?	?	?	?
PILEATED WOODPECKER	?	?	?	?	?	+	?
OLIVE-SIDED FLYCATCHER	+	+	?	?	?	?	?
WESTERN WOOD PEWEE	?	?	?	?	?	?	?
WILLOW FLYCATCHER	?	?	?	?	?	?	?
LEAST FLYCATCHER	?	?	?	?	?	?	?
HAMMOND'S FLYCATCHER	?	?	-	?	?	-	?
DUSKY FLYCATCHER	-	-	-	-	-	-	?
CORDILLERAN FLYCATCHER	-	-	-	-	-	-	?
SAY'S PHOEBE	?	?	?	?	?	?	?
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	?	?	?	?	?	?	?
EASTERN KINGBIRD	?	?	?	?	?	?	?
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	-	-	-	-	-	-	?
VIOLET-GREEN SWALLOW	?	?+	?+	+	+	?+	+
ROUGH-WINGED SWALLOW	?	?	?	?	?	?	?
CLIFF SWALLOW	?	?	?	?	?	?	?
BARN SWALLOW	?	?	?	?	?	?	?
GRAY JAY	+	+	?	+	?	?	?
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	?	?	?	?	?	?	?
COMMON CROW	?	?	?	?	?	?	?
COMMON RAVEN	?	?	?	?	?	?	?
BLACK-CAPPED CHICKADEE	-	-	-	-	-	-	?
MOUNTAIN CHICKADEE	+	+	+	+	?-	+	-
BOREAL CHICKADEE	+	+	+	+	?-	+	-
CHESTNUT-BACKED CHICKADEE	+	+	?	+	?	?	?
RED-BREASTED NUTHATCH	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
WHITE-BREASTED NUTHATCH	?	?	-	?	?	-	?
PYGMY NUTHATCH	?	?	-	?	?	-	?
BROWN CREEPER	?	?	?	?	?	?	?
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	?	?	?	?	?	?	?
RUBY-CROWNED KINGLET	?	?-	+	?-	-	+	-
WINTER WREN	?	?	?	?	?	?	?
MARSH WREN	?	?	?	?	?	?	?
DIPPER	?	?	?	?	?	?	?
GOLDEN-CROWNED KINGLET	+	+	?	+	?	?	?
EASTERN BLUEBIRD	?	?	?	?	?	?	?
WESTERN BLUEBIRD	?	?	?	?	?	?	?
MOUNTAIN BLUEBIRD	?	?	?	?	?	?	?
TOWNSEND'S SOLITAIRE	?	?	?	?	?	?	?
VEERY	?	?	?	?	?	?	?
SWAINSON'S THRUSH	?	?	?	?	?	?	?
HERMIT THRUSH	?	?	?	?	?	?	?
AMERICAN ROBIN	?	?	?	?	?	?	?
VARIED THRUSH	?	?	?	?	?	?	?
GRAY CATBIRD	?	?	?	?	?	?	?
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	?	?	?	?	?	?	?
WATER PIPIT	?	?	?	?	?	?	?
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	?	?	?	?	?	?	?
CEDAR WAXWING	-	-	-	-	-	-	?
NORTHERN SHRIKE	?	?	?	?	?	?	?
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	?	?	?	?	?	?	?
SOLITARY VIREO	+	+	?	+	?	?	?
WARBLING VIREO	-	-	-	-	-	-	?
RED-EYED VIREO	?	?	?	?	?	?	?
TENNESSEE WARBLER	?	?	?	?	?	?	?
ORANGE-CROWNED WARBLER	?	?	?	?	?	?	?
NASHVILLE WARBLER	?	?	?	?	?	?	?
YELLOW WARBLER	?	?	?	?	?	?	?
YELLOW-RUMPED WARBLER	?	?	?	?	?	?	?
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	?	?	?	?	?	?	?
BLACK-AND-WHITE WARBLER	-	-	-	-	-	-	?
AMERICAN REDSTART	-	-	-	-	-	-	?
OVENBIRD	-	-	-	-	-	-	?
NORTHERN WATERTHRUSH	?	?	?	?	?	?	?
MACGILLIVRAY'S WARBLER	-	-	-	-	-	-	?
COMMON YELLOWTHROAT	-	-	-	-	-	-	?
WILSON'S WARBLER	-	-	-	-	-	-	?
YELLOW-BREASTED CHAT	?	?	?	?	?	?	?
WESTERN TANAGER	?	?	-	?	?	-	?
NORTHERN CARDINAL	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-HEADED GROSBEAK	-	-	-	-	-	-	?
LAZULI BUNTING	?	?	?	?	?	?	?
INDIGO BUNTING	?	?	?	?	?	?	?
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	?	?	?	?	?	?	?
RUFOUS-SIDED TOWHEE	?	?	?	?	?	?	?
TREE SPARROW	?	?	?	?	?	?	?
CHIPPING SPARROW	?	?	?	?	?	?	?
CLAY-COLORED SPARROW	?	?	?	?	?	?	?
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	?	?	?	?	?	?	?
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	?	?	?	?	?	?	?
FOX SPARROW	?	?	?	?	?	?	?
SONG SPARROW	?	?	?	?	?	?	?
LINCOLN'S SPARROW	?	?	?	?	?	?	?
WHITE-THROATED SPARROW	?	?	?	?	?	?	?
WHITE-CROWNED SPARROW	?	?	?	?	?	?	?
HARRIS' SPARROW	?	?	?	?	?	?	?
DARK-EYED JUNCO	?	?	?	?	?	?	?
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	?	?	?	?	?	?	?
BOBOLINK	?	?	?	?	?	?	?
RED-WINGED BLACKBIRD	?	?	?	?	?	?	?
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	?	?	?	?	?	?	?
RUSTY BLACKBIRD	?	?	?	?	?	?	?
BREWER'S BLACKBIRD	?	?	?	?	?	?	?
COMMON GRACKLE	?	?	?	?	?	?	?
BROWN-HEADED COWBIRD	?	?	?	?	?	?	?
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	?	?	?	?	?	?	?
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	+	+	+	+	? -	+	-
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	?	?	?	?	?	?	?
HOARY REDPOLL	?	?	?	?	?	?	?
PINE SISKIN	?	?	?	?	?	?	?
AMERICAN GOLDFINCH	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	?	?	?	?	?	?	?
MASKED SHREW	?	?	?	?	?	?	?
PREBLE'S SHREW	?	?	?	?	?	?	?
VAGRANT SHREW	?	?	?	?	?	?	?
DWARF SHREW	?	?	?	?	?	?	?
WATER SHREW	?	?	?	?	?	?	?
MERRIAM'S SHREW	?	?	?	?	?	?	?
PYGMY SHREW	?	?	?	?	?	?	?
LITTLE BROWN MYOTIS	?	?	?	?	?	?	?
YUMA MYOTIS	?	?	?	?	?	?	?
LONG-EARED MYOTIS	?	?	?	?	?	?	?
LONG-LEGGED MYOTIS	?	?	?	?	?	?	?
CALIFORNIA MYOTIS	?	?	?	?	?	?	?
WESTERN SMALL-FOOTED MYOTIS	?	?	?	?	?	?	?
NORTHERN MYOTIS (KEEN'S)	?	?	?	?	?	?	?
SILVER-HAIRED BAT	?	?	?	?	?	?	?
BIG BROWN BAT	?	?	?	?	?	?	?
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	?	?	?	?	?	?	?
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	-	-	-	-	-	-	?
MOUNTAIN COTTONTAIL	?	?	?	?	?	?	?
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	?	?	?	?	?	?	?
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	?	?	?	?	?	?	?
YELLOW-PINE CHIPMUNK	?	?	?	?	?	?	?
RED-TAILED CHIPMUNK	+	+	+	+	? -	+	-
UINTA CHIPMUNK	?	?	?	?	?	?	?
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR.SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	?	?	?	?	?	?
COLUMBIAN GROUND SQUIRREL	?	?	?	?	?	?	?
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	?	?	?	?	?	?	?
EASTERN FOX SQUIRREL	?	?	?	?	?	?	?
RED SQUIRREL	?	?	?	?	?	?	?
NORTHERN FLYING SQUIRREL	?	?	?	?	?	?	?
NORTHERN POCKET GOPHER	?	?	?	?	?	?	?
IDAHO POCKET GOPHER	?	?	?	?	?	?	?
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	?	?	?	?	?	?	?
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	?	?	?	?	?	?	?
WHITE-FOOTED MOUSE	?	?	?	?	?	?	?
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	?	?	?	?	?	?
SOUTHERN RED-BACKED VOLE	+	+	+	+	?-	+	?
HEATHER VOLE	?	?	?	?	?	?	?
MEADOW VOLE	?	?	?	?	?	?	?
MONTANE VOLE	?	?	?	?	?	?	?
LONG-TAILED VOLE	?	?	?	?	?	?	?
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	?	?	?	?	?	?	?
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	?	?	?	?	?	?	?
NORTHERN BOG LEMMING	?	?	?	?	?	?	?
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	?	?	?	?	?	?	?
PORCUPINE	+	+	?	?	?	?	?
COYOTE	?	?	?	?	?	?	?
GRAY WOLF	?	?	?	?	?	?	?
RED FOX	?	?	?	?	?	?	?
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	?	?	?	?	?	?	?
GRIZZLY BEAR	?	?	?	?	?	?	?
RACCOON	-	-	-	-	-	-	?
MARTEN	?	?	?	?	?	?	?
FISHER	?	?	?	?	?	?	?
ERMINE	+	+	+	+	?-	+	-
LEAST WEASEL	?	?	?	?	?	?	?
LONG-TAILED WEASEL	?	?	?	?	?	?	?
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	?	?	?	?	?	?	?
WOLVERINE	+	+	+	+	?-	+	-
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	?	?	?	?	?	?	?
STRIPED SKUNK	-	-	-	-	-	-	?
RIVER OTTER	?	?	?	?	?	?	?
MOUNTAIN LION	?	?	?	?	?	?	?
LYNX	+	+	?	+	?	?	?
BOBCAT	?	?	?	?	?	?	?
WAPITI OR ELK	?	?	?	?	?	?	?
MULE DEER	+	+	+	+	?-	+	-
WHITE-TAILED DEER	-	-	-	-	-	-	?
MOOSE	?	?	?	?	?	?	?

Table WLD-2 (continued)
DESCRIPTOR FOREST TYPE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
WOODLAND CARIBOU	?	?	?	?	?	?	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	?	?	?	?	?	?	?
SNAPPING TURTLE	?	?	?	?	?	?	?
PAINTED TURTLE	?	?	?	?	?	?	?
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	?	?	?	?	?	?	?
SHORT-HORNED LIZARD	?	?	?	?	?	?	?
SAGEBRUSH LIZARD	?	?	?	?	?	?	?
WESTERN SKINK	?	?	?	?	?	?	?
RUBBER BOA	?	?	?	?	?	?	?
RACER	?	?	?	?	?	?	?
WESTERN HOGNOSE SNAKE	?	?	?	?	?	?	?
MILK SNAKE	?	?	?	?	?	?	?
PINE OR GOPHER SNAKE	?	?	?	?	?	?	?
W. TERRESTRIAL GARTER SNAKE	?	?	?	?	?	?	?
PLAINS GARTER SNAKE	?	?	?	?	?	?	?
COMMON GARTER SNAKE	?	?	?	?	?	?	?
WESTERN RATTLESNAKE	?	?	?	?	?	?	?

Table WLD-3
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	?	?	?	?	?	?	?
TIGER SALAMANDER	?	?	?	?	?	?	?
COEUR D'ALENE SALAMANDER (VD)	?	?	?	?	?	?	?
ROUGHSKIN NEWT	?	?	?	?	?	?	?
IDAHO GIANT SALAMANDER	?	?	?	?	?	?	?
TAILED FROG	?	?	?	?	?	?	?
WESTERN TOAD	?	?	?	?	?	?	?
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	?	?	?	?	?	?	?
PACIFIC CHORUS FROG	?	?	?	?	?	?	?
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	?	?	?	?	?	?	?
LEOPARD FROG	?	?	?	?	?	?	?
SPOTTED FROG	?	?	?	?	?	?	?
WOOD FROG	?	?	?	?	?	?	?
COMMON LOON	?	?	?	?	?	?	?
PIED-BILLED GREBE	?	?	?	?	?	?	?
HORNED GREBE	?	?	?	?	?	?	?
RED-NECKED GREBE	?	?	?	?	?	?	?
EARED GREBE	?	?	?	?	?	?	?
WESTERN GREBE (CLARK'S)	?	?	?	?	?	?	?
WHITE PELICAN	?	?	?	?	?	?	?
DOUBLE-CRESTED CORMORANT	?	?	?	?	?	?	?
AMERICAN BITTERN	?	?	?	?	?	?	?
GREAT BLUE HERON	?	?	?	?	?	?	?
BLACK-CROWNED NIGHT HERON	?	?	?	?	?	?	?
WHITE-FACED IBIS	?	?	?	?	?	?	?
TUNDRA SWAN	?	?	?	?	?	?	?
TRUMPETER SWAN	?	?	?	?	?	?	?
MUTE SWAN	?	?	?	?	?	?	?
GREATER WHITE-FRONTED GOOSE	?	?	?	?	?	?	?
SNOW GOOSE	?	?	?	?	?	?	?
ROSS' GOOSE	?	?	?	?	?	?	?
CANADA GOOSE	?	?	?	?	?	?	?
WOOD DUCK	?	?	?	?	?	?	?
GREEN-WINGED TEAL	?	?	?	?	?	?	?
MALLARD	?	?	?	?	?	?	?
NORTHERN PINTAIL	?	?	?	?	?	?	?
BLUE-WINGED TEAL	?	?	?	?	?	?	?
CINNAMON TEAL	?	?	?	?	?	?	?
NORTHERN SHOVELER	?	?	?	?	?	?	?
GADWALL	?	?	?	?	?	?	?
EURASIAN WIGEON	?	?	?	?	?	?	?
AMERICAN WIGEON	?	?	?	?	?	?	?
CANVASBACK	?	?	?	?	?	?	?
REDHEAD	?	?	?	?	?	?	?
RING-NECKED DUCK	?	?	?	?	?	?	?

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	?	?	?	?	?	?	?
HARLEQUIN DUCK	?	?	?	?	?	?	?
COMMON GOLDENEYE	?	?	?	?	?	?	?
BARROW'S GOLDENEYE	?	?	?	?	?	?	?
BUFFLEHEAD	?	?	?	?	?	?	?
HOODED MERGANSER	?	?	?	?	?	?	?
COMMON MERGANSER	?	?	?	?	?	?	?
RED-BREASTED MERGANSER	?	?	?	?	?	?	?
RUDDY DUCK	?	?	?	?	?	?	?
TURKEY VULTURE	?	?	?	?	?	?	?
OSPREY	?	?	?	?	?	?	?
BALD EAGLE	?	?	?	?	?	?	?
NORTHERN HARRIER (MARSH HAWK)	?	?	?	?	?	?	?
SHARP-SHINNED HAWK	?	?	?	?	?	?	?
COOPER'S HAWK	?	?	?	?	?	?	?
NORTHERN GOSHAWK	?	?	?	?	?	?	?
BROAD-WINGED HAWK	?	?	?	?	?	?	?
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	-	?	-	?	?	-	?
FERRUGINOUS HAWK	?	?	?	?	?	?	?
ROUGH-LEGGED HAWK	?	?	?	?	?	?	?
GOLDEN EAGLE	?	?	?	?	?	?	?
AMERICAN KESTREL	-	-	-	?	?+	-	?
MERLIN	-	-	-	?	?+	-	?-
PEREGRINE FALCON	?	?	?	?	?	?	?
GYRFALCON	?	?	?	?	?	?	?
PRAIRIE FALCON	?	?	?	?	?	?	?
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	?	?	?	?	?	?
RING-NECKED PHEASANT	?	?	?	?	?	?	?
SPRUCE GROUSE	?	?	?	?	?	?	?
BLUE GROUSE	-	-	-	?	?+	-	?-
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	?	?	?	?	?	?	?
SAGE GROUSE	?	?	?	?	?	?	?
SHARP-TAILED GROUSE (COL.)	?	?	?	?	?	?	?
WILD TURKEY	-	-	-	?	?+	-	?-
NORTHERN BOBWHITE	?	?	?	?	?	?	?
VIRGINIA RAIL	?	?	?	?	?	?	?
SORA	?	?	?	?	?	?	?
AMERICAN COOT	?	?	?	?	?	?	?
SANDHILL CRANE	?	?	?	?	?	?	?
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	?	?	?	?	?	?	?
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	?	?	?	?	?	?	?
PIPING PLOVER	?	?	?	?	?	?	?
KILLDEER	?	?	?	?	?	?	?
MOUNTAIN PLOVER	?	?	?	?	?	?	?

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	?	?	?	?	?	?	?
AMERICAN AVOCET	?	?	?	?	?	?	?
GREATER YELLOWLEGS	?	?	?	?	?	?	?
LESSER YELLOWLEGS	?	?	?	?	?	?	?
SOLITARY SANDPIPER	?	?	?	?	?	?	?
WILLET	?	?	?	?	?	?	?
SPOTTED SANDPIPER	?	?	?	?	?	?	?
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	?	?	?	?	?	?	?
LONG-BILLED CURLEW	?	?	?	?	?	?	?
MARBLED GODWIT	?	?	?	?	?	?	?
RUDDY TURNSTONE	?	?	?	?	?	?	?
SANDERLING	?	?	?	?	?	?	?
SEMIPALMATED SANDPIPER	?	?	?	?	?	?	?
WESTERN SANDPIPER	?	?	?	?	?	?	?
LEAST SANDPIPER	?	?	?	?	?	?	?
BAIRD'S SANDPIPER	?	?	?	?	?	?	?
PECTORAL SANDPIPER	?	?	?	?	?	?	?
DUNLIN	?	?	?	?	?	?	?
STILT SANDPIPER	?	?	?	?	?	?	?
LONG-BILLED DOWITCHER	?	?	?	?	?	?	?
COMMON SNIPE	?	?	?	?	?	?	?
WILSON'S PHALAROPE	?	?	?	?	?	?	?
RED-NECKED PHALAROPE	?	?	?	?	?	?	?
FRANKLIN'S GULL	?	?	?	?	?	?	?
BONAPARTE'S GULL	?	?	?	?	?	?	?
RING-BILLED GULL	?	?	?	?	?	?	?
CALIFORNIA GULL	?	?	?	?	?	?	?
CASPIAN TERN	?	?	?	?	?	?	?
COMMON TERN	?	?	?	?	?	?	?
FORSTER'S TERN	?	?	?	?	?	?	?
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	?	?	?	?	?	?	?
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	?	?	?	?	?	?	?
BLACK-BILLED CUCKOO	+	+	+	?+	?-	+	?+
YELLOW-BILLED CUCKOO	+	+	+	?+	?-	+	?+
FLAMMULATED OWL	-	-	-	?	?+	-	?
EASTERN SCREECH-OWL	-	?	-	?	?	-	?
WESTERN SCREECH-OWL	-	?	-	?	?	-	?
GREAT HORNED OWL	?	?	?	?	?	?	?
SNOWY OWL	?	?	?	?	?	?	?
NORTHERN PYGMY OWL	?	?	?	?	?	?	?
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	?	?	?	?	?	?	?
GREAT GRAY OWL	?	?	?	?	?	?	?
LONG-EARED OWL	?	?	?	?	?	?	?
SHORT-EARED OWL	?	?	?	?	?	?	?
BOREAL OWL	?	?	?	?	?	?	?
SAW-WHET OWL	?	?	?	?	?	?	?

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	?	?	?	?	?	?	?
VAUX'S SWIFT	?	?	?	?	?	?	?
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	?	?	?	?	?	?	?
CALLIOPE HUMMINGBIRD	?	?	?	?	?	?	?
RUFOUS HUMMINGBIRD	?	?	?	?	?	?	?
BELTED KINGFISHER	?	?	?	?	?	?	?
LEWIS' WOODPECKER	-	-	-	?	?+	-	?-
RED-HEADED WOODPECKER	?	?	?	?	?	?	?
YELLOW-BELLIED SASPUCKER (RED-NAPED)	?	?	?	?	?	?	?
WILLIAMSON'S SAPSUCKER	?	?	?	?	?	?	?
DOWNY WOODPECKER	?	?	?	?	?	?	?
HAIRY WOODPECKER	-	-	-	?	?+	-	?
THREE-TOED WOODPECKER	?	?	?	?	?	?	?
BLACK-BACKED WOODPECKER	-	-	-	?	?+	-	?
NORTHERN FLICKER	-	-	-	?	?+	-	?-
PILEATED WOODPECKER	?	?	?	?	?	?	?
OLIVE-SIDED FLYCATCHER	?	?	?	?	?	?	?
WESTERN WOOD PEWEE	?	?	?	?	?	?	?
WILLOW FLYCATCHER	?	?	?	?	?	?	?
LEAST FLYCATCHER	?	?	?	?	?	?	?
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	?	?	?	?	?	?	?
CORDILLERAN FLYCATCHER	?	?	?	?	?	?	?
SAY'S PHOEBE	?	?	?	?	?	?	?
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	?	?	?	?	?	?	?
EASTERN KINGBIRD	?	?	?	?	?	?	?
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	-	-	-	?	?+	-	?-
VIOLET-GREEN SWALLOW	?	?	?	?	?	?	?
ROUGH-WINGED SWALLOW	?	?	?	?	?	?	?
BANK SWALLOW	?	?	?	?	?	?	?
CLIFF SWALLOW	?	?	?	?	?	?	?
BARN SWALLOW	?	?	?	?	?	?	?
GRAY JAY	?	?	?	?	?	?	?
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	?	?	?	?	?	?	?
COMMON CROW	?	?	?	?	?	?	?
COMMON RAVEN	?	?	?	?	?	?	?
BLACK-CAPPED CHICKADEE	?	?	?	?	?	?	?
MOUNTAIN CHICKADEE	?	?	?	?	?	?	?
BOREAL CHICKADEE	?	?	?	?	?	?	?
CHESTNUT-BACKED CHICKADEE	+	+	+	?+	?-	+	?+

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
RED-BREASTED NUTHATCH	+	+	+	?+	?-	+	?+
WHITE-BREASTED NUTHATCH	-	-	-	?	?+	-	?
PYGMY NUTHATCH	?	?	?	?	?	?	?
BROWN CREEPER	?	?	?	?	?	?	?
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	?	?	?	?	?	?	?
RUBY-CROWNED KINGLET	+	+	+	?+	?-	+	?+
WINTER WREN	+	+	+	?+	?-	+	?+
MARSH WREN	?	?	?	?	?	?	?
DIPPER	?	?	?	?	?	?	?
GOLDEN-CROWNED KINGLET	?	?	?	?	?	?	?
EASTERN BLUEBIRD	?	?	?	?	?	?	?
WESTERN BLUEBIRD	?	?	?	?	?	?	?
MOUNTAIN BLUEBIRD	?	?	?	?	?	?	?
TOWNSEND'S SOLITAIRE	-	-	-	?	?+	-	?-
VEERY	+	+	+	?+	?-	+	?+
SWAINSON'S THRUSH	+	+	+	?+	?-	+	?+
HERMIT THRUSH	?	?	?	?	?	?	?
AMERICAN ROBIN	?	?	?	?	?	?	?
VARIED THRUSH	+	+	+	?+	?-	+	?+
GRAY CATBIRD	?	?	?	?	?	?	?
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	?	?	?	?	?	?	?
WATER PIPIT	?	?	?	?	?	?	?
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	?	?	?	?	?	?	?
CEDAR WAXWING	?	?	?	?	?	?	?
NORTHERN SHRIKE	?	?	?	?	?	?	?
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	?	?	?	?	?	?	?
SOLITARY VIREO	+	+	+	?+	?-	+	?+
WARBLING VIREO	?	?	?	?	?	?	?
RED-EYED VIREO	?	?	?	?	?	?	?
TENNESSEE WARBLER	?	?	?	?	?	?	?
ORANGE-CROWNED WARBLER	?	?	?	?	?	?	?
NASHVILLE WARBLER	?	?	?	?	?	?	?
YELLOW WARBLER	?	?	?	?	?	?	?
YELLOW-RUMPED WARBLER	?	?	?	?	?	?	?
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	?	?	?	?	?	?	?
BLACK-AND-WHITE WARBLER	?	?	?	?	?	?	?
AMERICAN REDSTART	?	?	?	?	?	?	?
OVENBIRD	?	?	?	?	?	?	?
NORTHERN WATERTHRUSH	?	?	?	?	?	?	?
MACGILLIVRAY'S WARBLER	?	?	?	?	?	?	?
COMMON YELLOWTHROAT	-	-	-	?	?+	-	?-
WILSON'S WARBLER	?	?	?	?	?	?	?
YELLOW-BREASTED CHAT	?	?	?	?	?	?	?
WESTERN TANAGER	-	?-	-	?-	0	-	?

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
NORTHERN CARDINAL	?	?	?	?	?	?	?
BLACK-HEADED GROSBEAK	-	-	-	?	?+	-	?-
LAZULI BUNTING	?	?	?	?	?	?	?
INDIGO BUNTING	?	?	?	?	?	?	?
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	?	?	?	?	?	?	?
RUFOUS-SIDED TOWHEE	?	?	?	?	?	?	?
TREE SPARROW	?	?	?	?	?	?	?
CHIPPING SPARROW	?	?	?	?	?	?	?
CLAY-COLORED SPARROW	?	?	?	?	?	?	?
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	?	?	?	?	?	?	?
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	?	?	?	?	?	?	?
FOX SPARROW	?	?	?	?	?	?	?
SONG SPARROW	?	?	?	?	?	?	?
LINCOLN'S SPARROW	?	?	?	?	?	?	?
WHITE-THROATED SPARROW	?	?	?	?	?	?	?
WHITE-CROWNED SPARROW	?	?	?	?	?	?	?
HARRIS' SPARROW	?	?	?	?	?	?	?
DARK-EYED JUNCO	-	-	-	?	?+	-	?-
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	?	?	?	?	?	?	?
BOBOLINK	?	?	?	?	?	?	?
RED-WINGED BLACKBIRD	?	?	?	?	?	?	?
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	?	?	?	?	?	?	?
RUSTY BLACKBIRD	?	?	?	?	?	?	?
BREWER'S BLACKBIRD	?	?	?	?	?	?	?
COMMON GRACKLE	?	?	?	?	?	?	?
BROWN-HEADED COWBIRD	?	?	?	?	?	?	?
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	?	?	?	?	?	?	?
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	?	?	?	?	?	?	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	?	?	?	?	?	?	?
HOARY REDPOLL	?	?	?	?	?	?	?
PINE SISKIN	?	?	?	?	?	?	?

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
AMERICAN GOLDFINCH	?	?	?	?	?	?	?
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	?	?	?	?	?	?	?
MASKED SHREW	?	?	?	?	?	?	?
PREBLE'S SHREW	?	?	?	?	?	?	?
VAGRANT SHREW	?	?	?	?	?	?	?
DWARF SHREW	?	?	?	?	?	?	?
WATER SHREW	?	?	?	?	?	?	?
MERRIAM'S SHREW	?	?	?	?	?	?	?
PYGMY SHREW	?	?	?	?	?	?	?
LITTLE BROWN MYOTIS	?	?	?	?	?	?	?
YUMA MYOTIS	?	?	?	?	?	?	?
LONG-EARED MYOTIS	?	?	?	?	?	?	?
LONG-LEGGED MYOTIS	?	?	?	?	?	?	?
CALIFORNIA MYOTIS	?	?	?	?	?	?	?
WESTERN SMALL-FOOTED MYOTIS	?	?	?	?	?	?	?
NORTHERN MYOTIS (KEEN'S)	?	?	?	?	?	?	?
SILVER-HAIRED BAT	?	?	?	?	?	?	?
BIG BROWN BAT	?	?	?	?	?	?	?
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	?	?	?	?	?	?	?
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	-	-	-	?	?+	-	?-
MOUNTAIN COTTONTAIL	?	?	?	?	?	?	?
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	?	?	?	?	?	?	?
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	-	-	-	?	?+	-	?-
YELLOW-PINE CHIPMUNK	?	?	?	?	?	?	?
RED-TAILED CHIPMUNK	-	-	-	?	?+	-	?
UINTA CHIPMUNK	-	-	-	?	?+	-	?
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	?	?	?	?	?	?
COLUMBIAN GROUND SQUIRREL	?	?	?	?	?	?	?
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	?	?	?	?	?-	?	?
EASTERN FOX SQUIRREL	?	?	?	?	?	?	?
RED SQUIRREL	?	?	?	?	?	?	?
NORTHERN FLYING SQUIRREL	?	?	?	?	?	?	?
NORTHERN POCKET GOPHER	?	?	?	?	?	?	?
IDAHO POCKET GOPHER	?	?	?	?	?	?	?

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	?	?	?	?	?	?	?
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	?	?	?	?	?	?	?
WHITE-FOOTED MOUSE	-	-	-	?	?+	-	?-
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	?	?	?	?	?	?
SOUTHERN RED-BACKED VOLE	?	?	?	?	?	?	?
HEATHER VOLE	?	?	?	?	?	?	?
MEADOW VOLE	-	-	-	?	?+	-	?-
MONTANE VOLE	?	?	?	?	?	?	?
LONG-TAILED VOLE	?	?	?	?	?	?	?
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	?	?	?	?	?	?	?
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	?	?	?	?	?	?	?
NORTHERN BOG LEMMING	?	?	?	?	?	?	?
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	?	?	?	?	?	?	?
PORCUPINE	?	?	?	?	?	?	?
COYOTE	?	?	?	?	?	?	?
GRAY WOLF	?	?	?	?	?	?	?
RED FOX	?	?	?	?	?	?	?
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	?	?	?	?	?	?	?
GRIZZLY BEAR	?	?	?	?	?	?	?
RACCOON	?	?	?	?	?	?	?
MARTEN	?	?	?	?	?-	?	?
FISHER	+	+	+	?+	?-	+	?+
ERMINE	?	?	?	?	?	?	?
LEAST WEASEL	?	?	?	?	?	?	?
LONG-TAILED WEASEL	?	?	?	?	?	?	?
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	?	?	?	?	?	?	?
WOLVERINE	?	?	?	?	?	?	?
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	-	-	-	?	?+	-	?-
STRIPED SKUNK	-	-	-	?	?+	-	?-
RIVER OTTER	?	?	?	?	?	?	?
MOUNTAIN LION	?	?	?	?	?	?	?
LYNX	+	+	+	?+	?-	+	?+
BOBCAT	?	?	?	?	?	?	?
WAPITI OR ELK	?	?	?	?	?	?	?
MULE DEER	?	?	?	?	?	?	?
WHITE-TAILED DEER	?	?	?	?	?	?	?

Table WLD-3 (continued)
DESCRIPTOR STOCKING LEVEL

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
MOOSE	?	?	?	?	?	?	?
WOODLAND CARIBOU	?	?	?	?	?	?	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	?	?	?	?	?	?	?
SNAPPING TURTLE	?	?	?	?	?	?	?
PAINTED TURTLE	?	?	?	?	?	?	?
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	?	?	?	?	?	?	?
SHORT-HORNED LIZARD	-	-	-	?	?+	-	?-
SAGEBRUSH LIZARD	-	-	-	?	?+	-	?-
WESTERN SKINK	?	?	?	?	?	?	?
RUBBER BOA	?	?	?	?	?	?	?
RACER	-	-	-	?	?+	-	?-
WESTERN HOGNOSE SNAKE	?	?	?	?	?	?	?
MILK SNAKE	?	?	?	?	?	?	?
PINE OR GOPHER SNAKE	-	-	-	?	?+	-	?-
W. TERRESTRIAL GARTER SNAKE	?	?	?	?	?	?	?
PLAINS GARTER SNAKE	?	?	?	?	?	?	?
COMMON GARTER SNAKE	?	?	?	?	?	?	?
WESTERN RATTLESNAKE	?	?	?	?	?	?	?

Table WLD-4
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	?	?	?	?	?	?	?
TIGER SALAMANDER	?	?	?	?	?	?	?
COEUR D'ALENE SALAMANDER (VD)	?	?	?	?	?	?	?
ROUGHSKIN NEWT	?	?	?	?	?	?	?
IDAHO GIANT SALAMANDER	?	?	?	?	?	?	?
TAILED FROG	?	?	?	?	?	?	?
WESTERN TOAD	?	?	?	?	?	?	?
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	?	?	?	?	?	?	?
PACIFIC CHORUS FROG	?	?	?	?	?	?	?
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	?	?	?	?	?	?	?
LEOPARD FROG	?	?	?	?	?	?	?
SPOTTED FROG	?	?	?	?	?	?	?
WOOD FROG	?	?	?	?	?	?	?
COMMON LOON	?	?	?	?	?	?	?
PIED-BILLED GREBE	?	?	?	?	?	?	?
HORNED GREBE	?	?	?	?	?	?	?
RED-NECKED GREBE	?	?	?	?	?	?	?
EARED GREBE	?	?	?	?	?	?	?
WESTERN GREBE (CLARK'S)	?	?	?	?	?	?	?
WHITE PELICAN	?	?	?	?	?	?	?
DOUBLE-CRESTED CORMORANT	-	+	+	-	-	+	+
AMERICAN BITTERN	?	?	?	?	?	?	?
GREAT BLUE HERON	?	?	?	?	?	?	?
BLACK-CROWNED NIGHT HERON	?	?	?	?	?	?	?
WHITE-FACED IBIS	?	?	?	?	?	?	?
TUNDRA SWAN	?	?	?	?	?	?	?
TRUMPETER SWAN	?	?	?	?	?	?	?
MUTE SWAN	?	?	?	?	?	?	?
GREATER WHITE-FRONTED GOOSE	?	?	?	?	?	?	?
SNOW GOOSE	?	?	?	?	?	?	?
ROSS' GOOSE	?	?	?	?	?	?	?
CANADA GOOSE	?	?	?	?	?	?	?
WOOD DUCK	-	+	+	-	-	+	+
GREEN-WINGED TEAL	?	?	?	?	?	?	?
MALLARD	?	?	?	?	?	?	?
NORTHERN PINTAIL	?	?	?	?	?	?	?
BLUE-WINGED TEAL	?	?	?	?	?	?	?
CINNAMON TEAL	?	?	?	?	?	?	?
NORTHERN SHOVELER	?	?	?	?	?	?	?
GADWALL	?	?	?	?	?	?	?
EURASIAN WIGEON	?	?	?	?	?	?	?
AMERICAN WIGEON	?	?	?	?	?	?	?
CANVASBACK	?	?	?	?	?	?	?
REDHEAD	?	?	?	?	?	?	?
RING-NECKED DUCK	?	?	?	?	?	?	?

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	?	?	?	?	?	?	?
HARLEQUIN DUCK	?	?	?	?	?	?	?
COMMON GOLDENEYE	-	+	+	-	-	+	+
BARROW'S GOLDENEYE	-	+	+	-	-	+	+
BUFFLEHEAD	-	+	+	-	-	+	+
HOODED MERGANSER	-	+	+	-	-	+	+
COMMON MERGANSER	-	+	+	-	-	+	+
RED-BREASTED MERGANSER	?	?	?	?	?	?	?
RUDDY DUCK	?	?	?	?	?	?	?
TURKEY VULTURE	+	?	+	+	-	+	-
OSPREY	-	+	+	-	-	+	+
BALD EAGLE	-	+	+	-	-	+	+
NORTHERN HARRIER (MARSH HAWK)	?	?	?	?	?	?	?
SHARP-SHINNED HAWK	?	?	?	?	?	?	?
COOPER'S HAWK	?	?	?	?	?	?	?
NORTHERN GOSHAWK	?	?	?	?	?	?	?
BROAD-WINGED HAWK	+	?	+	+	-	+	-
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	?	?	?	?	?	?	?
FERRUGINOUS HAWK	?	?	?	?	?	?	?
ROUGH-LEGGED HAWK	?	?	?	?	?	?	?
GOLDEN EAGLE	-	+	+	-	-	+	+
AMERICAN KESTREL	-	+	+	-	-	+	+
MERLIN	-	+	+	-	-	+	+
PEREGRINE FALCON	?	?	?	?	?	?	?
GYRFALCON	?	?	?	?	?	?	?
PRAIRIE FALCON	?	?	?	?	?	?	?
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	?	?	?	?	?	?
RING-NECKED PHEASANT	?	?	?	?	?	?	?
SPRUCE GROUSE	?	?	?	?	?	?	?
BLUE GROUSE	?	?	?	?	?	?	?
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	?	?	?	?	?	?	?
SAGE GROUSE	?	?	?	?	?	?	?
SHARP-TAILED GROUSE (COL.)	?	?	?	?	?	?	?
WILD TURKEY	?	?	?	?	?	?	?
NORTHERN BOBWHITE	?	?	?	?	?	?	?
VIRGINIA RAIL	?	?	?	?	?	?	?
SORA	?	?	?	?	?	?	?
AMERICAN COOT	?	?	?	?	?	?	?
SANDHILL CRANE	?	?	?	?	?	?	?
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	?	?	?	?	?	?	?
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	?	?	?	?	?	?	?
PIPING PLOVER	?	?	?	?	?	?	?
KILLDEER	?	?	?	?	?	?	?
MOUNTAIN PLOVER	?	?	?	?	?	?	?

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	?	?	?	?	?	?	?
AMERICAN AVOCET	?	?	?	?	?	?	?
GREATER YELLOWLEGS	?	?	?	?	?	?	?
LESSER YELLOWLEGS	?	?	?	?	?	?	?
SOLITARY SANDPIPER	?	?	?	?	?	?	?
WILLET	?	?	?	?	?	?	?
SPOTTED SANDPIPER	?	?	?	?	?	?	?
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	?	?	?	?	?	?	?
LONG-BILLED CURLEW	?	?	?	?	?	?	?
MARBLED GODWIT	?	?	?	?	?	?	?
RUDDY TURNSTONE	?	?	?	?	?	?	?
SANDERLING	?	?	?	?	?	?	?
SEMIPALMATED SANDPIPER	?	?	?	?	?	?	?
WESTERN SANDPIPER	?	?	?	?	?	?	?
LEAST SANDPIPER	?	?	?	?	?	?	?
BAIRD'S SANDPIPER	?	?	?	?	?	?	?
PECTORAL SANDPIPER	?	?	?	?	?	?	?
DUNLIN	?	?	?	?	?	?	?
STILT SANDPIPER	?	?	?	?	?	?	?
LONG-BILLED DOWITCHER	?	?	?	?	?	?	?
COMMON SNIPE	?	?	?	?	?	?	?
WILSON'S PHALAROPE	?	?	?	?	?	?	?
RED-NECKED PHALAROPE	?	?	?	?	?	?	?
FRANKLIN'S GULL	?	?	?	?	?	?	?
BONAPARTE'S GULL	?	?	?	?	?	?	?
RING-BILLED GULL	?	?	?	?	?	?	?
CALIFORNIA GULL	?	?	?	?	?	?	?
CASPIAN TERN	?	?	?	?	?	?	?
COMMON TERN	?	?	?	?	?	?	?
FORSTER'S TERN	?	?	?	?	?	?	?
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	?	?	?	?	?	?	?
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	?	?	?	?	?	?	?
BLACK-BILLED CUCKOO	?	?	?	?	?	?	?
YELLOW-BILLED CUCKOO	?	?	?	?	?	?	?
FLAMMULATED OWL	-	+	+	-	-	+	+
EASTERN SCREECH-OWL	-	+	+	-	-	+	+
WESTERN SCREECH-OWL	-	+	+	-	-	+	+
GREAT HORNED OWL	+	?	+	+	-	+	-
SNOWY OWL	?	?	?	?	?	?	?
NORTHERN PYGMY OWL	-	+	+	-	-	+	+
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	-	+	+	-	-	+	+
GREAT GRAY OWL	+	?	+	?	?	?	-
LONG-EARED OWL	?	?	?	?	?	?	?
SHORT-EARED OWL	?	?	?	?	?	?	?
BOREAL OWL	+	?	+	+	-	+	-
SAW-WHET OWL	-	+	+	-	-	+	+

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	-	+	+	-	-	+	+
VAUX'S SWIFT	-	+	+	-	-	+	+
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	?	?	?	?	?	?	?
CALLIOPE HUMMINGBIRD	?	?	?	?	?	?	?
RUFOUS HUMMINGBIRD	?	?	?	?	?	?	?
BELTED KINGFISHER	?	?	?	?	?	?	?
LEWIS' WOODPECKER	+	?	+	+	-	+	-
RED-HEADED WOODPECKER	+	?	+	+	-	+	-
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	+	?	+	+	-	+	-
WILLIAMSON'S SAPSUCKER	+	?	+	+	-	+	-
DOWNY WOODPECKER	+	?	+	+	-	+	-
HAIRY WOODPECKER	+	?	+	+	-	+	-
THREE-TOED WOODPECKER	-	+	+	-	-	+	+
BLACK-BACKED WOODPECKER	+	?	+	+	-	+	-
NORTHERN FLICKER	-	+	+	-	-	+	+
PILEATED WOODPECKER	-	+	+	-	-	+	+
OLIVE-SIDED FLYCATCHER	?	?	?	?	?	?	?
WESTERN WOOD PEWEE	?	?	?	?	?	?	?
WILLOW FLYCATCHER	?	?	?	?	?	?	?
LEAST FLYCATCHER	?	?	?	?	?	?	?
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	?	?	?	?	?	?	?
CORDILLERAN FLYCATCHER	+	?	+	+	-	+	-
SAY'S PHOEBE	+	?	+	+	-	+	-
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	?	?	?	?	?	?	?
EASTERN KINGBIRD	?	?	?	?	?	?	?
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	+	?	+	+	-	+	-
VIOLET-GREEN SWALLOW	+	?	+	+	-	+	-
ROUGH-WINGED SWALLOW	?	?	?	?	?	?	?
BANK SWALLOW	?	?	?	?	?	?	?
CLIFF SWALLOW	?	?	?	?	?	?	?
BARN SWALLOW	?	?	?	?	?	?	?
GRAY JAY	?	?	?	?	?	?	?
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	?	?	?	?	?	?	?
COMMON CROW	?	?	?	?	?	?	?
COMMON RAVEN	?	?	?	?	?	?	?
BLACK-CAPPED CHICKADEE	+	?	+	+	-	+	-
MOUNTAIN CHICKADEE	+	?	+	+	-	+	-
BOREAL CHICKADEE	+	?	+	+	-	+	-
CHESTNUT-BACKED CHICKADEE	+	?	+	+	-	+	-

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
RED-BREASTED NUTHATCH	+	?	+	+	-	+	-
WHITE-BREASTED NUTHATCH	+	?	+	+	-	+	-
PYGMY NUTHATCH	-	+	+	-	-	+	+
BROWN CREEPER	+	?	+	+	-	+	-
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	+	?	+	+	-	+	-
RUBY-CROWNED KINGLET	?	?	?	?	?	?	?
WINTER WREN	+	?	+	+	-	+	-
MARSH WREN	?	?	?	?	?	?	?
DIPPER	?	?	?	?	?	?	?
GOLDEN-CROWNED KINGLET	?	?	?	?	?	?	?
EASTERN BLUEBIRD	+	?	+	+	-	+	-
WESTERN BLUEBIRD	+	?	+	+	-	+	-
MOUNTAIN BLUEBIRD	+	?	+	+	-	+	-
TOWNSEND'S SOLITAIRE	?	?	?	?	?	?	?
VEERY	?	?	?	?	?	?	?
SWAINSON'S THRUSH	?	?	?	?	?	?	?
HERMIT THRUSH	?	?	?	?	?	?	?
AMERICAN ROBIN	?	?	?	?	?	?	?
VARIED THRUSH	?	?	?	?	?	?	?
GRAY CATBIRD	?	?	?	?	?	?	?
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	?	?	?	?	?	?	?
WATER PIPIT	?	?	?	?	?	?	?
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	?	?	?	?	?	?	?
CEDAR WAXWING	?	?	?	?	?	?	?
NORTHERN SHRIKE	?	?	?	?	?	?	?
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	+	?	+	+	-	+	-
SOLITARY VIREO	?	?	?	?	?	?	?
WARBLING VIREO	?	?	?	?	?	?	?
RED-EYED VIREO	?	?	?	?	?	?	?
TENNESSEE WARBLER	?	?	?	?	?	?	?
ORANGE-CROWNED WARBLER	?	?	?	?	?	?	?
NASHVILLE WARBLER	?	?	?	?	?	?	?
YELLOW WARBLER	?	?	?	?	?	?	?
YELLOW-RUMPED WARBLER	?	?	?	?	?	?	?
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	?	?	?	?	?	?	?
BLACK-AND-WHITE WARBLER	?	?	?	?	?	?	?
AMERICAN REDSTART	?	?	?	?	?	?	?
OVENBIRD	?	?	?	?	?	?	?
NORTHERN WATERTHRUSH	?	?	?	?	?	?	?
MACGILLIVRAY'S WARBLER	?	?	?	?	?	?	?
COMMON YELLOWTHROAT	?	?	?	?	?	?	?
WILSON'S WARBLER	?	?	?	?	?	?	?
YELLOW-BREASTED CHAT	?	?	?	?	?	?	?
WESTERN TANAGER	?	?	?	?	?	?	?

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
NORTHERN CARDINAL	?	?	?	?	?	?	?
BLACK-HEADED GROSBEAK	?	?	?	?	?	?	?
LAZULI BUNTING	?	?	?	?	?	?	?
INDIGO BUNTING	?	?	?	?	?	?	?
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	?	?	?	?	?	?	?
RUFOUS-SIDED TOWHEE	?	?	?	?	?	?	?
TREE SPARROW	?	?	?	?	?	?	?
CHIPPING SPARROW	?	?	?	?	?	?	?
CLAY-COLORED SPARROW	?	?	?	?	?	?	?
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	?	?	?	?	?	?	?
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	?	?	?	?	?	?	?
FOX SPARROW	?	?	?	?	?	?	?
SONG SPARROW	?	?	?	?	?	?	?
LINCOLN'S SPARROW	?	?	?	?	?	?	?
WHITE-THROATED SPARROW	?	?	?	?	?	?	?
WHITE-CROWNED SPARROW	?	?	?	?	?	?	?
HARRIS' SPARROW	?	?	?	?	?	?	?
DARK-EYED JUNCO	?	?	?	?	?	?	?
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	?	?	?	?	?	?	?
BOBOLINK	?	?	?	?	?	?	?
RED-WINGED BLACKBIRD	?	?	?	?	?	?	?
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	?	?	?	?	?	?	?
RUSTY BLACKBIRD	?	?	?	?	?	?	?
BREWER'S BLACKBIRD	?	?	?	?	?	?	?
COMMON GRACKLE	?	?	?	?	?	?	?
BROWN-HEADED COWBIRD	?	?	?	?	?	?	?
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	?	?	?	?	?	?	?
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	?	?	?	?	?	?	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	?	?	?	?	?	?	?
HOARY REDPOLL	?	?	?	?	?	?	?
PINE SISKIN	?	?	?	?	?	?	?

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
AMERICAN GOLDFINCH	?	?	?	?	?	?	?
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	+	?	+	+	-	+	-
MASKED SHREW	+	?	+	+	-	+	-
PREBLE'S SHREW	?	?	?	?	?	?	?
VAGRANT SHREW	?	?	?	?	?	?	?
DWARF SHREW	?	?	?	?	?	?	?
WATER SHREW	?	?	?	?	?	?	?
MERRIAM'S SHREW	?	?	?	?	?	?	?
PYGMY SHREW	?	?	?	?	?	?	?
LITTLE BROWN MYOTIS	+	?	+	+	-	+	-
YUMA MYOTIS	?	?	?	?	?	?	?
LONG-EARED MYOTIS	+	?	+	+	-	+	-
LONG-LEGGED MYOTIS	+	?	+	+	-	+	-
CALIFORNIA MYOTIS	+	?	+	+	-	+	-
WESTERN SMALL-FOOTED MYOTIS	+	?	+	+	-	+	-
NORTHERN MYOTIS (KEEN'S)	+	?	+	+	-	+	-
SILVER-HAIRED BAT	+	?	+	+	-	+	-
BIG BROWN BAT	+	?	+	+	-	+	-
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	?	?	?	?	?	?	?
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	?	?	?	?	?	?	?
MOUNTAIN COTTONTAIL	?	?	?	?	?	?	?
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	?	?	?	?	?	?	?
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	+	?	+	+	-	+	-
YELLOW-PINE CHIPMUNK	?	?	?	?	?	?	?
RED-TAILED CHIPMUNK	?	?	?	?	?	?	?
UINTA CHIPMUNK	?	?	?	?	?	?	?
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	?	?	?	?	?	?
COLUMBIAN GROUND SQUIRREL	?	?	?	?	?	?	?
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	+	?	+	+	-	+	-
EASTERN FOX SQUIRREL	-	+	+	-	-	+	+
RED SQUIRREL	+	?	+	+	-	+	-
NORTHERN FLYING SQUIRREL	+	?	+	+	-	+	-
NORTHERN POCKET GOPHER	?	?	?	?	?	?	?
IDAHO POCKET GOPHER	?	?	?	?	?	?	?

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	?	?	?	?	?	?	?
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	?	?	?	?	?	?	?
WHITE-FOOTED MOUSE	+	?	+	+	-	+	-
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	?	?	?	?	?	?
SOUTHERN RED-BACKED VOLE	?	?	?	?	?	?	?
HEATHER VOLE	?	?	?	?	?	?	?
MEADOW VOLE	?	?	?	?	?	?	?
MONTANE VOLE	?	?	?	?	?	?	?
LONG-TAILED VOLE	?	?	?	?	?	?	?
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	?	?	?	?	?	?	?
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	?	?	?	?	?	?	?
NORTHERN BOG LEMMING	?	?	?	?	?	?	?
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	?	?	?	?	?	?	?
PORCUPINE	+	?	+	+	-	+	-
COYOTE	?	?	?	?	?	?	?
GRAY WOLF	?	?	?	?	?	?	?
RED FOX	?	?	?	?	?	?	?
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	+	?	+	+	-	+	-
GRIZZLY BEAR	?	?	?	?	?	?	?
RACCOON	-	+	+	-	-	+	+
MARTEN	-	+	+	-	-	+	+
FISHER	-	+	+	-	-	+	+
ERMINE	+	?	+	+	-	+	-
LEAST WEASEL	?	?	?	?	?	?	?
LONG-TAILED WEASEL	+	?	+	+	-	+	-
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	?	?	?	?	?	?	?
WOLVERINE	?	?	?	?	?	?	?
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	+	?	+	+	-	+	-
STRIPED SKUNK	+	?	+	+	-	+	-
RIVER OTTER	?	?	?	?	?	?	?
MOUNTAIN LION	?	?	?	?	?	?	?
LYNX	+	?	+	+	-	+	-
BOBCAT	?	?	?	?	?	?	?
WAPITI OR ELK	?	?	?	?	?	?	?
MULE DEER	?	?	?	?	?	?	?
WHITE-TAILED DEER	?	?	?	?	?	?	?

Table WLD-4 (continued)
DESCRIPTOR SNAG ABUNDANCE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
MOOSE	?	?	?	?	?	?	?
WOODLAND CARIBOU	?	?	?	?	?	?	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	?	?	?	?	?	?	?
SNAPPING TURTLE	?	?	?	?	?	?	?
PAINTED TURTLE	?	?	?	?	?	?	?
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	?	?	?	?	?	?	?
SHORT-HORNED LIZARD	?	?	?	?	?	?	?
SAGEBRUSH LIZARD	?	?	?	?	?	?	?
WESTERN SKINK	?	?	?	?	?	?	?
RUBBER BOA	?	?	?	?	?	?	?
RACER	?	?	?	?	?	?	?
WESTERN HOGNOSE SNAKE	?	?	?	?	?	?	?
MILK SNAKE	+	?	+	+	-	+	-
PINE OR GOPHER SNAKE	?	?	?	?	?	?	?
W. TERRESTRIAL GARTER SNAKE	?	?	?	?	?	?	?
PLAINS GARTER SNAKE	?	?	?	?	?	?	?
COMMON GARTER SNAKE	?	?	?	?	?	?	?
WESTERN RATTLESNAKE	?	?	?	?	?	?	?

Table WLD-5
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	?	+	+	?	-	+	?
TIGER SALAMANDER	?	+	+	?	-	+	?
COEUR D'ALENE SALAMANDER (VD)	?	+	+	?	-	+	?
ROUGHSKIN NEWT	?	+	+	?	-	+	?
IDAHO GIANT SALAMANDER	?	+	+	?	-	+	?
TAILED FROG	?	+	+	?	-	+	?
WESTERN TOAD	?	+	+	?	-	+	?
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	?	+	+	?	-	+	?
PACIFIC CHORUS FROG	?	+	+	?	-	+	?
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	?	?	?	?	?	?	?
LEOPARD FROG	?	?	?	?	?	?	?
SPOTTED FROG	?	?	?	?	?	?	?
WOOD FROG	?	+	+	?	-	+	?
COMMON LOON	?	?	?	?	?	?	?
PIED-BILLED GREBE	?	?	?	?	?	?	?
HORNED GREBE	?	?	?	?	?	?	?
RED-NECKED GREBE	?	?	?	?	?	?	?
EARED GREBE	?	?	?	?	?	?	?
WESTERN GREBE (CLARK'S)	?	?	?	?	?	?	?
WHITE PELICAN	?	?	?	?	?	?	?
DOUBLE-CRESTED CORMORANT	?	?	?	?	?	?	?
AMERICAN BITTERN	?	?	?	?	?	?	?
GREAT BLUE HERON	?	?	?	?	?	?	?
BLACK-CROWNED NIGHT HERON	?	?	?	?	?	?	?
WHITE-FACED IBIS	?	?	?	?	?	?	?
TUNDRA SWAN	?	?	?	?	?	?	?
TRUMPETER SWAN	?	?	?	?	?	?	?
MUTE SWAN	?	?	?	?	?	?	?
GREATER WHITE-FRONTED GOOSE	?	?	?	?	?	?	?
SNOW GOOSE	?	?	?	?	?	?	?
ROSS' GOOSE	?	?	?	?	?	?	?
CANADA GOOSE	?	?	?	?	?	?	?
WOOD DUCK	?	?	?	?	?	?	?
GREEN-WINGED TEAL	?	?	?	?	?	?	?
MALLARD	?	?	?	?	?	?	?
NORTHERN PINTAIL	?	?	?	?	?	?	?
BLUE-WINGED TEAL	?	?	?	?	?	?	?
CINNAMON TEAL	?	?	?	?	?	?	?
NORTHERN SHOVELER	?	?	?	?	?	?	?
GADWALL	?	?	?	?	?	?	?
EURASIAN WIGEON	?	?	?	?	?	?	?
AMERICAN WIGEON	?	?	?	?	?	?	?
CANVASBACK	?	?	?	?	?	?	?
REDHEAD	?	?	?	?	?	?	?
RING-NECKED DUCK	?	?	?	?	?	?	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	?	?	?	?	?	?	?
HARLEQUIN DUCK	?	+	+	?	-	+	?0
COMMON GOLDENEYE	?	?	?	?	?	?	?
BARROW'S GOLDENEYE	?	?	?	?	?	?	?
BUFFLEHEAD	?	?	?	?	?	?	?
HOODED MERGANSER	?	?	?	?	?	?	?
COMMON MERGANSER	?	?	?	?	?	?	?
RED-BREASTED MERGANSER	?	?	?	?	?	?	?
RUDDY DUCK	?	?	?	?	?	?	?
TURKEY VULTURE	?	?	?	?	?	?	?
OSPREY	?	?	?	?	?	?	?
BALD EAGLE	?	?	?	?	?	?	?
NORTHERN HARRIER (MARSH HAWK)	?	?	?	?	?	?	?
SHARP-SHINNED HAWK	?	?	?	?	?	?	?
COOPER'S HAWK	?	?	?	?	?	?	?
NORTHERN GOSHAWK	?	+	+	?	-	+	?
BROAD-WINGED HAWK	?	?	?	?	?	?	?
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	?	?	?	?	?	?	?
FERRUGINOUS HAWK	?	?	?	?	?	?	?
ROUGH-LEGGED HAWK	?	?	?	?	?	?	?
GOLDEN EAGLE	?	?	?	?	?	?	?
AMERICAN KESTREL	?	?	?	?	?	?	?
MERLIN	?	?	?	?	?	?	?
PEREGRINE FALCON	?	?	?	?	?	?	?
GYRFALCON	?	?	?	?	?	?	?
PRAIRIE FALCON	?	?	?	?	?	?	?
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	+	+	?	-	+	?
RING-NECKED PHEASANT	?	?	?	?	?	?	?
SPRUCE GROUSE	?	?	?	?	?	?	?
BLUE GROUSE	?	+	+	?	-	+	?
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	?	+	+	?	-	+	?
SAGE GROUSE	?	?	?	?	?	?	?
SHARP-TAILED GROUSE (COL.)	?	?	?	?	?	?	?
WILD TURKEY	?	?	?	?	?	?	?
NORTHERN BOBWHITE	?	?	?	?	?	?	?
VIRGINIA RAIL	?	?	?	?	?	?	?
SORA	?	?	?	?	?	?	?
AMERICAN COOT	?	?	?	?	?	?	?
SANDHILL CRANE	?	?	?	?	?	?	?
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	?	?	?	?	?	?	?
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	?	?	?	?	?	?	?
PIPING PLOVER	?	?	?	?	?	?	?
KILLDEER	?	?	?	?	?	?	?
MOUNTAIN PLOVER	?	?	?	?	?	?	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	?	?	?	?	?	?	?
AMERICAN AVOCET	?	?	?	?	?	?	?
GREATER YELLOWLEGS	?	?	?	?	?	?	?
LESSER YELLOWLEGS	?	?	?	?	?	?	?
SOLITARY SANDPIPER	?	?	?	?	?	?	?
WILLET	?	?	?	?	?	?	?
SPOTTED SANDPIPER	?	?	?	?	?	?	?
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	?	?	?	?	?	?	?
LONG-BILLED CURLEW	?	?	?	?	?	?	?
MARBLED GODWIT	?	?	?	?	?	?	?
RUDDY TURNSTONE	?	?	?	?	?	?	?
SANDERLING	?	?	?	?	?	?	?
SEMIPALMATED SANDPIPER	?	?	?	?	?	?	?
WESTERN SANDPIPER	?	?	?	?	?	?	?
LEAST SANDPIPER	?	?	?	?	?	?	?
BAIRD'S SANDPIPER	?	?	?	?	?	?	?
PECTORAL SANDPIPER	?	?	?	?	?	?	?
DUNLIN	?	?	?	?	?	?	?
STILT SANDPIPER	?	?	?	?	?	?	?
LONG-BILLED DOWITCHER	?	?	?	?	?	?	?
COMMON SNIPE	?	?	?	?	?	?	?
WILSON'S PHALAROPE	?	?	?	?	?	?	?
RED-NECKED PHALAROPE	?	?	?	?	?	?	?
FRANKLIN'S GULL	?	?	?	?	?	?	?
BONAPARTE'S GULL	?	?	?	?	?	?	?
RING-BILLED GULL	?	?	?	?	?	?	?
CALIFORNIA GULL	?	?	?	?	?	?	?
CASPIAN TERN	?	?	?	?	?	?	?
COMMON TERN	?	?	?	?	?	?	?
FORSTER'S TERN	?	?	?	?	?	?	?
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	?	?	?	?	?	?	?
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	?	?	?	?	?	?	?
BLACK-BILLED CUCKOO	?	?	?	?	?	?	?
YELLOW-BILLED CUCKOO	?	?	?	?	?	?	?
FLAMMULATED OWL	?	?	?	?	?	?	?
EASTERN SCREECH-OWL	?	?	?	?	?	?	?
WESTERN SCREECH-OWL	?	?	?	?	?	?	?
GREAT HORNED OWL	?	?	?	?	?	?	?
SNOWY OWL	?	?	?	?	?	?	?
NORTHERN PYGMY OWL	?	?	?	?	?	?	?
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	?	?	?	?	?	?	?
GREAT GRAY OWL	?	?	?	?	?	?	?
LONG-EARED OWL	?	?	?	?	?	?	?
SHORT-EARED OWL	?	?	?	?	?	?	?
BOREAL OWL	?	?	?	?	?	?	?
SAW-WHET OWL	?	?	?	?	?	?	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	?	?	?	?	?	?	?
VAUX'S SWIFT	?	?	?	?	?	?	?
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	?	?	?	?	?	?	?
CALLIOPE HUMMINGBIRD	?	?	?	?	?	?	?
RUFOUS HUMMINGBIRD	?	?	?	?	?	?	?
BELTED KINGFISHER	?	?	?	?	?	?	?
LEWIS' WOODPECKER	?	?	?	?	?	?	?
RED-HEADED WOODPECKER	?	?	?	?	?	?	?
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	?	?	?	?	?	?	?
WILLIAMSON'S SAPSUCKER	?	?	?	?	?	?	?
DOWNY WOODPECKER	?	?	?	?	?	?	?
HAIRY WOODPECKER	?	?	?	?	?	?	?
THREE-TOED WOODPECKER	?	?	?	?	?	?	?
BLACK-BACKED WOODPECKER	?	?	?	?	?	?	?
NORTHERN FLICKER	?	?	?	?	?	?	?
PILEATED WOODPECKER	?	?	?	?	?	?	?
OLIVE-SIDED FLYCATCHER	?	?	?	?	?	?	?
WESTERN WOOD PEWEE	?	?	?	?	?	?	?
WILLOW FLYCATCHER	?	?	?	?	?	?	?
LEAST FLYCATCHER	?	?	?	?	?	?	?
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	?	?	?	?	?	?	?
CORDILLERAN FLYCATCHER	?	?	?	?	?	?	?
SAY'S PHOEBE	?	?	?	?	?	?	?
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	?	?	?	?	?	?	?
EASTERN KINGBIRD	?	?	?	?	?	?	?
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	?	?	?	?	?	?	?
VIOLET-GREEN SWALLOW	?	?	?	?	?	?	?
ROUGH-WINGED SWALLOW	?	?	?	?	?	?	?
BANK SWALLOW	?	?	?	?	?	?	?
CLIFF SWALLOW	?	?	?	?	?	?	?
BARN SWALLOW	?	?	?	?	?	?	?
GRAY JAY	?	?	?	?	?	?	?
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	?	?	?	?	?	?	?
COMMON CROW	?	?	?	?	?	?	?
COMMON RAVEN	?	?	?	?	?	?	?
BLACK-CAPPED CHICKADEE	?	?	?	?	?	?	?
MOUNTAIN CHICKADEE	?	?	?	?	?	?	?
BOREAL CHICKADEE	?	?	?	?	?	?	?
CHESTNUT-BACKED CHICKADEE	?	?	?	?	?	?	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
RED-BREASTED NUTHATCH	?	?	?	?	?	?	?
WHITE-BREASTED NUTHATCH	?	?	?	?	?	?	?
PYGMY NUTHATCH	?	?	?	?	?	?	?
BROWN CREEPER	?	?	?	?	?	?	?
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	?	?	?	?	?	?	?
RUBY-CROWNED KINGLET	?	?	?	?	?	?	?
WINTER WREN	?	?	?	?	?	?	?
MARSH WREN	?	?	?	?	?	?	?
DIPPER	?	+	+	?	-	+	?
GOLDEN-CROWNED KINGLET	?	?	?	?	?	?	?
EASTERN BLUEBIRD	?	?	?	?	?	?	?
WESTERN BLUEBIRD	?	?	?	?	?	?	?
MOUNTAIN BLUEBIRD	?	?	?	?	?	?	?
TOWNSEND'S SOLITAIRE	?	?	?	?	?	?	?
VEERY	?	+	+	?	-	+	?
SWAINSON'S THRUSH	?	+	+	?	-	+	?
HERMIT THRUSH	?	?	?	?	?	?	?
AMERICAN ROBIN	?	?	?	?	?	?	?
VARIED THRUSH	?	?	?	?	?	?	?
GRAY CATBIRD	?	?	?	?	?	?	?
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	?	?	?	?	?	?	?
WATER PIPIT	?	?	?	?	?	?	?
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	?	?	?	?	?	?	?
CEDAR WAXWING	?	?	?	?	?	?	?
NORTHERN SHRIKE	?	?	?	?	?	?	?
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	?	?	?	?	?	?	?
SOLITARY VIREO	?	?	?	?	?	?	?
WARBLING VIREO	?	?	?	?	?	?	?
RED-EYED VIREO	?	?	?	?	?	?	?
TENNESSEE WARBLER	?	?	?	?	?	?	?
ORANGE-CROWNED WARBLER	?	?	?	?	?	?	?
NASHVILLE WARBLER	?	?	?	?	?	?	?
YELLOW WARBLER	?	?	?	?	?	?	?
YELLOW-RUMPED WARBLER	?	?	?	?	?	?	?
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	?	?	?	?	?	?	?
BLACK-AND-WHITE WARBLER	?	+	+	?	-	+	?
AMERICAN REDSTART	?	?	?	?	?	?	?
OVENBIRD	?	?	?	?	?	?	?
NORTHERN WATERTHRUSH	?	+	+	?	-	+	?
MACGILLIVRAY'S WARBLER	?	?	?	?	?	?	?
COMMON YELLOWTHROAT	?	?	?	?	?	?	?
WILSON'S WARBLER	?	?	?	?	?	?	?
YELLOW-BREASTED CHAT	?	?	?	?	?	?	?
WESTERN TANAGER	?	?	?	?	?	?	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
NORTHERN CARDINAL	?	?	?	?	?	?	?
BLACK-HEADED GROSBEAK	?	?	?	?	?	?	?
LAZULI BUNTING	?	?	?	?	?	?	?
INDIGO BUNTING	?	?	?	?	?	?	?
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	?	?	?	?	?	?	?
RUFOUS-SIDED TOWHEE	?	?	?	?	?	?	?
TREE SPARROW	?	?	?	?	?	?	?
CHIPPING SPARROW	?	?	?	?	?	?	?
CLAY-COLORED SPARROW	?	?	?	?	?	?	?
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	?	?	?	?	?	?	?
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	?	?	?	?	?	?	?
FOX SPARROW	?	?	?	?	?	?	?
SONG SPARROW	?	?	?	?	?	?	?
LINCOLN'S SPARROW	?	?	?	?	?	?	?
WHITE-THROATED SPARROW	?	?	?	?	?	?	?
WHITE-CROWNED SPARROW	?	?	?	?	?	?	?
HARRIS' SPARROW	?	?	?	?	?	?	?
DARK-EYED JUNCO	?	+	+	?	-	+	?
MCGOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	?	?	?	?	?	?	?
BOBOLINK	?	?	?	?	?	?	?
RED-WINGED BLACKBIRD	?	?	?	?	?	?	?
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	?	?	?	?	?	?	?
RUSTY BLACKBIRD	?	?	?	?	?	?	?
BREWER'S BLACKBIRD	?	?	?	?	?	?	?
COMMON GRACKLE	?	?	?	?	?	?	?
BROWN-HEADED COWBIRD	?	?	?	?	?	?	?
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	?	?	?	?	?	?	?
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	?	?	?	?	?	?	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	?	?	?	?	?	?	?
HOARY REDPOLL	?	?	?	?	?	?	?
PINE SISKIN	?	?	?	?	?	?	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
AMERICAN GOLDFINCH	?	?	?	?	?	?	?
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	?	?	?	?	?	?	?
MASKED SHREW	?	?	?	?	?	?	?
PREBLE'S SHREW	?	?	?	?	?	?	?
VAGRANT SHREW	?	+	+	?	-	+	?
DWARF SHREW	?	+	+	?	-	+	?
WATER SHREW	?	+	+	?	-	+	?
MERRIAM'S SHREW	?	+	+	?	-	+	?
PYGMY SHREW	?	+	+	?	-	+	?
LITTLE BROWN MYOTIS	?	?	?	?	?	?	?
YUMA MYOTIS	?	?	?	?	?	?	?
LONG-EARED MYOTIS	?	?	?	?	?	?	?
LONG-LEGGED MYOTIS	?	?	?	?	?	?	?
CALIFORNIA MYOTIS	?	?	?	?	?	?	?
WESTERN SMALL-FOOTED MYOTIS	?	?	?	?	?	?	?
NORTHERN MYOTIS (KEEN'S)	?	?	?	?	?	?	?
SILVER-HAIRED BAT	?	?	?	?	?	?	?
BIG BROWN BAT	?	?	?	?	?	?	?
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	?	?	?	?	?	?	?
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	?	+	+	?	-	+	?
MOUNTAIN COTTONTAIL	?	?	?	?	?	?	?
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	?	+	+	?	-	+	?
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	?	?	?	?	?	?	?
YELLOW-PINE CHIPMUNK	?	+	+	?	-	+	?
RED-TAILED CHIPMUNK	?	+	+	?	-	+	?
UINTA CHIPMUNK	?	+	+	?	-	+	?
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	+	+	?	-	+	?
COLUMBIAN GROUND SQUIRREL	?	?	?	?	?	?	?
THIRTEEN-LINED GR. SQUIR:	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	?	?	?	?	?	?	?
EASTERN FOX SQUIRREL	?	?	?	?	?	?	?
RED SQUIRREL	?	?	?	?	?	?	?
NORTHERN FLYING SQUIRREL	?	?	?	?	?	?	?
NORTHERN POCKET GOPHER	?	?	?	?	?	?	?
IDAHO POCKET GOPHER	?	+	+	?	-	+	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	?	?	?	?	?	?	?
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	?	+	+	?	-	+	?
WHITE-FOOTED MOUSE	?	?	?	?	?	?	?
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	+	+	?	-	+	?
SOUTHERN RED-BACKED VOLE	?	+	+	?	-	+	?
HEATHER VOLE	?	+	+	?	-	+	?
MEADOW VOLE	?	+	+	?	-	+	?
MONTANE VOLE	?	+	+	?	-	+	?
LONG-TAILED VOLE	?	?	?	?	?	?	?
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	?	+	+	?	-	+	?
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	?	?	?	?	?	?	?
NORTHERN BOG LEMMING	?	+	+	?	-	+	?
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	?	+	+	?	-	+	?
PORCUPINE	?	?	?	?	?	?	?
COYOTE	?	+	+	?	-	+	?
GRAY WOLF	?	?	?	?	?	?	?
RED FOX	?	+	+	?	-	+	?
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	?	?	?	?	?	?	?
GRIZZLY BEAR	?	+	+	?	-	+	?
RACCOON	?	?	?	?	?	?	?
MARTEN	?	?	?	?	?	?	?
FISHER	?	?	?	?	?	?	?
ERMINE	?	?	?	?	?	?	?
LEAST WEASEL	?	+	+	?	-	+	?
LONG-TAILED WEASEL	?	?	?	?	?	?	?
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	?	+	+	?	-	+	?
WOLVERINE	?	+	+	?	-	+	?
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	?	?	?	?	?	?	?
STRIPED SKUNK	?	?	?	?	?	?	?
RIVER OTTER	?	+	+	?	-	+	?
MOUNTAIN LION	?	?	?	?	?	?	?
LYNX	?	?	?	?	?	?	?
BOBCAT	?	+	+	?	-	+	?
WAPITI OR ELK	?	?	?	?	?	?	?
MULE DEER	?	?	?	?	?	?	?
WHITE-TAILED DEER	?	?	?	?	?	?	?

Table WLD-5 (continued)
DESCRIPTOR WOODY DEBRIS ON THE FOREST FLOOR

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
MOOSE	?	?	?	?	?	?	?
WOODLAND CARIBOU	?	?	?	?	?	?	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	?	?	?	?	?	?	?
SNAPPING TURTLE	?	+	+	?	-	+	?
PAINTED TURTLE	?	+	+	?	-	+	?
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	?	+	+	?	-	+	?
SHORT-HORNED LIZARD	?	?	?	?	?	?	?
SAGEBRUSH LIZARD	?	+	+	?	-	+	?
WESTERN SKINK	?	+	+	?	-	+	?
RUBBER BOA	?	+	+	?	-	+	?
RACER	?	+	+	?	-	+	?
WESTERN HOGNOSE SNAKE	?	+	+	?	-	+	?
MILK SNAKE	?	?	?	?	?	?	?
PINE OR GOPHER SNAKE	?	+	+	?	-	+	?
W. TERRESTRIAL GARTER SNAKE	?	+	+	?	-	+	?
PLAINS GARTER SNAKE	?	+	+	?	-	+	?
COMMON GARTER SNAKE	?	+	+	?	-	+	?
WESTERN RATTLESNAKE	?	+	+	?	-	+	?

Table WLD-6
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	-	-	-	-	-	-	-
TIGER SALAMANDER	?	?	?	?	?	?	?
COEUR D'ALENE SALAMANDER (VD)	?	?	?	?	?	?	-
ROUGHSKIN NEWT	?	?	?	?	?	?	-
IDAHO GIANT SALAMANDER	?	?	?	?	?	?	?
TAILED FROG	-	-	-	-	-	-	-
WESTERN TOAD	-	-	-	-	-	-	-
GREAT PLAINS TOAD	-	-	-	-	-	-	?
CANADIAN TOAD	-	-	-	-	-	-	?
WOODHOUSE'S TOAD	-	-	-	-	-	-	?
WESTERN CHORUS FROG	-	-	-	-	-	-	?
PACIFIC CHORUS FROG	?	?	?	?	?	?	-
PLAINS SPADEFOOT	-	-	-	-	-	-	?
BULLFROG	?	?	?	?	?	?	-
LEOPARD FROG	-	-	-	-	-	-	-
SPOTTED FROG	-	-	-	-	-	-	-
WOOD FROG	?	?	?	?	?	?	?
COMMON LOON	-	-	-	-	-	-	-
PIED-BILLED GREBE	-	-	-	-	-	-	-
HORNED GREBE	-	-	-	-	-	-	-
RED-NECKED GREBE	-	-	-	-	-	-	-
EARED GREBE	-	-	-	-	-	-	-
WESTERN GREBE (CLARK'S)	-	-	-	-	-	-	-
WHITE PELICAN	?	?	?	?	?	?	?
DOUBLE-CRESTED CORMORANT	-	-	-	-	-	-	-
AMERICAN BITTERN	-	-	-	-	-	-	-
GREAT BLUE HERON	-	-	-	-	-	-	-
BLACK-CROWNED NIGHT HERON	-	-	-	-	-	-	-
WHITE-FACED IBIS	-	-	-	-	-	-	-
TUNDRA SWAN	-	-	-	-	-	-	-
TRUMPETER SWAN	-	-	-	-	-	-	-
MUTE SWAN	-	-	-	-	-	-	-
GREATER WHITE-FRONTED GOOSE	-	-	-	-	-	-	-
SNOW GOOSE	-	-	-	-	-	-	-
ROSS' GOOSE	-	-	-	-	-	-	-
CANADA GOOSE	-	-	-	-	-	-	-
WOOD DUCK	-	-	-	-	-	-	-
GREEN-WINGED TEAL	-	-	-	-	-	-	-
MALLARD	-	-	-	-	-	-	-
NORTHERN PINTAIL	-	-	-	-	-	-	-
BLUE-WINGED TEAL	-	-	-	-	-	-	-
CINNAMON TEAL	-	-	-	-	-	-	-
NORTHERN SHOVELER	-	-	-	-	-	-	-
GADWALL	-	-	-	-	-	-	-
EURASIAN WIGEON	-	-	-	-	-	-	?
AMERICAN WIGEON	-	-	-	-	-	-	-
CANVASBACK	-	-	-	-	-	-	-
REDHEAD	-	-	-	-	-	-	-
RING-NECKED DUCK	-	-	-	-	-	-	-

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	-	-	-	-	-	-	-
HARLEQUIN DUCK	-	-	-	-	-	-	-
COMMON GOLDENEYE	-	-	-	-	-	-	-
BARROW'S GOLDENEYE	-	-	-	-	-	-	-
BUFFLEHEAD	-	-	-	-	-	-	-
HOODED MERGANSER	-	-	-	-	-	-	-
COMMON MERGANSER	-	-	-	-	-	-	-
RED-BREASTED MERGANSER	-	-	-	-	-	-	-
RUDDY DUCK	-	-	-	-	-	-	-
TURKEY VULTURE	-	-	-	-	-	-	-
OSPREY	-	-	-	-	-	-	-
BALD EAGLE	-	-	-	-	-	-	-
NORTHERN HARRIER (MARSH HAWK)	-	-	-	-	-	-	-
SHARP-SHINNED HAWK	?	?	?	?	?	?	?
COOPER'S HAWK	-	-	-	-	-	-	-
NORTHERN GOSHAWK	?	?	?	?	?	?	?
BROAD-WINGED HAWK	?	?	?	?	?	?	?
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	?	?	?	?	?	?	-
FERRUGINOUS HAWK	-	-	-	-	-	-	-
ROUGH-LEGGED HAWK	-	-	-	-	-	-	-
GOLDEN EAGLE	?	?	?	?	?	?	?
AMERICAN KESTREL	-	-	-	-	-	-	-
MERLIN	-	-	-	-	-	-	-
PEREGRINE FALCON	?	?	?	?	?	?	?
GYRFALCON	-	-	-	-	-	-	-
PRAIRIE FALCON	?	?	?	?	?	?	?
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	?	?	?	?	?	?
RING-NECKED PHEASANT	-	-	-	-	-	-	-
SPRUCE GROUSE	?	?	?	?	?	?	?
BLUE GROUSE	?	?	?	?	?	?	?
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	?	?	?	?	?	?	?
SAGE GROUSE	?	?	?	?	?	?	?
SHARP-TAILED GROUSE (COL.)	-	-	-	-	-	-	-
WILD TURKEY	?	?	?	?	?	?	?
NORTHERN BOBWHITE	-	-	-	-	-	-	-
VIRGINIA RAIL	-	-	-	-	-	-	-
SORA	-	-	-	-	-	-	-
AMERICAN COOT	-	-	-	-	-	-	-
SANDHILL CRANE	-	-	-	-	-	-	-
WHOOPING CRANE	-	-	-	-	-	-	?
BLACK-BELLIED PLOVER	-	-	-	-	-	-	-
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	-	-	-	-	-	-	-
PIPING PLOVER	-	-	-	-	-	-	-
KILLDEER	-	-	-	-	-	-	-
MOUNTAIN PLOVER	?	?	?	?	?	?	?

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	-	-	-	-	-	-	-
AMERICAN AVOCET	-	-	-	-	-	-	-
GREATER YELLOWLEGS	-	-	-	-	-	-	-
LESSER YELLOWLEGS	-	-	-	-	-	-	-
SOLITARY SANDPIPER	-	-	-	-	-	-	-
WILLET	-	-	-	-	-	-	-
SPOTTED SANDPIPER	-	-	-	-	-	-	-
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	-	-	-	-	-	-	-
LONG-BILLED CURLEW	-	-	-	-	-	-	-
MARBLED GODWIT	-	-	-	-	-	-	-
RUDDY TURNSTONE	-	-	-	-	-	-	-
SANDERLING	-	-	-	-	-	-	-
SEMIPALMATED SANDPIPER	-	-	-	-	-	-	-
WESTERN SANDPIPER	-	-	-	-	-	-	-
LEAST SANDPIPER	-	-	-	-	-	-	-
BAIRD'S SANDPIPER	-	-	-	-	-	-	-
PECTORAL SANDPIPER	-	-	-	-	-	-	-
DUNLIN	-	-	-	-	-	-	-
STILT SANDPIPER	-	-	-	-	-	-	-
LONG-BILLED DOWITCHER	-	-	-	-	-	-	-
COMMON SNIPE	-	-	-	-	-	-	-
WILSON'S PHALAROPE	-	-	-	-	-	-	-
RED-NECKED PHALAROPE	-	-	-	-	-	-	-
FRANKLIN'S GULL	-	-	-	-	-	-	-
BONAPARTE'S GULL	-	-	-	-	-	-	-
RING-BILLED GULL	-	-	-	-	-	-	-
CALIFORNIA GULL	-	-	-	-	-	-	-
CASPIAN TERN	-	-	-	-	-	-	-
COMMON TERN	-	-	-	-	-	-	-
FORSTER'S TERN	-	-	-	-	-	-	-
LEAST TERN	-	-	-	-	-	-	?
BLACK TERN	-	-	-	-	-	-	-
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	-	-	-	-	-	-	-
BLACK-BILLED CUCKOO	-	-	-	-	-	-	-
YELLOW-BILLED CUCKOO	-	-	-	-	-	-	-
FLAMMULATED OWL	?	?	?	?	?	?	?
EASTERN SCREECH-OWL	-	-	-	-	-	-	?
WESTERN SCREECH-OWL	-	-	-	-	-	-	-
GREAT HORNED OWL	-	-	-	-	-	-	-
SNOWY OWL	-	-	-	-	-	-	-
NORTHERN PYGMY OWL	?	?	?	?	?	?	?
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	-	-	-	-	-	-	-
GREAT GRAY OWL	-	-	-	-	-	-	-
LONG-EARED OWL	-	-	-	-	-	-	-
SHORT-EARED OWL	-	-	-	-	-	-	-
BOREAL OWL	-	-	-	-	-	-	-
SAW-WHET OWL	-	-	-	-	-	-	-

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	?	?	?	?	?	?	?
VAUX'S SWIFT	-	-	-	-	-	-	-
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	-	-	-	-	-	-	-
CALLIOPE HUMMINGBIRD	-	-	-	-	-	-	-
RUFOUS HUMMINGBIRD	-	-	-	-	-	-	-
BELTED KINGFISHER	-	-	-	-	-	-	-
LEWIS' WOODPECKER	-	-	-	-	-	-	-
RED-HEADED WOODPECKER	-	-	-	-	-	-	-
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	-	-	-	-	-	-	?
WILLIAMSON'S SAPSUCKER	-	-	-	-	-	-	-
DOWNY WOODPECKER	-	-	-	-	-	-	-
HAIRY WOODPECKER	-	-	-	-	-	-	-
THREE-TOED WOODPECKER	-	-	-	-	-	-	-
BLACK-BACKED WOODPECKER	-	-	-	-	-	-	-
NORTHERN FLICKER	-	-	-	-	-	-	-
PILEATED WOODPECKER	-	-	-	-	-	-	-
OLIVE-SIDED FLYCATCHER	-	-	-	-	-	-	-
WESTERN WOOD PEWEE	-	-	-	-	-	-	-
WILLOW FLYCATCHER	-	-	-	-	-	-	-
LEAST FLYCATCHER	-	-	-	-	-	-	-
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	-	-	-	-	-	-	-
CORDILLERAN FLYCATCHER	-	-	-	-	-	-	-
SAY'S PHOEBE	?	?	?	?	?	?	?
CASSIN'S KINGBIRD	-	-	-	-	-	-	?
WESTERN KINGBIRD	-	-	-	-	-	-	-
EASTERN KINGBIRD	-	-	-	-	-	-	-
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	-	-	-	-	-	-	-
VIOLET-GREEN SWALLOW	-	-	-	-	-	-	-
ROUGH-WINGED SWALLOW	-	-	-	-	-	-	-
BANK SWALLOW	-	-	-	-	-	-	-
CLIFF SWALLOW	-	-	-	-	-	-	-
BARN SWALLOW	-	-	-	-	-	-	-
GRAY JAY	-	-	-	-	-	-	-
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	-	-	-	-	-	-	-
COMMON CROW	-	-	-	-	-	-	-
COMMON RAVEN	-	-	-	-	-	-	-
BLACK-CAPPED CHICKADEE	-	-	-	-	-	-	-
MOUNTAIN CHICKADEE	-	-	-	-	-	-	-
BOREAL CHICKADEE	-	-	-	-	-	-	-
CHESTNUT-BACKED CHICKADEE	-	-	-	-	-	-	-

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
RED-BREASTED NUTHATCH	-	-	-	-	-	-	-
WHITE-BREASTED NUTHATCH	-	-	-	-	-	-	-
PYGMY NUTHATCH	?	?	?	?	?	?	?
BROWN CREEPER	-	-	-	-	-	-	-
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	-	-	-	-	-	-	-
RUBY-CROWNED KINGLET	-	-	-	-	-	-	-
WINTER WREN	-	-	-	-	-	-	-
MARSH WREN	-	-	-	-	-	-	-
DIPPER	-	-	-	-	-	-	-
GOLDEN-CROWNED KINGLET	?	?	?	?	?	?	?
EASTERN BLUEBIRD	-	-	-	-	-	-	?
WESTERN BLUEBIRD	-	-	-	-	-	-	-
MOUNTAIN BLUEBIRD	?	?	?	?	?	?	?
TOWNSEND'S SOLITAIRE	-	-	-	-	-	-	-
VEERY	-	-	-	-	-	-	-
SWAINSON'S THRUSH	-	-	-	-	-	-	-
HERMIT THRUSH	-	-	-	-	-	-	-
AMERICAN ROBIN	-	-	-	-	-	-	-
VARIED THRUSH	-	-	-	-	-	-	-
GRAY CATBIRD	-	-	-	-	-	-	-
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	-	-	-	-	-	-	-
WATER PIPIT	-	-	-	-	-	-	-
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	-	-	-	-	-	-	-
CEDAR WAXWING	-	-	-	-	-	-	-
NORTHERN SHRIKE	-	-	-	-	-	-	-
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	-	-	-	-	-	-	-
SOLITARY VIREO	-	-	-	-	-	-	-
WARBLING VIREO	-	-	-	-	-	-	-
RED-EYED VIREO	-	-	-	-	-	-	-
TENNESSEE WARBLER	-	-	-	-	-	-	-
ORANGE-CROWNED WARBLER	-	-	-	-	-	-	-
NASHVILLE WARBLER	-	-	-	-	-	-	-
YELLOW WARBLER	-	-	-	-	-	-	-
YELLOW-RUMPED WARBLER	-	-	-	-	-	-	-
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	-	-	-	-	-	-	-
BLACK-AND-WHITE WARBLER	-	-	-	-	-	-	-
AMERICAN REDSTART	-	-	-	-	-	-	-
OVENBIRD	?	?	?	?	?	?	?
NORTHERN WATERTHRUSH	-	-	-	-	-	-	-
MACGILLIVRAY'S WARBLER	-	-	-	-	-	-	-
COMMON YELLOWTHROAT	-	-	-	-	-	-	-
WILSON'S WARBLER	-	-	-	-	-	-	-
YELLOW-BREASTED CHAT	-	-	-	-	-	-	-
WESTERN TANAGER	?	?	?	?	?	?	?

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
NORTHERN CARDINAL	?	?	?	?	?	?	?
BLACK-HEADED GROSBEAK	-	-	-	-	-	-	-
LAZULI BUNTING	-	-	-	-	-	-	-
INDIGO BUNTING	-	-	-	-	-	-	-
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	-	-	-	-	-	-	-
RUFOUS-SIDED TOWHEE	-	-	-	-	-	-	-
TREE SPARROW	-	-	-	-	-	-	-
CHIPPING SPARROW	-	-	-	-	-	-	-
CLAY-COLORED SPARROW	-	-	-	-	-	-	-
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	-	-	-	-	-	-	-
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	-	-	-	-	-	-	-
FOX SPARROW	-	-	-	-	-	-	-
SONG SPARROW	-	-	-	-	-	-	-
LINCOLN'S SPARROW	-	-	-	-	-	-	-
WHITE-THROATED SPARROW	-	-	-	-	-	-	-
WHITE-CROWNED SPARROW	-	-	-	-	-	-	-
HARRIS' SPARROW	-	-	-	-	-	-	-
DARK-EYED JUNCO	-	-	-	-	-	-	-
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	-	-	-	-	-	-	-
BOBOLINK	-	-	-	-	-	-	-
RED-WINGED BLACKBIRD	-	-	-	-	-	-	-
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	-	-	-	-	-	-	-
RUSTY BLACKBIRD	-	-	-	-	-	-	-
BREWER'S BLACKBIRD	-	-	-	-	-	-	-
COMMON GRACKLE	-	-	-	-	-	-	-
BROWN-HEADED COWBIRD	-	-	-	-	-	-	-
ORCHARD ORIOLE	-	-	-	-	-	-	?
NORTHERN ORIOLE	-	-	-	-	-	-	-
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	?	?	?	?	?	?	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	-	-	-	-	-	-	-
HOARY REDPOLL	-	-	-	-	-	-	-
PINE SISKIN	?	?	?	?	?	?	?

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
AMERICAN GOLDFINCH	-	-	-	-	-	-	-
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	?	?	?	?	?	?	?
MASKED SHREW	-	-	-	-	-	-	-
PREBLE'S SHREW	-	-	-	-	-	-	-
VAGRANT SHREW	?	?	?	?	?	?	-
DWARF SHREW	-	-	-	-	-	-	?
WATER SHREW	-	-	-	-	-	-	-
MERRIAM'S SHREW	?	?	?	?	?	?	?
PYGMY SHREW	-	-	-	-	-	-	-
LITTLE BROWN MYOTIS	-	-	-	-	-	-	-
YUMA MYOTIS	-	-	-	-	-	-	-
LONG-EARED MYOTIS	-	-	-	-	-	-	-
LONG-LEGGED MYOTIS	-	-	-	-	-	-	-
CALIFORNIA MYOTIS	?	?	?	?	?	?	-
WESTERN SMALL-FOOTED MYOTIS	-	-	-	-	-	-	?
NORTHERN MYOTIS (KEEN'S)	?	?	?	?	?	?	?
SILVER-HAIRED BAT	-	-	-	-	-	-	-
BIG BROWN BAT	?	?	?	?	?	?	?
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	-	-	-	-	-	-	?
TOWNSEND'S BIG-EARED BAT	?	?	?	?	?	?	?
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	-	-	-	-	-	-	?
MOUNTAIN COTTONTAIL	-	-	-	-	-	-	-
DESERT COTTONTAIL	-	-	-	-	-	-	?
SNOWSHOE HARE	-	-	-	-	-	-	-
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	-	-	-	-	-	-	-
YELLOW-PINE CHIPMUNK	?	?	?	?	?	?	?
RED-TAILED CHIPMUNK	?	?	?	?	?	?	?
UINTA CHIPMUNK	?	?	?	?	?	?	?
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	?	?	?	?	?	?
COLUMBIAN GROUND SQUIRREL	-	-	-	-	-	-	-
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	-	-	-	-	-	-	?
EASTERN FOX SQUIRREL	-	-	-	-	-	-	-
RED SQUIRREL	-	-	-	-	-	-	-
NORTHERN FLYING SQUIRREL	-	-	-	-	-	-	-
NORTHERN POCKET GOPHER	-	-	-	-	-	-	-
IDAHO POCKET GOPHER	?	?	?	?	?	?	?

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
OLIVE-BACKED POCKET MOUSE	-	-	-	-	-	-	?
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	-	-	-	-	-	-	-
WESTERN HARVEST MOUSE	-	-	-	-	-	-	?
DEER MOUSE	-	-	-	-	-	-	-
WHITE-FOOTED MOUSE	-	-	-	-	-	-	?
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	?	?	?	?	?	?
SOUTHERN RED-BACKED VOLE	-	-	-	-	-	-	-
HEATHER VOLE	?	?	?	?	?	?	?
MEADOW VOLE	-	-	-	-	-	-	-
MONTANE VOLE	-	-	-	-	-	-	-
LONG-TAILED VOLE	-	-	-	-	-	-	-
PRAIRIE VOLE	-	-	-	-	-	-	?
WATER VOLE (RICHARDSON'S)	-	-	-	-	-	-	-
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	-	-	-	-	-	-	-
NORTHERN BOG LEMMING	-	-	-	-	-	-	-
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	-	-	-	-	-	-	-
PORCUPINE	-	-	-	-	-	-	-
COYOTE	-	-	-	-	-	-	-
GRAY WOLF	?	?	?	?	?	?	?
RED FOX	-	-	-	-	-	-	-
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	-	-	-	-	-	-	-
GRIZZLY BEAR	-	-	-	-	-	-	?
RACCOON	-	-	-	-	-	-	-
MARTEN	-	-	-	-	-	-	-
FISHER	-	-	-	-	-	-	-
ERMINE	-	-	-	-	-	-	-
LEAST WEASEL	-	-	-	-	-	-	?
LONG-TAILED WEASEL	-	-	-	-	-	-	-
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	-	-	-	-	-	-	-
WOLVERINE	?	?	?	?	?	?	?
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	-	-	-	-	-	-	-
STRIPED SKUNK	-	-	-	-	-	-	-
RIVER OTTER	-	-	-	-	-	-	-
MOUNTAIN LION	-	-	-	-	-	-	-
LYNX	-	-	-	-	-	-	-
BOBCAT	-	-	-	-	-	-	-
WAPITI OR ELK	?	?	?	?	?	?	?
MULE DEER	-	-	-	-	-	-	-
WHITE-TAILED DEER	-	-	-	-	-	-	-

Table WLD-6 (continued)
DESCRIPTOR RIPARIAN AREAS AND WETLANDS EAST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
MOOSE	-	-	-	-	-	-	-
WOODLAND CARIBOU	?	?	?	?	?	?	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	-	-	-	-	-	-	-
SNAPPING TURTLE	-	-	-	-	-	-	-
PAINTED TURTLE	-	-	-	-	-	-	-
SPINY SOFTSHELL TURTLE	-	-	-	-	-	-	?
NORTHERN ALLIGATOR LIZARD	?	?	?	?	?	?	-
SHORT-HORNED LIZARD	?	?	?	?	?	?	?
SAGEBRUSH LIZARD	?	?	?	?	?	?	?
WESTERN SKINK	?	?	?	?	?	?	-
RUBBER BOA	-	-	-	-	-	-	-
RACER	-	-	-	-	-	-	-
WESTERN HOGNOSE SNAKE	-	-	-	-	-	-	?
MILK SNAKE	-	-	-	-	-	-	?
PINE OR GOPHER SNAKE	-	-	-	-	-	-	-
W. TERRESTRIAL GARTER SNAKE	-	-	-	-	-	-	-
PLAINS GARTER SNAKE	-	-	-	-	-	-	?
COMMON GARTER SNAKE	-	-	-	-	-	-	-
WESTERN RATTLESNAKE	-	-	-	-	-	-	-

Table WLD-7
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	-	+	+	+	+	+	+
TIGER SALAMANDER	?	?	?	?	?	?	?
COEUR D'ALENE SALAMANDER (VD)	-	+	+	+	+	+	+
ROUGHSKIN NEWT	-	+	+	+	+	+	+
IDAHO GIANT SALAMANDER	?	?	?	?	?	?	?
TAILED FROG	-	+	+	+	+	+	+
WESTERN TOAD	-	+	+	+	+	+	+
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	?	?	?	?	?	?	?
PACIFIC CHORUS FROG	-	+	+	+	+	+	+
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	-	+	+	+	+	+	+
LEOPARD FROG	-	+	+	+	+	+	+
SPOTTED FROG	-	+	+	+	+	+	+
WOOD FROG	?	?	?	?	?	?	?
COMMON LOON	-	+	+	+	+	+	+
PIED-BILLED GREBE	-	+	+	+	+	+	+
HORNED GREBE	-	+	+	+	+	+	+
RED-NECKED GREBE	-	+	+	+	+	+	+
EARED GREBE	-	+	+	+	+	+	+
WESTERN GREBE (CLARK'S)	-	+	+	+	+	+	+
WHITE PELICAN	?	?	?	?	?	?	?
DOUBLE-CRESTED CORMORANT	-	+	+	+	+	+	+
AMERICAN BITTERN	-	+	+	+	+	+	+
GREAT BLUE HERON	-	+	+	+	+	+	+
BLACK-CROWNED NIGHT HERON	-	+	+	+	+	+	+
WHITE-FACED IBIS	-	+	+	+	+	+	+
TUNDRA SWAN	-	+	+	+	+	+	+
TRUMPETER SWAN	-	+	+	+	+	+	+
MUTE SWAN	-	+	+	+	+	+	+
GREATER WHITE-FRONTED GOOSE	-	+	+	+	+	+	+
SNOW GOOSE	-	+	+	+	+	+	+
ROSS' GOOSE	-	+	+	+	+	+	+
CANADA GOOSE	-	+	+	+	+	+	+
WOOD DUCK	-	+	+	+	+	+	+
GREEN-WINGED TEAL	-	+	+	+	+	+	+
MALLARD	-	+	+	+	+	+	+
NORTHERN PINTAIL	-	+	+	+	+	+	+
BLUE-WINGED TEAL	-	+	+	+	+	+	+
CINNAMON TEAL	-	+	+	+	+	+	+
NORTHERN SHOVELER	-	+	+	+	+	+	+
GADWALL	-	+	+	+	+	+	+
EURASIAN WIGEON	?	?	?	?	?	?	?
AMERICAN WIGEON	-	+	+	+	+	+	+
CANVASBACK	-	+	+	+	+	+	+
REDHEAD	-	+	+	+	+	+	+
RING-NECKED DUCK	-	+	+	+	+	+	+

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	-	+	+	+	+	+	+
HARLEQUIN DUCK	-	+	+	+	+	+	+
COMMON GOLDENEYE	-	+	+	+	+	+	+
BARROW'S GOLDENEYE	-	+	+	+	+	+	+
BUFFLEHEAD	-	+	+	+	+	+	+
HOODED MERGANSER	-	+	+	+	+	+	+
COMMON MERGANSER	-	+	+	+	+	+	+
RED-BREASTED MERGANSER	-	+	+	+	+	+	+
RUDDY DUCK	-	+	+	+	+	+	+
TURKEY VULTURE	-	+	+	+	+	+	+
OSPREY	-	+	+	+	+	+	+
BALD EAGLE	-	+	+	+	+	+	+
NORTHERN HARRIER (MARSH HAWK)	-	+	+	+	+	+	+
SHARP-SHINNED HAWK	?	?	?	?	?	?	?
COOPER'S HAWK	-	+	+	+	+	+	+
NORTHERN GOSHAWK	?	?	?	?	?	?	?
BROAD-WINGED HAWK	?	?	?	?	?	?	?
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	-	+	+	+	+	+	+
FERRUGINOUS HAWK	-	+	+	+	+	+	+
ROUGH-LEGGED HAWK	-	+	+	+	+	+	+
GOLDEN EAGLE	?	?	?	?	?	?	?
AMERICAN KESTREL	-	+	+	+	+	+	+
MERLIN	-	+	+	+	+	+	+
PEREGRINE FALCON	?	?	?	?	?	?	?
GYRFALCON	-	+	+	+	+	+	+
PRAIRIE FALCON	?	?	?	?	?	?	?
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	?	?	?	?	?	?
RING-NECKED PHEASANT	-	+	+	+	+	+	+
SPRUCE GROUSE	?	?	?	?	?	?	?
BLUE GROUSE	?	?	?	?	?	?	?
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	?	?	?	?	?	?	?
SAGE GROUSE	?	?	?	?	?	?	?
SHARP-TAILED GROUSE (COL.)	-	+	+	+	+	+	+
WILD TURKEY	?	?	?	?	?	?	?
NORTHERN BOBWHITE	-	+	+	+	+	+	+
VIRGINIA RAIL	-	+	+	+	+	+	+
SORA	-	+	+	+	+	+	+
AMERICAN COOT	-	+	+	+	+	+	+
SANDHILL CRANE	-	+	+	+	+	+	+
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	-	+	+	+	+	+	+
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	-	+	+	+	+	+	+
PIPING PLOVER	-	+	+	+	+	+	+
KILLDEER	-	+	+	+	+	+	+
MOUNTAIN PLOVER	?	?	?	?	?	?	?

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	-	+	+	+	+	+	+
AMERICAN AVOCET	-	+	+	+	+	+	+
GREATER YELLOWLEGS	-	+	+	+	+	+	+
LESSER YELLOWLEGS	-	+	+	+	+	+	+
SOLITARY SANDPIPER	-	+	+	+	+	+	+
WILLET	-	+	+	+	+	+	+
SPOTTED SANDPIPER	-	+	+	+	+	+	+
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	-	+	+	+	+	+	+
LONG-BILLED CURLEW	-	+	+	+	+	+	+
MARBLED GODWIT	-	+	+	+	+	+	+
RUDDY TURNSTONE	-	+	+	+	+	+	+
SANDERLING	-	+	+	+	+	+	+
SEMIPALMATED SANDPIPER	-	+	+	+	+	+	+
WESTERN SANDPIPER	-	+	+	+	+	+	+
LEAST SANDPIPER	-	+	+	+	+	+	+
BAIRD'S SANDPIPER	-	+	+	+	+	+	+
PECTORAL SANDPIPER	-	+	+	+	+	+	+
DUNLIN	-	+	+	+	+	+	+
STILT SANDPIPER	-	+	+	+	+	+	+
LONG-BILLED DOWITCHER	-	+	+	+	+	+	+
COMMON SNIPE	-	+	+	+	+	+	+
WILSON'S PHALAROPE	-	+	+	+	+	+	+
RED-NECKED PHALAROPE	-	+	+	+	+	+	+
FRANKLIN'S GULL	-	+	+	+	+	+	+
BONAPARTE'S GULL	-	+	+	+	+	+	+
RING-BILLED GULL	-	+	+	+	+	+	+
CALIFORNIA GULL	-	+	+	+	+	+	+
CASPIAN TERN	-	+	+	+	+	+	+
COMMON TERN	-	+	+	+	+	+	+
FORSTER'S TERN	-	+	+	+	+	+	+
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	-	+	+	+	+	+	+
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	-	+	+	+	+	+	+
BLACK-BILLED CUCKOO	-	+	+	+	+	+	+
YELLOW-BILLED CUCKOO	-	+	+	+	+	+	+
FLAMMULATED OWL	?	?	?	?	?	?	?
EASTERN SCREECH-OWL	?	?	?	?	?	?	?
WESTERN SCREECH-OWL	-	+	+	+	+	+	+
GREAT HORNED OWL	-	+	+	+	+	+	+
SNOWY OWL	-	+	+	+	+	+	+
NORTHERN PYGMY OWL	?	?	?	?	?	?	?
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	-	+	+	+	+	+	+
GREAT GRAY OWL	-	+	+	+	+	+	+
LONG-EARED OWL	-	+	+	+	+	+	+
SHORT-EARED OWL	-	+	+	+	+	+	+
BOREAL OWL	-	+	+	+	+	+	+
SAW-WHET OWL	-	+	+	+	+	+	+

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	?	?	?	?	?	?	?
VAUX'S SWIFT	-	+	+	+	+	+	+
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	-	+	+	+	+	+	+
CALLIOPE HUMMINGBIRD	-	+	+	+	+	+	+
RUFOUS HUMMINGBIRD	-	+	+	+	+	+	+
BELTED KINGFISHER	-	+	+	+	+	+	+
LEWIS' WOODPECKER	-	+	+	+	+	+	+
RED-HEADED WOODPECKER	-	+	+	+	+	+	+
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	?	?	?	?	?	?	?
WILLIAMSON'S SAPSUCKER	-	+	+	+	+	+	+
DOWNY WOODPECKER	-	+	+	+	+	+	+
HAIRY WOODPECKER	-	+	+	+	+	+	+
THREE-TOED WOODPECKER	-	+	+	+	+	+	+
BLACK-BACKED WOODPECKER	-	+	+	+	+	+	+
NORTHERN FLICKER	-	+	+	+	+	+	+
PILEATED WOODPECKER	-	+	+	+	+	+	+
OLIVE-SIDED FLYCATCHER	-	+	+	+	+	+	+
WESTERN WOOD PEWEE	-	+	+	+	+	+	+
WILLOW FLYCATCHER	-	+	+	+	+	+	+
LEAST FLYCATCHER	-	+	+	+	+	+	+
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	-	+	+	+	+	+	+
CORDILLERAN FLYCATCHER	-	+	+	+	+	+	+
SAY'S PHOEBE	?	?	?	?	?	?	?
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	-	+	+	+	+	+	+
EASTERN KINGBIRD	-	+	+	+	+	+	+
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	-	+	+	+	+	+	+
VIOLET-GREEN SWALLOW	-	+	+	+	+	+	+
ROUGH-WINGED SWALLOW	-	+	+	+	+	+	+
BANK SWALLOW	-	+	+	+	+	+	+
CLIFF SWALLOW	-	+	+	+	+	+	+
BARN SWALLOW	-	+	+	+	+	+	+
GRAY JAY	-	+	+	+	+	+	+
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	-	+	+	+	+	+	+
COMMON CROW	-	+	+	+	+	+	+
COMMON RAVEN	-	+	+	+	+	+	+
BLACK-CAPPED CHICKADEE	-	+	+	+	+	+	+
MOUNTAIN CHICKADEE	-	+	+	+	+	+	+
BOREAL CHICKADEE	-	+	+	+	+	+	+
CHESTNUT-BACKED CHICKADEE	-	+	+	+	+	+	+

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
RED-BREASTED NUTHATCH	-	+	+	+	+	+	+
WHITE-BREASTED NUTHATCH	-	+	+	+	+	+	+
PYGMY NUTHATCH	?	?	?	?	?	?	?
BROWN CREEPER	-	+	+	+	+	+	+
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	-	+	+	+	+	+	+
RUBY-CROWNED KINGLET	-	+	+	+	+	+	+
WINTER WREN	-	+	+	+	+	+	+
MARSH WREN	-	+	+	+	+	+	+
DIPPER	-	+	+	+	+	+	+
GOLDEN-CROWNED KINGLET	?	?	?	?	?	?	?
EASTERN BLUEBIRD	?	?	?	?	?	?	?
WESTERN BLUEBIRD	-	+	+	+	+	+	+
MOUNTAIN BLUEBIRD	?	?	?	?	?	?	?
TOWNSEND'S SOLITAIRE	-	+	+	+	+	+	+
VEERY	-	+	+	+	+	+	+
SWAINSON'S THRUSH	-	+	+	+	+	+	+
HERMIT THRUSH	-	+	+	+	+	+	+
AMERICAN ROBIN	-	+	+	+	+	+	+
VARIED THRUSH	-	+	+	+	+	+	+
GRAY CATBIRD	-	+	+	+	+	+	+
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	-	+	+	+	+	+	+
WATER PIPIT	-	+	+	+	+	+	+
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	-	+	+	+	+	+	+
CEDAR WAXWING	-	+	+	+	+	+	+
NORTHERN SHRIKE	-	+	+	+	+	+	+
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	-	+	+	+	+	+	+
SOLITARY VIREO	-	+	+	+	+	+	+
WARBLING VIREO	-	+	+	+	+	+	+
RED-EYED VIREO	-	+	+	+	+	+	+
TENNESSEE WARBLER	-	+	+	+	+	+	+
ORANGE-CROWNED WARBLER	-	+	+	+	+	+	+
NASHVILLE WARBLER	-	+	+	+	+	+	+
YELLOW WARBLER	-	+	+	+	+	+	+
YELLOW-RUMPED WARBLER	-	+	+	+	+	+	+
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	-	+	+	+	+	+	+
BLACK-AND-WHITE WARBLER	-	+	+	+	+	+	+
AMERICAN REDSTART	-	+	+	+	+	+	+
OVENBIRD	?	?	?	?	?	?	?
NORTHERN WATERTHRUSH	-	+	+	+	+	+	+
MACGILLIVRAY'S WARBLER	-	+	+	+	+	+	+
COMMON YELLOWTHROAT	-	+	+	+	+	+	+
WILSON'S WARBLER	-	+	+	+	+	+	+
YELLOW-BREASTED CHAT	-	+	+	+	+	+	+
WESTERN TANAGER	?	?	?	?	?	?	?

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
NORTHERN CARDINAL	?	?	?	?	?	?	?
BLACK-HEADED GROSBEAK	-	+	+	+	+	+	+
LAZULI BUNTING	-	+	+	+	+	+	+
INDIGO BUNTING	-	+	+	+	+	+	+
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	-	+	+	+	+	+	+
RUFOUS-SIDED TOWHEE	-	+	+	+	+	+	+
TREE SPARROW	-	+	+	+	+	+	+
CHIPPING SPARROW	-	+	+	+	+	+	+
CLAY-COLORED SPARROW	-	+	+	+	+	+	+
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	-	+	+	+	+	+	+
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	-	+	+	+	+	+	+
FOX SPARROW	-	+	+	+	+	+	+
SONG SPARROW	-	+	+	+	+	+	+
LINCOLN'S SPARROW	-	+	+	+	+	+	+
WHITE-THROATED SPARROW	-	+	+	+	+	+	+
WHITE-CROWNED SPARROW	-	+	+	+	+	+	+
HARRIS' SPARROW	-	+	+	+	+	+	+
DARK-EYED JUNCO	-	+	+	+	+	+	+
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	-	+	+	+	+	+	+
BOBOLINK	-	+	+	+	+	+	+
RED-WINGED BLACKBIRD	-	+	+	+	+	+	+
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	-	+	+	+	+	+	+
RUSTY BLACKBIRD	-	+	+	+	+	+	+
BREWER'S BLACKBIRD	-	+	+	+	+	+	+
COMMON GRACKLE	-	+	+	+	+	+	+
BROWN-HEADED COWBIRD	-	+	+	+	+	+	+
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	-	+	+	+	+	+	+
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	?	?	?	?	?	?	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	-	+	+	+	+	+	+
HOARY REDPOLL	-	+	+	+	+	+	+
PINE SISKIN	?	?	?	?	?	?	?

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
AMERICAN GOLDFINCH	-	+	+	+	+	+	+
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	?	?	?	?	?	?	?
MASKED SHREW	-	+	+	+	+	+	+
PREBLE'S SHREW	-	+	+	+	+	+	+
VAGRANT SHREW	-	+	+	+	+	+	+
DWARF SHREW	?	?	?	?	?	?	?
WATER SHREW	-	+	+	+	+	+	+
MERRIAM'S SHREW	?	?	?	?	?	?	?
PYGMY SHREW	-	+	+	+	+	+	+
LITTLE BROWN MYOTIS	-	+	+	+	+	+	+
YUMA MYOTIS	-	+	+	+	+	+	+
LONG-EARED MYOTIS	-	+	+	+	+	+	+
LONG-LEGGED MYOTIS	-	+	+	+	+	+	+
CALIFORNIA MYOTIS	-	+	+	+	+	+	+
WESTERN SMALL-FOOTED MYOTIS	?	?	?	?	?	?	?
NORTHERN MYOTIS (KEEN'S)	?	?	?	?	?	?	?
SILVER-HAIRED BAT	-	+	+	+	+	+	+
BIG BROWN BAT	?	?	?	?	?	?	?
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	?	?	?	?	?	?	?
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	?	?	?	?	?	?	?
MOUNTAIN COTTONTAIL	-	+	+	+	+	+	+
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	-	+	+	+	+	+	+
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	-	+	+	+	+	+	+
YELLOW-PINE CHIPMUNK	?	?	?	?	?	?	?
RED-TAILED CHIPMUNK	?	?	?	?	?	?	?
UINTA CHIPMUNK	?	?	?	?	?	?	?
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	?	?	?	?	?	?
COLUMBIAN GROUND SQUIRREL	-	+	+	+	+	+	+
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	?	?	?	?	?	?	?
EASTERN FOX SQUIRREL	-	+	+	+	+	+	+
RED SQUIRREL	-	+	+	+	+	+	+
NORTHERN FLYING SQUIRREL	-	+	+	+	+	+	+
NORTHERN POCKET GOPHER	-	+	+	+	+	+	+
IDAHO POCKET GOPHER	?	?	?	?	?	?	?

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
	-----	----	-----	-----	-------	----	-----
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	-	+	+	+	+	+	+
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	-	+	+	+	+	+	+
WHITE-FOOTED MOUSE	?	?	?	?	?	?	?
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	?	?	?	?	?	?
SOUTHERN RED-BACKED VOLE	-	+	+	+	+	+	+
HEATHER VOLE	?	?	?	?	?	?	?
MEADOW VOLE	-	+	+	+	+	+	+
MONTANE VOLE	-	+	+	+	+	+	+
LONG-TAILED VOLE	-	+	+	+	+	+	+
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	-	+	+	+	+	+	+
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	-	+	+	+	+	+	+
NORTHERN BOG LEMMING	-	+	+	+	+	+	+
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	-	+	+	+	+	+	+
PORCUPINE	-	+	+	+	+	+	+
COYOTE	-	+	+	+	+	+	+
GRAY WOLF	?	?	?	?	?	?	?
RED FOX	-	+	+	+	+	+	+
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	-	+	+	+	+	+	+
GRIZZLY BEAR	?	?	?	?	?	?	?
RACCOON	-	+	+	+	+	+	+
MARTEN	-	+	+	+	+	+	+
FISHER	-	+	+	+	+	+	+
ERMINE	-	+	+	+	+	+	+
LEAST WEASEL	?	?	?	?	?	?	?
LONG-TAILED WEASEL	-	+	+	+	+	+	+
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	-	+	+	+	+	+	+
WOLVERINE	?	?	?	?	?	?	?
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	-	+	+	+	+	+	+
STRIPED SKUNK	-	+	+	+	+	+	+
RIVER OTTER	-	+	+	+	+	+	+
MOUNTAIN LION	-	+	+	+	+	+	+
LYNX	-	+	+	+	+	+	+
BOBCAT	-	+	+	+	+	+	+
WAPITI OR ELK	?	?	?	?	?	?	?
MULE DEER	-	+	+	+	+	+	+
WHITE-TAILED DEER	-	+	+	+	+	+	+

Table WLD-7 (continued)
DESCRIPTOR RIPARIAN AREA AND WETLANDS CONDITIONS WEST OF THE DIVIDE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
MOOSE	-	+	+	+	+	+	+
WOODLAND CARIBOU	?	?	?	?	?	?	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	-	+	+	+	+	+	+
SNAPPING TURTLE	-	+	+	+	+	+	+
PAINTED TURTLE	-	+	+	+	+	+	+
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	-	+	+	+	+	+	+
SHORT-HORNED LIZARD	?	?	?	?	?	?	?
SAGEBRUSH LIZARD	?	?	?	?	?	?	?
WESTERN SKINK	-	+	+	+	+	+	+
RUBBER BOA	-	+	+	+	+	+	+
RACER	-	+	+	+	+	+	+
WESTERN HOGNOSE SNAKE	?	?	?	?	?	?	?
MILK SNAKE	?	?	?	?	?	?	?
PINE OR GOPHER SNAKE	-	+	+	+	+	+	+
TERRESTRIAL GARTER SNAKE	-	+	+	+	+	+	+
PLAINS GARTER SNAKE	?	?	?	?	?	?	?
COMMON GARTER SNAKE	-	+	+	+	+	+	+
WESTERN RATTLESNAKE	-	+	+	+	+	+	+

Table WLD-8
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	?	?	?	?	?	?	?
TIGER SALAMANDER	?	?	?	?	?	?	?
COEUR D'ALENE SALAMANDER (VD)	?	?	?	?	?	?	?
ROUGHSIN NEWT	?	?	?	?	?	?	?
IDAHO GIANT SALAMANDER	?	?	?	?	?	?	?
TAILED FROG	?	?	?	?	?	?	?
WESTERN TOAD	?	?	?	?	?	?	?
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	?	?	?	?	?	?	?
PACIFIC CHORUS FROG	?	?	?	?	?	?	?
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	?	?	?	?	?	?	?
LEOPARD FROG	?	?	?	?	?	?	?
SPOTTED FROG	?	?	?	?	?	?	?
WOOD FROG	?	?	?	?	?	?	?
COMMON LOON	?	?	?	?	?	?	?
PIED-BILLED GREBE	?	?	?	?	?	?	?
HORNED GREBE	?	?	?	?	?	?	?
RED-NECKED GREBE	?	?	?	?	?	?	?
EARED GREBE	?	?	?	?	?	?	?
WESTERN GREBE (CLARK'S)	?	?	?	?	?	?	?
WHITE PELICAN	-	+	+	-	-	-	+
DOUBLE-CRESTED CORMORANT	-	-	-	-	-	-	-
AMERICAN BITTERN	?	?	?	?	?	?	?
GREAT BLUE HERON	-	-	-	-	-	-	-
BLACK-CROWNED NIGHT HERON	-	+	+	-	-	-	+
WHITE-FACED IBIS	?	?	?	?	?	?	?
TUNDRA SWAN	?	?	?	?	?	?	?
TRUMPETER SWAN	?	?	?	?	?	?	?
MUTE SWAN	?	?	?	?	?	?	?
GREATER WHITE-FRONTED GOOSE	?	?	?	?	?	?	?
SNOW GOOSE	?	?	?	?	?	?	?
ROSS' GOOSE	?	?	?	?	?	?	?
CANADA GOOSE	?	?	?	?	?	?	?
WOOD DUCK	?	?	?	?	?	?	?
GREEN-WINGED TEAL	?	?	?	?	?	?	?
MALLARD	?	?	?	?	?	?	?
NORTHERN PINTAIL	?	?	?	?	?	?	?
BLUE-WINGED TEAL	?	?	?	?	?	?	?
CINNAMON TEAL	?	?	?	?	?	?	?
NORTHERN SHOVELER	?	?	?	?	?	?	?
GADWALL	?	?	?	?	?	?	?
EURASIAN WIGEON	?	?	?	?	?	?	?
AMERICAN WIGEON	?	?	?	?	?	?	?
CANVASBACK	?	?	?	?	?	?	?
REDHEAD	?	?	?	?	?	?	?
RING-NECKED DUCK	?	?	?	?	?	?	?

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	?	?	?	?	?	?	?
HARLEQUIN DUCK	?	?	?	?	?	?	?
COMMON GOLDENEYE	?	?	?	?	?	?	?
BARROW'S GOLDENEYE	?	?	?	?	?	?	?
BUFFLEHEAD	?	?	?	?	?	?	?
HOODED MERGANSER	?	?	?	?	?	?	?
COMMON MERGANSER	?	?	?	?	?	?	?
RED-BREASTED MERGANSER	?	?	?	?	?	?	?
RUDDY DUCK	?	?	?	?	?	?	?
TURKEY VULTURE	-	-	-	-	-	-	-
OSPREY	-	-	-	-	-	-	-
BALD EAGLE	-	+	+	-	-	-	+
NORTHERN HARRIER (MARSH HAWK)	?	?	?	?	?	?	?
SHARP-SHINNED HAWK	-	-	-	-	-	-	-
COOPER'S HAWK	-	-	-	-	-	-	-
NORTHERN GOSHAWK	-	+	+	-	-	-	+
BROAD-WINGED HAWK	?	?	?	?	?	?	?
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	-	-	-	-	-	-	-
FERRUGINOUS HAWK	-	+	+	-	-	-	+
ROUGH-LEGGED HAWK	?	?	?	?	?	?	?
GOLDEN EAGLE	-	-	-	-	-	-	-
AMERICAN KESTREL	-	-	-	-	-	-	-
MERLIN	?	?	?	?	?	?	?
PEREGRINE FALCON	-	+	+	-	-	-	+
GYRFALCON	?	?	?	?	?	?	?
PRAIRIE FALCON	-	-	-	-	-	-	-
GRAY PARTRIDGE	?	?	?	?	?	?	?
CHUKAR	?	?	?	?	?	?	?
RING-NECKED PHEASANT	?	?	?	?	?	?	?
SPRUCE GROUSE	?	?	?	?	?	?	?
BLUE GROUSE	?	?	?	?	?	?	?
WHITE-TAILED PTARMIGAN	?	?	?	?	?	?	?
RUFFED GROUSE	?	?	?	?	?	?	?
SAGE GROUSE	-	-	-	-	-	-	-
SHARP-TAILED GROUSE (COL.)	?	?	?	?	?	?	?
WILD TURKEY	-	-	-	-	-	-	-
NORTHERN BOBWHITE	?	?	?	?	?	?	?
VIRGINIA RAIL	?	?	?	?	?	?	?
SORA	?	?	?	?	?	?	?
AMERICAN COOT	?	?	?	?	?	?	?
SANDHILL CRANE	-	-	-	-	-	-	-
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	?	?	?	?	?	?	?
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	?	?	?	?	?	?	?
PIPING PLOVER	?	?	?	?	?	?	?
KILLDEER	?	?	?	?	?	?	?
MOUNTAIN PLOVER	-	+	+	-	-	-	+

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	?	?	?	?	?	?	?
AMERICAN AVOCET	?	?	?	?	?	?	?
GREATER YELLOWLEGS	?	?	?	?	?	?	?
LESSER YELLOWLEGS	?	?	?	?	?	?	?
SOLITARY SANDPIPER	?	?	?	?	?	?	?
WILLET	?	?	?	?	?	?	?
SPOTTED SANDPIPER	?	?	?	?	?	?	?
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	?	?	?	?	?	?	?
LONG-BILLED CURLEW	-	-	-	-	-	-	-
MARBLED GODWIT	?	?	?	?	?	?	?
RUDDY TURNSTONE	?	?	?	?	?	?	?
SANDERLING	?	?	?	?	?	?	?
SEMIPALMATED SANDPIPER	?	?	?	?	?	?	?
WESTERN SANDPIPER	?	?	?	?	?	?	?
LEAST SANDPIPER	?	?	?	?	?	?	?
BAIRD'S SANDPIPER	?	?	?	?	?	?	?
PECTORAL SANDPIPER	?	?	?	?	?	?	?
DUNLIN	?	?	?	?	?	?	?
STILT SANDPIPER	?	?	?	?	?	?	?
LONG-BILLED DOWITCHER	?	?	?	?	?	?	?
COMMON SNIPE	?	?	?	?	?	?	?
WILSON'S PHALAROPE	?	?	?	?	?	?	?
RED-NECKED PHALAROPE	?	?	?	?	?	?	?
FRANKLIN'S GULL	?	?	?	?	?	?	?
BONAPARTE'S GULL	?	?	?	?	?	?	?
RING-BILLED GULL	?	?	?	?	?	?	?
CALIFORNIA GULL	?	?	?	?	?	?	?
CASPIAN TERN	?	?	?	?	?	?	?
COMMON TERN	?	?	?	?	?	?	?
FORSTER'S TERN	?	?	?	?	?	?	?
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	?	?	?	?	?	?	?
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	?	?	?	?	?	?	?
BLACK-BILLED CUCKOO	?	?	?	?	?	?	?
YELLOW-BILLED CUCKOO	?	?	?	?	?	?	?
FLAMMULATED OWL	?	?	?	?	?	?	?
EASTERN SCREECH-OWL	?	?	?	?	?	?	?
WESTERN SCREECH-OWL	?	?	?	?	?	?	?
GREAT HORNED OWL	?	?	?	?	?	?	?
SNOWY OWL	?	?	?	?	?	?	?
NORTHERN PYGMY OWL	?	?	?	?	?	?	?
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	?	?	?	?	?	?	?
GREAT GRAY OWL	?	?	?	?	?	?	?
LONG-EARED OWL	?	?	?	?	?	?	?
SHORT-EARED OWL	?	?	?	?	?	?	?
BOREAL OWL	?	?	?	?	?	?	?
SAW-WHET OWL	?	?	?	?	?	?	?

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	?	?	?	?	?	?	?
VAUX'S SWIFT	?	?	?	?	?	?	?
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	?	?	?	?	?	?	?
CALLIOPE HUMMINGBIRD	?	?	?	?	?	?	?
RUFOUS HUMMINGBIRD	?	?	?	?	?	?	?
BELTED KINGFISHER	?	?	?	?	?	?	?
LEWIS' WOODPECKER	?	?	?	?	?	?	?
RED-HEADED WOODPECKER	?	?	?	?	?	?	?
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	?	?	?	?	?	?	?
WILLIAMSON'S SAPSUCKER	?	?	?	?	?	?	?
DOWNY WOODPECKER	?	?	?	?	?	?	?
HAIRY WOODPECKER	?	?	?	?	?	?	?
THREE-TOED WOODPECKER	?	?	?	?	?	?	?
BLACK-BACKED WOODPECKER	?	?	?	?	?	?	?
NORTHERN FLICKER	?	?	?	?	?	?	?
PILEATED WOODPECKER	-	-	-	-	-	-	-
OLIVE-SIDED FLYCATCHER	?	?	?	?	?	?	?
WESTERN WOOD PEWEE	?	?	?	?	?	?	?
WILLOW FLYCATCHER	?	?	?	?	?	?	?
LEAST FLYCATCHER	?	?	?	?	?	?	?
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	?	?	?	?	?	?	?
CORDILLERAN FLYCATCHER	?	?	?	?	?	?	?
SAY'S PHOEBE	?	?	?	?	?	?	?
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	?	?	?	?	?	?	?
EASTERN KINGBIRD	?	?	?	?	?	?	?
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	?	?	?	?	?	?	?
VIOLET-GREEN SWALLOW	?	?	?	?	?	?	?
ROUGH-WINGED SWALLOW	?	?	?	?	?	?	?
BANK SWALLOW	?	?	?	?	?	?	?
CLIFF SWALLOW	?	?	?	?	?	?	?
BARN SWALLOW	?	?	?	?	?	?	?
GRAY JAY	?	?	?	?	?	?	?
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	-	-	-	-	-	-	-
COMMON CROW	?	?	?	?	?	?	?
COMMON RAVEN	?	?	?	?	?	?	?
BLACK-CAPPED CHICKADEE	?	?	?	?	?	?	?
MOUNTAIN CHICKADEE	?	?	?	?	?	?	?
BOREAL CHICKADEE	?	?	?	?	?	?	?
CHESTNUT-BACKED CHICKADEE	?	?	?	?	?	?	?

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
RED-BREASTED NUTHATCH	?	?	?	?	?	?	?
WHITE-BREASTED NUTHATCH	?	?	?	?	?	?	?
PYGMY NUTHATCH	?	?	?	?	?	?	?
BROWN CREEPER	?	?	?	?	?	?	?
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	?	?	?	?	?	?	?
RUBY-CROWNED KINGLET	?	?	?	?	?	?	?
WINTER WREN	?	?	?	?	?	?	?
MARSH WREN	?	?	?	?	?	?	?
DIPPER	?	?	?	?	?	?	?
GOLDEN-CROWNED KINGLET	?	?	?	?	?	?	?
EASTERN BLUEBIRD	?	?	?	?	?	?	?
WESTERN BLUEBIRD	?	?	?	?	?	?	?
TOWNSEND'S SOLITAIRE	?	?	?	?	?	?	?
VEERY	?	?	?	?	?	?	?
SWAINSON'S THRUSH	?	?	?	?	?	?	?
HERMIT THRUSH	?	?	?	?	?	?	?
AMERICAN ROBIN	?	?	?	?	?	?	?
VARIED THRUSH	?	?	?	?	?	?	?
GRAY CATBIRD	?	?	?	?	?	?	?
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	?	?	?	?	?	?	?
WATER PIPIT	?	?	?	?	?	?	?
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	?	?	?	?	?	?	?
CEDAR WAXWING	?	?	?	?	?	?	?
NORTHERN SHRIKE	?	?	?	?	?	?	?
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	?	?	?	?	?	?	?
SOLITARY VIREO	?	?	?	?	?	?	?
WARBLING VIREO	?	?	?	?	?	?	?
RED-EYED VIREO	?	?	?	?	?	?	?
TENNESSEE WARBLER	?	?	?	?	?	?	?
ORANGE-CROWNED WARBLER	?	?	?	?	?	?	?
NASHVILLE WARBLER	?	?	?	?	?	?	?
YELLOW WARBLER	?	?	?	?	?	?	?
YELLOW-RUMPED WARBLER	?	?	?	?	?	?	?
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	?	?	?	?	?	?	?
BLACK-AND-WHITE WARBLER	?	?	?	?	?	?	?
AMERICAN REDSTART	?	?	?	?	?	?	?
OVENBIRD	?	?	?	?	?	?	?
NORTHERN WATERTHRUSH	?	?	?	?	?	?	?
MACGILLIVRAY'S WARBLER	?	?	?	?	?	?	?
COMMON YELLOWTHROAT	?	?	?	?	?	?	?
WILSON'S WARBLER	?	?	?	?	?	?	?
YELLOW-BREASTED CHAT	?	?	?	?	?	?	?
WESTERN TANAGER	?	?	?	?	?	?	?
NORTHERN CARDINAL	?	?	?	?	?	?	?

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-HEADED GROSBEAK	?	?	?	?	?	?	?
LAZULI BUNTING	?	?	?	?	?	?	?
INDIGO BUNTING	?	?	?	?	?	?	?
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	?	?	?	?	?	?	?
RUFOUS-SIDED TOWHEE	?	?	?	?	?	?	?
TREE SPARROW	?	?	?	?	?	?	?
CHIPPING SPARROW	?	?	?	?	?	?	?
CLAY-COLORED SPARROW	?	?	?	?	?	?	?
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	?	?	?	?	?	?	?
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	?	?	?	?	?	?	?
FOX SPARROW	?	?	?	?	?	?	?
SONG SPARROW	?	?	?	?	?	?	?
LINCOLN'S SPARROW	?	?	?	?	?	?	?
WHITE-THROATED SPARROW	?	?	?	?	?	?	?
WHITE-CROWNED SPARROW	?	?	?	?	?	?	?
HARRIS' SPARROW	?	?	?	?	?	?	?
DARK-EYED JUNCO	?	?	?	?	?	?	?
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	?	?	?	?	?	?	?
BOBOLINK	?	?	?	?	?	?	?
RED-WINGED BLACKBIRD	?	?	?	?	?	?	?
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	?	?	?	?	?	?	?
RUSTY BLACKBIRD	?	?	?	?	?	?	?
BREWER'S BLACKBIRD	?	?	?	?	?	?	?
COMMON GRACKLE	?	?	?	?	?	?	?
BROWN-HEADED COWBIRD	?	?	?	?	?	?	?
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	?	?	?	?	?	?	?
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	?	?	?	?	?	?	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	?	?	?	?	?	?	?
HOARY REDPOLL	?	?	?	?	?	?	?
PINE SISKIN	?	?	?	?	?	?	?
AMERICAN GOLDFINCH	?	?	?	?	?	?	?

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	?	?	?	?	?	?	?
MASKED SHREW	?	?	?	?	?	?	?
PREBLE'S SHREW	?	?	?	?	?	?	?
VAGRANT SHREW	?	?	?	?	?	?	?
DWARF SHREW	?	?	?	?	?	?	?
WATER SHREW	?	?	?	?	?	?	?
MERRIAM'S SHREW	?	?	?	?	?	?	?
PYGMY SHREW	?	?	?	?	?	?	?
LITTLE BROWN MYOTIS	?	?	?	?	?	?	?
YUMA MYOTIS	-	-	-	-	-	-	-
LONG-EARED MYOTIS	?	?	?	?	?	?	?
LONG-LEGGED MYOTIS	?	?	?	?	?	?	?
CALIFORNIA MYOTIS	?	?	?	?	?	?	?
WESTERN SMALL-FOOTED MYOTIS	?	?	?	?	?	?	?
NORTHERN MYOTIS (KEEN'S)	?	?	?	?	?	?	?
SILVER-HAIRED BAT	?	?	?	?	?	?	?
BIG BROWN BAT	?	?	?	?	?	?	?
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	-	+	+	-	-	-	+
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	?	?	?	?	?	?	?
MOUNTAIN COTTONTAIL	?	?	?	?	?	?	?
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	?	?	?	?	?	?	?
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	?	?	?	?	?	?	?
YELLOW-PINE CHIPMUNK	?	?	?	?	?	?	?
RED-TAILED CHIPMUNK	?	?	?	?	?	?	?
UINTA CHIPMUNK	?	?	?	?	?	?	?
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	?	?	?	?	?	?	?
COLUMBIAN GROUND SQUIRREL	?	?	?	?	?	?	?
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	?	?	?	?	?	?	?
EASTERN FOX SQUIRREL	?	?	?	?	?	?	?
RED SQUIRREL	?	?	?	?	?	?	?
NORTHERN FLYING SQUIRREL	?	?	?	?	?	?	?
NORTHERN POCKET GOPHER	?	?	?	?	?	?	?
IDAHO POCKET GOPHER	?	?	?	?	?	?	?
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	?	?	?	?	?	?	?
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	?	?	?	?	?	?	?
WHITE-FOOTED MOUSE	?	?	?	?	?	?	?
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	?	?	?	?	?	?	?
SOUTHERN RED-BACKED VOLE	?	?	?	?	?	?	?
HEATHER VOLE	?	?	?	?	?	?	?
MEADOW VOLE	?	?	?	?	?	?	?
MONTANE VOLE	?	?	?	?	?	?	?
LONG-TAILED VOLE	?	?	?	?	?	?	?
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	?	?	?	?	?	?	?
SAGEBRUSH VOLE	?	?	?	?	?	?	?
MUSKRAT	?	?	?	?	?	?	?
NORTHERN BOG LEMMING	?	?	?	?	?	?	?
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	?	?	?	?	?	?	?
PORCUPINE	?	?	?	?	?	?	?
COYOTE	-	-	-	-	-	?	-
GRAY WOLF	-	+	+	-	-	-	+
RED FOX	-	-	-	-	-	?	-
KIT OR SWIFT FOX	?	?	?	?	?	?	?
BLACK BEAR	-	-	-	-	-	+	-
GRIZZLY BEAR	-	+	+	-	-	+	+
RACCOON	?	?	?	?	?	?	?
MARTEN	-	-	-	-	-	+	-
FISHER	?	?	?	?	?	?	?
ERMINE	?	?	?	?	?	?	?
LEAST WEASEL	?	?	?	?	?	?	?
LONG-TAILED WEASEL	?	?	?	?	?	?	?
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	?	?	?	?	?	?	?
WOLVERINE	?	?	?	?	?	?	?
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	?	?	?	?	?	?	?
STRIPED SKUNK	?	?	?	?	?	?	?
RIVER OTTER	?	?	?	?	?	?	?
MOUNTAIN LION	-	-	-	-	-	+	-
LYNX	?	?	?	?	?	?	?
BOBCAT	?	?	?	?	?	?	?
WAPITI OR ELK	-	-	-	-	-	+	-
MULE DEER	?	?	?	?	?	?	?
WHITE-TAILED DEER	?	?	?	?	?	?	?
MOOSE	?	?	?	?	?	?	?

Table WLD-8 (continued)
DESCRIPTOR RECREATIONAL USE

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
WOODLAND CARIBOU	?	?	?	?	?	?	?
PRONGHORN	?	?	?	?	?	?	?
BISON	?	?	?	?	?	?	?
MOUNTAIN GOAT	?	?	?	?	?	?	?
BIGHORN SHEEP	?	?	?	?	?	?	?
SNAPPING TURTLE	?	?	?	?	?	?	?
PAINTED TURTLE	?	?	?	?	?	?	?
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	?	?	?	?	?	?	?
SHORT-HORNED LIZARD	?	?	?	?	?	?	?
SAGEBRUSH LIZARD	?	?	?	?	?	?	?
WESTERN SKINK	?	?	?	?	?	?	?
RUBBER BOA	?	?	?	?	?	?	?
RACER	?	?	?	?	?	?	?
WESTERN HOGNOSE SNAKE	?	?	?	?	?	?	?
MILK SNAKE	?	?	?	?	?	?	?
PINE OR GOPHER SNAKE	?	?	?	?	?	?	?
W. TERRESTRIAL GARTER SNAKE	?	?	?	?	?	?	?
PLAINS GARTER SNAKE	?	?	?	?	?	?	?
COMMON GARTER SNAKE	?	?	?	?	?	?	?
WESTERN RATTLESNAKE	?	?	?	?	?	?	?

Table WLD-9
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LONG-TOED SALAMANDER	-	?-	+	-	-	?	?-
TIGER SALAMANDER	-	?-	+	-	-	?	?-
COEUR D'ALENE SALAMANDER (VD)	-	+	+	-	-	?	+
ROUGHSKIN NEWT	-	?-	+	-	-	?	?-
IDAHO GIANT SALAMANDER	-	+	+	-	-	?	+
TAILED FROG	-	+	+	-	-	?	+
WESTERN TOAD	-	?-	+	-	-	?	?-
GREAT PLAINS TOAD	?	?	?	?	?	?	?
CANADIAN TOAD	?	?	?	?	?	?	?
WOODHOUSE'S TOAD	?	?	?	?	?	?	?
WESTERN CHORUS FROG	-	?-	+	-	-	?	?-
PACIFIC CHORUS FROG	-	?-	+	-	-	?	?-
PLAINS SPADEFOOT	?	?	?	?	?	?	?
BULLFROG	?	?	?	?	?	?	?
LEOPARD FROG	?	?	?	?	?	?	?
SPOTTED FROG	?	?	?	?	?	?	?
WOOD FROG	-	?-	+	-	-	?	?-
COMMON LOON	?	?	?	?	?	?	?
PIED-BILLED GREBE	?	?	?	?	?	?	?
HORNED GREBE	?	?	?	?	?	?	?
RED-NECKED GREBE	?	?	?	?	?	?	?
EARED GREBE	?	?	?	?	?	?	?
WESTERN GREBE (CLARK'S)	?	?	?	?	?	?	?
WHITE PELICAN	-	+	+	-	-	?	+
DOUBLE-CRESTED CORMORANT	-	?-	+	-	-	?	?-
AMERICAN BITTERN	?	?	?	?	?	?	?
GREAT BLUE HERON	-	?-	+	-	-	?	?-
BLACK-CROWNED NIGHT HERON	-	+	+	?	-	?	+
WHITE-FACED IBIS	?	?	?	?	?	?	?
TUNDRA SWAN	-	?-	+	+	-	+	-
TRUMPETER SWAN	-	+	+	+	-	+	+
MUTE SWAN	?	?	?	?	?	?	?
GREATER WHITE-FRONTED GOOSE	-	?-	+	+	-	+	-
SNOW GOOSE	-	?-	+	+	-	+	-
ROSS' GOOSE	-	?-	+	+	-	+	-
CANADA GOOSE	-	?-	+	+	-	+	-
WOOD DUCK	-	?-	+	+	-	+	-
GREEN-WINGED TEAL	-	?-	+	+	-	+	-
MALLARD	-	?-	+	+	-	+	-
NORTHERN PINTAIL	-	?-	+	+	-	+	-
BLUE-WINGED TEAL	-	?-	+	+	-	+	-
CINNAMON TEAL	-	?-	+	+	-	+	-
NORTHERN SHOVELER	-	?-	+	+	-	+	-
GADWALL	-	?-	+	+	-	+	-
EURASIAN WIGEON	-	?-	+	+	-	+	-
AMERICAN WIGEON	-	?-	+	+	-	+	-
CANVASBACK	-	?-	+	+	-	+	-
REDHEAD	-	?-	+	+	-	+	-
RING-NECKED DUCK	-	?-	+	+	-	+	-

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
LESSER SCAUP	-	?-	+	+	-	+	-
HARLEQUIN DUCK	-	+	+	+	-	+	+
COMMON GOLDENEYE	-	?-	+	+	-	+	-
BARROW'S GOLDENEYE	-	?-	+	+	-	+	-
BUFFLEHEAD	-	?-	+	+	-	+	-
HOODED MERGANSER	-	?-	+	+	-	+	-
COMMON MERGANSER	-	?-	+	+	-	+	-
RED-BREASTED MERGANSER	-	?-	+	+	-	+	-
RUDDY DUCK	-	?-	+	+	-	+	-
TURKEY VULTURE	-	?-	+	-	-	?	?-
OSPREY	-	?-	+	-	-	?	?-
BALD EAGLE	-	+	+	-	-	?	+
NORTHERN HARRIER (MARSH HAWK)	?	?	?	?	?	?	?
SHARP-SHINNED HAWK	-	?-	+	-	-	?	?-
COOPER'S HAWK	-	?-	+	-	-	?	?-
NORTHERN GOSHAWK	-	+	+	-	-	?	+
BROAD-WINGED HAWK	-	?-	+	-	-	?	?-
SWAINSON'S HAWK	?	?	?	?	?	?	?
RED-TAILED HAWK	-	?-	+	-	-	?	?-
FERRUGINOUS HAWK	-	+	+	-	-	?	+
ROUGH-LEGGED HAWK	?	?	?	?	?	?	?
GOLDEN EAGLE	-	?-	+	-	-	?	?-
AMERICAN KESTREL	-	?-	+	-	-	?	?-
MERLIN	-	?-	+	-	-	?	?-
PEREGRINE FALCON	-	+	+	-	-	?	+
GYRFALCON	?	?	?	?	?	?	?
PRAIRIE FALCON	-	?-	+	-	-	?	?-
GRAY PARTRIDGE	-	?-	+	+	-	+	-
CHUKAR	-	?-	+	+	-	+	-
RING-NECKED PHEASANT	-	?-	+	+	-	+	-
SPRUCE GROUSE	-	?-	+	+	-	+	-
BLUE GROUSE	-	?-	+	+	-	+	-
WHITE-TAILED PTARMIGAN	?	?	?	+	?	+	?
RUFFED GROUSE	-	?-	+	+	-	+	-
SAGE GROUSE	-	?-	+	+	-	+	-
SHARP-TAILED GROUSE (COL.)	-	+	+	+	-	+	+
WILD TURKEY	-	?-	+	+	-	+	-
NORTHERN BOBWHITE	?	?	?	?	?	?	?
VIRGINIA RAIL	?	?	?	+	?	+	?
SORA	?	?	?	+	?	+	?
AMERICAN COOT	-	?-	+	+	-	+	-
SANDHILL CRANE	-	?-	+	+	-	+	-
WHOOPING CRANE	?	?	?	?	?	?	?
BLACK-BELLIED PLOVER	?	?	?	?	?	?	?
LESSER GOLDEN PLOVER	?	?	?	?	?	?	?
SEMIPALMATED PLOVER	?	?	?	?	?	?	?
PIPING PLOVER	?	?	?	?	?	?	?
KILLDEER	?	?	?	?	?	?	?
MOUNTAIN PLOVER	-	+	+	-	-	?	+

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
BLACK-NECKED STILT	?	?	?	?	?	?	?
AMERICAN AVOCET	?	?	?	?	?	?	?
GREATER YELLOWLEGS	?	?	?	?	?	?	?
LESSER YELLOWLEGS	?	?	?	?	?	?	?
SOLITARY SANDPIPER	?	?	?	?	?	?	?
WILLET	?	?	?	?	?	?	?
SPOTTED SANDPIPER	?	?	?	?	?	?	?
UPLAND SANDPIPER	?	?	?	?	?	?	?
WHIMBREL	?	?	?	?	?	?	?
LONG-BILLED CURLEW	-	?-	+	-	-	?	?-
MARBLED GODWIT	?	?	?	?	?	?	?
RUDDY TURNSTONE	?	?	?	?	?	?	?
SANDERLING	?	?	?	?	?	?	?
SEMIPALMATED SANDPIPER	?	?	?	?	?	?	?
WESTERN SANDPIPER	?	?	?	?	?	?	?
LEAST SANDPIPER	?	?	?	?	?	?	?
BAIRD'S SANDPIPER	?	?	?	?	?	?	?
PECTORAL SANDPIPER	?	?	?	?	?	?	?
DUNLIN	?	?	?	?	?	?	?
STILT SANDPIPER	?	?	?	?	?	?	?
LONG-BILLED DOWITCHER	?	?	?	?	?	?	?
COMMON SNIPE	-	?-	+	+	-	+	-
WILSON'S PHALAROPE	?	?	?	?	?	?	?
RED-NECKED PHALAROPE	?	?	?	?	?	?	?
FRANKLIN'S GULL	?	?	?	?	?	?	?
BONAPARTE'S GULL	?	?	?	?	?	?	?
RING-BILLED GULL	?	?	?	?	?	?	?
CALIFORNIA GULL	?	?	?	?	?	?	?
CASPIAN TERN	?	?	?	?	?	?	?
COMMON TERN	?	?	?	?	?	?	?
FORSTER'S TERN	?	?	?	?	?	?	?
LEAST TERN	?	?	?	?	?	?	?
BLACK TERN	?	?	?	?	?	?	?
ROCK DOVE	?	?	?	?	?	?	?
MOURNING DOVE	-	?-	+	+	-	+	-
BLACK-BILLED CUCKOO	?	?	?	?	?	?	?
YELLOW-BILLED CUCKOO	?	?	?	?	?	?	?
FLAMMULATED OWL	-	+	+	-	-	?	+
EASTERN SCREECH-OWL	-	?-	+	-	-	?	?-
WESTERN SCREECH-OWL	-	?-	+	-	-	?	?-
GREAT HORNED OWL	-	?-	+	-	-	?	?-
SNOWY OWL	?	?	?	?	?	?	?
NORTHERN PYGMY OWL	-	?-	+	-	-	?	?-
BURROWING OWL	?	?	?	?	?	?	?
BARRED OWL	-	?-	+	-	-	?	?-
GREAT GRAY OWL	-	+	+	-	-	?	+
LONG-EARED OWL	?	?	?	?	?	?	?
SHORT-EARED OWL	?	?	?	?	?	?	?
BOREAL OWL	-	+	+	-	-	?	+
SAW-WHET OWL	-	?-	+	-	-	?	?-

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
COMMON NIGHTHAWK	?	?	?	?	?	?	?
COMMON POORWILL	?	?	?	?	?	?	?
BLACK SWIFT	?	?	?	?	?	?	?
CHIMNEY SWIFT	-	?-	+	-	-	?	?-
VAUX'S SWIFT	-	?-	+	-	-	?	?-
WHITE-THROATED SWIFT	?	?	?	?	?	?	?
BLACK-CHINNED HUMMINGBIRD	?	?	?	?	?	?	?
CALLIOPE HUMMINGBIRD	?	?	?	?	?	?	?
RUFOUS HUMMINGBIRD	?	?	?	?	?	?	?
BELTED KINGFISHER	?	?	?	?	?	?	?
LEWIS' WOODPECKER	-	?-	+	-	-	?	?-
RED-HEADED WOODPECKER	-	?-	+	-	-	?	?-
YELLOW-BELLIED SAPSUCKER (RED-NAPED)	-	?-	+	-	-	?	?-
WILLIAMSON'S SAPSUCKER	-	?-	+	-	-	?	?-
DOWNY WOODPECKER	-	?-	+	-	-	?	?-
HAIRY WOODPECKER	-	?-	+	-	-	?	?-
THREE-TOED WOODPECKER	-	?-	+	-	-	?	?-
BLACK-BACKED WOODPECKER	-	+	+	-	-	?	+
NORTHERN FLICKER	-	?-	+	-	-	?	?-
PILEATED WOODPECKER	-	?-	+	-	-	?	?-
OLIVE-SIDED FLYCATCHER	?	?	?	?	?	?	?
WESTERN WOOD PEWEE	?	?	?	?	?	?	?
WILLOW FLYCATCHER	?	?	?	?	?	?	?
LEAST FLYCATCHER	?	?	?	?	?	?	?
HAMMOND'S FLYCATCHER	?	?	?	?	?	?	?
DUSKY FLYCATCHER	?	?	?	?	?	?	?
CORDILLERAN FLYCATCHER	-	?-	+	-	-	?	?-
SAY'S PHOEBE	-	?-	+	-	-	?	?-
CASSIN'S KINGBIRD	?	?	?	?	?	?	?
WESTERN KINGBIRD	?	?	?	?	?	?	?
EASTERN KINGBIRD	?	?	?	?	?	?	?
HORNED LARK	?	?	?	?	?	?	?
TREE SWALLOW	-	?-	+	-	-	?	?-
VIOLET-GREEN SWALLOW	-	?-	+	-	-	?	?-
ROUGH-WINGED SWALLOW	?	?	?	?	?	?	?
BANK SWALLOW	?	?	?	?	?	?	?
CLIFF SWALLOW	?	?	?	?	?	?	?
BARN SWALLOW	?	?	?	?	?	?	?
GRAY JAY	?	?	?	?	?	?	?
STELLER'S JAY	?	?	?	?	?	?	?
PINYON JAY	?	?	?	?	?	?	?
CLARK'S NUTCRACKER	?	?	?	?	?	?	?
BLACK-BILLED MAGPIE	-	?-	+	-	-	?	?-
COMMON CROW	?	?	?	?	?	?	?
COMMON RAVEN	?	?	?	?	?	?	?
BLACK-CAPPED CHICKADEE	-	?-	+	-	-	?	?-
MOUNTAIN CHICKADEE	-	?-	+	-	-	?	?-
BOREAL CHICKADEE	-	?-	+	-	-	?	?-
CHESTNUT-BACKED CHICKADEE	-	?-	+	-	-	?	?-

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
RED-BREASTED NUTHATCH	-	?-	+	-	-	?	?-
WHITE-BREASTED NUTHATCH	-	?-	+	-	-	?	?-
PYGMY NUTHATCH	-	?-	+	-	-	?	?-
BROWN CREEPER	-	?-	+	-	-	?	?-
ROCK WREN	?	?	?	?	?	?	?
CANYON WREN	?	?	?	?	?	?	?
HOUSE WREN	-	?-	+	-	-	?	?-
RUBY-CROWNED KINGLET	?	?	?	?	?	?	?
WINTER WREN	-	?-	+	-	-	?	?-
MARSH WREN	?	?	?	?	?	?	?
DIPPER	-	?-	+	-	-	?	?-
GOLDEN-CROWNED KINGLET	?	?	?	?	?	?	?
EASTERN BLUEBIRD	-	?-	+	-	-	?	?-
WESTERN BLUEBIRD	-	?-	+	-	-	?	?-
MOUNTAIN BLUEBIRD	-	?-	+	-	-	?	?-
TOWNSEND'S SOLITAIRE	?	?	?	?	?	?	?
VEERY	-	?-	+	-	-	?	?-
SWAINSON'S THRUSH	-	?-	+	-	-	?	?-
HERMIT THRUSH	?	?	?	?	?	?	?
AMERICAN ROBIN	?	?	?	?	?	?	?
VARIED THRUSH	?	?	?	?	?	?	?
GRAY CATBIRD	?	?	?	?	?	?	?
SAGE THRASHER	?	?	?	?	?	?	?
BROWN THRASHER	?	?	?	?	?	?	?
WATER PIPIT	?	?	?	?	?	?	?
SPRAGUE'S PIPIT	?	?	?	?	?	?	?
BOHEMIAN WAXWING	?	?	?	?	?	?	?
CEDAR WAXWING	?	?	?	?	?	?	?
NORTHERN SHRIKE	?	?	?	?	?	?	?
LOGGERHEAD SHRIKE	?	?	?	?	?	?	?
EUROPEAN STARLING	-	?-	+	-	-	?	?-
SOLITARY VIREO	?	?	?	?	?	?	?
WARBLING VIREO	?	?	?	?	?	?	?
RED-EYED VIREO	?	?	?	?	?	?	?
TENNESSEE WARBLER	?	?	?	?	?	?	?
ORANGE-CROWNED WARBLER	?	?	?	?	?	?	?
NASHVILLE WARBLER	?	?	?	?	?	?	?
YELLOW WARBLER	?	?	?	?	?	?	?
YELLOW-RUMPED WARBLER	?	?	?	?	?	?	?
TOWNSEND'S WARBLER	?	?	?	?	?	?	?
BLACKPOLL WARBLER	?	?	?	?	?	?	?
BLACK-AND-WHITE WARBLER	-	?-	+	-	-	?	?-
AMERICAN REDSTART	?	?	?	?	?	?	?
OVENBIRD	?	?	?	?	?	?	?
NORTHERN WATERTHRUSH	-	?-	+	-	-	?	?-
MACGILLIVRAY'S WARBLER	?	?	?	?	?	?	?
COMMON YELLOWTHROAT	?	?	?	?	?	?	?
WILSON'S WARBLER	?	?	?	?	?	?	?
YELLOW-BREASTED CHAT	?	?	?	?	?	?	?
WESTERN TANAGER	?	?	?	?	?	?	?

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
NORTHERN CARDINAL	?	?	?	?	?	?	?
BLACK-HEADED GROSBEAK	?	?	?	?	?	?	?
LAZULI BUNTING	?	?	?	?	?	?	?
INDIGO BUNTING	?	?	?	?	?	?	?
DICKCISSEL	?	?	?	?	?	?	?
GREEN-TAILED TOWHEE	?	?	?	?	?	?	?
RUFOUS-SIDED TOWHEE	?	?	?	?	?	?	?
TREE SPARROW	?	?	?	?	?	?	?
CHIPPING SPARROW	?	?	?	?	?	?	?
CLAY-COLORED SPARROW	?	?	?	?	?	?	?
BREWER'S SPARROW	?	?	?	?	?	?	?
FIELD SPARROW	?	?	?	?	?	?	?
VESPER SPARROW	?	?	?	?	?	?	?
LARK SPARROW	?	?	?	?	?	?	?
LARK BUNTING	?	?	?	?	?	?	?
SAVANNAH SPARROW	?	?	?	?	?	?	?
BAIRD'S SPARROW	?	?	?	?	?	?	?
GRASSHOPPER SPARROW	?	?	?	?	?	?	?
LE CONTE'S SPARROW	?	?	?	?	?	?	?
FOX SPARROW	?	?	?	?	?	?	?
SONG SPARROW	?	?	?	?	?	?	?
LINCOLN'S SPARROW	?	?	?	?	?	?	?
WHITE-THROATED SPARROW	?	?	?	?	?	?	?
WHITE-CROWNED SPARROW	?	?	?	?	?	?	?
HARRIS' SPARROW	?	?	?	?	?	?	?
DARK-EYED JUNCO	-	?-	+	-	-	?	?-
MCCOWN'S LONGSPUR	?	?	?	?	?	?	?
LAPLAND LONGSPUR	?	?	?	?	?	?	?
CHESTNUT-COLLARED LONGSPUR	?	?	?	?	?	?	?
SNOW BUNTING	?	?	?	?	?	?	?
BOBOLINK	?	?	?	?	?	?	?
RED-WINGED BLACKBIRD	?	?	?	?	?	?	?
WESTERN MEADOWLARK	?	?	?	?	?	?	?
YELLOW-HEADED BLACKBIRD	?	?	?	?	?	?	?
RUSTY BLACKBIRD	?	?	?	?	?	?	?
BREWER'S BLACKBIRD	?	?	?	?	?	?	?
COMMON GRACKLE	?	?	?	?	?	?	?
BROWN-HEADED COWBIRD	?	?	?	?	?	?	?
ORCHARD ORIOLE	?	?	?	?	?	?	?
NORTHERN ORIOLE	?	?	?	?	?	?	?
BLACK ROSY FINCH	?	?	?	?	?	?	?
GRAY-CROWNED ROSY FINCH	?	?	?	?	?	?	?
PINE GROSBEAK	?	?	?	?	?	?	?
CASSIN'S FINCH	?	?	?	?	?	?	?
HOUSE FINCH	?	?	?	?	?	?	?
RED CROSSBILL	?	?	?	?	?	?	?
WHITE-WINGED CROSSBILL	?	?	?	?	?	?	?
COMMON REDPOLL	?	?	?	?	?	?	?
HOARY REDPOLL	?	?	?	?	?	?	?
PINE SISKIN	?	?	?	?	?	?	?

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
AMERICAN GOLDFINCH	?	?	?	?	?	?	?
EVENING GROSBEAK	?	?	?	?	?	?	?
HOUSE SPARROW	-	?-	+	-	-	?	?-
MASKED SHREW	-	?-	+	-	-	-	?-
PREBLE'S SHREW	?	?	?	?	?	?	?
VAGRANT SHREW	-	?-	+	-	-	?	?-
DWARF SHREW	-	+	+	-	-	?	+
WATER SHREW	-	?-	+	-	-	?	?-
MERRIAM'S SHREW	-	+	+	-	-	?	+
PYGMY SHREW	-	?-	+	-	-	?	?-
LITTLE BROWN MYOTIS	-	?-	+	-	-	?	?-
YUMA MYOTIS	-	?-	+	-	-	?	?-
LONG-EARED MYOTIS	-	?-	+	-	-	?	?-
LONG-LEGGED MYOTIS	-	?-	+	-	-	?	?-
CALIFORNIA MYOTIS	-	?-	+	-	-	?	?-
WESTERN SMALL-FOOTED MYOTIS	-	?-	+	-	-	?	?-
NORTHERN MYOTIS (KEEN'S)	-	+	+	-	-	?	+
SILVER-HAIRED BAT	-	?-	+	-	-	?	?-
BIG BROWN BAT	-	?-	+	-	-	?	?-
HOARY BAT	?	?	?	?	?	?	?
SPOTTED BAT	?	?	?	?	?	?	?
TOWNSEND'S BIG-EARED BAT	-	+	+	-	-	?	+
PALLID BAT	?	?	?	?	?	?	?
PIKA	?	?	?	?	?	?	?
EASTERN COTTONTAIL	-	?-	+	-	-	?	?-
MOUNTAIN COTTONTAIL	?	?	?	?	?	?	?
DESERT COTTONTAIL	?	?	?	?	?	?	?
SNOWSHOE HARE	-	?-	+	-	-	?	?-
WHITE-TAILED JACK RABBIT	?	?	?	?	?	?	?
BLACK-TAILED JACKRABBIT	?	?	?	?	?	?	?
PYGMY RABBIT	?	?	?	?	?	?	?
LEAST CHIPMUNK	-	?-	+	-	-	?	?-
YELLOW-PINE CHIPMUNK	-	?-	+	-	-	?	?-
RED-TAILED CHIPMUNK	-	?-	+	-	-	?	?-
UINTA CHIPMUNK	-	?-	+	-	-	?	?-
YELLOW-BELLIED MARMOT	?	?	?	?	?	?	?
HOARY MARMOT	?	?	?	?	?	?	?
RICHARDSON'S GR. SQUIR.	?	?	?	?	?	?	?
UINTA GROUND SQUIRREL	-	?-	+	-	-	?	?-
COLUMBIAN GROUND SQUIRREL	?	?	?	?	?	?	?
THIRTEEN-LINED GR. SQUIR.	?	?	?	?	?	?	?
GOLDEN-MANTLED GR. SQUIR.	?	?	?	?	?	?	?
BLACK-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
WHITE-TAILED PRAIRIE DOG	?	?	?	?	?	?	?
EASTERN GRAY SQUIRREL	-	?-	+	-	-	?	?-
EASTERN FOX SQUIRREL	-	?-	+	-	-	?	?-
RED SQUIRREL	-	?-	+	-	-	?	?-
NORTHERN FLYING SQUIRREL	-	?-	+	-	-	?	?-
NORTHERN POCKET GOPHER	?	?	?	?	?	?	?
IDAHO POCKET GOPHER	-	?-	+	-	-	?	?-

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
OLIVE-BACKED POCKET MOUSE	?	?	?	?	?	?	?
GREAT BASIN POCKET MOUSE	?	?	?	?	?	?	?
HISPID POCKET MOUSE	?	?	?	?	?	?	?
ORD'S KANGAROO RAT	?	?	?	?	?	?	?
BEAVER	-	?-	+	+	-	+	-
WESTERN HARVEST MOUSE	?	?	?	?	?	?	?
DEER MOUSE	-	?-	+	-	-	?	?-
WHITE-FOOTED MOUSE	-	?-	+	-	-	?	?-
NORTHERN GRASSHOPPER MOUSE	?	?	?	?	?	?	?
BUSHY-TAILED WOODRAT	-	?-	+	-	-	-	?-
SOUTHERN RED-BACKED VOLE	-	?-	+	-	-	?	?-
HEATHER VOLE	-	?-	+	-	-	?	?-
MEADOW VOLE	-	?-	+	-	-	?	?-
MONTANE VOLE	-	?-	+	-	-	?	?-
LONG-TAILED VOLE	?	?	?	?	?	?	?
PRAIRIE VOLE	?	?	?	?	?	?	?
WATER VOLE (RICHARDSON'S)	-	?-	+	-	-	?	?-
SAGEBRUSH VOLE	?	?	?	?	?	?	-
MUSKRAT	-	?-	+	+	-	+	?
NORTHERN BOG LEMMING	-	+	+	-	-	?	+
NORWAY RAT	?	?	?	?	?	?	?
HOUSE MOUSE	?	?	?	?	?	?	?
MEADOW JUMPING MOUSE	?	?	?	?	?	?	?
WESTERN JUMPING MOUSE	-	?-	+	-	-	?	?-
PORCUPINE	-	?-	+	-	-	?	?-
COYOTE	-	?-	+	-	-	?	?-
GRAY WOLF	-	+	+	-	-	?	+
RED FOX	-	?-	+	-	-	?	?-
KIT OR SWIFT FOX	?	?	?	+	?	+	?
BLACK BEAR	-	?-	+	+	-	+	-
GRIZZLY BEAR	-	+	+	+	-	+	+
RACCOON	-	?-	+	?	-	?	?-
MARTEN	-	?-	+	+	-	+	-
FISHER	-	+	+	+	-	+	+
ERMINE	-	?-	+	+	-	+	-
LEAST WEASEL	-	?-	+	-	-	?	?-
LONG-TAILED WEASEL	-	?-	+	-	-	?	?-
BLACK-FOOTED FERRET	?	?	?	?	?	?	?
MINK	-	?-	+	+	-	+	-
WOLVERINE	-	+	+	+	-	+	+
BADGER	?	?	?	?	?	?	?
WESTERN SPOTTED SKUNK	-	?-	+	-	-	?	?-
STRIPED SKUNK	-	?-	+	-	-	?	?-
RIVER OTTER	-	?-	+	+	-	+	-
MOUNTAIN LION	-	?-	+	+	-	+	-
LYNX	-	+	+	+	-	+	+
BOBCAT	-	?-	+	+	-	+	-
WAPITI OR ELK	-	?-	+	+	-	+	-
MULE DEER	-	?-	+	+	-	+	-
WHITE-TAILED DEER	-	?-	+	+	-	+	-
MOOSE	-	?-	+	+	-	+	-

Table WLD-9 (continued)
DESCRIPTOR ROAD DENSITY

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
WOODLAND CARIBOU	?	?	?	+	?	+	?
PRONGHORN	-	?-	+	+	-	+	-
BISON	-	?-	+	+	-	+	-
MOUNTAIN GOAT	-	?-	+	+	-	+	-
BIGHORN SHEEP	-	?-	+	+	-	+	-
SNAPPING TURTLE	-	+	+	-	-	?	+
PAINTED TURTLE	-	?-	+	-	-	?	?-
SPINY SOFTSHELL TURTLE	?	?	?	?	?	?	?
NORTHERN ALLIGATOR LIZARD	-	?-	+	-	-	?	?-
SHORT-HORNED LIZARD	?	?	?	?	?	?	?
SAGEBRUSH LIZARD	-	?-	+	-	-	?	?-
WESTERN SKINK	-	?-	+	-	-	?	?-
RUBBER BOA	-	?-	+	-	-	?	?-
RACER	-	?-	+	-	-	?	?-
WESTERN HOGNOSE SNAKE	-	+	+	-	-	?	+
MILK SNAKE	-	?-	+	-	-	?	?-
PINE OR GOPHER SNAKE	-	?-	+	-	-	?	?-
W. TERRESTRIAL GARTER SNAKE	-	?-	+	-	-	?	?-
PLAINS GARTER SNAKE	-	?-	+	-	-	?	?-
COMMON GARTER SNAKE	-	?-	+	-	-	?	?-
WESTERN RATTLESNAKE	-	?-	+	-	-	?	?-

PART III: BACKGROUND DATA ON SPECIES IN WILDLIFE ANALYSIS

Table WLD-10
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES

			Resident/Migrant[a]		
OBS	Scientific Name	Common Name	SUM	WIN	MIG
AMPHIBIANS					
1	AMBYSTOMA MACRODACTYLUM	LONG-TOED SALAMANDER	Y	Y	N
2	AMBYSTOMA TIGRINUM	TIGER SALAMANDER	Y	Y	N
3	PLETHODON IDAHOENSIS	COEUR D'ALENE SALAMANDER (VD)	Y	Y	N
4	TARICHA GRANULOSA	ROUGHSKIN NEWT	Y	Y	N
5	DICAMPTODON ATERRIMUS	IDAHO GIANT SALAMANDER			
6	ASCAPHUS TRUEI	TAILED FROG	Y	Y	N
7	BUFO BOREAS	WESTERN TOAD	Y	Y	N
8	BUFO COGNATUS	GREAT PLAINS TOAD	Y	Y	N
9	BUFO HEMIOPHRYS	CANADIAN TOAD	Y	Y	N
10	BUFO WOODHOUSII	WOODHOUSE'S TOAD	Y	Y	N
11	PSEUDACRIS TRISERIATA	WESTERN CHORUS FROG	Y	Y	N
12	PSEUDACRIS REGILLA	PACIFIC CHORUS FROG	Y	Y	N
13	SCAPHIOPUS BOMBIFRONS	PLAINS SPADEFOOT	Y	Y	N
14	RANA CATESBEIANA	BULLFROG	Y	Y	N
15	RANA PIPIENS	LEOPARD FROG	Y	Y	N
16	RANA PRETIOSA	SPOTTED FROG	Y	Y	N
17	RANA SYLVATICA	WOOD FROG			
BIRDS					
18	GAVIA IMMER	COMMON LOON	Y		N
19	PODILYMBUS PODICEPS	PIED-BILLED GREBE	Y		N
20	PODICEPS AURITUS	HORNED GREBE	Y		N
21	PODICEPS GRISEGENA	RED-NECKED GREBE	Y		N
22	PODICEPS NIGRICOLLIS	EARED GREBE	Y		N
23	AECHMOPHORUS OCCIDENTALIS	WESTERN GREBE (CLARK'S)	Y		N
24	PELECANUS ERYTHRORHYNCHOS	WHITE PELICAN	Y		N
25	PHALACROCORAX AURITUS	DOUBLE-CRESTED CORMORANT	Y		N
26	BOTAURUS LENTIGINOSUS	AMERICAN BITTERN	Y		N
27	ARDEA HERODIAS	GREAT BLUE HERON	Y	Y	N
28	NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT HERON	Y		N
29	PLEGADIS CHIHI	WHITE-FACED IBIS	Y		Y
30	CYGNUS COLUMBIANUS	TUNDRA SWAN			Y
31	CYGNUS BUCCINATOR	TRUMPETER SWAN	Y	Y	N
32	CYGNUS OLOR	MUTE SWAN	Y	Y	N
33	ANSER ALBIFRONS	GREATER WHITE-FRONTED GOOSE			Y
34	CHEN CAERULESCENS	SNOW GOOSE			Y
35	CHEN ROSSII	ROSS' GOOSE			Y
36	BRANTA CANADENSIS	CANADA GOOSE	Y	Y	N
37	AIX SPONSA	WOOD DUCK	Y	Y	N
38	ANAS CRECCA	GREEN-WINGED TEAL	Y	Y	N
39	ANAS PLATYRHYNCHOS	MALLARD	Y	Y	N
40	ANAS ACUTA	NORTHERN PINTAIL	Y	Y	N
41	ANAS DISCORS	BLUE-WINGED TEAL	Y		N
42	ANAS CYANOPTERA	CINNAMON TEAL	Y		N
43	ANAS CLYPEATA	NORTHERN SHOVELER	Y		N
44	ANAS STREPERA	GADWALL	Y	Y	N

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES

			Resident/Migrant[a]		
OBS	Scientific Name	Common Name	SUM	WIN	MIG
45	ANAS PENELOPE	EURASIAN WIGEON			Y
46	ANAS AMERICANA	AMERICAN WIGEON	Y	Y	N
47	AYTHYA VALISINERIA	CANVASBACK	Y	Y	N
48	AYTHYA AMERICANA	REDHEAD	Y	Y	N
49	AYTHYA COLLARIS	RING-NECKED DUCK	Y		N
50	AYTHYA AFFINIS	LESSER SCAUP	Y	Y	N
51	HISTRIONICUS HISTRIONICUS	HARLEQUIN DUCK	Y		N
52	BUCEPHALA CLANGULA	COMMON GOLDENEYE	Y	Y	N
53	BUCEPHALA ISLANDICA	BARROW'S GOLDENEYE	Y	Y	N
54	BUCEPHALA ALBEOLA	BUFFLEHEAD	Y	Y	N
55	LOPHODYTES CUCULLATUS	HOODED MERGANSER	Y	Y	N
56	MERGUS MERGANSER	COMMON MERGANSER	Y	Y	N
57	MERGUS SERRATOR	RED-BREASTED MERGANSER			Y
58	OXYURA JAMAICENSIS	RUDDY DUCK	Y		N
59	CATHARTES AURA	TURKEY VULTURE	Y		N
60	PANDION HALIAETUS	OSPREY	Y		N
61	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	Y	Y	N
62	CIRCUS CYANEUS	NORTHERN HARRIER (MARSH HAWK)	Y	Y	N
63	ACCIPITER STRIATUS	SHARP-SHINNED HAWK	Y	Y	N
64	ACCIPITER COOPERII	COOPER'S HAWK	Y	Y	N
65	ACCIPITER GENTILIS	NORTHERN GOSHAWK	Y	Y	N
66	BUTEO PLATYPTERUS	BROAD-WINGED HAWK			Y
67	BUTEO SWAINSONI	SWAINSON'S HAWK			
68	BUTEO JAMAICENSIS	RED-TAILED HAWK	Y	Y	N
69	BUTEO REGALIS	FERRUGINOUS HAWK	Y		N
70	BUTEO LAGOPUS	ROUGH-LEGGED HAWK		Y	N
71	AQUILA CHRYSAETOS	GOLDEN EAGLE	Y	Y	N
72	FALCO SPARVERIUS	AMERICAN KESTREL	Y	Y	N
73	FALCO COLUMBARIUS	MERLIN	Y	Y	N
74	FALCO PEREGRINUS	PEREGRINE FALCON	Y	Y	N
75	FALCO RUSTICOLUS	GYRFALCON		Y	N
76	FALCO MEXICANUS	PRAIRIE FALCON	Y	Y	N
77	PERDIX PERDIX	GRAY PARTRIDGE	Y	Y	N
78	ALECTORIS CHUKAR	CHUKAR	Y	Y	N
79	PHASIANUS COLCHICUS	RING-NECKED PHEASANT	Y	Y	N
80	DENDRAGAPUS CANADENSIS	SPRUCE GROUSE	Y	Y	N
81	DENDRAGAPUS OBSCURUS	BLUE GROUSE	Y	Y	N
82	LAGOPUS LEUCURUS	WHITE-TAILED PTARMIGAN	Y	Y	N
83	BONASA UMBELLUS	RUFFED GROUSE	Y	Y	N
84	CENTROCERCUS UROPHASIANUS	SAGE GROUSE	Y	Y	N
85	TYMPANUCHUS PHASIANELLUS	SHARP-TAILED GROUSE (COL.)	Y	Y	N
86	MELEAGRIS GALLOPAVO	WILD TURKEY	Y	Y	N
87	COLINUS VIRGINIANUS	NORTHERN BOBWHITE	Y	Y	N
88	RALLUS LIMICOLA	VIRGINIA RAIL	Y		N
89	PORZANA CAROLINA	SORA	Y		N
90	FULICA AMERICANA	AMERICAN COOT	Y	Y	N
91	GRUS CANADENSIS	SANDHILL CRANE	Y		N
92	GRUS AMERICANA	WHOOPING CRANE			Y
93	PLUVIALIS SQUATAROLA	BLACK-BELLIED PLOVER			Y
94	PLUVIALIS DOMINICA	LESSER GOLDEN PLOVER			Y

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES)

OBS	Scientific Name	Common Name	Resident/Migrant[a] SUM	WIN	MIG
95	CHARADRIUS SEMIPALMATUS	SEMIPALMATED PLOVER			Y
96	CHARADRIUS MELODUS	PIPING PLOVER	Y		Y
97	CHARADRIUS VOCIFERUS	KILLDEER	Y	Y	N
98	CHARADRIUS MONTANUS	MOUNTAIN PLOVER	Y		N
99	HIMANTOPUS MEXICANUS	BLACK-NECKED STILT	Y		N
100	RECURVIROSTRA AMERICANA	AMERICAN AVOCET	Y		N
101	TRINGA MELANOLEUCA	GREATER YELLOWLEGS			Y
102	TRINGA FLAVIPES	LESSER YELLOWLEGS			Y
103	TRINGA SOLITARIA	SOLITARY SANDPIPER			Y
104	CATOPTROPHORUS SEMIPALMATUS	WILLET	Y		N
105	ACTITIS MACULARIA	SPOTTED SANDPIPER	Y		N
106	BARTRAMIA LONGICAUDA	UPLAND SANDPIPER	Y		N
107	NUMENIUS PHAEOPUS	WHIMBREL			Y
108	NUMENIUS AMERICANUS	LONG-BILLED CURLEW	Y		N
109	LIMOSA FEDOA	MARBLED GODWIT	Y		N
110	ARENARIA INTERPRES	RUDDY TURNSTONE			Y
111	CALIDRIS ALBA	SANDERLING			Y
112	CALIDRIS PUSILLA	SEMIPALMATED SANDPIPER			Y
113	CALIDRIS MAURI	WESTERN SANDPIPER			Y
114	CALIDRIS MINUTILLA	LEAST SANDPIPER			Y
115	CALIDRIS BAIRDII	BAIRD'S SANDPIPER			Y
116	CALIDRIS MELANOTOS	PECTORAL SANDPIPER			Y
117	CALIDRIS ALPINA	DUNLIN			Y
118	CALIDRIS HIMANTOPUS	STILT SANDPIPER			Y
119	LIMNODROMUS SCOLOPACEUS	LONG-BILLED DOWITCHER			Y
120	GALLINAGO GALLINAGO	COMMON SNIPE	Y	Y	N
121	PHALAROPUS TRICOLOR	WILSON'S PHALAROPE	Y		N
122	PHALAROPUS LOBATUS	RED-NECKED PHALAROPE			Y
123	LARUS PIPIXCAN	FRANKLIN'S GULL	Y		N
124	LARUS PHILADELPHIA	BONAPARTE'S GULL			Y
125	LARUS DELAWARENSIS	RING-BILLED GULL	Y		N
126	LARUS CALIFORNICUS	CALIFORNIA GULL	Y		N
127	STERNA CASPIA	CASPIAN TERN			Y
128	STERNA HIRUNDO	COMMON TERN	Y		N
129	STERNA FORSTERI	FORSTER'S TERN	Y		Y
130	STERNA ANTILLARUM	LEAST TERN	Y		Y
131	CHLIDONIAS NIGER	BLACK TERN	Y		N
132	COLUMBA LIVIA	ROCK DOVE	Y	Y	N
133	ZENAIDA MACROURA	MOURNING DOVE	Y	Y	N
134	COCCYZUS ERYTHROPTHALMUS	BLACK-BILLED CUCKOO	Y		N
135	COCCYZUS AMERICANUS	YELLOW-BILLED CUCKOO			Y
136	OTUS FLAMMEOLUS	FLAMMULATED OWL	Y		Y
137	OTUS ASIO	EASTERN SCREECH-OWL	Y	Y	N
138	OTUS KENNICOTTII	WESTERN SCREECH-OWL	Y	Y	N
139	BUBO VIRGINIANUS	GREAT HORNED OWL	Y	Y	N
140	NYCTEA SCANDIACA	SNOWY OWL		Y	N
141	GLAUCIDIUM GNOMA	NORTHERN PYGMY OWL	Y	Y	N
142	SPEOTYTO CUNICULARIA	BURROWING OWL	Y		N
143	STRIX VARIA	BARRED OWL	Y	Y	N
144	STRIX NEBULOSA	GREAT GRAY OWL	Y	Y	N

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES

OBS	Scientific Name	Common Name	Resident/Migrant[a] SUM	WIN	MIG
145	ASIO OTUS	LONG-EARED OWL	Y	Y	N
146	ASIO FLAMMEUS	SHORT-EARED OWL	Y	Y	N
147	AEGOLIUS FUNEREUS	BOREAL OWL	Y	Y	N
148	AEGOLIUS ACADICUS	SAW-WHET OWL	Y	Y	N
149	CHORDEILES MINOR	COMMON NIGHTHAWK	Y		N
150	PHALAENOPTILUS NUTTALLII	COMMON POORWILL	Y		N
151	CYPSELOIDES NIGER	BLACK SWIFT	Y		N
152	CHAETURA PELAGICA	CHIMNEY SWIFT	Y		N
153	CHAETURA VAUXI	VAUX'S SWIFT	Y		N
154	AERONAUTES SAXATALIS	WHITE-THROATED SWIFT	Y		N
155	ARCHILOCHUS ALEXANDRI	BLACK-CHINNED HUMMINGBIRD	Y		N
156	STELLULA CALLIOPE	CALLIOPE HUMMINGBIRD	Y		N
157	SELASPHORUS RUFUS	RUFOUS HUMMINGBIRD	Y		N
158	CERYLE ALCYON	BELTED KINGFISHER	Y	Y	N
159	MELANERPES LEWIS	LEWIS' WOODPECKER	Y	Y	N
160	MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER	Y		N
161	SPHYRAPICUS VARIUS	YELLOW-BELLIED(R-NAP)SAPSUCKER			
162	SPHYRAPICUS THYROIDEUS	WILLIAMSON'S SAPSUCKER	Y		N
163	PICOIDES PUBESCENS	DOWNY WOODPECKER	Y	Y	N
164	PICOIDES VILLOSUS	HAIRY WOODPECKER	Y	Y	N
165	PICOIDES TRIDACTYLUS	THREE-TOED WOODPECKER	Y	Y	N
166	PICOIDES ARCTICUS	BLACK-BACKED WOODPECKER	Y	Y	N
167	COLAPTES AURATUS	NORTHERN FLICKER	Y	Y	N
168	DRYOCOPUS PILEATUS	PILEATED WOODPECKER	Y	Y	N
169	CONTOPUS BOREALIS	OLIVE-SIDED FLYCATCHER	Y		N
170	CONTOPUS SORDIDULUS	WESTERN WOOD PEWEE	Y		N
171	EMPIDONAX TRAILLII	WILLOW FLYCATCHER	Y		N
172	EMPIDONAX MINIMUS	LEAST FLYCATCHER	Y		N
173	EMPIDONAX HAMMONDII	HAMMOND'S FLYCATCHER	Y		N
174	EMPIDONAX OBERHOLSERI	DUSKY FLYCATCHER	Y		N
175	EMPIDONAX OCCIDENTALIS	CORDILLERAN FLYCATCHER	Y		N
176	SAYORNIS SAYA	SAY'S PHOEBE	Y		N
177	TYRANNUS VOCIFERANS	CASSIN'S KINGBIRD	Y		N
178	TYRANNUS VERTICALIS	WESTERN KINGBIRD	Y		N
179	TYRANNUS TYRANNUS	EASTERN KINGBIRD	Y		N
180	EREMOPHILA ALPESTRIS	HORNED LARK	Y	Y	N
181	TACHYCINETA BICOLOR	TREE SWALLOW	Y		N
182	TACHYCINETA THALASSINA	VIOLET-GREEN SWALLOW	Y		N
183	STELGIDOPTERYX SERRIPENNIS	ROUGH-WINGED SWALLOW	Y		N
184	RIPARIA RIPARIA	BANK SWALLOW	Y		N
185	HIRUNDO PYRRHONOTA	CLIFF SWALLOW	Y		N
186	HIRUNDO RUSTICA	BARN SWALLOW	Y		N
187	PERISOREUS CANADENSIS	GRAY JAY	Y	Y	N
188	CYANOCITTA STELLERI	STELLER'S JAY	Y	Y	N
189	GYMNORHINUS CYANOCEPHALUS	PINYON JAY	Y	Y	N
190	NUCIFRAGA COLUMBIANA	CLARK'S NUTCRACKER	Y	Y	N
191	PICA PICA	BLACK-BILLED MAGPIE	Y	Y	N
192	CORVUS BRACHYRHYNCHOS	COMMON CROW	Y	Y	N
193	CORVUS CORAX	COMMON RAVEN	Y	Y	N
194	PARUS ATRICAPILLUS	BLACK-CAPPED CHICKADEE	Y	Y	N

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES

OBS	Scientific Name	Common Name	Resident/Migrant[a] SUM	WIN	MIG
195	PARUS GAMBELI	MOUNTAIN CHICKADEE	Y	Y	N
196	PARUS HUDSONICUS	BOREAL CHICKADEE	Y	Y	N
197	PARUS RUFESCENS	CHESTNUT-BACKED CHICKADEE	Y	Y	N
198	SITTA CANADENSIS	RED-BREASTED NUTHATCH	Y	Y	N
199	SITTA CAROLINENSIS	WHITE-BREASTED NUTHATCH	Y	Y	N
200	SITTA PYGMAEA	PYGMY NUTHATCH	Y	Y	N
201	CERTHIA AMERICANA	BROWN CREEPER	Y	Y	N
202	SALPINCTES OBSOLETUS	ROCK WREN	Y		N
203	CATHERPES MEXICANUS	CANYON WREN	Y		N
204	TROGLODYTES AEDON	HOUSE WREN	Y		N
205	TROGLODYTES TROGLODYTES	WINTER WREN	Y	Y	N
206	CISTOTHORUS PALUSTRIS	MARSH WREN	Y	Y	N
207	CINCLUS MEXICANUS	DIPPER	Y	Y	N
208	REGULUS SATRAPA	GOLDEN-CROWNED KINGLET	Y	Y	N
209	REGULUS CALENDULA	RUBY-CROWNED KINGLET	Y		N
210	SIALIA SIALIS	EASTERN BLUEBIRD	Y		N
211	SIALIA MEXICANA	WESTERN BLUEBIRD	Y		N
212	SIALIA CURRUCOIDES	MOUNTAIN BLUEBIRD	Y		N
213	MYADESTES TOWNSENDI	TOWNSEND'S SOLITAIRE	Y	Y	N
214	CATHARUS FUSCESCENS	VEERY	Y		N
215	CATHARUS USTULATUS	SWAINSON'S THRUSH	Y		N
216	CATHARUS GUTTATUS	HERMIT THRUSH	Y		N
217	TURDUS MIGRATORIUS	AMERICAN ROBIN	Y	Y	N
218	IXOREUS NAEVIUS	VARIED THRUSH	Y		N
219	DUMETELLA CAROLINENSIS	GRAY CATBIRD	Y		N
220	OREOSCOPTES MONTANUS	SAGE THRASHER	Y		N
221	TOXOSTOMA RUFUM	BROWN THRASHER	Y		N
222	ANTHUS RUBESCENS	WATER PIPIT	Y		N
223	ANTHUS SPRAGUEII	SPRAGUE'S PIPIT	Y		N
224	BOMBYCILLA GARRULUS	BOHEMIAN WAXWING	Y	Y	N
225	BOMBYCILLA CEDRORUM	CEDAR WAXWING	Y	Y	N
226	LANIUS EXCUBITOR	NORTHERN SHRIKE		Y	N
227	LANIUS LUDOVICIANUS	LOGGERHEAD SHRIKE	Y		N
228	STURNUS VULGARIS	EUROPEAN STARLING	Y	Y	N
229	VIREO SOLITARIUS	SOLITARY VIREO	Y		N
230	VIREO GILVUS	WARBLING VIREO	Y		N
231	VIREO OLIVACEUS	RED-EYED VIREO	Y		N
232	VERMIVORA PEREGRINA	TENNESSEE WARBLER			Y
233	VERMIVORA CELATA	ORANGE-CROWNED WARBLER	Y		N
234	VERMIVORA RUFICAPILLA	NASHVILLE WARBLER	Y		N
235	DENDROICA PETECHIA	YELLOW WARBLER	Y		N
236	DENDROICA CORONATA	YELLOW-RUMPED WARBLER	Y		N
237	DENDROICA TOWNSENDI	TOWNSEND'S WARBLER	Y		N
238	DENDROICA STRIATA	BLACKPOLL WARBLER			Y
239	MNIOTILTA VARIA	BLACK-AND-WHITE WARBLER			Y
240	SETOPHAGA RUTICILLA	AMERICAN REDSTART	Y		N
241	SEIURUS AUROCAPILLUS	OVENBIRD	Y		N
242	SEIURUS NOVEBORACENSIS	NORTHERN WATERTHRUSH	Y		N
243	OPORORNIS TOLMIEI	MACGILLIVRAY'S WARBLER	Y		N
244	GEOTHLYPIS TRICHAS	COMMON YELLOWTHROAT	Y		N

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES

OBS	Scientific Name	Common Name	Resident/Migrant[a] SUM	WIN	MIG
245	WILSONIA PUSILLA	WILSON'S WARBLER	Y		N
246	ICTERIA VIRENS	YELLOW-BREASTED CHAT	Y		N
247	PIRANGA LUDOVICIANA	WESTERN TANAGER	Y		N
248	CARDINALIS CARDINALIS	NORTHERN CARDINAL			
249	PHEUCTICUS MELANOCEPHALUS	BLACK-HEADED GROSBEAK	Y		N
250	PASSERINA AMOENA	LAZULI BUNTING	Y		N
251	PASSERINA CYANEA	INDIGO BUNTING			Y
252	SPIZA AMERICANA	DICKCISSEL	Y		N
253	PIPILO CHLORURUS	GREEN-TAILED TOWHEE	Y		N
254	PIPILO ERYTHROPHTHALMUS	RUFOUS-SIDED TOWHEE	Y		N
255	SPIZELLA ARBOREA	TREE SPARROW		Y	N
256	SPIZELLA PASSERINA	CHIPPING SPARROW	Y		N
257	SPIZELLA PALLIDA	CLAY-COLORED SPARROW	Y		N
258	SPIZELLA BREWERI	BREWER'S SPARROW	Y		N
259	SPIZELLA PUSILLA	FIELD SPARROW	Y		N
260	POOECETES GRAMINEUS	VESPER SPARROW	Y		N
261	CHONDESTES GRAMMACUS	LARK SPARROW	Y		N
262	CALAMOSPIZA MELANOCORYS	LARK BUNTING	Y		N
263	PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW	Y		N
264	AMMODRAMUS BAIRDII	BAIRD'S SPARROW	Y		N
265	AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW	Y		N
266	AMMODRAMUS LECONTEII	LE CONTE'S SPARROW	Y		N
267	PASSERELLA ILIACA	FOX SPARROW	Y		N
268	MELOSPIZA MELODIA	SONG SPARROW	Y	Y	N
269	MELOSPIZA LINCOLNII	LINCOLN'S SPARROW	Y		N
270	ZONOTRICHIA ALBICOLLIS	WHITE-THROATED SPARROW			Y
271	ZONOTRICHIA LEUCOPHRYS	WHITE-CROWNED SPARROW	Y		N
272	ZONOTRICHIA QUERULA	HARRIS' SPARROW		Y	Y
273	JUNCO HYEMALIS	DARK-EYED JUNCO	Y	Y	N
274	CALCARIUS MCCOWNII	MCCOWN'S LONGSPUR	Y		N
275	CALCARIUS LAPPONICUS	LAPLAND LONGSPUR		Y	N
276	CALCARIUS ORNATUS	CHESTNUT-COLLARED LONGSPUR	Y		N
277	PLECTROPHENAX NIVALIS	SNOW BUNTING		Y	N
278	DOLICHONYX ORYZIVORUS	BOBOLINK	Y		N
279	AGELAIUS PHOENICEUS	RED-WINGED BLACKBIRD	Y	Y	N
280	STURNELLA NEGLECTA	WESTERN MEADOWLARK	Y	Y	N
281	XANTHOCEPHALUS XANTHOCEPHALUS	YELLOW-HEADED BLACKBIRD	Y		N
282	EUPHAGUS CAROLINUS	RUSTY BLACKBIRD			Y
283	EUPHAGUS CYANOCEPHALUS	BREWER'S BLACKBIRD	Y	Y	N
284	QUISCALUS QUISCULA	COMMON GRACKLE	Y		N
285	MOLOTHRUS ATER	BROWN-HEADED COWBIRD	Y		N
286	ICTERUS SPURIUS	ORCHARD ORIOLE	Y		N
287	ICTERUS GALBULA	NORTHERN ORIOLE	Y		N
288	LEUCOSTICTE ATRATA	BLACK ROSY FINCH	Y	Y	N
289	LEUCOSTICTE TEPHROCOTIS	GRAY-CROWNED ROSY FINCH	Y	Y	Y
290	PINICOLA ENUCLEATOR	PINE GROSBEAK	Y	Y	N
291	CARPODACUS CASSINII	CASSIN'S FINCH	Y	Y	N
292	CARPODACUS MEXICANUS	HOUSE FINCH	Y	Y	N
293	LOXIA CURVIROSTRA	RED CROSSBILL	Y	Y	N
294	LOXIA LEUCOPTERA	WHITE-WINGED CROSSBILL			Y

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES)

OBS	Scientific Name	Common Name	Resident/Migrant[a] SUM	WIN	MIG
295	CARDUELIS FLAMMEA	COMMON REDPOLL		Y	N
296	CARDUELIS HORNEMANNI	HOARY REDPOLL		Y	N
297	CARDUELIS PINUS	PINE SISKIN	Y	Y	N
298	CARDUELIS TRISTIS	AMERICAN GOLDFINCH	Y	Y	N
299	COCCOTHRAUSTES VESPERTINUS	EVENING GROSBEAK	Y	Y	N
300	PASSER DOMESTICUS	HOUSE SPARROW	Y	Y	N
MAMMALS					
301	SOREX CINEREUS	MASKED SHREW	Y	Y	N
302	SOREX PREBLEI	PREBLE'S SHREW	Y	Y	N
303	SOREX VAGRANS	VAGRANT SHREW	Y	Y	N
304	SOREX NANUS	DWARF SHREW	Y	Y	N
305	SOREX PALUSTRIS	WATER SHREW	Y	Y	N
306	SOREX MERRIAMI	MERRIAM'S SHREW	Y	Y	N
307	SOREX HOYI	PYGMY SHREW	Y	Y	N
308	MYOTIS LUCIFUGUS	LITTLE BROWN MYOTIS	Y		N
309	MYOTIS YUMANENSIS	YUMA MYOTIS	Y		N
310	MYOTIS EVOTIS	LONG-EARED MYOTIS	Y	Y	N
311	MYOTIS VOLANS	LONG-LEGGED MYOTIS	Y		N
312	MYOTIS CALIFORNICUS	CALIFORNIA MYOTIS	Y		N
313	MYOTIS CILIOLABRUM	WESTERN SMALL-FOOTED MYOTIS	Y		N
314	MYOTIS SEPTENTRIONALIS	NORTHERN MYOTIS (KEEN'S)	Y	Y	N
315	LASIONYCTERIS NOCTIVAGANS	SILVER-HAIRED BAT	Y		N
316	EPTESICUS FUSCUS	BIG BROWN BAT	Y		N
317	LASIURUS CINEREUS	HOARY BAT	Y		N
318	EUDERMA MACULATUM	SPOTTED BAT	Y		N
319	PLECOTUS TOWNSENDII	TOWNSEND'S BIG-EARED BAT	Y	Y	N
320	ANTROZOUS PALLIDUS	PALLID BAT	Y		N
321	OCHOTONA PRINCEPS	PIKA	Y	Y	N
322	SYLVILAGUS FLORIDANUS	EASTERN COTTONTAIL	Y	Y	N
323	SYLVILAGUS NUTTALLII	MOUNTAIN COTTONTAIL	Y	Y	N
324	SYLVILAGUS AUDUBONII	DESERT COTTONTAIL	Y	Y	N
325	LEPUS AMERICANUS	SNOWSHOE HARE	Y	Y	N
326	LEPUS TOWNSENDII	WHITE-TAILED JACK RABBIT	Y	Y	N
327	LEPUS CALIFORNICUS	BLACK-TAILED JACKRABBIT	Y	Y	N
328	BRACHYLAGUS IDAHOENSIS	PYGMY RABBIT	Y	Y	N
329	TAMIAS MINIMUS	LEAST CHIPMUNK	Y	Y	N
330	TAMIAS AMOENUS	YELLOW-PINE CHIPMUNK	Y	Y	N
331	TAMIAS RUFICAUDUS	RED-TAILED CHIPMUNK	Y	Y	N
332	TAMIAS UMBRINUS	UINTA CHIPMUNK	Y	Y	N
333	MARMOTA FLAVIVENTRIS	YELLOW-BELLIED MARMOT	Y	Y	N
334	MARMOTA CALIGATA	HOARY MARMOT	Y	Y	N
335	SPERMOPHILUS RICHARDSONII	RICHARDSON'S GROUND SQUIRREL	Y	Y	N
336	SPERMOPHILUS ARMATUS	UINTA GROUND SQUIRREL	Y	Y	N
337	SPERMOPHILUS COLUMBIANUS	COLUMBIAN GROUND SQUIRREL	Y	Y	N
338	SPERMOPHILUS TRIDECEMLINEATUS	THIRTEEN-LINED GROUND SQUIRREL	Y	Y	N
339	SPERMOPHILUS LATERALIS	GOLDEN-MANTLED GROUND SQUIRREL	Y	Y	N
340	CYNOMYS LUDOVICIANUS	BLACK-TAILED PRAIRIE DOG	Y	Y	N
341	CYNOMYS LEUCURUS	WHITE-TAILED PRAIRIE DOG	Y	Y	N
342	SCIURUS CAROLINENSIS	EASTERN GRAY SQUIRREL	Y	Y	N

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES

OBS	Scientific Name	Common Name	Resident/Migrant[a] SUM	WIN	MIG
343	SCIURUS NIGER	EASTERN FOX SQUIRREL	Y	Y	N
344	TAMIASCIURUS HUDSONICUS	RED SQUIRREL	Y	Y	N
345	GLAUCOMYS SABRINUS	NORTHERN FLYING SQUIRREL	Y	Y	N
346	THOMOMYS TALPOIDES	NORTHERN POCKET GOPHER	Y	Y	N
347	THOMOMYS IDAHOENSIS	IDAHO POCKET GOPHER	Y	Y	N
348	PEROGNATHUS FASCIATUS	OLIVE-BACKED POCKET MOUSE	Y	Y	N
349	PEROGNATHUS PARVUS	GREAT BASIN POCKET MOUSE	Y	Y	N
350	CHAETODIPUS HISPIDUS	HISPID POCKET MOUSE	Y	Y	N
351	DIPODOMYS ORDII	ORD'S KANGAROO RAT	Y	Y	N
352	CASTOR CANADENSIS	BEAVER	Y	Y	N
353	REITHRODONTOMYS MEGALOTIS	WESTERN HARVEST MOUSE	Y	Y	N
354	PEROMYSCUS MANICULATUS	DEER MOUSE	Y	Y	N
355	PEROMYSCUS LEUCOPUS	WHITE-FOOTED MOUSE	Y	Y	N
356	ONYCHOMYS LEUCOGASTER	NORTHERN GRASSHOPPER MOUSE	Y	Y	N
357	NEOTOMA CINEREA	BUSHY-TAILED WOODRAT	Y	Y	N
358	CLETHRIONOMYS GAPPERI	SOUTHERN RED-BACKED VOLE	Y	Y	N
359	PHENACOMYS INTERMEDIUS	HEATHER VOLE	Y	Y	N
360	MICROTUS PENNSYLVANICUS	MEADOW VOLE	Y	Y	N
361	MICROTUS MONTANUS	MONTANE VOLE	Y	Y	N
362	MICROTUS LONGICAUDUS	LONG-TAILED VOLE	Y	Y	N
363	MICROTUS OCHROGASTER	PRAIRIE VOLE	Y	Y	N
364	MICROTUS RICHARDSONI	WATER VOLE (RICHARDSON'S)	Y	Y	N
365	LAGURUS CURTATUS	SAGEBRUSH VOLE	Y	Y	N
366	ONDATRA ZIBETHICUS	MUSKRAT	Y	Y	N
367	SYNAPTOMYS BOREALIS	NORTHERN BOG LEMMING	Y	Y	N
368	RATTUS NORVEGICUS	NORWAY RAT	Y	Y	N
369	MUS MUSCULUS	HOUSE MOUSE	Y	Y	N
370	ZAPUS HUDSONIUS	MEADOW JUMPING MOUSE	Y	Y	N
371	ZAPUS PRINCEPS	WESTERN JUMPING MOUSE	Y	Y	N
372	ERETHIZON DORSATUM	PORCUPINE	Y	Y	N
373	CANIS LATRANS	COYOTE	Y	Y	N
374	CANIS LUPUS	GRAY WOLF	Y	Y	N
375	VULPES VULPES	RED FOX	Y	Y	N
376	VULPES VELOX	KIT OR SWIFT FOX	Y	Y	N
377	URSUS AMERICANUS	BLACK BEAR	Y	Y	N
378	URSUS ARCTOS HORRIBILIS	GRIZZLY BEAR			
379	PROCYON LOTOR	RACCOON	Y	Y	N
380	MARTES AMERICANA	MARTEN	Y	Y	N
381	MARTES PENNANTI	FISHER	Y	Y	N
382	MUSTELA ERMINEA	ERMINE	Y	Y	N
383	MUSTELA NIVALIS	LEAST WEASEL	Y	Y	N
384	MUSTELA FRENATA	LONG-TAILED WEASEL	Y	Y	N
385	MUSTELA NIGRIPES	BLACK-FOOTED FERRET			
386	MUSTELA VISON	MINK	Y	Y	N
387	GULO GULO	WOLVERINE	Y	Y	N
388	TAXIDEA TAXUS	BADGER	Y	Y	N
389	SPILOGALE GRACILIS	WESTERN SPOTTED SKUNK	Y	Y	N
390	MEPHITIS MEPHITIS	STRIPED SKUNK	Y	Y	N
391	LUTRA CANADENSIS	RIVER OTTER	Y	Y	N
392	FELIS CONCOLOR	MOUNTAIN LION	Y	Y	N

Table WLD-10 (continued)
WILDLIFE SPECIES LIKELY TO OCCUR IN MONTANA AND USED IN ALL ANALYSES

			Resident/Migrant[a]		
OBS	Scientific Name	Common Name	SUM	WIN	MIG
393	FELIS LYNX	LYNX	Y	Y	N
394	FELIS RUFUS	BOBCAT	Y	Y	N
395	CERVUS ELAPHUS	WAPITI OR ELK	Y	Y	N
396	ODOCOILEUS HEMIONUS	MULE DEER	Y	Y	N
397	ODOCOILEUS VIRGINIANUS	WHITE-TAILED DEER	Y	Y	N
398	ALCES ALCES	MOOSE	Y	Y	N
399	RANGIFER TARANDUS CARIBOU	WOODLAND CARIBOU			
400	ANTILOCAPRA AMERICANA	PRONGHORN	Y	Y	N
401	BOS BISON	BISON	Y	Y	N
402	OREAMNOS AMERICANUS	MOUNTAIN GOAT	Y	Y	N
403	OVIS CANADENSIS	BIGHORN SHEEP	Y	Y	N
REPTILES					
404	CHELYDRA SERPENTINA	SNAPPING TURTLE	Y	Y	N
405	CHRYSEMYS PICTA	PAINTED TURTLE	Y	Y	N
406	APALONE SPINIFERA	SPINY SOFTSHELL TURTLE	Y	Y	N
407	ELGARIA COERULEA	NORTHERN ALLIGATOR LIZARD	Y	Y	N
408	PHRYNOSOMA DOUGLASI	SHORT-HORNED LIZARD	Y	Y	N
409	SCELOPORUS GRACIOSUS	SAGEBRUSH LIZARD	Y	Y	N
410	EUMECES SKILTONIANUS	WESTERN SKINK	Y	Y	N
411	CHARINA BOTTAE	RUBBER BOA	Y	Y	N
412	COLUBER CONSTRICTOR	RACER	Y	Y	N
413	HETERODON NASICUS	WESTERN HOGNOSE SNAKE	Y	Y	N
414	LAMPROPELTIS TRIANGULUM	MILK SNAKE	Y	Y	N
415	PITUOPHIS MELANOLEUCUS	PINE OR GOPHER SNAKE	Y	Y	N
416	THAMNOPHIS ELEGANS	W. TERRESTRIAL GARTER SNAKE	Y	Y	N
417	THAMNOPHIS RADIX	PLAINS GARTER SNAKE	Y	Y	N
418	THAMNOPHIS SIRTALIS	COMMON GARTER SNAKE	Y	Y	N
419	CROTALUS VIRIDIS	WESTERN RATTLESNAKE	Y	Y	N

[a]Residency or migratory status: SUM=summer resident breeding within the state, WIN= winter resident, MIG= migrates through the state.

Table WLD-11
LIST OF SPECIES OF SPECIAL CONCERN AND OCCURENCE IN EACH LAND OFFICE AREA
(A value of 1 indicates presence, 0 absence, in the Land Office area)

		---------Special	Status[a]---------			------DNRC	Land	Office-----			
OBS	Common Name	Global rank	State rank	USFWS ESA	Forest Service	NWLO	SWLO	CLO	NELO	SLO	ELO
1	COEUR D'ALENE SALAMANDER	G3	S2		SENSITIVE	1	1	0	0	0	0
2	IDAHO GIANT SALAMANDER	G4	S1			1	1	0	0	0	0
3	TAILED FROG	G3	S3			1	1	1	0	0	0
4	CANADIAN TOAD	G5	S1			0	0	1	1	0	0
5	COMMON LOON	G5	S3		SENSITIVE	1	1	1	1	1	1
6	CLARK'S GREBE	G5	S2			0	0	0	0	0	0
7	AMERICAN WHITE PELICAN	G3	S2			1	1	1	1	1	1
8	BLACK-CROWNED NIGHT-HERON	G5	S3			1	1	1	1	1	1
9	WHITE-FACED IBIS	G5	S2	C2		1	1	1	1	1	1
10	TRUMPETER SWAN	G4	S1	C2	SENSITIVE	1	1	1	1	1	1
11	HARLEQUIN DUCK	G5	S2	C2	SENSITIVE	1	1	1	1	1	0
12	BALD EAGLE	G3	S3	LE	ENDANGERED	1	1	1	1	1	1
13	NORTHERN GOSHAWK	G4	S4	C2		1	1	1	1	1	1
14	FERRUGINOUS HAWK	G4	S3	C2	SENSITIVE	1	1	1	1	1	1
15	PEREGRINE FALCON	G3	S1	LE	ENDANGERED	1	1	1	1	1	1
16	COLUMBIAN SHARP-TAILED GROUSE	G4	S1	C2	SENSITIVE	1	1	0	0	0	0
17	WHOOPING CRANE	G1	SZ	LE	ENDANGERED	0	0	1	1	1	1
18	PIPING PLOVER	G3	S2	LT	THREATENED	1	1	1	1	0	1
19	MOUNTAIN PLOVER	G3	S2	C2	SENSITIVE	1	1	1	1	1	1
20	BLACK-NECKED STILT	G5	S3			1	1	1	1	1	1
21	FRANKLIN'S GULL	G5	S3			1	1	1	1	1	1
22	CASPIAN TERN	G5	S3			1	1	1	1	1	1
23	COMMON TERN	G5	S3			1	1	1	1	1	1
24	FORSTER'S TERN	G5	S3			1	1	1	1	1	1
25	LEAST TERN	G4	S1	LE	THREATENED	0	0	1	1	0	1
26	BLACK TERN	G4	S3	C2		1	1	1	1	1	1
27	YELLOW-BILLED CUCKOO	G5	S3			1	1	1	1	1	1
28	FLAMMULATED OWL	G4	S1		SENSITIVE	1	1	1	0	0	0
29	BURROWING OWL	G4	S3			1	1	1	1	1	1
30	GREAT GRAY OWL	G5	S3			1	1	1	1	1	0
31	BOREAL OWL	G5	S3		SENSITIVE	1	1	1	0	1	0
32	BLACK SWIFT	G4	S3			1	1	1	0	0	0
33	BLACK-BACKED WOODPECKER	G5	S3		SENSITIVE	1	1	1	0	1	1
34	CASSIN'S KINGBIRD	G5	S1			0	0	0	1	1	1
35	LOGGERHEAD SHRIKE	G4	S4	C2		1	1	1	1	1	1
36	DICKCISSEL	G4	S1			0	1	0	1	1	1
37	BAIRD'S SPARROW	G3	S3	C2		1	1	1	1	1	1
38	LE CONTE'S SPARROW	G4	S1			1	1	0	1	1	1
39	PREBLE'S SHREW	G4	S3	C2		0	1	1	1	1	1
40	DWARF SHREW	G4	S3			0	0	1	1	1	1
41	MERRIAM'S SHREW	G5	S3			0	0	0	1	1	1
42	FRINGED MYOTIS	G5	S3			0	1	1	0	0	0
43	NORTHERN MYOTIS	G4	S2			0	0	0	0	0	1
44	SPOTTED BAT	G4	S1	C2	SENSITIVE	0	0	0	0	1	1
45	TOWNSEND'S BIG-EARED BAT	G4	S2		SENSITIVE	1	1	1	1	1	1
46	PALLID BAT	G5	S1		SENSITIVE	0	0	0	0	1	0
47	BLACK-TAILED JACK RABBIT	G5	S2			0	0	1	0	0	0
48	PYGMY RABBIT	G5	S3	C2		0	0	1	0	0	0
49	UINTA CHIPMUNK	G5	S3			0	0	1	0	1	0
50	WHITE-TAILED PRAIRIE DOG	G4	S2		SENSITIVE	0	0	0	0	1	0
51	GREAT BASIN POCKET MOUSE	G5	S2			0	0	1	0	0	0
52	HISPID POCKET MOUSE	G5	S1			0	0	0	0	0	1
53	NORTHERN BOG LEMMING	G5	S2		SENSITIVE	1	1	1	0	0	0
54	MEADOW JUMPING MOUSE	G5	S3			0	0	0	0	0	1
55	GRAY WOLF	G4	S1	LE	ENDANGERED	1	1	1	1	0	0
56	KIT OR SWIFT FOX	G4	SH	C2		0	0	0	1	0	1

Table WLD-11 (continued)
LIST OF SPECIES OF SPECIAL CONCERN AND OCCURENCE IN EACH LAND OFFICE AREA
(A value of 1 indicates presence, 0 absence, in the Land Office area)

		Special Status[a]				DNRC Land Office					
OBS	Common Name	Global rank	State rank	USFWS ESA	Forest Service	NWLO	SWLO	CLO	NELO	SLO	ELO
57	GRIZZLY BEAR	G4	S1	LT	THREATENED	1	1	1	0	1	0
58	FISHER	G5	S2		SENSITIVE	1	1	1	0	0	0
59	BLACK-FOOTED FERRET	G1	SH	LE	ENDANGERED	0	0	0	0	0	0
60	WOLVERINE	G4	S3	C2	SENSITIVE	1	1	1	1	1	0
61	LYNX	G5	S3	C2	SENSITIVE	1	1	1	1	1	0
62	WOODLAND CARIBOU	G5	SX	C2	ENDANGERED	0	0	0	0	0	0
63	SNAPPING TURTLE	G5	S3			1	0	0	1	1	1
64	SPINY SOFTSHELL	G5	S3			0	0	0	1	1	1
65	WESTERN HOGNOSE SNAKE	G5	S3			0	0	1	1	1	1
66	SMOOTH GREEN SNAKE	G5	S3			0	0	0	1	0	0

[a]Special status codes:

Global Rank and State Rank of abundance as determined by the Montana Natural Heritage Program (MHP) on a scale of 1 (critically imperiled) to 5 (demonstrably secure). SH=state historic, SX=believed to be extinct, historic records only, SZ=ranking not applicable.

U.S. Fish & Wildlife Service Endangered Species Act (USFWS ESA) classification, LE=endangered, LT=threatened, C1=substantial biological information to support listing as endangered or threatened, C2=current information indicated that listing may be appropriate but substantial biological information is not on file to support an immediate ruling.[1]

U.S. Forest Service threatened, endangered or sensitive species list.

[1] Please note that since the printing of the DEIS, the USFWS has eliminated C2 species from their listing process. C2 species were candidate species being considered for protection by the USFWS. Despite the elimination of this category, we have retained the information on C2 species in this EIS because we feel it provides useful information in assessing the impacts of management activities on sensitive and threatened species.

Table WLD-12
MONTANA GAME AND FURBEARER SPECIES FOUND IN EACH LAND OFFICE AREA
(A value of 1 indicates presence, 0 absence, in the Land Office area)

		State	-------DNRC Land Office--------					
OBS	Common Name	class[a]	NWLO	SWLO	CLO	NELO	SLO	ELO
1	MARTEN	FB	1	1	1	1	1	0
2	ERMINE	FB	1	1	1	1	1	1
3	MINK	FB	1	1	1	1	1	1
4	RIVER OTTER	FB	1	1	1	1	1	1
5	BOBCAT	FB	1	1	1	1	1	1
6	MUSKRAT	FB	1	1	1	1	1	1
7	BEAVER	FB	1	1	1	1	1	1
8	KIT OR SWIFT FOX	FBCS	0	0	0	0	0	1
9	FISHER	FBRH	1	1	1	0	0	0
10	WOLVERINE	FBRH	1	1	1	1	1	0
11	LYNX	FBRH	1	1	1	1	1	0
12	BLACK BEAR	GA	1	1	1	1	1	0
13	MOUNTAIN LION	GA	1	1	1	1	1	1
14	WAPITI OR ELK	GA	1	1	1	1	1	0
15	MULE DEER	GA	1	1	1	1	1	1
16	WHITE-TAILED DEER	GA	1	1	1	1	1	1
17	MOOSE	GA	1	1	1	1	1	0
18	PRONGHORN	GA	1	1	1	1	1	1
19	MOUNTAIN GOAT	GA	1	1	1	1	1	0
20	BIGHORN SHEEP	GA	1	1	1	1	1	1
21	WOODLAND CARIBOU	GACS	0	0	0	0	0	0
22	GRIZZLY BEAR	GARH	0	0	1	0	1	0
23	BISON	GARH	1	0	1	0	0	0
24	TRUMPETER SWAN	MB	1	1	1	1	1	1
25	TUNDRA SWAN	MB	1	1	1	1	1	1
26	CANADA GOOSE	MB	1	1	1	1	1	1
27	GREATER WHITE-FRONTED GOOSE	MB	1	1	1	1	1	1
28	SNOW GOOSE	MB	1	1	1	1	1	1
29	ROSS' GOOSE	MB	1	1	1	1	1	1
30	NORTHERN PINTAIL	MB	1	1	1	1	1	1
31	GREEN-WINGED TEAL	MB	1	1	1	1	1	1
32	CINNAMON TEAL	MB	1	1	1	1	1	1
33	BLUE-WINGED TEAL	MB	1	1	1	1	1	1
34	MALLARD	MB	1	1	1	1	1	1
35	GADWALL	MB	1	1	1	1	1	1
36	AMERICAN WIGEON	MB	1	1	1	1	1	1
37	EURASIAN WIGEON	MB	0	0	0	0	0	0
38	NORTHERN SHOVELER	MB	1	1	1	1	1	1
39	WOOD DUCK	MB	1	1	1	1	1	1
40	LESSER SCAUP	MB	1	1	1	1	1	1
41	REDHEAD	MB	1	1	1	1	1	1
42	RING-NECKED DUCK	MB	1	1	1	1	1	1
43	CANVASBACK	MB	1	1	1	1	1	1
44	BUFFLEHEAD	MB	1	1	1	1	1	1
45	COMMON GOLDENEYE	MB	1	1	1	1	1	1
46	BARROW'S GOLDENEYE	MB	1	1	1	1	1	1
47	HARLEQUIN DUCK	MB	1	1	1	1	1	0

Table WLD-12 (continued)
MONTANA GAME AND FURBEARER SPECIES FOUND IN EACH LAND OFFICE AREA
(A value of 1 indicates presence, 0 absence, in the Land Office area)

OBS	Common Name	State class[a]	NWLO	SWLO	CLO	NELO	SLO	ELO
			--------DNRC Land Office-------					
48	RUDDY DUCK	MB	1	1	1	1	1	1
49	HOODED MERGANSER	MB	1	1	1	1	1	1
50	COMMON MERGANSER	MB	1	1	1	1	1	1
51	RED-BREASTED MERGANSER	MB	1	1	1	1	1	1
52	SANDHILL CRANE	MB	1	1	1	1	1	1
53	AMERICAN COOT	MB	1	1	1	1	1	1
54	COMMON SNIPE	MB	1	1	1	1	1	1
55	MOURNING DOVE	MB	1	1	1	1	1	1
56	VIRGINIA RAIL	MBCS	1	1	1	1	1	1
57	SORA	MBCS	1	1	1	1	1	1
58	WILD TURKEY	UB	1	1	1	1	1	1
59	BLUE GROUSE	UB	1	1	1	1	1	0
60	SPRUCE GROUSE	UB	1	1	1	0	0	0
61	RUFFED GROUSE	UB	1	1	1	1	1	1
62	SHARP-TAILED GROUSE	UB	1	1	1	1	1	1
63	SAGE GROUSE	UB	0	1	1	1	1	1
64	CHUKAR	UB	1	1	1	1	1	1
65	RING-NECKED PHEASANT	UB	1	1	1	1	1	1
66	GRAY PARTRIDGE	UB	1	1	1	1	1	1
67	WHITE-TAILED PTARMIGAN	UBCS	1	1	1	0	0	0

[a]State classification: FB=furbearer, GA=game animal, MB=migratory game bird, UB=upland game bird, CS=closed season, RH=restricted harvest.

Table WLD-13
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA

(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
1	LONG-TOED SALAMANDER	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0
2	TIGER SALAMANDER	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0
3	COEUR D'ALENE SALAMANDER	1	0	1	0	1	0	0	0	0	1	1	0	0	0	0
4	ROUGHSKIN NEWT	1	1	1	1	1	0	1	0	1	1	0	0	0	0	0
5	IDAHO GIANT SALAMANDER	1	1	0	0	1	0	0	0	0	1	1	0	0	0	0
6	TAILED FROG	1	0	1	0	1	0	0	0	0	1	1	1	0	0	0
7	WESTERN TOAD	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0
8	GREAT PLAINS TOAD	0	1	1	0	0	1	0	0	1	0	0	1	1	1	1
9	CANADIAN TOAD	1	1	1	1	0	0	0	0	1	0	0	1	1	0	0
10	WOODHOUSE'S TOAD	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1
11	WESTERN CHORUS FROG	0	1	1	1	1	0	0	0	1	0	0	1	1	1	1
12	PACIFIC CHORUS FROG	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0
13	PLAINS SPADEFOOT	0	1	1	0	0	1	1	0	1	0	0	1	1	1	1
14	BULLFROG	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0
15	LEOPARD FROG	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1
16	SPOTTED FROG	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0
17	WOOD FROG	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
18	COMMON LOON	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
19	PIED-BILLED GREBE	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
20	HORNED GREBE	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
21	RED-NECKED GREBE	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0
22	EARED GREBE	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1
23	WESTERN GREBE (CLARK'S)	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
24	WHITE PELICAN	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1
25	DOUBLE-CRESTED CORMORANT	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
26	AMERICAN BITTERN	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1
27	GREAT BLUE HERON	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1
28	BLACK-CROWNED NIGHT HERO	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1
29	WHITE-FACED IBIS	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
30	TUNDRA SWAN	1	1	1	0	0	0	0	1	0	1	1	1	1	1	1
31	TRUMPETER SWAN	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
32	MUTE SWAN	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0
33	GREATER WHITE-FRONTED GOOSE	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1
34	SNOW GOOSE	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1
35	ROSS' GOOSE	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1
36	CANADA GOOSE	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1
37	WOOD DUCK	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1
38	GREEN-WINGED TEAL	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1
39	MALLARD	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
40	NORTHERN PINTAIL	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1
41	BLUE-WINGED TEAL	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1
42	CINNAMON TEAL	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
43	NORTHERN SHOVELER	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
44	GADWALL	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1
45	EURASIAN WIGEON	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0
46	AMERICAN WIGEON	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1
47	CANVASBACK	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
48	REDHEAD	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
49	RING-NECKED DUCK	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
50	LESSER SCAUP	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
51	HARLEQUIN DUCK	1	0	1	0	0	0	0	0	0	1	1	1	1	1	0
52	COMMON GOLDENEYE	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1
53	BARROW'S GOLDENEYE	1	1	1	0	1	0	0	0	0	1	1	1	1	1	1
54	BUFFLEHEAD	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1
55	HOODED MERGANSER	1	1	1	0	1	0	0	0	0	1	1	1	1	1	1
56	COMMON MERGANSER	1	1	1	0	1	0	0	0	0	1	1	1	1	1	1
57	RED-BREASTED MERGANSER	1	1	1	0	1	0	0	0	0	1	1	1	1	1	1
58	RUDDY DUCK	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1

Table WLD-13 (continued)
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA
(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
59	TURKEY VULTURE	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
60	OSPREY	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
61	BALD EAGLE	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
62	NORTHERN HARRIER (MARSH HAWK)	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1
63	SHARP-SHINNED HAWK	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1
64	COOPER'S HAWK	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1
65	NORTHERN GOSHAWK	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
66	BROAD-WINGED HAWK	0	0	0	1	1	0	0	0	0	1	0	1	1	1	1
67	SWAINSON'S HAWK	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1
68	RED-TAILED HAWK	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
69	FERRUGINOUS HAWK	0	0	1	0	0	1	1	0	1	1	1	1	1	1	1
70	ROUGH-LEGGED HAWK	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1
71	GOLDEN EAGLE	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1
72	AMERICAN KESTREL	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1
73	MERLIN	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1
74	PEREGRINE FALCON	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1
75	GYRFALCON	0	0	1	1	0	0	0	1	0	1	1	1	1	1	1
76	PRAIRIE FALCON	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
77	GRAY PARTRIDGE	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1
78	CHUKAR	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
79	RING-NECKED PHEASANT	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
80	SPRUCE GROUSE	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0
81	BLUE GROUSE	0	0	0	1	1	1	0	0	1	1	1	1	1	1	0
82	WHITE-TAILED PTARMIGAN	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0
83	RUFFED GROUSE	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1
84	SAGE GROUSE	0	0	0	1	0	1	0	0	1	0	1	1	1	1	1
85	SHARP-TAILED GROUSE (COL.)	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
86	WILD TURKEY	0	0	0	1	1	1	0	0	1	1	1	1	1	1	1
87	NORTHERN BOBWHITE	0	0	1	1	0	1	1	0	1	1	1	0	1	0	0
88	VIRGINIA RAIL	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1
89	SORA	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1
90	AMERICAN COOT	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
91	SANDHILL CRANE	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1
92	WHOOPING CRANE	0	1	1	0	0	0	0	0	1	0	0	1	1	1	1
93	BLACK-BELLIED PLOVER	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1
94	LESSER GOLDEN PLOVER	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
95	SEMIPALMATED PLOVER	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
96	PIPING PLOVER	0	0	1	0	0	0	0	0	0	1	1	1	1	0	1
97	KILLDEER	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1
98	MOUNTAIN PLOVER	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
99	BLACK-NECKED STILT	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1
100	AMERICAN AVOCET	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
101	GREATER YELLOWLEGS	1	1	1	0	0	0	0	1	0	1	1	1	1	1	1
102	LESSER YELLOWLEGS	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1
103	SOLITARY SANDPIPER	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1
104	WILLET	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1
105	SPOTTED SANDPIPER	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1
106	UPLAND SANDPIPER	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
107	WHIMBREL	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
108	LONG-BILLED CURLEW	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1
109	MARBLED GODWIT	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1
110	RUDDY TURNSTONE	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1
111	SANDERLING	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1
112	SEMIPALMATED SANDPIPER	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
113	WESTERN SANDPIPER	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1
114	LEAST SANDPIPER	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
115	BAIRD'S SANDPIPER	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
116	PECTORAL SANDPIPER	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
117	DUNLIN	0	0	1	0	0	0	0	1	0	1	1	1	1	1	1
118	STILT SANDPIPER	0	1	1	0	0	0	0	1	0	1	1	1	1	1	1
119	LONG-BILLED DOWITCHER	0	1	1	0	0	0	0	1	0	1	1	1	1	1	1

Table WLD-13 (continued)
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA
(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
120	COMMON SNIPE	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1
121	WILSON'S PHALAROPE	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1
122	RED-NECKED PHALAROPE	0	1	1	0	0	0	0	1	0	1	1	1	1	1	1
123	FRANKLIN'S GULL	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
124	BONAPARTE'S GULL	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1
125	RING-BILLED GULL	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
126	CALIFORNIA GULL	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
127	CASPIAN TERN	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
128	COMMON TERN	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
129	FORSTER'S TERN	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
130	LEAST TERN	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
131	BLACK TERN	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1
132	ROCK DOVE	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
133	MOURNING DOVE	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
134	BLACK-BILLED CUCKOO	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
135	YELLOW-BILLED CUCKOO	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
136	FLAMMULATED OWL	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0
137	EASTERN SCREECH-OWL	0	0	1	1	1	0	0	0	1	0	0	1	1	1	1
138	WESTERN SCREECH-OWL	0	0	1	1	1	1	0	0	0	1	1	1	0	0	0
139	GREAT HORNED OWL	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
140	SNOWY OWL	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
141	NORTHERN PYGMY OWL	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1
142	BURROWING OWL	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1
143	BARRED OWL	0	0	1	0	1	0	0	0	0	1	1	1	1	0	0
144	GREAT GRAY OWL	0	0	1	1	1	0	0	0	1	1	1	1	1	1	0
145	LONG-EARED OWL	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
146	SHORT-EARED OWL	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1
147	BOREAL OWL	0	0	1	0	1	0	0	0	0	1	1	1	0	1	0
148	SAW-WHET OWL	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1
149	COMMON NIGHTHAWK	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1
150	COMMON POORWILL	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1
151	BLACK SWIFT	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
152	CHIMNEY SWIFT	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
153	VAUX'S SWIFT	0	0	1	0	1	0	0	0	0	1	1	1	0	0	0
154	WHITE-THROATED SWIFT	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
155	BLACK-CHINNED HUMMINGBIRD	0	0	1	1	0	1	0	0	0	1	1	1	1	1	0
156	CALLIOPE HUMMINGBIRD	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
157	RUFOUS HUMMINGBIRD	0	0	1	1	1	1	0	1	1	1	1	1	1	1	0
158	BELTED KINGFISHER	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
159	LEWIS' WOODPECKER	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
160	RED-HEADED WOODPECKER	0	0	1	1	0	0	0	0	0	1	1	1	1	1	1
161	YELLOW-BELLIED (R-NAP) SAPSUCKER	0	0	1	1	1	0	0	0	0	0	0	1	1	0	0
162	WILLIAMSON'S SAPSUCKER	0	0	1	1	1	0	0	0	0	1	1	1	0	1	0
163	DOWNY WOODPECKER	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1
164	HAIRY WOODPECKER	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
165	THREE-TOED WOODPECKER	0	0	1	0	1	0	0	0	0	1	1	1	1	1	0
166	BLACK-BACKED WOODPECKER	0	0	1	0	1	0	0	0	0	1	1	1	0	1	1
167	NORTHERN FLICKER	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1
168	PILEATED WOODPECKER	0	0	1	1	1	0	0	0	0	1	1	1	0	0	0
169	OLIVE-SIDED FLYCATCHER	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
170	WESTERN WOOD PEWEE	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
171	WILLOW FLYCATCHER	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
172	LEAST FLYCATCHER	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1
173	HAMMOND'S FLYCATCHER	0	0	0	1	1	1	0	0	0	1	1	1	1	1	0
174	DUSKY FLYCATCHER	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
175	CORDILLERAN FLYCATCHER	0	0	1	1	1	0	0	0	0	1	1	1	1	1	0
176	SAY'S PHOEBE	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1
177	CASSIN'S KINGBIRD	0	0	1	1	0	1	1	0	1	0	0	0	1	1	1
178	WESTERN KINGBIRD	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1
179	EASTERN KINGBIRD	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1

Table WLD-13 (continued)
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA

(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
180	HORNED LARK	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
181	TREE SWALLOW	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1
182	VIOLET-GREEN SWALLOW	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1
183	ROUGH-WINGED SWALLOW	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1
184	BANK SWALLOW	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1
185	CLIFF SWALLOW	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1
186	BARN SWALLOW	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1
187	GRAY JAY	0	0	1	1	1	0	0	0	0	1	1	1	1	1	0
188	STELLER'S JAY	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
189	PINYON JAY	0	0	0	1	0	1	0	0	0	1	1	1	1	1	1
190	CLARK'S NUTCRACKER	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
191	BLACK-BILLED MAGPIE	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
192	COMMON CROW	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1
193	COMMON RAVEN	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
194	BLACK-CAPPED CHICKADEE	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
195	MOUNTAIN CHICKADEE	0	0	1	1	1	0	0	0	0	1	1	1	1	1	0
196	BOREAL CHICKADEE	0	0	1	0	1	0	0	0	0	1	1	1	0	0	0
197	CHESTNUT-BACKED CHICKADEE	0	0	1	1	1	0	0	0	0	1	1	1	0	0	0
198	RED-BREASTED NUTHATCH	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
199	WHITE-BREASTED NUTHATCH	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
200	PYGMY NUTHATCH	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
201	BROWN CREEPER	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
202	ROCK WREN	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1
203	CANYON WREN	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
204	HOUSE WREN	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
205	WINTER WREN	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
206	MARSH WREN	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1
207	DIPPER	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0
208	GOLDEN-CROWNED KINGLET	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1
209	RUBY-CROWNED KINGLET	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
210	EASTERN BLUEBIRD	0	0	1	1	0	0	1	0	1	0	0	1	1	0	1
211	WESTERN BLUEBIRD	0	0	1	1	0	0	1	0	1	1	1	1	1	0	0
212	MOUNTAIN BLUEBIRD	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1
213	TOWNSEND'S SOLITAIRE	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
214	VEERY	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
215	SWAINSON'S THRUSH	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
216	HERMIT THRUSH	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
217	AMERICAN ROBIN	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
218	VARIED THRUSH	0	0	1	1	1	1	0	0	0	1	1	1	1	1	0
219	GRAY CATBIRD	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
220	SAGE THRASHER	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1
221	BROWN THRASHER	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
222	WATER PIPIT	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
223	SPRAGUE'S PIPIT	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
224	BOHEMIAN WAXWING	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
225	CEDAR WAXWING	0	0	1	1	1	0	0	0	1	1	1	1	1	1	1
226	NORTHERN SHRIKE	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
227	LOGGERHEAD SHRIKE	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1
228	EUROPEAN STARLING	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
229	SOLITARY VIREO	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
230	WARBLING VIREO	0	0	1	1	1	0	1	0	0	1	1	1	1	1	1
231	RED-EYED VIREO	0	0	1	0	1	1	1	0	0	1	1	1	1	1	1
232	TENNESSEE WARBLER	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1
233	ORANGE-CROWNED WARBLER	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
234	NASHVILLE WARBLER	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
235	YELLOW WARBLER	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
236	YELLOW-RUMPED WARBLER	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
237	TOWNSEND'S WARBLER	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1
238	BLACKPOLL WARBLER	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
239	BLACK-AND-WHITE WARBLER	0	0	1	1	1	1	0	0	1	1	0	1	1	1	1

Table WLD-13 (continued)
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA
(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
240	AMERICAN REDSTART	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
241	OVENBIRD	0	0	0	1	1	1	0	0	1	0	1	1	1	1	1
242	NORTHERN WATERTHRUSH	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
243	MACGILLIVRAY'S WARBLER	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
244	COMMON YELLOWTHROAT	0	0	1	0	1	1	0	0	1	1	1	1	1	1	1
245	WILSON'S WARBLER	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
246	YELLOW-BREASTED CHAT	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
247	WESTERN TANAGER	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1
248	NORTHERN CARDINAL	0	0	1	1	0	1	0	0	1	0	0	0	0	0	0
249	BLACK-HEADED GROSBEAK	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
250	LAZULI BUNTING	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1
251	INDIGO BUNTING	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
252	DICKCISSEL	0	0	0	0	0	0	1	0	1	0	1	0	1	1	1
253	GREEN-TAILED TOWHEE	0	0	1	0	0	1	0	0	0	1	1	1	1	1	0
254	RUFOUS-SIDED TOWHEE	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
255	TREE SPARROW	0	0	1	0	0	1	0	0	1	1	1	1	1	1	1
256	CHIPPING SPARROW	0	0	1	1	0	0	1	0	1	1	1	1	1	1	1
257	CLAY-COLORED SPARROW	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
258	BREWER'S SPARROW	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
259	FIELD SPARROW	0	0	0	1	0	1	0	0	1	1	0	1	1	1	1
260	VESPER SPARROW	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1
261	LARK SPARROW	0	0	0	1	0	0	1	0	1	1	1	1	1	1	1
262	LARK BUNTING	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
263	SAVANNAH SPARROW	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
264	BAIRD'S SPARROW	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
265	GRASSHOPPER SPARROW	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1
266	LE CONTE'S SPARROW	0	0	1	0	0	0	0	0	1	1	1	0	1	1	1
267	FOX SPARROW	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1
268	SONG SPARROW	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
269	LINCOLN'S SPARROW	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
270	WHITE-THROATED SPARROW	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
271	WHITE-CROWNED SPARROW	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
272	HARRIS' SPARROW	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
273	DARK-EYED JUNCO	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
274	MCCOWN'S LONGSPUR	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
275	LAPLAND LONGSPUR	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
276	CHESTNUT-COLLARED LONGSPUR	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
277	SNOW BUNTING	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1
278	BOBOLINK	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1
279	RED-WINGED BLACKBIRD	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1
280	WESTERN MEADOWLARK	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1
281	YELLOW-HEADED BLACKBIRD	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1
282	RUSTY BLACKBIRD	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
283	BREWER'S BLACKBIRD	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
284	COMMON GRACKLE	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1
285	BROWN-HEADED COWBIRD	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
286	ORCHARD ORIOLE	0	0	1	1	0	1	1	0	0	0	0	0	1	1	1
287	NORTHERN ORIOLE	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1
288	BLACK ROSY FINCH	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1
289	GRAY-CROWNED ROSY FINCH	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0
290	PINE GROSBEAK	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1
291	CASSIN'S FINCH	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1
292	HOUSE FINCH	0	0	0	1	0	1	1	0	1	1	1	1	1	1	1
293	RED CROSSBILL	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1
294	WHITE-WINGED CROSSBILL	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
295	COMMON REDPOLL	0	0	1	1	1	1	0	1	0	1	1	1	1	1	1
296	HOARY REDPOLL	0	0	1	1	0	0	0	1	1	1	1	1	1	1	1
297	PINE SISKIN	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1
298	AMERICAN GOLDFINCH	0	0	1	1	0	1	0	0	1	1	1	1	1	1	1
299	EVENING GROSBEAK	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1

Table WLD-13 (continued)
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA

(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
300	HOUSE SPARROW	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
301	MASKED SHREW	0	0	1	1	1	1	1	0	1	1	1	1	1	1	0
302	PREBLE'S SHREW	0	0	1	0	1	1	0	0	1	0	1	1	1	1	1
303	VAGRANT SHREW	0	0	1	1	1	1	0	0	1	1	1	0	0	0	0
304	DWARF SHREW	0	0	1	0	1	1	0	1	1	0	0	1	1	1	1
305	WATER SHREW	1	1	1	0	0	0	0	0	0	1	1	1	1	1	0
306	MERRIAM'S SHREW	0	0	0	1	0	1	0	0	1	0	0	0	1	1	1
307	PYGMY SHREW	0	0	1	0	1	1	0	0	1	1	0	0	1	0	0
308	LITTLE BROWN MYOTIS	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
309	YUMA MYOTIS	1	1	1	1	1	1	0	0	1	1	1	1	1	0	0
310	LONG-EARED MYOTIS	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1
311	LONG-LEGGED MYOTIS	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1
312	CALIFORNIA MYOTIS	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0
313	WESTERN SMALL-FOOTED MYOTIS	0	0	1	0	1	1	0	0	1	0	0	1	0	1	1
314	NORTHERN MYOTIS (KEEN'S)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
315	SILVER-HAIRED BAT	1	1	1	0	1	0	0	0	0	1	1	1	1	1	1
316	BIG BROWN BAT	0	0	0	1	1	1	0	0	1	1	1	1	1	1	1
317	HOARY BAT	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
318	SPOTTED BAT	0	0	1	1	1	1	0	0	1	0	0	0	0	1	1
319	TOWNSEND'S BIG-EARED BAT	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1
320	PALLID BAT	0	0	0	1	1	1	0	0	1	0	0	0	0	1	0
321	PIKA	0	0	0	0	0	0	0	1	0	1	1	1	1	1	0
322	EASTERN COTTONTAIL	0	0	1	1	0	1	0	0	1	0	0	0	0	0	1
323	MOUNTAIN COTTONTAIL	0	0	1	1	0	1	0	0	0	1	1	1	1	1	1
324	DESERT COTTONTAIL	0	0	1	1	0	1	1	0	1	0	0	1	1	1	1
325	SNOWSHOE HARE	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
326	WHITE-TAILED JACKRABBIT	0	0	0	1	0	1	0	1	1	1	1	1	1	1	1
327	BLACK-TAILED JACKRABBIT	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0
328	PYGMY RABBIT	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
329	LEAST CHIPMUNK	0	0	1	1	1	1	0	1	0	1	1	1	1	1	1
330	YELLOW-PINE CHIPMUNK	0	0	0	1	0	1	0	0	0	1	1	1	1	1	0
331	RED-TAILED CHIPMUNK	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0
332	UINTA CHIPMUNK	0	0	0	1	1	1	0	0	0	0	0	1	0	1	0
333	YELLOW-BELLIED MARMOT	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
334	HOARY MARMOT	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0
335	RICHARDSON'S GROUND SQUIRREL	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1
336	UINTA GROUND SQUIRREL	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0
337	COL. GROUND SQUIRREL	0	0	1	1	0	1	0	1	1	1	1	1	0	0	0
338	THIRTEEN-LINED GROUND SQUIRREL	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1
339	GOLDEN-MANTLED GROUND SQUIRREL	0	0	0	1	0	1	0	1	0	1	1	1	1	1	1
340	BLACK-TAILED PRAIRIE DOG	0	0	0	0	0	0	1	0	1	0	0	1	1	1	1
341	WHITE-TAILED PRAIRIE DOG	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0
342	EASTERN GRAY SQUIRREL	0	0	1	1	1	0	0	0	0	0	0	1	1	0	1
343	EASTERN FOX SQUIRREL	0	0	1	1	1	1	0	0	0	0	1	1	0	1	1
344	RED SQUIRREL	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1
345	NORTHERN FLYING SQUIRREL	0	0	1	0	1	0	0	0	0	1	1	1	0	1	0
346	NORTHERN POCKET GOPHER	0	0	1	1	0	1	0	1	1	1	1	1	1	1	1
347	IDAHO POCKET GOPHER	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0
348	OLIVE-BACKED POCKET MOUSE	0	0	1	0	0	1	0	0	1	0	0	0	1	1	1
349	GREAT BASIN POCKET MOUSE	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0
350	HISPID POCKET MOUSE	0	0	0	1	0	1	1	0	1	0	0	0	0	0	1

Table WLD-13 (continued)
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA
(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
351	ORD'S KANGAROO RAT	0	0	0	1	0	1	0	0	1	0	0	0	1	1	1
352	BEAVER	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
353	WESTERN HARVEST MOUSE	0	0	1	1	0	1	0	0	1	0	0	0	1	1	1
354	DEER MOUSE	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
355	WHITE-FOOTED MOUSE	0	0	1	1	1	1	0	0	1	0	0	0	1	1	1
356	NORTHERN GRASSHOPPER MOUSE	0	0	0	0	0	1	0	0	1	1	0	1	1	1	1
357	BUSHY-TAILED WOODRAT	0	0	0	1	1	1	0	1	0	1	1	1	1	1	1
358	SOUTHERN RED-BACKED VOLE	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1
359	HEATHER VOLE	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0
360	MEADOW VOLE	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
361	MONTANE VOLE	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0
362	LONG-TAILED VOLE	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1
363	PRAIRIE VOLE	0	0	1	0	0	1	0	0	1	0	0	1	1	1	1
364	WATER VOLE (RICHARDSON'S)	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0
365	SAGEBRUSH VOLE	0	0	0	0	0	1	0	0	1	0	1	1	1	1	1
366	MUSKRAT	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
367	NORTHERN BOG LEMMING	0	0	1	0	1	0	0	0	1	1	1	1	0	0	0
368	NORWAY RAT	0	0	0	1	0	0	1	0	1	1	1	1	1	0	1
369	HOUSE MOUSE	0	0	0	1	1	0	1	0	1	1	1	1	1	1	1
370	MEADOW JUMPING MOUSE	0	0	1	0	0	1	0	0	1	0	0	0	0	0	1
371	WESTERN JUMPING MOUSE	0	0	1	0	0	0	0	0	1	1	1	1	1	1	0
372	PORCUPINE	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
373	COYOTE	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
374	GRAY WOLF	0	0	0	1	1	1	0	1	1	1	0	1	1	0	0
375	RED FOX	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1
376	KIT OR SWIFT FOX	0	0	0	1	0	1	1	0	1	0	0	0	0	0	1
377	BLACK BEAR	0	0	1	1	1	0	0	0	0	1	1	1	1	1	0
378	GRIZZLY BEAR	0	0	1	1	1	1	0	1	1	0	0	1	0	1	0
379	RACCOON	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1
380	MARTEN	0	0	1	1	1	0	0	0	0	1	1	1	1	1	0
381	FISHER	0	0	1	0	1	0	0	0	0	1	1	1	0	0	0
382	ERMINE	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1
383	LEAST WEASEL	0	0	1	1	0	1	0	0	1	0	0	1	1	1	1
384	LONG-TAILED WEASEL	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
385	BLACK-FOOTED FERRET	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
386	MINK	0	0	1	0	0	0	0	0	0	1	1	1	1	1	1
387	WOLVERINE	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0
388	BADGER	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1
389	WESTERN SPOTTED SKUNK	0	0	1	1	0	1	0	0	1	0	1	1	0	0	0
390	STRIPED SKUNK	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1
391	RIVER OTTER	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
392	MOUNTAIN LION	0	0	1	1	1	0	0	0	0	1	1	1	1	1	1
393	LYNX	0	0	1	0	1	0	0	1	0	1	1	1	1	1	0
394	BOBCAT	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
395	WAPITI OR ELK	0	0	0	1	1	1	0	1	1	1	1	1	1	1	0
396	MULE DEER	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1
397	WHITE-TAILED DEER	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1
398	MOOSE	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0
399	WOODLAND CARIBOU	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
400	PRONGHORN	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
401	BISON	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0
402	MOUNTAIN GOAT	0	0	0	1	0	0	0	1	1	1	1	1	1	1	0
403	BIGHORN SHEEP	0	0	1	1	0	0	0	1	1	1	1	1	1	1	1
404	SNAPPING TURTLE	1	1	1	0	0	0	0	0	0	1	0	0	1	1	1
405	PAINTED TURTLE	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
406	SPINY SOFTSHELL TURTLE	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1
407	NORTHERN ALLIGATOR LIZARD	0	0	1	1	1	1	0	0	1	1	1	0	0	0	0
408	SHORT-HORNED LIZARD	0	0	0	1	1	1	0	0	1	0	0	1	1	1	1
409	SAGEBRUSH LIZARD	0	0	0	1	1	1	0	0	1	0	0	1	0	1	1

Table WLD-13 (continued)
WILDLIFE SPECIES ASSOCIATED WITH GENERAL HABITATS IN MONTANA
(A value of 1 in the general habitat category indicates that the species is associated with that habitat. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		General habitat category[a]									DNRC Land Office					
OBS	Common Name	RIVER	LACUST	PALUST	WOODLAND	FOREST	SHRUB	SAVANNAH	ALPINE	GRASS	NWLO	SWLO	CLO	NELO	SLO	ELO
410	WESTERN SKINK	0	0	1	1	1	1	0	0	1	1	1	0	0	0	0
411	RUBBER BOA	0	0	1	1	1	1	0	0	1	1	1	1	0	1	0
412	RACER	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
413	WESTERN HOGNOSE SNAKE	0	0	1	1	0	1	0	0	1	0	0	1	1	1	1
414	MILK SNAKE	0	0	1	1	1	1	1	0	1	0	0	0	1	1	1
415	PINE OR GOPHER SNAKE	0	0	1	1	0	1	1	0	1	1	1	1	1	1	1
416	W. TERRESTRIAL GARTER SNAKE	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
417	PLAINS GARTER SNAKE	1	1	1	0	0	0	0	0	1	0	0	1	1	1	1
418	COMMON GARTER SNAKE	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1
419	WESTERN RATTLESNAKE	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1

Table WLD-14
WILDLIFE SPECIES ASSOCIATED WITH SEVEN FOREST COVER TYPES IN MONTANA

(A value of 1 in the forest cover type indicates that the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		Forest Type							DNRC Land Office					
Obs	Common Name	Hard wood	Doug fir	Pine Larch	Grand fir	Lodge pole	Subalp fir	Cedar Hemlk	NWLO	SWLO	CLO	NELO	SLO	ELO
1	GREAT BLUE HERON	1	0	0	0	0	1	1	1	1	1	1	1	1
2	BLACK-CROWNED NIGHT HERON	1	0	0	0	0	0	0	1	1	1	1	1	1
3	WOOD DUCK	1	1	1	0	0	1	1	1	1	1	1	1	1
4	BUFFLEHEAD	1	1	1	1	1	1	1	1	1	1	1	1	1
5	COMMON GOLDENEYE	1	0	0	0	0	0	0	1	1	1	1	1	1
6	BARROW'S GOLDENEYE	1	0	0	0	0	0	0	1	1	1	1	1	1
7	HOODED MERGANSER	1	1	1	0	0	0	0	1	1	1	1	1	1
8	COMMON MERGANSER	1	0	1	0	0	0	0	1	1	1	1	1	1
9	TURKEY VULTURE	1	1	1	0	0	0	0	1	1	1	1	1	1
10	COOPER'S HAWK	1	1	1	1	1	1	1	1	1	1	1	1	1
11	NORTHERN GOSHAWK	1	1	1	1	1	1	1	1	1	1	1	1	1
12	SHARP-SHINNED HAWK	0	1	1	1	1	1	1	1	1	1	1	1	1
13	RED-TAILED HAWK	1	1	1	1	1	1	1	1	1	1	1	1	1
14	ROUGH-LEGGED HAWK	1	0	0	0	0	0	0	1	1	1	1	1	1
15	BROAD-WINGED HAWK	1	0	0	0	0	0	0	1	0	1	1	1	1
16	FERRUGINOUS HAWK	1	0	1	0	0	0	0	1	1	1	1	1	1
17	SWAINSON'S HAWK	1	1	1	0	1	0	0	1	1	1	1	1	1
18	GOLDEN EAGLE	1	1	1	1	1	1	1	1	1	1	1	1	1
19	BALD EAGLE	1	1	1	0	0	1	1	1	1	1	1	1	1
20	OSPREY	1	1	1	1	1	1	1	1	1	1	1	1	1
21	MERLIN	0	1	1	1	1	1	1	1	1	1	1	1	1
22	AMERICAN KESTREL	1	1	1	1	1	1	1	1	1	1	1	1	1
23	WILD TURKEY	1	1	1	0	0	0	0	1	1	1	1	1	1
24	BLUE GROUSE	1	1	1	1	1	1	1	1	1	1	1	1	0
25	SPRUCE GROUSE	0	1	1	1	1	1	1	1	1	1	0	0	0
26	RUFFED GROUSE	1	1	1	1	1	1	1	1	1	1	1	1	1
27	NORTHERN BOBWHITE	1	0	0	0	0	0	0	1	1	0	1	0	0
28	RING-NECKED PHEASANT	1	0	0	0	0	0	0	1	1	1	1	1	1
29	GRAY PARTRIDGE	1	0	0	0	0	0	0	1	1	1	1	1	1
30	MOURNING DOVE	1	1	1	0	1	0	0	1	1	1	1	1	1
31	YELLOW-BILLED CUCKOO	1	1	1	0	0	0	0	1	1	1	1	1	1
32	BLACK-BILLED CUCKOO	1	1	1	0	0	0	0	1	1	1	1	1	1
33	WESTERN SCREECH-OWL	1	1	1	0	1	1	1	1	1	1	0	0	0
34	FLAMMULATED OWL	1	1	0	1	1	1	0	1	1	1	0	0	0
35	LONG-EARED OWL	1	1	1	1	1	1	0	1	1	1	1	1	1
36	GREAT HORNED OWL	1	1	1	1	1	1	1	1	1	1	1	1	1
37	GREAT GRAY OWL	1	1	1	1	1	1	0	1	1	1	1	1	0
38	BARRED OWL	1	1	1	1	1	1	1	1	1	1	1	0	0
39	SAW-WHET OWL	1	1	1	0	1	1	1	1	1	1	1	1	1
40	BOREAL OWL	1	1	1	1	1	1	1	1	1	1	0	1	0
41	NORTHERN PYGMY OWL	1	1	1	1	1	1	1	1	1	1	1	1	1
42	COMMON POORWILL	0	1	1	1	1	1	1	1	1	1	1	1	1
43	COMMON NIGHTHAWK	1	1	1	1	1	1	1	1	1	1	1	1	1
44	VAUX'S SWIFT	1	1	1	1	1	1	1	1	1	1	0	0	0
45	RUFOUS HUMMINGBIRD	1	1	1	1	1	1	1	1	1	1	1	1	0
46	NORTHERN FLICKER	1	1	1	1	1	1	1	1	1	1	1	1	1
47	PILEATED WOODPECKER	1	0	1	1	1	1	1	1	1	1	0	0	0
48	RED-HEADED WOODPECKER	1	0	1	0	0	0	0	1	1	1	1	1	1
49	LEWIS' WOODPECKER	1	1	1	1	1	1	1	1	1	1	1	1	1
50	DOWNY WOODPECKER	1	1	1	1	1	1	1	1	1	1	1	1	1
51	HAIRY WOODPECKER	1	1	1	1	1	1	1	1	1	1	1	1	1
52	BLACK-BACKED WOODPECKER	1	1	1	1	1	1	1	1	1	1	0	1	1
53	THREE-TOED WOODPECKER	0	1	1	1	1	1	1	1	1	1	1	1	0
54	WILLIAMSON'S SAPSUCKER	1	1	1	1	1	1	1	1	1	1	0	1	0
55	YELLOW-BELLIED (R-NAP) SAPSUCKER	1	1	1	1	1	1	1	0	0	1	1	0	0
56	EASTERN KINGBIRD	1	1	1	0	0	0	0	1	1	1	1	1	1
57	WESTERN KINGBIRD	1	1	1	0	0	0	0	1	1	1	1	1	1
58	CORDILLERAN FLYCATCHER	1	1	1	1	1	1	1	1	1	1	1	1	0
59	CASSIN'S KINGBIRD	1	0	1	0	0	1	1	0	0	0	1	1	1
60	HAMMOND'S FLYCATCHER	1	1	1	1	1	1	1	1	1	1	1	1	0

Table WLD-14 (continued)
WILDLIFE SPECIES ASSOCIATED WITH SEVEN FOREST COVER TYPES IN MONTANA

(A value of 1 in the forest cover type indicates that the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		Forest Type							DNRC Land Office					
Obs	Common Name	Hard wood	Doug fir	Pine Larch	Grand fir	Lodge pole	Subalp fir	Cedar Hemlk	NWLO	SWLO	CLO	NELO	SLO	ELO
61	DUSKY FLYCATCHER	1	1	1	0	1	1	1	1	1	1	1	1	1
62	OLIVE-SIDED FLYCATCHER	1	1	1	1	1	1	1	1	1	1	1	1	1
63	WESTERN WOOD PEWEE	1	0	1	0	0	1	1	1	1	1	1	1	1
64	BARN SWALLOW	1	0	0	0	0	0	0	1	1	1	1	1	1
65	CLIFF SWALLOW	1	0	0	0	0	0	0	1	1	1	1	1	1
66	VIOLET-GREEN SWALLOW	1	1	1	1	1	1	1	1	1	1	1	1	1
67	TREE SWALLOW	1	1	1	0	0	1	1	1	1	1	1	1	1
68	BANK SWALLOW	1	1	1	0	0	0	0	1	1	1	1	1	1
69	ROUGH-WINGED SWALLOW	1	1	1	0	0	0	0	1	1	1	1	1	1
70	STELLER'S JAY	0	1	1	1	1	1	1	1	1	1	1	1	1
71	GRAY JAY	1	1	1	1	1	1	1	1	1	1	1	1	0
72	BLACK-BILLED MAGPIE	1	1	1	0	0	1	1	1	1	1	1	1	1
73	CLARK'S NUTCRACKER	0	1	1	1	1	1	1	1	1	1	1	1	1
74	COMMON CROW	1	1	1	1	1	1	1	1	1	1	1	1	1
75	COMMON RAVEN	1	1	1	1	1	1	1	1	1	1	1	1	1
76	BLACK-CAPPED CHICKADEE	1	1	1	0	0	1	1	1	1	1	1	1	1
77	MOUNTAIN CHICKADEE	1	1	1	1	1	1	1	1	1	1	1	1	0
78	BOREAL CHICKADEE	0	0	1	1	1	1	1	1	1	1	0	0	0
79	CHESTNUT-BACKED CHICKADEE	0	1	1	1	1	1	1	1	1	1	0	0	0
80	RED-BREASTED NUTHATCH	0	1	1	1	1	1	1	1	1	1	1	1	1
81	WHITE-BREASTED NUTHATCH	1	1	1	1	1	1	1	1	1	1	1	1	1
82	PYGMY NUTHATCH	0	1	1	1	1	1	1	1	1	1	1	1	1
83	BROWN CREEPER	1	1	1	1	1	1	1	1	1	1	1	1	1
84	HOUSE WREN	1	1	1	1	1	1	1	1	1	1	1	1	1
85	WINTER WREN	1	1	1	1	1	1	1	1	1	1	1	1	1
86	AMERICAN ROBIN	1	1	1	1	1	1	1	1	1	1	1	1	1
87	VARIED THRUSH	0	1	1	1	1	1	1	1	1	1	1	1	0
88	TOWNSEND'S SOLITAIRE	0	1	1	1	1	1	1	1	1	1	1	1	1
89	VEERY	1	1	1	1	1	1	1	1	1	1	1	1	1
90	HERMIT THRUSH	1	1	1	1	1	1	1	1	1	1	1	1	1
91	SWAINSON'S THRUSH	1	1	1	1	1	1	1	1	1	1	1	1	1
92	MOUNTAIN BLUEBIRD	1	1	1	1	1	1	1	1	1	1	1	1	1
93	WESTERN BLUEBIRD	1	1	1	1	1	1	1	1	1	1	1	0	0
94	EASTERN BLUEBIRD	1	1	1	0	0	1	1	0	0	1	1	0	1
95	RUBY-CROWNED KINGLET	1	1	1	1	1	1	1	1	1	1	1	1	1
96	GOLDEN-CROWNED KINGLET	1	1	1	1	1	1	1	1	1	1	1	1	1
97	CEDAR WAXWING	1	1	1	0	1	1	1	1	1	1	1	1	1
98	BOHEMIAN WAXWING	1	1	1	1	1	1	1	1	1	1	1	1	1
99	LOGGERHEAD SHRIKE	1	0	0	0	0	1	1	1	1	1	1	1	1
100	EUROPEAN STARLING	1	1	1	0	1	1	1	1	1	1	1	1	1
101	WARBLING VIREO	1	1	1	1	1	0	0	1	1	1	1	1	1
102	RED-EYED VIREO	1	0	0	0	0	0	0	1	1	1	1	1	1
103	SOLITARY VIREO	1	1	1	1	1	1	0	1	1	1	1	1	1
104	BLACK-AND-WHITE WARBLER	1	0	1	0	0	0	0	1	0	1	1	1	1
105	ORANGE-CROWNED WARBLER	1	1	1	0	1	0	0	1	1	1	1	1	1
106	YELLOW-RUMPED WARBLER	0	1	1	1	1	1	1	1	1	1	1	1	1
107	BLACKPOLL WARBLER	0	1	1	1	1	1	1	1	1	1	1	1	1
108	TOWNSEND'S WARBLER	0	0	0	0	1	0	0	1	1	1	1	1	1
109	MACGILLIVRAY'S WARBLER	1	1	1	1	1	1	1	1	1	1	1	1	1
110	WILSON'S WARBLER	1	0	1	1	1	1	1	1	1	1	1	1	1
111	AMERICAN REDSTART	1	0	0	0	0	0	0	1	1	1	1	1	1
112	OVENBIRD	1	1	1	0	0	1	1	0	1	1	1	1	1
113	NORTHERN WATERTHRUSH	1	0	1	0	0	1	1	1	1	1	1	1	1
114	COMMON YELLOWTHROAT	1	0	0	0	0	0	0	1	1	1	1	1	1
115	HOUSE SPARROW	1	0	0	0	0	0	0	1	1	1	1	1	1
116	BREWER'S BLACKBIRD	1	1	1	0	0	0	0	1	1	1	1	1	1
117	BROWN-HEADED COWBIRD	1	1	1	0	0	0	0	1	1	1	1	1	1
118	ORCHARD ORIOLE	1	0	0	0	0	0	0	0	0	0	1	1	1
119	WESTERN TANAGER	1	1	1	1	1	1	1	1	1	1	1	1	1
120	BLACK-HEADED GROSBEAK	1	1	1	1	1	1	0	1	1	1	1	1	1
121	EVENING GROSBEAK	1	1	1	1	1	1	1	1	1	1	1	1	1
122	CASSIN'S FINCH	0	1	1	1	1	1	1	1	1	1	1	1	1
123	HOUSE FINCH	1	1	1	0	0	0	0	1	1	1	1	1	1

Table WLD-14 (continued)
WILDLIFE SPECIES ASSOCIATED WITH SEVEN FOREST COVER TYPES IN MONTANA
(A value of 1 in the forest cover type indicates that the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		Forest Type							DNRC Land Office					
Obs	Common Name	Hard wood	Doug fir	Pine Larch	Grand fir	Lodge pole	Subalp fir	Cedar Hemlk	NWLO	SWLO	CLO	NELO	SLO	ELO
124	PINE GROSBEAK	0	1	1	1	1	1	1	1	1	1	1	1	1
125	COMMON REDPOLL	1	0	1	0	0	1	1	1	1	1	1	1	1
126	PINE SISKIN	1	1	1	1	1	1	1	1	1	1	1	1	1
127	RED CROSSBILL	0	1	1	1	1	1	1	1	1	1	1	1	1
128	WHITE-WINGED CROSSBILL	0	1	1	1	1	1	1	1	1	1	1	1	1
129	LARK SPARROW	0	0	1	0	0	0	0	1	1	1	1	1	1
130	DARK-EYED JUNCO	1	1	1	1	1	1	1	1	1	1	1	1	1
131	CHIPPING SPARROW	1	1	1	1	0	1	1	1	1	1	1	1	1
132	WHITE-THROATED SPARROW	1	1	1	0	0	0	0	1	1	1	1	1	1
133	MASKED SHREW	0	1	0	0	0	1	1	1	1	1	1	1	0
134	MERRIAM'S SHREW	0	0	0	0	0	1	1	0	0	0	1	1	1
135	VAGRANT SHREW	1	0	1	1	1	1	1	1	1	0	0	0	0
136	PREBLE'S SHREW	0	0	0	0	1	1	1	0	1	1	1	1	1
137	DWARF SHREW	0	0	0	0	0	1	0	0	0	1	1	1	1
138	PYGMY SHREW	0	1	1	1	1	1	1	1	0	0	1	0	0
139	CALIFORNIA MYOTIS	1	1	1	0	0	0	0	1	1	0	0	0	0
140	LONG-EARED MYOTIS	1	1	1	1	1	1	1	1	1	1	1	1	1
141	NORTHERN MYOTIS (KEEN'S)	1	0	1	0	0	0	0	0	0	0	0	0	1
142	LITTLE BROWN MYOTIS	1	1	1	1	1	1	1	1	1	1	1	1	1
143	WESTERN SMALL-FOOTED MYOTIS	1	1	1	1	1	1	1	0	0	1	0	1	1
144	LONG-LEGGED MYOTIS	0	1	1	1	1	1	1	1	1	1	1	1	1
145	YUMA MYOTIS	1	1	1	0	0	1	1	1	1	1	1	0	0
146	SILVER-HAIRED BAT	0	1	1	0	1	1	1	1	1	1	1	1	1
147	BIG BROWN BAT	1	1	1	1	1	1	0	1	1	1	1	1	1
148	HOARY BAT	1	1	1	1	1	1	1	1	1	1	1	1	1
149	SPOTTED BAT	0	0	1	0	0	1	1	0	0	0	0	1	1
150	TOWNSEND'S BIG-EARED BAT	0	1	1	1	1	0	0	1	1	1	1	1	1
151	PALLID BAT	0	0	1	0	0	1	1	0	0	0	0	1	0
152	BLACK BEAR	1	1	1	1	1	1	1	1	1	1	1	1	0
153	GRIZZLY BEAR	1	1	1	1	1	1	1	0	0	1	0	1	0
154	RACCOON	1	0	0	0	0	0	0	1	1	1	1	1	1
155	MARTEN	0	0	1	1	1	1	1	1	1	1	1	1	0
156	FISHER	1	1	1	1	1	1	1	1	1	1	0	0	0
157	ERMINE	1	0	1	1	1	1	1	1	1	1	1	1	1
158	LONG-TAILED WEASEL	1	1	1	1	1	1	1	1	1	1	1	1	1
159	WOLVERINE	1	0	1	0	1	1	1	1	1	1	1	1	0
160	BADGER	1	1	1	0	0	1	1	1	1	1	1	1	1
161	WESTERN SPOTTED SKUNK	1	1	1	0	0	0	0	0	1	1	0	0	0
162	STRIPED SKUNK	1	0	1	0	0	1	1	1	1	1	1	1	1
163	COYOTE	1	1	1	1	1	1	1	1	1	1	1	1	1
164	GRAY WOLF	1	1	1	1	1	1	1	1	0	1	1	0	0
165	RED FOX	1	1	1	1	1	1	1	1	1	1	1	1	1
166	MOUNTAIN LION	1	1	1	1	1	1	1	1	1	1	1	1	1
167	LYNX	1	1	1	1	1	1	1	1	1	1	1	1	0
168	BOBCAT	1	1	1	1	1	1	1	1	1	1	1	1	1
169	BLACK-TAILED PRAIRIE DOG	1	1	1	0	1	1	1	0	0	1	1	1	1
170	YELLOW-PINE CHIPMUNK	0	1	1	1	1	1	1	1	1	1	1	1	0
171	LEAST CHIPMUNK	1	1	1	1	1	1	1	1	1	1	1	1	1
172	RED-TAILED CHIPMUNK	0	0	1	1	1	1	1	1	1	1	0	0	0
173	UINTA CHIPMUNK	0	0	1	1	1	1	1	0	0	1	0	1	0
174	EASTERN GRAY SQUIRREL	1	0	1	0	0	1	1	0	0	1	1	0	1
175	EASTERN FOX SQUIRREL	1	0	1	0	0	1	1	0	1	1	0	1	1
176	RED SQUIRREL	1	1	1	1	1	1	1	1	1	1	1	1	1
177	NORTHERN FLYING SQUIRREL	1	1	1	1	1	1	1	1	1	1	0	1	0
178	WHITE-FOOTED MOUSE	1	1	1	1	1	1	1	0	0	0	1	1	1
179	BUSHY-TAILED WOODRAT	1	1	1	1	1	1	1	1	1	1	1	1	1
180	NORTHERN BOG LEMMING	1	0	1	0	1	1	1	1	1	1	0	0	0
181	HEATHER VOLE	0	0	1	0	1	1	1	1	1	1	1	1	0
182	SOUTHERN RED-BACKED VOLE	0	0	1	1	1	1	1	1	1	1	1	1	1
183	LONG-TAILED VOLE	1	1	1	1	1	1	1	1	1	1	1	1	1
184	NORWAY RAT	1	0	0	0	0	1	1	1	1	1	1	0	1
185	HOUSE MOUSE	1	0	1	0	0	1	1	1	1	1	1	1	1

Table WLD-14 (continued)
WILDLIFE SPECIES ASSOCIATED WITH SEVEN FOREST COVER TYPES IN MONTANA
(A value of 1 in the forest cover type indicates that the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		Forest Type							DNRC Land Office					
Obs	Common Name	Hard wood	Doug fir	Pine Larch	Grand fir	Lodge pole	Subalp fir	Cedar Hemlk	NWLO	SWLO	CLO	NELO	SLO	ELO
186	PORCUPINE	1	1	1	1	1	1	1	1	1	1	1	1	1
187	SNOWSHOE HARE	1	0	1	1	1	1	1	1	1	1	1	1	1
188	BLACK-TAILED JACKRABBIT	0	0	1	0	0	1	1	0	0	1	0	0	0
189	DESERT COTTONTAIL	0	0	1	0	0	1	1	0	0	1	1	1	1
190	EASTERN COTTONTAIL	1	0	0	0	0	0	0	0	0	0	0	0	1
191	WAPITI OR ELK	1	1	1	1	1	1	1	1	1	1	1	1	0
192	MULE DEER	0	1	1	1	1	1	1	1	1	1	1	1	1
193	WHITE-TAILED DEER	1	1	1	1	1	1	1	1	1	1	1	1	1
194	MOOSE	1	1	1	1	1	1	1	1	1	1	1	1	0
195	WOODLAND CARIBOU	0	0	1	1	1	1	1	0	0	0	0	0	0
196	RUBBER BOA	0	1	0	1	0	1	1	1	1	1	0	1	0
197	RACER	1	1	1	1	0	1	1	1	1	1	1	1	1
198	PINE OR GOPHER SNAKE	1	1	1	1	1	1	1	1	1	1	1	1	1
199	MILK SNAKE	1	1	1	0	0	0	0	0	0	0	1	1	1
200	W. TERRESTRIAL GARTER SNAKE	1	1	1	1	1	1	1	1	1	1	1	1	1
201	COMMON GARTER SNAKE	1	1	1	1	1	1	1	1	1	1	1	1	1
202	WESTERN RATTLESNAKE	1	0	1	0	0	0	0	1	1	1	1	1	1
203	SAGEBRUSH LIZARD	0	0	1	0	0	1	1	0	0	1	0	1	1
204	SHORT-HORNED LIZARD	0	1	1	0	0	1	1	0	0	1	1	1	1
205	WESTERN SKINK	0	1	1	0	1	1	1	1	1	0	0	0	0
206	NORTHERN ALLIGATOR LIZARD	1	1	0	0	0	1	1	1	1	0	0	0	0
207	COEUR D'ALENE SALAMANDER (VD)	1	1	1	1	1	1	1	1	1	0	0	0	0
208	WOOD FROG	0	1	1	0	0	1	1	0	0	0	0	0	0
209	WESTERN TOAD	0	0	0	0	0	1	1	1	1	1	1	1	0

Table WLD-15
WILDLIFE SPECIES ASSOCIATED WITH SIX FOREST SUCCESSIONAL STAGES IN MONTANA
(A value of 1 in the successional stage indicates the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		-------Successional Stage[a]-----						-----DNRC Land Office-----					
Obs	Common Name	grass forb	seed-ling	pole	yng	mat	old growth	NWLO	SWLO	CLO	NELO	SLO	ELO
1	GREAT BLUE HERON	0	0	0	1	1	1	1	1	1	1	1	1
2	BLACK-CROWNED NIGHT HERON	0	1	1	1	1	0	1	1	1	1	1	1
3	WOOD DUCK	0	0	0	0	1	1	1	1	1	1	1	1
4	BUFFLEHEAD	0	0	0	1	1	1	1	1	1	1	1	1
5	COMMON GOLDENEYE	0	0	0	1	1	1	1	1	1	1	1	1
6	BARROW'S GOLDENEYE	0	0	0	1	1	1	1	1	1	1	1	1
7	HOODED MERGANSER	0	0	0	0	1	1	1	1	1	1	1	1
8	COMMON MERGANSER	0	0	0	1	1	1	1	1	1	1	1	1
9	TURKEY VULTURE	1	1	0	0	1	1	1	1	1	1	1	1
10	COOPER'S HAWK	1	1	1	1	1	1	1	1	1	1	1	1
11	NORTHERN GOSHAWK	1	1	0	1	1	1	1	1	1	1	1	1
12	SHARP-SHINNED HAWK	1	1	1	1	1	1	1	1	1	1	1	1
13	RED-TAILED HAWK	1	1	1	1	1	1	1	1	1	1	1	1
14	ROUGH-LEGGED HAWK	1	1	0	0	1	1	1	1	1	1	1	1
15	BROAD-WINGED HAWK	1	1	1	1	1	1	1	0	1	1	1	1
16	FERRUGINOUS HAWK	1	1	0	1	1	1	1	1	1	1	1	1
17	SWAINSON'S HAWK	1	1	0	1	1	1	1	1	1	1	1	1
18	GOLDEN EAGLE	1	1	1	0	1	1	1	1	1	1	1	1
19	BALD EAGLE	1	1	1	1	1	1	1	1	1	1	1	1
20	OSPREY	0	0	0	0	1	1	1	1	1	1	1	1
21	MERLIN	1	1	1	1	1	1	1	1	1	1	1	1
22	AMERICAN KESTREL	1	0	1	1	1	1	1	1	1	1	1	1
23	WILD TURKEY	1	1	1	1	1	1	1	1	1	1	1	1
24	BLUE GROUSE	1	1	1	1	1	1	1	1	1	1	1	0
25	SPRUCE GROUSE	0	1	1	1	1	1	1	1	1	0	0	0
26	RUFFED GROUSE	1	1	1	1	0	1	1	1	1	1	1	1
27	NORTHERN BOBWHITE	1	1	1	1	0	0	1	1	0	1	0	0
28	RING-NECKED PHEASANT	1	1	1	1	1	1	1	1	1	1	1	1
29	GRAY PARTRIDGE	1	1	0	0	0	0	1	1	1	1	1	1
30	MOURNING DOVE	1	1	1	1	1	1	1	1	1	1	1	1
31	YELLOW-BILLED CUCKOO	0	1	1	1	1	0	1	1	1	1	1	1
32	BLACK-BILLED CUCKOO	0	1	1	1	1	0	1	1	1	1	1	1
33	WESTERN SCREECH-OWL	1	1	0	0	1	1	1	1	1	0	0	0
34	FLAMMULATED OWL	1	1	0	0	1	1	1	1	1	0	0	0
35	LONG-EARED OWL	1	1	1	1	1	1	1	1	1	1	1	1
36	GREAT HORNED OWL	1	1	1	1	1	1	1	1	1	1	1	1
37	GREAT GRAY OWL	1	1	1	1	1	1	1	1	1	1	1	0
38	BARRED OWL	1	1	0	0	1	1	1	1	1	1	0	0
39	SAW-WHET OWL	1	1	1	1	1	1	1	1	1	1	1	1
40	BOREAL OWL	1	1	0	1	1	1	1	1	1	0	1	0
41	NORTHERN PYGMY OWL	1	1	1	0	1	1	1	1	1	1	1	1
42	COMMON POORWILL	1	1	1	1	1	1	1	1	1	1	1	1
43	COMMON NIGHTHAWK	1	1	1	1	1	1	1	1	1	1	1	1
44	VAUX'S SWIFT	1	1	1	1	1	1	1	1	1	0	0	0
45	RUFOUS HUMMINGBIRD	1	1	1	1	1	1	1	1	1	1	1	0
46	NORTHERN FLICKER	1	1	1	1	1	1	1	1	1	1	1	1
47	PILEATED WOODPECKER	0	0	0	1	1	1	1	1	1	0	0	0
48	RED-HEADED WOODPECKER	0	1	1	1	1	1	1	1	1	1	1	1
49	LEWIS' WOODPECKER	1	1	0	1	1	1	1	1	1	1	1	1
50	DOWNY WOODPECKER	0	1	1	1	1	1	1	1	1	1	1	1
51	HAIRY WOODPECKER	0	0	1	1	1	1	1	1	1	1	1	1
52	BLACK-BACKED WOODPECKER	0	0	1	1	1	1	1	1	1	0	1	1
53	THREE-TOED WOODPECKER	0	0	1	1	1	1	1	1	1	1	1	0
54	WILLIAMSON'S SAPSUCKER	0	0	1	1	1	1	1	1	1	0	1	0
55	YELLOW-BELLIED (R-NAP) SAPSUCKER	0	1	1	1	1	1	0	0	1	1	0	0
56	SAY'S PHOEBE	1	1	0	0	0	0	1	1	1	1	1	1
57	EASTERN KINGBIRD	1	1	1	1	1	1	1	1	1	1	1	1
58	WESTERN KINGBIRD	1	1	1	1	1	1	1	1	1	1	1	1

Table WLD-15 (continued)
WILDLIFE SPECIES ASSOCIATED WITH SIX FOREST SUCCESSIONAL STAGES IN MONTANA

(A value of 1 in the successional stage indicates the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		-------Successional Stage[a]-----						-----DNRC Land Office-----					
Obs	Common Name	grass forb	seed-ling	pole	yng	mat	old growth	NWLO	SWLO	CLO	NELO	SLO	ELO
59	CORDILLERAN FLYCATCHER	0	1	1	1	1	1	1	1	1	1	1	0
60	CASSIN'S KINGBIRD	1	1	1	1	1	1	0	0	0	1	1	1
61	HAMMOND'S FLYCATCHER	0	1	1	1	1	1	1	1	1	1	1	0
62	DUSKY FLYCATCHER	1	1	1	1	1	1	1	1	1	1	1	1
63	OLIVE-SIDED FLYCATCHER	1	1	1	1	1	1	1	1	1	1	1	1
64	WESTERN WOOD PEWEE	0	1	1	1	1	1	1	1	1	1	1	1
65	CLIFF SWALLOW	1	1	1	1	0	0	1	1	1	1	1	1
66	VIOLET-GREEN SWALLOW	1	1	1	1	1	1	1	1	1	1	1	1
67	TREE SWALLOW	1	1	0	1	1	1	1	1	1	1	1	1
68	BANK SWALLOW	1	1	0	0	0	0	1	1	1	1	1	1
69	ROUGH-WINGED SWALLOW	1	1	0	0	0	0	1	1	1	1	1	1
70	STELLER'S JAY	1	1	1	1	1	1	1	1	1	1	1	1
71	GRAY JAY	0	1	1	1	1	1	1	1	1	1	1	0
72	BLACK-BILLED MAGPIE	1	1	1	1	1	1	1	1	1	1	1	1
73	CLARK'S NUTCRACKER	0	0	0	1	1	1	1	1	1	1	1	1
74	COMMON CROW	1	1	1	1	1	1	1	1	1	1	1	1
75	COMMON RAVEN	1	1	1	1	1	1	1	1	1	1	1	1
76	BLACK-CAPPED CHICKADEE	0	1	1	1	1	1	1	1	1	1	1	1
77	MOUNTAIN CHICKADEE	0	0	1	1	1	1	1	1	1	1	1	0
78	BOREAL CHICKADEE	0	0	0	1	1	1	1	1	1	0	0	0
79	CHESTNUT-BACKED CHICKADEE	0	1	1	1	1	1	1	1	1	0	0	0
80	RED-BREASTED NUTHATCH	0	0	1	1	1	1	1	1	1	1	1	1
81	WHITE-BREASTED NUTHATCH	0	0	0	1	1	1	1	1	1	1	1	1
82	PYGMY NUTHATCH	0	0	1	1	1	1	1	1	1	1	1	1
83	BROWN CREEPER	0	0	1	1	1	1	1	1	1	1	1	1
84	HOUSE WREN	0	1	1	1	1	1	1	1	1	1	1	1
85	WINTER WREN	0	1	1	1	1	1	1	1	1	1	1	1
86	AMERICAN ROBIN	1	1	1	1	1	1	1	1	1	1	1	1
87	VARIED THRUSH	0	1	1	1	1	1	1	1	1	1	1	0
88	TOWNSEND'S SOLITAIRE	1	1	1	1	1	1	1	1	1	1	1	1
89	VEERY	0	1	1	1	1	1	1	1	1	1	1	1
90	HERMIT THRUSH	0	1	1	1	1	1	1	1	1	1	1	1
91	SWAINSON'S THRUSH	0	1	1	1	1	1	1	1	1	1	1	1
92	MOUNTAIN BLUEBIRD	1	1	1	1	1	1	1	1	1	1	1	1
93	WESTERN BLUEBIRD	1	1	1	1	1	1	1	1	1	1	0	0
94	EASTERN BLUEBIRD	1	1	1	1	1	1	0	0	1	1	0	1
95	RUBY-CROWNED KINGLET	0	1	1	1	1	1	1	1	1	1	1	1
96	GOLDEN-CROWNED KINGLET	0	1	1	1	1	1	1	1	1	1	1	1
97	CEDAR WAXWING	0	1	1	1	1	1	1	1	1	1	1	1
98	BOHEMIAN WAXWING	0	1	1	1	1	1	1	1	1	1	1	1
99	NORTHERN SHRIKE	1	1	0	0	0	0	1	1	1	1	1	1
100	LOGGERHEAD SHRIKE	1	1	1	1	1	1	1	1	1	1	1	1
101	EUROPEAN STARLING	1	1	0	1	1	1	1	1	1	1	1	1
102	WARBLING VIREO	0	1	1	1	1	1	1	1	1	1	1	1
103	RED-EYED VIREO	0	1	1	1	1	1	1	1	1	1	1	1
104	PHILADELPHIA VIREO	0	1	1	1	1	1	0	1	0	1	0	0
105	SOLITARY VIREO	0	0	1	1	1	1	1	1	1	1	1	1
106	BLACK-AND-WHITE WARBLER	0	0	1	1	1	1	1	0	1	1	1	1
107	ORANGE-CROWNED WARBLER	0	1	0	1	1	1	1	1	1	1	1	1
108	YELLOW-RUMPED WARBLER	0	1	1	1	1	1	1	1	1	1	1	1
109	BLACKPOLL WARBLER	0	0	0	1	1	1	1	1	1	1	1	1
110	TOWNSEND'S WARBLER	0	0	0	0	1	1	1	1	1	1	1	1
111	WILSON'S WARBLER	0	1	1	1	1	1	1	1	1	1	1	1
112	AMERICAN REDSTART	1	1	1	1	1	1	1	1	1	1	1	1
113	OVENBIRD	0	1	1	1	1	1	0	1	1	1	1	1
114	NORTHERN WATERTHRUSH	1	1	0	0	0	0	1	1	1	1	1	1
115	COMMON YELLOWTHROAT	1	1	0	0	0	0	1	1	1	1	1	1
116	HOUSE SPARROW	1	1	1	1	1	1	1	1	1	1	1	1
117	BREWER'S BLACKBIRD	1	1	1	1	1	1	1	1	1	1	1	1
118	BROWN-HEADED COWBIRD	1	1	1	1	1	1	1	1	1	1	1	1
119	ORCHARD ORIOLE	0	1	1	1	1	1	0	0	0	1	1	1
120	WESTERN TANAGER	0	0	0	1	1	1	1	1	1	1	1	1
121	BLACK-HEADED GROSBEAK	1	1	1	1	1	1	1	1	1	1	1	1

Table WLD-15 (continued)
WILDLIFE SPECIES ASSOCIATED WITH SIX FOREST SUCCESSIONAL STAGES IN MONTANA
(A value of 1 in the successional stage indicates the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		-------Successional Stage[a]-----						-----DNRC Land Office-----					
Obs	Common Name	grass forb	seed-ling	pole	yng	mat	old growth	NWLO	SWLO	CLO	NELO	SLO	ELO
122	EVENING GROSBEAK	1	1	1	1	1	1	1	1	1	1	1	1
123	CASSIN'S FINCH	1	1	1	1	1	1	1	1	1	1	1	1
124	HOUSE FINCH	1	1	1	1	1	1	1	1	1	1	1	1
125	PINE GROSBEAK	0	0	1	1	1	1	1	1	1	1	1	1
126	COMMON REDPOLL	1	1	0	0	0	0	1	1	1	1	1	1
127	PINE SISKIN	1	1	1	1	1	1	1	1	1	1	1	1
128	RED CROSSBILL	0	0	0	1	1	1	1	1	1	1	1	1
129	WHITE-WINGED CROSSBILL	0	0	0	1	1	1	1	1	1	1	1	1
130	VESPER SPARROW	1	1	0	0	0	0	1	1	1	1	1	1
131	LARK SPARROW	1	1	0	0	0	0	1	1	1	1	1	1
132	DARK-EYED JUNCO	1	1	1	1	1	1	1	1	1	1	1	1
133	CHIPPING SPARROW	0	1	1	1	1	1	1	1	1	1	1	1
134	WHITE-THROATED SPARROW	1	1	1	1	1	1	1	1	1	1	1	1
135	MASKED SHREW	1	1	1	1	1	1	1	1	1	1	1	0
136	MERRIAM'S SHREW	1	1	0	0	0	0	0	0	0	1	1	1
137	VAGRANT SHREW	1	1	1	1	1	1	1	1	0	0	0	0
138	PREBLE'S SHREW	1	1	1	1	1	1	0	1	1	1	1	1
139	DWARF SHREW	1	1	1	1	1	1	0	0	1	1	1	1
140	PYGMY SHREW	0	0	1	1	1	1	1	0	0	1	0	0
141	CALIFORNIA MYOTIS	1	1	1	1	1	1	1	1	0	0	0	0
142	LONG-EARED MYOTIS	1	1	1	1	1	1	1	1	1	1	1	1
143	NORTHERN MYOTIS (KEEN'S)	1	1	1	1	1	1	0	0	0	0	0	1
144	LITTLE BROWN MYOTIS	1	1	0	0	1	1	1	1	1	1	1	1
145	WESTERN SMALL-FOOTED MYOTIS	1	1	0	0	1	1	0	0	1	0	1	1
146	LONG-LEGGED MYOTIS	1	1	0	0	1	1	1	1	1	1	1	1
147	YUMA MYOTIS	1	1	0	0	1	1	1	1	1	1	0	0
148	SILVER-HAIRED BAT	1	1	1	1	1	1	1	1	1	1	1	1
149	BIG BROWN BAT	1	1	0	0	1	1	1	1	1	1	1	1
150	HOARY BAT	1	1	1	1	1	1	1	1	1	1	1	1
151	TOWNSEND'S BIG-EARED BAT	1	1	1	1	0	0	1	1	1	1	1	1
152	PALLID BAT	1	1	0	0	1	1	0	0	0	0	1	0
153	BLACK BEAR	1	1	1	1	1	1	1	1	1	1	1	0
154	GRIZZLY BEAR	1	1	1	1	1	1	0	0	1	0	1	0
155	RACCOON	1	1	0	0	1	1	1	1	1	1	1	1
156	MARTEN	0	0	1	1	1	1	1	1	1	1	1	0
157	FISHER	0	0	1	1	1	1	1	1	1	0	0	0
158	ERMINE	1	1	1	1	1	1	1	1	1	1	1	1
159	LONG-TAILED WEASEL	1	1	1	1	1	1	1	1	1	1	1	1
160	WOLVERINE	1	1	1	1	1	1	1	1	1	1	1	0
161	BADGER	1	1	0	0	0	0	1	1	1	1	1	1
162	WESTERN SPOTTED SKUNK	1	1	1	0	0	0	0	1	1	0	0	0
163	STRIPED SKUNK	1	1	0	0	0	0	1	1	1	1	1	1
164	COYOTE	1	1	1	1	1	1	1	1	1	1	1	1
165	GRAY WOLF	1	1	1	1	1	1	1	0	1	1	0	0
166	RED FOX	1	1	1	1	1	1	1	1	1	1	1	1
167	MOUNTAIN LION	1	1	1	1	1	1	1	1	1	1	1	1
168	LYNX	1	1	1	1	1	1	1	1	1	1	1	0
169	BOBCAT	1	1	1	1	1	1	1	1	1	1	1	1
170	BLACK-TAILED PRAIRIE DOG	1	1	0	0	0	0	0	0	1	1	1	1
171	YELLOW-PINE CHIPMUNK	0	1	1	1	1	1	1	1	1	1	1	0
172	LEAST CHIPMUNK	1	1	0	0	0	0	1	1	1	1	1	1
173	RED-TAILED CHIPMUNK	1	1	1	1	1	1	1	1	1	0	0	0
174	UINTA CHIPMUNK	0	1	0	0	1	1	0	0	1	0	1	0
175	EASTERN GRAY SQUIRREL	0	0	0	0	1	1	0	0	1	1	0	1
176	EASTERN FOX SQUIRREL	0	0	0	0	1	1	0	1	1	0	1	1
177	RED SQUIRREL	0	0	1	1	1	1	1	1	1	1	1	1
178	NORTHERN FLYING SQUIRREL	0	0	1	1	1	1	1	1	1	0	1	0
179	WHITE-FOOTED MOUSE	1	1	1	1	1	1	0	0	0	1	1	1
180	BUSHY-TAILED WOODRAT	1	1	1	1	1	1	1	1	1	1	1	1
181	NORTHERN BOG LEMMING	1	1	1	0	0	0	1	1	1	0	0	0
182	HEATHER VOLE	1	1	0	0	0	0	1	1	1	1	1	0
183	SOUTHERN RED-BACKED VOLE	0	0	1	1	1	1	1	1	1	1	1	1

Table WLD-15 (continued)
WILDLIFE SPECIES ASSOCIATED WITH SIX FOREST SUCCESSIONAL STAGES IN MONTANA
(A value of 1 in the successional stage indicates the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		-------Successional Stage[a]-----						-----DNRC Land Office-----					
Obs	Common Name	grass forb	seed-ling	pole	yng	mat	old growth	NWLO	SWLO	CLO	NELO	SLO	ELO
184	MEADOW VOLE	1	0	0	0	0	0	1	1	1	1	1	1
185	LONG-TAILED VOLE	1	1	1	1	1	1	1	1	1	1	1	1
186	NORWAY RAT	0	1	1	0	0	0	1	1	1	1	0	1
187	HOUSE MOUSE	1	1	0	0	0	0	1	1	1	1	1	1
188	PORCUPINE	1	1	1	1	1	1	1	1	1	1	1	1
189	SNOWSHOE HARE	1	1	1	1	1	1	1	1	1	1	1	1
190	WAPITI OR ELK	1	1	1	1	1	1	1	1	1	1	1	0
191	MULE DEER	1	1	1	1	1	1	1	1	1	1	1	1
192	WHITE-TAILED DEER	1	1	1	1	1	1	1	1	1	1	1	1
193	MOOSE	1	1	1	1	1	1	1	1	1	1	1	0
194	WOODLAND CARIBOU	1	1	0	0	1	1	0	0	0	0	0	0
195	RUBBER BOA	1	1	1	1	1	1	1	1	1	0	1	0
196	RACER	1	1	0	0	0	0	1	1	1	1	1	1
197	PINE OR GOPHER SNAKE	1	1	1	1	1	1	1	1	1	1	1	1
198	MILK SNAKE	1	1	1	1	1	1	0	0	0	1	1	1
199	W. TERRESTRIAL GARTER SNAKE	1	1	1	1	1	1	1	1	1	1	1	1
200	WESTERN RATTLESNAKE	1	1	1	1	1	1	1	1	1	1	1	1
201	SAGEBRUSH LIZARD	1	1	1	1	1	1	0	0	1	0	1	1
202	SHORT-HORNED LIZARD	1	1	1	1	1	1	0	0	1	1	1	1
203	WESTERN SKINK	1	1	0	0	0	0	1	1	0	0	0	0
204	NORTHERN ALLIGATOR LIZARD	1	1	1	1	1	1	1	1	0	0	0	0
205	COEUR D'ALENE SALAMANDER (VD)	1	1	1	1	1	1	1	1	0	0	0	0
206	WOOD FROG	0	0	1	1	1	1	0	0	0	0	0	0

[a]Successional stages:
Grass/forb - plant community dominated by grasses and forbs.
Shrub/seedling - Plant community dominated by shrubs and/or tree seedlings (trees < 1 inch dbh).
Pole stand - Plant community dominated aby saplings and pole size trees (1-8.9 inches dbh).
Yng=young forest - Dominant trees are at least 9 inches dbh but have not reached maturity.
Mat=mature - Plant community dominated by mature, vigorous trees.
Old-growth -Plant community characterized by large dominant trees past maturity, showing decadence and with a significant component of dead trees.

Table WLD-16
WILDLIFE SPECIES ASSOCIATED WITH THREE FOREST CANOPY CLASSES IN MONTANA, BASED ON PERCENT CANOPY CLOSURE

(A value of 1 in the canopy class indicates that the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		---Canopy---			------DNRC Land Office------					
Obs	Common name	>70	30-70	<30	NWLO	SWLO	CLO	NELO	SLO	ELO
1	TURKEY VULTURE	0	1	1	1	1	1	1	1	1
2	COOPER'S HAWK	1	1	0	1	1	1	1	1	1
3	NORTHERN GOSHAWK	1	1	1	1	1	1	1	1	1
4	SHARP-SHINNED HAWK	1	1	1	1	1	1	1	1	1
5	RED-TAILED HAWK	1	1	1	1	1	1	1	1	1
6	ROUGH-LEGGED HAWK	0	0	1	1	1	1	1	1	1
7	FERRUGINOUS HAWK	0	0	1	1	1	1	1	1	1
8	SWAINSON'S HAWK	0	0	1	1	1	1	1	1	1
9	MERLIN	0	1	1	1	1	1	1	1	1
10	AMERICAN KESTREL	0	1	1	1	1	1	1	1	1
11	WILD TURKEY	0	1	1	1	1	1	1	1	1
12	BLUE GROUSE	0	1	1	1	1	1	1	1	0
13	SPRUCE GROUSE	1	1	1	1	1	1	0	0	0
14	RUFFED GROUSE	0	1	1	1	1	1	1	1	1
15	MOURNING DOVE	0	1	1	1	1	1	1	1	1
16	YELLOW-BILLED CUCKOO	1	0	0	1	1	1	1	1	1
17	BLACK-BILLED CUCKOO	1	0	0	1	1	1	1	1	1
18	WESTERN SCREECH-OWL	1	1	1	1	1	1	0	0	0
19	FLAMMULATED OWL	0	1	1	1	1	1	0	0	0
20	LONG-EARED OWL	1	0	0	1	1	1	1	1	1
21	GREAT GRAY OWL	1	1	1	1	1	1	1	1	0
22	NORTHERN PYGMY OWL	0	1	1	1	1	1	1	1	1
23	COMMON POORWILL	0	0	1	1	1	1	1	1	1
24	COMMON NIGHTHAWK	0	1	1	1	1	1	1	1	1
25	VAUX'S SWIFT	0	0	1	1	1	1	0	0	0
26	RUFOUS HUMMINGBIRD	0	0	1	1	1	1	1	1	0
27	NORTHERN FLICKER	0	1	1	1	1	1	1	1	1
28	PILEATED WOODPECKER	1	0	0	1	1	1	0	0	0
29	LEWIS' WOODPECKER	0	0	1	1	1	1	1	1	1
30	DOWNY WOODPECKER	0	1	1	1	1	1	1	1	1
31	HAIRY WOODPECKER	0	1	1	1	1	1	1	1	1
32	BLACK-BACKED WOODPECKER	0	1	1	1	1	1	0	1	1
33	WILLIAMSON'S SAPSUCKER	1	0	0	1	1	1	0	1	0
34	WESTERN KINGBIRD	0	0	1	1	1	1	1	1	1
35	CORDILLERAN FLYCATCHER	1	1	0	1	1	1	1	1	0
36	CASSIN'S KINGBIRD	0	1	1	0	0	0	1	1	1
37	HAMMOND'S FLYCATCHER	0	1	1	1	1	1	1	1	0
38	DUSKY FLYCATCHER	0	0	1	1	1	1	1	1	1
39	OLIVE-SIDED FLYCATCHER	0	1	1	1	1	1	1	1	1
40	WESTERN WOOD PEWEE	0	1	1	1	1	1	1	1	1
41	BARN SWALLOW	0	0	1	1	1	1	1	1	1
42	CLIFF SWALLOW	0	0	1	1	1	1	1	1	1
43	VIOLET-GREEN SWALLOW	0	0	1	1	1	1	1	1	1
44	TREE SWALLOW	0	0	1	1	1	1	1	1	1

Table WLD-16 (continued)
WILDLIFE SPECIES ASSOCIATED WITH THREE FOREST CANOPY CLASSES IN MONTANA, BASED ON PERCENT CANOPY CLOSURE
(A value of 1 in the canopy class indicates that the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		---Canopy---			------DNRC Land Office------					
Obs	Common name	>70	30-70	<30	NWLO	SWLO	CLO	NELO	SLO	ELO
45	BANK SWALLOW	0	0	1	1	1	1	1	1	1
46	ROUGH-WINGED SWALLOW	0	0	1	1	1	1	1	1	1
47	STELLER'S JAY	1	1	0	1	1	1	1	1	1
48	GRAY JAY	1	0	0	1	1	1	1	1	0
49	CLARK'S NUTCRACKER	1	1	1	1	1	1	1	1	1
50	COMMON RAVEN	0	0	1	1	1	1	1	1	1
51	MOUNTAIN CHICKADEE	0	1	1	1	1	1	1	1	0
52	CHESTNUT-BACKED CHICKADEE	1	1	0	1	1	1	0	0	0
53	RED-BREASTED NUTHATCH	1	1	0	1	1	1	1	1	1
54	WHITE-BREASTED NUTHATCH	0	1	1	1	1	1	1	1	1
55	BROWN CREEPER	1	0	0	1	1	1	1	1	1
56	WINTER WREN	1	0	0	1	1	1	1	1	1
57	AMERICAN ROBIN	0	1	1	1	1	1	1	1	1
58	VARIED THRUSH	1	0	0	1	1	1	1	1	0
59	TOWNSEND'S SOLITAIRE	0	1	1	1	1	1	1	1	1
60	VEERY	1	0	0	1	1	1	1	1	1
61	HERMIT THRUSH	0	1	1	1	1	1	1	1	1
62	SWAINSON'S THRUSH	1	0	0	1	1	1	1	1	1
63	MOUNTAIN BLUEBIRD	0	0	1	1	1	1	1	1	1
64	WESTERN BLUEBIRD	0	0	1	1	1	1	1	0	0
65	EASTERN BLUEBIRD	0	0	1	0	0	1	1	0	1
66	RUBY-CROWNED KINGLET	1	1	0	1	1	1	1	1	1
67	GOLDEN-CROWNED KINGLET	0	1	1	1	1	1	1	1	1
68	CEDAR WAXWING	0	0	1	1	1	1	1	1	1
69	NORTHERN SHRIKE	0	0	1	1	1	1	1	1	1
70	LOGGERHEAD SHRIKE	0	0	1	1	1	1	1	1	1
71	WARBLING VIREO	0	0	1	1	1	1	1	1	1
72	SOLITARY VIREO	1	1	0	1	1	1	1	1	1
73	ORANGE-CROWNED WARBLER	0	1	1	1	1	1	1	1	1
74	NASHVILLE WARBLER	0	1	1	1	1	1	1	1	1
75	YELLOW-RUMPED WARBLER	0	0	1	1	1	1	1	1	1
76	TOWNSEND'S WARBLER	1	1	0	1	1	1	1	1	1
77	MACGILLIVRAY'S WARBLER	0	0	1	1	1	1	1	1	1
78	WILSON'S WARBLER	1	1	0	1	1	1	1	1	1
79	COMMON YELLOWTHROAT	0	0	1	1	1	1	1	1	1
80	BREWER'S BLACKBIRD	0	0	1	1	1	1	1	1	1
81	BROWN-HEADED COWBIRD	0	0	1	1	1	1	1	1	1
82	ORCHARD ORIOLE	0	1	1	0	0	0	1	1	1
83	WESTERN TANAGER	1	1	0	1	1	1	1	1	1
84	BLACK-HEADED GROSBEAK	0	1	1	1	1	1	1	1	1
85	CASSIN'S FINCH	0	1	0	1	1	1	1	1	1
86	HOUSE FINCH	0	1	1	1	1	1	1	1	1
87	COMMON REDPOLL	0	1	1	1	1	1	1	1	1
88	RED CROSSBILL	1	1	0	1	1	1	1	1	1
89	WHITE-WINGED CROSSBILL	1	1	0	1	1	1	1	1	1
90	LARK SPARROW	0	0	1	1	1	1	1	1	1
91	DARK-EYED JUNCO	0	1	1	1	1	1	1	1	1

Table WLD-16 (continued)
WILDLIFE SPECIES ASSOCIATED WITH THREE FOREST CANOPY CLASSES IN MONTANA, BASED ON PERCENT CANOPY CLOSURE
(A value of 1 in the canopy class indicates that the species finds optimum feeding or breeding conditions in the class. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		---Canopy---			------DNRC Land Office------					
Obs	Common name	>70	30-70	<30	NWLO	SWLO	CLO	NELO	SLO	ELO
92	CHIPPING SPARROW	0	1	1	1	1	1	1	1	1
93	WHITE-THROATED SPARROW	0	1	1	1	1	1	1	1	1
94	PYGMY SHREW	0	0	1	1	0	0	1	0	0
95	LITTLE BROWN MYOTIS	1	1	1	1	1	1	1	1	1
96	LONG-LEGGED MYOTIS	1	1	1	1	1	1	1	1	1
97	SILVER-HAIRED BAT	1	1	1	1	1	1	1	1	1
98	BIG BROWN BAT	1	1	1	1	1	1	1	1	1
99	HOARY BAT	1	1	1	1	1	1	1	1	1
100	BLACK BEAR	1	1	1	1	1	1	1	1	0
101	GRIZZLY BEAR	1	1	1	0	0	1	0	1	0
102	MARTEN	1	1	0	1	1	1	1	1	0
103	FISHER	1	1	0	1	1	1	0	0	0
104	BADGER	0	0	1	1	1	1	1	1	1
105	WESTERN SPOTTED SKUNK	0	0	1	0	1	1	0	0	0
106	STRIPED SKUNK	0	0	1	1	1	1	1	1	1
107	COYOTE	1	1	1	1	1	1	1	1	1
108	GRAY WOLF	0	1	1	1	0	1	1	0	0
109	RED FOX	0	0	1	1	1	1	1	1	1
110	LYNX	1	1	1	1	1	1	1	1	0
111	BLACK-TAILED PRAIRIE DOG	0	0	1	0	0	1	1	1	1
112	YELLOW-PINE CHIPMUNK	0	1	1	1	1	1	1	1	0
113	LEAST CHIPMUNK	0	0	1	1	1	1	1	1	1
114	RED-TAILED CHIPMUNK	0	1	1	1	1	1	0	0	0
115	UINTA CHIPMUNK	0	1	1	0	0	1	0	1	0
116	EASTERN GRAY SQUIRREL	1	1	0	0	0	1	1	0	1
117	EASTERN FOX SQUIRREL	0	1	1	0	1	1	0	1	1
118	RED SQUIRREL	1	1	0	1	1	1	1	1	1
119	NORTHERN FLYING SQUIRREL	1	1	0	1	1	1	0	1	0
120	WHITE-FOOTED MOUSE	0	1	1	0	0	0	1	1	1
121	SOUTHERN RED-BACKED VOLE	1	1	0	1	1	1	1	1	1
122	MEADOW VOLE	0	0	1	1	1	1	1	1	1
123	EASTERN COTTONTAIL	0	1	1	0	0	0	0	0	1
124	WAPITI OR ELK	1	1	1	1	1	1	1	1	0
125	MULE DEER	0	1	1	1	1	1	1	1	1
126	WHITE-TAILED DEER	1	1	1	1	1	1	1	1	1
127	MOOSE	1	1	1	1	1	1	1	1	0
128	WOODLAND CARIBOU	0	1	1	0	0	0	0	0	0
129	RACER	0	1	1	1	1	1	1	1	1
130	PINE OR GOPHER SNAKE	0	1	1	1	1	1	1	1	1
131	SAGEBRUSH LIZARD	0	0	1	0	0	1	0	1	1
132	SHORT-HORNED LIZARD	0	0	1	0	0	1	1	1	1
133	NORTHERN ALLIGATOR LIZARD	0	1	1	1	1	0	0	0	0

Table WLD-17
WILDLIFE SPECIES DEPENDENT ON SNAGS TO MEET THEIR BREEDING AND FEEDING NEEDS.
(A value of 1 indicates presence, 0 absence, in the Land Office area. A value of 1 under Snags >15" indicates a species which depends on snags 15 inches dbh and larger; a 0 indicates an ability to use smaller snags.)

		-----DNRC Land Office----------						Snags
Obs	Common Name	NWLO	SWLO	CLO	NELO	SLO	ELO	>15"
1	DOUBLE-CRESTED CORMORANT	1	1	1	1	1	1	1
2	WOOD DUCK	1	1	1	1	1	1	1
3	BUFFLEHEAD	1	1	1	1	1	1	1
4	COMMON GOLDENEYE	1	1	1	1	1	1	1
5	BARROW'S GOLDENEYE	1	1	1	1	1	1	1
6	HOODED MERGANSER	1	1	1	1	1	1	1
7	COMMON MERGANSER	1	1	1	1	1	1	1
8	TURKEY VULTURE	1	1	1	1	1	1	0
9	BROAD-WINGED HAWK	1	0	1	1	1	1	0
10	BALD EAGLE	1	1	1	1	1	1	1
11	OSPREY	1	1	1	1	1	1	1
12	MERLIN	1	1	1	1	1	1	1
13	AMERICAN KESTREL	1	1	1	1	1	1	1
14	EASTERN SCREECH-OWL	0	0	1	1	1	1	1
15	WESTERN SCREECH-OWL	1	1	1	0	0	0	1
16	FLAMMULATED OWL	1	1	1	0	0	0	1
17	GREAT HORNED OWL	1	1	1	1	1	1	0
18	GREAT GRAY OWL	1	1	1	1	1	0	0
19	BARRED OWL	1	1	1	1	0	0	1
20	SAW-WHET OWL	1	1	1	1	1	1	1
21	BOREAL OWL	1	1	1	0	1	0	0
22	NORTHERN PYGMY OWL	1	1	1	1	1	1	1
23	CHIMNEY SWIFT	0	0	1	1	1	1	1
24	VAUX'S SWIFT	1	1	1	0	0	0	1
25	NORTHERN FLICKER	1	1	1	1	1	1	1
26	PILEATED WOODPECKER	1	1	1	0	0	0	1
27	RED-HEADED WOODPECKER	1	1	1	1	1	1	0
28	LEWIS' WOODPECKER	1	1	1	1	1	1	0
29	DOWNY WOODPECKER	1	1	1	1	1	1	0
30	HAIRY WOODPECKER	1	1	1	1	1	1	0
31	BLACK-BACKED WOODPECKER	1	1	1	0	1	1	0
32	THREE-TOED WOODPECKER	1	1	1	1	1	0	1
33	WILLIAMSON'S SAPSUCKER	1	1	1	0	1	0	0
34	YELLOW-BELLIED (R-NAP) SAPSUCKER	0	0	1	1	0	0	0
35	SAY'S PHOEBE	1	1	1	1	1	1	0
36	CORDILLERAN FLYCATCHER	1	1	1	1	1	0	0
37	VIOLET-GREEN SWALLOW	1	1	1	1	1	1	0
38	TREE SWALLOW	1	1	1	1	1	1	0
39	BLACK-CAPPED CHICKADEE	1	1	1	1	1	1	0
40	MOUNTAIN CHICKADEE	1	1	1	1	1	0	0
41	BOREAL CHICKADEE	1	1	1	0	0	0	0
42	CHESTNUT-BACKED CHICKADEE	1	1	1	0	0	0	0
43	RED-BREASTED NUTHATCH	1	1	1	1	1	1	0
44	WHITE-BREASTED NUTHATCH	1	1	1	1	1	1	0
45	PYGMY NUTHATCH	1	1	1	1	1	1	1

Table WLD-17 (continued)
WILDLIFE SPECIES DEPENDENT ON SNAGS TO MEET THEIR BREEDING AND FEEDING NEEDS.
(A value of 1 indicates presence, 0 absence, in the Land Office area. A value of 1 under Snags >15" indicates a species which depends on snags 15 inches dbh and larger; a 0 indicates an ability to use smaller snags.)

		--------DNRC Land Office-------						Snags
Obs	Common Name	NWLO	SWLO	CLO	NELO	SLO	ELO	>15"
46	BROWN CREEPER	1	1	1	1	1	1	0
47	HOUSE WREN	1	1	1	1	1	1	0
48	WINTER WREN	1	1	1	1	1	1	0
49	MOUNTAIN BLUEBIRD	1	1	1	1	1	1	0
50	WESTERN BLUEBIRD	1	1	1	1	0	0	0
51	EASTERN BLUEBIRD	0	0	1	1	0	1	0
52	EUROPEAN STARLING	1	1	1	1	1	1	0
53	HOUSE SPARROW	1	1	1	1	1	1	0
54	MASKED SHREW	1	1	1	1	1	0	0
55	CALIFORNIA MYOTIS	1	1	0	0	0	0	0
56	LONG-EARED MYOTIS	1	1	1	1	1	1	0
57	NORTHERN MYOTIS (KEEN'S)	0	0	0	0	0	1	0
58	LITTLE BROWN MYOTIS	1	1	1	1	1	1	0
59	WESTERN SMALL-FOOTED MYOTIS	0	0	1	0	1	1	0
60	LONG-LEGGED MYOTIS	1	1	1	1	1	1	0
61	SILVER-HAIRED BAT	1	1	1	1	1	1	0
62	BIG BROWN BAT	1	1	1	1	1	1	0
63	BLACK BEAR	1	1	1	1	1	0	0
64	RACCOON	1	1	1	1	1	1	1
65	MARTEN	1	1	1	1	1	0	1
66	FISHER	1	1	1	0	0	0	1
67	ERMINE	1	1	1	1	1	1	0
68	LONG-TAILED WEASEL	1	1	1	1	1	1	0
69	WESTERN SPOTTED SKUNK	0	1	1	0	0	0	0
70	STRIPED SKUNK	1	1	1	1	1	1	0
71	LYNX	1	1	1	1	1	0	0
72	LEAST CHIPMUNK	1	1	1	1	1	1	0
73	EASTERN GRAY SQUIRREL	0	0	1	1	0	1	0
74	EASTERN FOX SQUIRREL	0	1	1	0	1	1	1
75	RED SQUIRREL	1	1	1	1	1	1	0
76	NORTHERN FLYING SQUIRREL	1	1	1	0	1	0	0
77	WHITE-FOOTED MOUSE	0	0	0	1	1	1	0
78	PORCUPINE	1	1	1	1	1	1	0
79	MILK SNAKE	0	0	0	1	1	1	0

Table WLD-18
WILDLIFE SPECIES DEPENDENT ON DOWN WOODY DEBRIS (LOGS, STUMPS, ETC.) TO MEET THEIR BREEDING AND FEEDING NEEDS
(A value of 1 indicates presence, 0 absence, in the Land Office area.)

		--------DNRC Land Office-------					
Obs	Common Name	NWLO	SWLO	CLO	NELO	SLO	ELO
1	WESTERN CHORUS FROG	0	0	1	1	1	1
2	UINTA GROUND SQUIRREL	0	0	1	0	1	0
3	IDAHO POCKET GOPHER	0	0	1	0	0	0
4	HARLEQUIN DUCK	1	1	1	1	1	0
5	NORTHERN GOSHAWK	1	1	1	1	1	1
6	BLUE GROUSE	1	1	1	1	1	0
7	SPRUCE GROUSE	1	1	1	0	0	0
8	RUFFED GROUSE	1	1	1	1	1	1
9	CHUKAR	1	1	1	1	1	1
10	DIPPER	1	1	1	1	1	0
11	VEERY	1	1	1	1	1	1
12	SWAINSON'S THRUSH	1	1	1	1	1	1
13	BLACK-AND-WHITE WARBLER	1	0	1	1	1	1
14	NORTHERN WATERTHRUSH	1	1	1	1	1	1
15	DARK-EYED JUNCO	1	1	1	1	1	1
16	MERRIAM'S SHREW	0	0	0	1	1	1
17	WATER SHREW	1	1	1	1	1	0
18	VAGRANT SHREW	1	1	0	0	0	0
19	DWARF SHREW	0	0	1	1	1	1
20	PYGMY SHREW	1	0	0	1	0	0
21	GRIZZLY BEAR	0	0	1	0	1	0
22	LEAST WEASEL	0	0	1	1	1	1
23	MINK	1	1	1	1	1	1
24	RIVER OTTER	1	1	1	1	1	1
25	WOLVERINE	1	1	1	1	1	0
26	COYOTE	1	1	1	1	1	1
27	RED FOX	1	1	1	1	1	1
28	BOBCAT	1	1	1	1	1	1
29	YELLOW-PINE CHIPMUNK	1	1	1	1	1	0
30	RED-TAILED CHIPMUNK	1	1	1	0	0	0
31	UINTA CHIPMUNK	0	0	1	0	1	0
32	DEER MOUSE	1	1	1	1	1	1
33	BUSHY-TAILED WOODRAT	1	1	1	1	1	1
34	NORTHERN BOG LEMMING	1	1	1	0	0	0
35	HEATHER VOLE	1	1	1	1	1	0
36	SOUTHERN RED-BACKED VOLE	1	1	1	1	1	1
37	MONTANE VOLE	1	1	1	1	1	0
38	MEADOW VOLE	1	1	1	1	1	1
39	WATER VOLE (RICHARDSON'S)	1	1	1	1	1	0
40	WESTERN JUMPING MOUSE	1	1	1	1	1	0
41	SNOWSHOE HARE	1	1	1	1	1	1
42	EASTERN COTTONTAIL	0	0	0	0	0	1
43	SNAPPING TURTLE	1	0	0	1	1	1
44	PAINTED TURTLE	1	1	1	1	1	1
45	RUBBER BOA	1	1	1	0	1	0
46	WESTERN HOGNOSE SNAKE	0	0	1	1	1	1

Table WLD-18 (continued)
WILDLIFE SPECIES DEPENDENT ON DOWN WOODY DEBRIS (LOGS, STUMPS, ETC.) TO MEET THEIR BREEDING AND FEEDING NEEDS
(A value of 1 indicates presence, 0 absence, in the Land Office area.)

		--------DNRC Land Office-------					
Obs	Common Name	NWLO	SWLO	CLO	NELO	SLO	ELO
47	RACER	1	1	1	1	1	1
48	PINE OR GOPHER SNAKE	1	1	1	1	1	1
49	W. TERRESTRIAL GARTER SNAKE	1	1	1	1	1	1
50	PLAINS GARTER SNAKE	0	0	1	1	1	1
51	COMMON GARTER SNAKE	1	1	1	1	1	1
52	WESTERN RATTLESNAKE	1	1	1	1	1	1
53	SAGEBRUSH LIZARD	0	0	1	0	1	1
54	WESTERN SKINK	1	1	0	0	0	0
55	NORTHERN ALLIGATOR LIZARD	1	1	0	0	0	0
56	LONG-TOED SALAMANDER	1	1	1	0	0	0
57	TIGER SALAMANDER	0	0	0	0	0	0
58	IDAHO GIANT SALAMANDER	1	1	0	0	0	0
59	ROUGHSKIN NEWT	1	0	0	0	0	0
60	COEUR D'ALENE SALAMANDER (VD)	1	1	0	0	0	0
61	TAILED FROG	1	1	1	0	0	0
62	PACIFIC CHORUS FROG	1	1	0	0	0	0
63	WOOD FROG	0	0	0	0	0	0
64	WESTERN TOAD	1	1	1	1	1	0

Table WLD-19
WILDLIFE SPECIES SENSITIVE TO HUMAN DISTURBANCE

(These species may not be able to meet their breeding and feeding needs in suitable habitat when human use of the area exceeds their limit of tolerance. A value of 1 indicates presence, 0 absence, in the Land Office area.)

		---------DNRC Land Office------					
Obs	Common Name	NWLO	SWLO	CLO	NELO	SLO	ELO
1	WHITE PELICAN	1	1	1	1	1	1
2	DOUBLE-CRESTED CORMORANT	1	1	1	1	1	1
3	GREAT BLUE HERON	1	1	1	1	1	1
4	BLACK-CROWNED NIGHT HERON	1	1	1	1	1	1
5	TURKEY VULTURE	1	1	1	1	1	1
6	COOPER'S HAWK	1	1	1	1	1	1
7	NORTHERN GOSHAWK	1	1	1	1	1	1
8	SHARP-SHINNED HAWK	1	1	1	1	1	1
9	RED-TAILED HAWK	1	1	1	1	1	1
10	FERRUGINOUS HAWK	1	1	1	1	1	1
11	GOLDEN EAGLE	1	1	1	1	1	1
12	BALD EAGLE	1	1	1	1	1	1
13	OSPREY	1	1	1	1	1	1
14	PRAIRIE FALCON	1	1	1	1	1	1
15	PEREGRINE FALCON	1	1	1	1	1	1
16	AMERICAN KESTREL	1	1	1	1	1	1
17	WILD TURKEY	1	1	1	1	1	1
18	SAGE GROUSE	0	1	1	1	1	1
19	SANDHILL CRANE	1	1	1	1	1	1
20	MOUNTAIN PLOVER	1	1	1	1	1	1
21	LONG-BILLED CURLEW	1	1	1	1	1	1
22	PILEATED WOODPECKER	1	1	1	0	0	0
23	BLACK-BILLED MAGPIE	1	1	1	1	1	1
24	YUMA MYOTIS	1	1	1	1	0	0
25	TOWNSEND'S BIG-EARED BAT	1	1	1	1	1	1
26	BLACK BEAR	1	1	1	1	1	0
27	GRIZZLY BEAR	0	0	1	0	1	0
28	MARTEN	1	1	1	1	1	0
29	COYOTE	1	1	1	1	1	1
30	GRAY WOLF	1	0	1	1	0	0
31	RED FOX	1	1	1	1	1	1
32	MOUNTAIN LION	1	1	1	1	1	1
33	WAPITI OR ELK	1	1	1	1	1	0

Table WLD-20
MONTANA WILDLIFE SPECIES WITH NO LEGAL PROTECTION
(These species may be shot, trapped, or otherwise harvested without restriction. A value of 1 indicates presence, 0 absence, in the Land Office area.)

Obs	Common Name	State Protection	NWLO	SWLO	CLO	NELO	SLO	ELO
1	CORDILLERAN FLYCATCHER		1	1	1	1	1	0
2	NORTHERN CARDINAL		0	0	0	0	0	0
3	GRAY-CROWNED ROSY FINCH		1	0	1	0	0	0
4	MUTE SWAN	?	1	1	1	1	1	0
5	LONG-TOED SALAMANDER	NG	1	1	1	0	0	0
6	TIGER SALAMANDER	NG	0	0	0	0	0	0
7	COEUR D'ALENE SALAMANDER (VD)	NG	1	1	0	0	0	0
8	ROUGHSKIN NEWT	NG	1	0	0	0	0	0
9	IDAHO GIANT SALAMANDER	NG	1	1	0	0	0	0
0	TAILED FROG	NG	1	1	1	0	0	0
11	WESTERN TOAD	NG	1	1	1	1	1	0
12	GREAT PLAINS TOAD	NG	0	0	1	1	1	1
13	CANADIAN TOAD	NG	0	0	1	1	0	0
14	WOODHOUSE'S TOAD	NG	0	0	1	1	1	1
15	WESTERN CHORUS FROG	NG	0	0	1	1	1	1
16	PACIFIC CHORUS FROG	NG	1	1	0	0	0	0
17	PLAINS SPADEFOOT	NG	0	0	1	1	1	1
18	BULLFROG	NG	1	1	0	0	0	0
19	LEOPARD FROG	NG	1	1	1	1	1	1
20	SPOTTED FROG	NG	1	1	1	1	1	0
21	WOOD FROG	NG	0	0	0	0	0	0
22	MASKED SHREW	NG	1	1	1	1	1	0
23	PREBLE'S SHREW	NG	0	1	1	1	1	1
24	VAGRANT SHREW	NG	1	1	0	0	0	0
25	DWARF SHREW	NG	0	0	1	1	1	1
26	WATER SHREW	NG	1	1	1	1	1	0
27	MERRIAM'S SHREW	NG	0	0	0	1	1	1
28	PYGMY SHREW	NG	1	0	0	1	0	0
29	LITTLE BROWN MYOTIS	NG	1	1	1	1	1	1
30	YUMA MYOTIS	NG	1	1	1	1	0	0
31	LONG-EARED MYOTIS	NG	1	1	1	1	1	1
32	LONG-LEGGED MYOTIS	NG	1	1	1	1	1	1
33	CALIFORNIA MYOTIS	NG	1	1	0	0	0	0
34	WESTERN SMALL-FOOTED MYOTIS	NG	0	0	1	0	1	1
35	NORTHERN MYOTIS (KEEN'S)	NG	0	0	0	0	0	1
36	SILVER-HAIRED BAT	NG	1	1	1	1	1	1
37	BIG BROWN BAT	NG	1	1	1	1	1	1
38	HOARY BAT	NG	1	1	1	1	1	1
39	SPOTTED BAT	NG	0	0	0	0	1	1
40	TOWNSEND'S BIG-EARED BAT	NG	1	1	1	1	1	1
41	PALLID BAT	NG	0	0	0	0	1	0
42	PIKA	NG	1	1	1	1	1	0
43	EASTERN COTTONTAIL	NG	0	0	0	0	0	1
44	MOUNTAIN COTTONTAIL	NG	1	1	1	1	1	1
45	DESERT COTTONTAIL	NG	0	0	1	1	1	1

Table WLD-20(continued)
MONTANA WILDLIFE SPECIES WITH NO LEGAL PROTECTION
(These species may be shot, trapped, or otherwise harvested without restriction. A value of 1 indicates presence, 0 absence, in the Land Office area.)

Obs	Common Name	State Protection	NWLO	SWLO	CLO	NELO	SLO	ELO
46	SNOWSHOE HARE	NG	1	1	1	1	1	1
47	WHITE-TAILED JACK RABBIT	NG	1	1	1	1	1	1
48	BLACK-TAILED JACKRABBIT	NG	0	0	1	0	0	0
49	PYGMY RABBIT	NG	0	0	1	0	0	0
50	LEAST CHIPMUNK	NG	1	1	1	1	1	1
51	YELLOW-PINE CHIPMUNK	NG	1	1	1	1	1	0
52	RED-TAILED CHIPMUNK	NG	1	1	1	0	0	0
53	UINTA CHIPMUNK	NG	0	0	1	0	1	0
54	YELLOW-BELLIED MARMOT	NG	1	1	1	1	1	1
55	HOARY MARMOT	NG	1	1	1	0	0	0
56	RICHARDSON'S GROUND SQUIRREL	NG	0	0	1	1	1	1
57	UINTA GROUND SQUIRREL	NG	0	0	1	0	1	0
58	COLUMBIAN GROUND SQUIRREL	NG	1	1	1	0	0	0
59	THIRTEEN-LINED GROUND SQUIRREL	NG	0	0	1	1	1	1
60	GOLDEN-MANTLED GROUND SQUIRREL	NG	1	1	1	1	1	1
61	BLACK-TAILED PRAIRIE DOG	NG	0	0	1	1	1	1
62	WHITE-TAILED PRAIRIE DOG	NG	0	0	0	0	1	0
63	EASTERN GRAY SQUIRREL	NG	0	0	1	1	0	1
64	EASTERN FOX SQUIRREL	NG	0	1	1	0	1	1
65	RED SQUIRREL	NG	1	1	1	1	1	1
66	NORTHERN FLYING SQUIRREL	NG	1	1	1	0	1	0
67	NORTHERN POCKET GOPHER	NG	1	1	1	1	1	1
68	IDAHO POCKET GOPHER	NG	0	0	1	0	0	0
69	OLIVE-BACKED POCKET MOUSE	NG	0	0	0	1	1	1
70	GREAT BASIN POCKET MOUSE	NG	0	0	1	0	0	0
71	HISPID POCKET MOUSE	NG	0	0	0	0	0	1
72	ORD'S KANGAROO RAT	NG	0	0	0	1	1	1
73	WESTERN HARVEST MOUSE	NG	0	0	0	1	1	1
74	DEER MOUSE	NG	1	1	1	1	1	1
75	WHITE-FOOTED MOUSE	NG	0	0	0	1	1	1
76	NORTHERN GRASSHOPPER MOUSE	NG	1	0	1	1	1	1
77	BUSHY-TAILED WOODRAT	NG	1	1	1	1	1	1
78	SOUTHERN RED-BACKED VOLE	NG	1	1	1	1	1	1
79	HEATHER VOLE	NG	1	1	1	1	1	0
80	MEADOW VOLE	NG	1	1	1	1	1	1
81	MONTANE VOLE	NG	1	1	1	1	1	0
82	LONG-TAILED VOLE	NG	1	1	1	1	1	1
83	PRAIRIE VOLE	NG	0	0	1	1	1	1
84	WATER VOLE (RICHARDSON'S)	NG	1	1	1	1	1	0
85	SAGEBRUSH VOLE	NG	0	1	1	1	1	1
86	NORTHERN BOG LEMMING	NG	1	1	1	0	0	0
87	NORWAY RAT	NG	1	1	1	1	0	1
88	HOUSE MOUSE	NG	1	1	1	1	1	1
89	MEADOW JUMPING MOUSE	NG	0	0	0	0	0	1
90	WESTERN JUMPING MOUSE	NG	1	1	1	1	1	0
91	PORCUPINE	NG	1	1	1	1	1	1
92	RED FOX	NG	1	1	1	1	1	1
93	RACCOON	NG	1	1	1	1	1	1

Table WLD-20 (continued)
MONTANA WILDLIFE SPECIES WITH NO LEGAL PROTECTION
(These species may be shot, trapped, or otherwise harvested without restriction. A value of 1 indicates presence, 0 absence, in the Land Office area.)

Obs	Common Name	State Protection	NWLO	SWLO	CLO	NELO	SLO	ELO
94	BADGER	NG	1	1	1	1	1	1
95	SNAPPING TURTLE	NG	1	0	0	1	1	1
96	PAINTED TURTLE	NG	1	1	1	1	1	1
97	SPINY SOFTSHELL TURTLE	NG	0	0	0	1	1	1
98	NORTHERN ALLIGATOR LIZARD	NG	1	1	0	0	0	0
99	SHORT-HORNED LIZARD	NG	0	0	1	1	1	1
100	SAGEBRUSH LIZARD	NG	0	0	1	0	1	1
101	WESTERN SKINK	NG	1	1	0	0	0	0
102	RUBBER BOA	NG	1	1	1	0	1	0
103	RACER	NG	1	1	1	1	1	1
104	WESTERN HOGNOSE SNAKE	NG	0	0	1	1	1	1
105	MILK SNAKE	NG	0	0	0	1	1	1
106	PINE OR GOPHER SNAKE	NG	1	1	1	1	1	1
107	W. TERRESTRIAL GARTER SNAKE	NG	1	1	1	1	1	1
108	PLAINS GARTER SNAKE	NG	0	0	1	1	1	1
109	COMMON GARTER SNAKE	NG	1	1	1	1	1	1
110	WESTERN RATTLESNAKE	NG	1	1	1	1	1	1
111	ROCK DOVE	U	1	1	1	1	1	1
112	BLACK-BILLED MAGPIE	U	1	1	1	1	1	1
113	COMMON CROW	U	1	1	1	1	1	1
114	EUROPEAN STARLING	U	1	1	1	1	1	1
115	RED-WINGED BLACKBIRD	U	1	1	1	1	1	1
116	YELLOW-HEADED BLACKBIRD	U	1	1	1	1	1	1
117	RUSTY BLACKBIRD	U	1	1	1	1	1	1
118	BREWER'S BLACKBIRD	U	1	1	1	1	1	1
119	COYOTE	U	1	1	1	1	1	1
120	LEAST WEASEL	U	0	0	1	1	1	1
121	LONG-TAILED WEASEL	U	1	1	1	1	1	1
122	WESTERN SPOTTED SKUNK	U	0	1	1	0	0	0
123	STRIPED SKUNK	U	1	1	1	1	1	1

APPENDIX FSH

FISHERIES EFFECTS ASSESSMENT METHODOLOGY

The fisheries effects assessment was produced using a nonparametric ranking system which compared relative resource effects resulting from the primary variables impacting the fishery resource. Using the Resource Management Standards and the management scenarios developed for each alternative, the acting agents were ranked from 1-7 for each of the alternatives. In the event of a tied ranking, the next two rankings (in some cases there was a three-way tie) were averaged and assigned to each of the alternatives. For example, if alternatives Alpha and Beta were found to be tied for the second ranking behind Gamma, Gamma would receive a rank of '1' while Alpha and Beta would each receive a composite rank of '2.5' which reflects the second and third rank averaged (i.e. (2+3)/2 = 2.5). This procedure was used until all seven alternatives were assigned a rank. This ranking procedure was used to assess relative effects under each alternative.

The fisheries effects assessment was split into three impact components: sediment and nutrient loading, availability of large organic debris, and water temperature. Each of the impact components was analyzed based on variables expected to be affected under the Pan. The sediment and nutrient impacts were evaluated based on four sub-components: volume of timber harvested, percentage of area clearcut or seed tree cut, road density, and numbers of AUMs. The large organic debris (LOD) section was evaluated based on three sub-components: number of retention trees, amount of open roads, and SMZ width. The third segment, water temperature, was evaluated based on three sub-components: number of retention trees, SMZ width, and numbers of AUMs.

Following the ranking of sub-components by alternative, the sub-components were summed to give an overall score for the three main components (sediments and nutrients, LOD, and water temperature) for each alterative. These components were given a weighting factor to indicate their relative influence on fisheries. The weighting factors assigned were 0.4 for sediment and nutrients, 0.4 for LOD, and 0.2 for water temperature. Water temperature, though important, was determined to have a smaller potential to be affected by activities under the alternatives.

The following tables show our effects rankings by alternative and descriptor, including our estimates of sub-component rankings. Statewide high harvest levels were used.

Ranking for Sediment and Nutrients:

	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Omega
Timber Harvest	4	3	1	5	7	2	6
CC & ST	6.5	4	1	4	6.5	2	4
Road Density	5	3	1	6	7	2	4
# of AUMs	7	4.5	1	2.5	6	2.5	4.5
Total	22.5	14.5	4.0	17.5	26.5	8.5	18.5

Ranking for Large Organic Debris:

	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Omega
Retention Trees	3.5	3.5	1	6.5	6.5	3.5	3.5
Open Roads	5	3	1	6.5	6.5	2	4
SMZ Width	5	3	1	6.5	6.5	3	3
Total	13.5	9.5	3	19.5	19.5	8.5	10.5

Ranking for Water Temperature:

	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Omega
Retention Trees	3.5	3.5	1	6.5	6.5	3.5	3.5
Open Roads	5	3	1	6.5	6.5	2	4
# AUMs	7	4.5	1	2.5	6	2.5	4.5
Total	15.5	11	3	15.5	19	8	12

Overall Scoring for Main Components Multiplied by Weighting:

	Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Omega
Sediments & Nutrients	9	5.8	1.6	7	10.6	3.4	7.4
Large Organic Debris	5.4	3.8	1.2	7.8	7.8	3.4	4.2
Water Temperature	3.1	2.2	0.6	3.1	3.8	1.6	2.4
Total	17.5	11.8	3.4	17.9	22.2	8.4	14

Relative Ranking of Potential Impacts
(1 - lowest potential)

Alpha	Beta	Gamma	Delta	Epsilon	Zeta	Omega
5	3	1	6	7	2	4

APPENDIX ECN

ECONOMIC ASSESSMENT

In this Appendix, we present the logic, assumptions, and other documentation supporting our presentation in Chapters III and IV. The Appendix consists of the following three parts:

PART I:	School Funding from Forested Lands
PART II:	Net Present Value of Expected Revenues
PART III:	Impacts on the Regional Economy

PART I: SCHOOL FUNDING FROM FORESTED LANDS

References to the school trust fund should actually be plural as there are multiple trust funds, each tied to specific land ownerships and each having specific beneficiaries. By far the largest group designate the Common Schools (public schools) as beneficiary, with proceeds managed by the Office of the Superintendent of Public Instruction (OSPI).[1]

Trust income follows two main paths to reach its beneficiaries. Some is Distributable, which means the largest share is paid directly to beneficiaries; and some is non-distributable, which means the money is invested in the permanent Trust and Legacy Account, managed by the State Board of Investments. Most of the annual interest earned from Permanent Fund investments is paid directly to trust beneficiaries. It appears as the Trust and Legacy Interest component of Distributable income.

FORESTED LANDS SHARE OF DNRC CONTRIBUTIONS TO SCHOOL TRUSTS

Each year, DNRC's Central Management Division compiles an updated "Five-Year Comparison of Distributable and Nondistributable Income Earned on State Lands." This one-page summary displays dollar amounts in each subsidiary account of the Distributable and Nondistributable income categories.[2] The <u>Forested Lands Share</u> of DNRC's annual contributions to the school trust funds (displayed in Table III-E1 in Chapter III) was compiled as follows.

The Distributable component derived from <u>forested</u> lands is comprised of Grazing, Timber Sale, and Other revenues; Transactions Fees; and Trust and Legacy Interest. Based on estimates made by DNRC's Lands Division, about 2.5 percent of total grazing revenues are derived from forested lands. By definition, 100 percent of timber sale revenue comes from forested lands; and we estimate that 50 percent of revenues in the Other, and Transactions Fees categories are derived from forested lands. Our estimate that 31.5 percent of Trust and Legacy Interest is derived from forested lands is based on the fact that an annual average of 31.5 percent of Nondistributable earnings (the source of income for the T&L Account) come from forested lands.

The Nondistributable component is made up of revenues earned from Timber Sales, Rights-of-Way, sales of Sand and Gravel, and Miscellaneous sources. Again, 100 percent of timber sale

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1 Alan Christianson, Chief of DNRC's Administrative Support Bureau, estimates that 95 percent of distributable trust income is paid to OSPI (phone conversation, 9/27/94).

2 Table ECN- 1 is the 1994 update of DNRC's "Five-Year Comparison of Distributable and Nondistributable Income Earned on State Lands".

revenues are earned from forested lands, as is an estimated 50 percent of revenues from rights-of-way, sand and gravel, and miscellaneous sources.[3]

The forested lands share of DNRC contributions to the school trusts is taken as the sum of Distributable forest-land-derived income as a percentage of total Distributable income. We made computations for fiscal years 1992 through 1994 and averaged the results.

[3] Timber sale earnings from state trust lands whose designated beneficiaries are the State Industrial School (Pine Hills), the University of Montana, the School for the Deaf and Blind, Montana Tech, Montana State University, MSU-Morrill, Eastern Montana College, and Western Montana College are Nondistributable. That is, they are paid to the Trust and Legacy account for management by the State Board of Investments with subsequent interest earnings later paid to the benefiting institutions. All but 5 percent of timber sale earnings from other trust lands are Distributable and paid directly to the Office of the Superintendent of Public Instruction.

Table ECN- 1
DNRC FIVE-YEAR COMPARISON OF DISTRIBUTABLE AND NONDISTRIBUTABLE INCOME EARNED ON STATE LANDS
(Dollars)

Distributable

	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994
Grazing	4,133,290	4,397,372	4,341,521	4,178,056	4,264,030
Ag. Rentals	7,350,754	7,561,710	8,703,800	7,660,483	9,486,264
Oil & Gas Leases	1,561,866	1,255,508	974,390	882,720	1,086,708
Oil & Gas Penalties	712,388	520,859	390,309	242,082	218,941
	225,303	298,907	57,518	123,212	498,875
Oil & Gas Bonus			2,422,419[4]	3,074,174	3,769,170
Timber Sales	16,551	11,281	10,554	7,892	5,450
Interest on CP's	23,423,134	25,837,210	26,683,372	30,154,986	25,212,411
T & L Interest	291,723	388,731	535,202	780,375	880,018
Other Revenues	174,195	140,223	135,605	170,426	178,308
Transaction Fees					
Total Distrib. Income	37,889,204	40,411,801	44,254,690	47,274,406	45,600,175

Nondistributable

	FY 1990	FY 1991	FY 1992	FY 1993	FY 1994
Install. on Land Sales	52,481	46,052	33,434	39,664	17,542
5% of Annual School Interest Income	1,826,685	1,887,657	2,085,059	2,193,351	2,154,925
Timber Sales	6,642,118	4,080,226	4,038,261	1,488,558	1,938,947
Rights-of-Way	105,350	111,059	100,704	96,002	87,021
Oil Royalties	2,597,544	3,027,647	2,556,997	2,251,402	1,669,113
Gas Royalties	1,115,172	864,965	832,843	841,818	754,417
Coal Royalties	2,302,504	1,576,105	1,489,909	1,726,767	3,632,514
Sand & Gravel	108,725	165,334	164,465	99,470	157,564
Miscellaneous	39,659	52,596	122,959	140,765	168,213
Ttl. Nondistrib. Income	14,790,238	11,811,641	11,424,631	8,877,797	10,580,256

[4] Timber Sales for the Common School Trust from 1/1/92 - 6/30/94 were distributed to OSPI.

DNRC SHARE OF TOTAL SCHOOL TRUST CONTRIBUTIONS

The Office of Public Instruction maintains a record of income and expenditures for the Public School Equalization Aid Account (Table ECN- 2). DNRC contributions appear as the Common School I&I entry. We computed the DNRC share as the Common School I&I amount divided by the total for all contributions, for fiscal years 1992 through 1994.

Table ECN- 2
PUBLIC SCHOOL EQUALIZATION AID ACCOUNT (02403)[5]

Source	FY 1991	FY 1992	FY 1993
Beginning Balance	24,760,394	8,529,077	2,551,627
STATE EQUALIZATION			
Individual Income Tax	115,933,687	92,880,426	101,544,521
Corporate License Tax	17,841,427	15,982,988	18,697,338
Coal Severance Tax	5,752,194	6,169,009	4,044,872
Common School I & I	35,865,505	39,616,168	41,673,746
U.S. Mineral Royalties	21,928,394	21,150,278	21,799,728
Ed Trst/Loc Impact Int	176,629	108,285	92,881
Education Trust Transfer	0	0	0
Coal Trust Interest	7,037,440	7,060,263	7,475,242
Lottery Revenue	4,200,337	5,493,509	8,061,582
STIP	141,131	11	37,703
Local Impact Reversion	1,091	699,885	2,487,344
CTLP Reversion	0	3,770	0
40 Mill Statewide Levy	56,993,455	76,612,406	73,857,657
55 Mill Levy	71,040,641	72,277,592	134,154,928
County Fund Surplus	14,414,814	9,868,668	(754,209)
General Fund Appropriation	0	12,100,000	0
Total	351,326,747	360,023,259	413,173,333
EXPENDITURES			
Foundation/Direct State Aid	322,015,455	316,010,821	354,651,024
Guaranteed Tax Base Aid	45,146,997	45,752,351	45,961,049
Transportation	0	3,908,166	3,914,457
School Facility Reimbursements	0	0	0
Tax Increment Districts	195,603	17,832	7,553
Bonus Payments	255,000	183,750	213,874
Telecommunications	0	147,466	152,850
Dept. of Commerce Audit	0	0	166,500
Prior Year Expenditures	0	(19,679)	(48,126)
HB 667 MAEFAIRS	0	0	0
SIMMS Grant	0	0	0
Total	367,613,055	366,000,708	405,019,180
Ending Fund Balance	8,474,085 (54,992)	2,551,628	10,705,780

[5] Source: Office of Public Instruction, 7/19/94

FUTURE DNRC CONTRIBUTIONS

We have no way of knowing how revenues other than those derived from forested state lands will change in the future. However, for the purpose of comparison of our alternatives, we can assume that all other sources of school funding will remain constant for the next twenty-five years. This will certainly not be true, but for comparison purposes only, it is a legitimate assumption.

Table IV-E17 (Net Present Value of Remaining Timber Asset Value under These Sets of Assumptions) tells us the range of expected future annual forested land earnings under each of the seven alternatives. Earnings are displayed for high and low output levels, for each of three assumptions regarding future output prices. Dividing the annualized equivalent of these estimated future earnings by average total school funding (with Trust & Legacy interest removed) for the most recent past three years gives us the percentage shares expected to derive from forested state lands.[6]

Table ECN- 3 shows us the results of those computations. Under our baseline price assumptions, the forested lands share of total school funding each year would range from a high of 2.7 percent under the Epsilon high output level, to a low of negative 0.2 percent under the Gamma low output level.[7] [8]

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6 Computation of average total school funding:

	FY 92	FY 93	FY 94	
$ TOTAL	$360,023,259	$413,173,333	$411,682,300	
INFLTN ADJ	$389,173,723	$431,499,570	$411,682,300	(PPI-All Commod)
THREE-YEAR AVERAGE	$410,785,198			
T&L INTEREST	$28,516,265	COMPUTATION BASE: $283,268,933		

7 We assume that "negative" contributions would simply mean zero contribution from forested state lands. We would not expect to withdraw money from the School Equalization Account.

8 In Chapter IV (Table IV-EC1), these numbers are reported as if T&L interest had been included, to make them comparable with recent DNRC forest land contributions of just under three percent per year.

Table ECN- 3
DNRC FORESTED LANDS SHARE OF TOTAL SCHOOL FUNDING

Total School Funding: $382,269 (not including T&L interest)

High Output Levels	Recent Past	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Baseline	6550	7570	6786	1923	8963	10303	4455	9563
%-no T&L	1.7	2.0	1.8	0.5	2.3	2.7	1.2	2.5
%-Adj for T&L	2.8	3.3	2.9	0.8	3.9	4.4	1.9	4.1
Leased Rec @ $1.59	6550	7583	6806	1949	9001	10316	4544	9582
%-no T&L	1.7	2.0	1.8	0.5	2.4	2.7	1.2	2.5
%-Adj for T&L	2.8	3.3	2.9	0.8	3.9	4.4	2.0	4.1
Timber Trend @	6550	9200	8216	2351	10793	12534	5283	11593
2.6%/yr	1.7	2.4	2.1	0.6	2.8	3.3	1.4	3.0
%-no T&L	2.8	4.0	3.5	1.0	4.7	5.4	2.3	5.0
%-Adj for T&L								

Low Output Levels	Recent Past	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Baseline	6550	1590	585	-890	630	4398	36	3361
%-no T&L	1.7	0.4	0.2	-0.2	0.2	1.2	0.0	0.9
%-Adj for T&L	2.8	0.7	0.3	-0.4	0.3	1.9	0.0	1.4
Leased Rec @ $1.59	6550	1594	591	-881	642	4402	66	3368
%-no T&L	1.7	0.4	0.2	-0.2	0.2	1.2	0.0	0.9
%-Adj for T&L	2.8	0.7	0.3	-0.4	0.3	1.9	0.0	1.5
Timber Trend @	6550	2405	1199	-676	1244	5814	450	4577
2.6%/yr	1.7	0.6	0.3	-0.2	0.3	1.5	0.1	1.2
%-no T&L	2.8	1.0	0.5	-0.3	0.5	2.5	0.2	2.0
%-Adj for T&L								

* WITH TRUST AND LEGACY INTEREST DEDUCTED. (We must remove the T&L interest component from the calculations in order to make meaningful comparisons between our known past figures and our estimated future figures.)

PART II: NET PRESENT VALUE OF EXPECTED REVENUES

In this section, we present the background necessary to understand how we arrived at estimated net present value equivalents of the future cost and revenue streams associated with each alternative. Part II is organized as follows:

I. USE LEVELS AND TRENDS
Documentation of reasoning, assumptions, and data that led us to current use levels, trends, and estimated future use levels for grazing, recreation, and timber.

II. COST ASSUMPTIONS
Explanation for our cost assumptions and our methodology for building costs into NPV calculations.

III. REVENUE ASSUMPTIONS
Explanation of revenue assumptions for grazing, recreation, and timber for both baseline and alternative levels.

IV. COMPUTATIONS
Discussion of computation parameters and sensitivity analysis.

I. USE LEVELS AND TRENDS

In this sub-section, we provide the background needed to understand how we arrived at projected future use levels under each alternative. Because of the length and complexity of the discussion, particularly with respect to recreation use, the material is further divided into separate sections on Grazing, Recreation, and Timber.

Grazing

Kevin Chappell, Agriculture and Grazing Management Bureau Chief, and Garry Williams, Central Land Office Forest and Lands Program Manager, interpreted the philosophy, specific intent, and resource management standards associated with each alternative to arrive at estimated future grazing levels on forested trust lands. Their estimates and supporting reasoning are presented in the Appendix SCN. The Table G-2 Grazing Use Schedule is based on these estimates with the classified Forest lands component expanded to give a high/low range of 50 percent above and 50 percent below the base levels.

The scenario estimates assumed each alternative was fully implemented. In reality, there would be a gradual adjustment from current use levels to the full-implementation level of any alternative. We assumed that the adjustment would take place at a rate of 1000 AUMs per year until the new level was reached, with use levels remaining constant thereafter, for the rest of the twenty-five year planning period. We structured the computations as if use levels remained constant for each five-year period then took a sudden jump to the next five-year level, and so forth.

Finally, in order to create a range of plausible High and Low levels of grazing use, we expanded the above use estimates to a range of High values, 50 percent above the core estimates, and a range of Low values, 50 percent below the core estimates. Table ECN- 4 shows the resulting schedule of AUMs on forested lands.

Table ECN- 4
ESTIMATED GRAZING USE SCHEDULE
(Max. adjustment from 1995 level = 1000 AUM/yr)

SCENARIO		1995	2000	2005	2010	2015	2020
HIGH	ALPHA	26,776	30,765	34,753	34,753	34,753	34,753
	BETA	26,776	26,577	26,377	26,377	26,377	26,377
	GAMMA	26,776	24,782	22,788	22,788	22,788	22,788
	DELTA	26,776	24,896	23,016	23,016	23,016	23,016
	EPSILON	26,776	27,175	27,574	27,574	27,574	27,574
	ZETA	26,776	24,896	23,016	23,016	23,016	23,016
	OMEGA	26,776	26,577	26,377	26,377	26,377	26,377
LOW	ALPHA	26,776	22,788	18,799	18,799	18,799	18,799
	BETA	26,776	21,392	16,007	16,007	16,007	16,007
	GAMMA	26,776	21,776	16,776	14,811	14,811	14,811
	DELTA	26,776	21,776	16,776	13,444	13,444	13,444
	EPSILON	26,776	21,591	16,406	16,406	16,406	16,406
	ZETA	26,776	21,776	16,776	13,444	13,444	13,444
	OMEGA	26,776	21,392	16,007	16,007	16,007	16,007

Recreation

Estimating the environmental and economic effects of recreation management under each alternative presented the challenge of predicting future recreation use levels and potential revenues on school trust lands in the absence of:

1) a well-developed current recreation program with known patterns of use;
2) data on current levels of dispersed recreation use on trust lands;
3) research studies on future participation rates in Montana as a whole, or on state lands in particular; and
4) research or experience-based estimates of prices and revenue collection mechanisms applicable to dispersed recreation use of state lands.

We confronted this assessment challenge through the following procedural steps:

Framing the Problem

1) Grouping types of recreation whose environmental effects are of a similar kind and which lend themselves to a similar means of fee collection.
2) Developing impact profiles that characterize the probable kinds of environmental effects caused by activities in each group.

Estimating Current Recreation Use

1) Developed site recreation.
2) Dispersed recreation.

Predicting Future Use

1) Studying national and regional trends to arrive at baseline growth trends for use in this analysis.
2) Adapting baseline trends for each activity group to reflect the philosophy of each alternative.
3) Combining estimated current use and estimated growth trends to calculate future use levels for each group, under each fully-implemented alternative.

Dispersed Leasing

1) Estimate the current share of recreation use in each activity group that is sold under dispersed recreation leases.
2) Predict future shares of activity levels to be sold under dispersed-use leases.

Adjustment Schedule

1) Predict the schedule of adjustment from current use levels to fully-implemented recreation use levels for each activity group, under each alternative.

Estimating Prices

1) Estimating average current prices charged by DNRC for those activities being marketed.
2) Estimating current market prices for each activity group.
3) Predicting future prices collected by DNRC. In some cases, this includes estimating the rate at which DNRC prices will approach market prices.
4) Predicting future selling prices of recreation offered under dispersed use leases.

Computing Total Present Value

1) Use the above schedules of predicted use levels and predicted prices, by activity group, time period, and alternative, to calculate future revenues.
2) Discount and add predicted future revenues to arrive at total present value of recreation sales under each alternative.

The problems of estimating prices and computing total present value are described in later sections. The remaining steps are discussed here.

Framing the Problem

Our first step was to develop a recreation classification scheme that allows us to:

1) minimize the number of use categories to keep effects assessment manageable;
2) correlate each category with a fee collection system that works the same for all activities in the category; and
3) correlate each category with the types of environmental impacts associated with those uses.

We approached this problem by first identifying the following seven impacts of recreation use and their resulting environmental effects.

Recreation Impact Parameters

A) Road Construction and Maintenance: Erosion, De-vegetation, Temporary Human Disturbance, Increased Water Yield, Habitat Fragmentation.
B) Road Use: Erosion, Human Disturbance.
C) Trail Construction and Maintenance: Minor Erosion, Temporary Human Disturbance.
D) Trail Use: Erosion, Human Disturbance.
E) Site Use: Compaction, Erosion, De-vegetation, Human Disturbance, Sewage and Garbage, Riparian Damage.
F) Sewage and Garbage: Wildlife Population Sinks, Health Hazard, Visual Pollution.
G) Riparian Damage: Compaction, Erosion, De-vegetation.

Then, we created a matrix that described the extent of each impact for three classes of recreation use, shown in Table ECN- 5.

Table ECN- 5
RECREATION EFFECTS MATRIX

IMPACTS	I	II	III
ROAD MAINT. & CONSTRUCTION A	More than ½ mile new. Maint. more than once yearly for recreation.	Up to ½ mile new. Maint. avg. ½ to 1 time/yr. for recreation.	No new roads. No additional maint. for recreation.
ROAD USE B	Open full season, daily use. Access & connected pleasure driving.	Seasonal closures. Use on 50% of days when open.	Seasonal closures. Non-motorized use, or pleasure driving w/o leaving vehicles.
TRAIL MAINT. & CONSTRUCTION C	Dense network of short trails around developed sites.	New trails of 1 to 3 miles to reach popular destinations.	Maintain existing trails, 3 to 10 miles connecting with other ownerships.
TRAIL USE D	Daily use during season.	Use on 50% of days during season.	Intermittent use spaced by long quiet periods.
SITE USE E	All use within 1/4 mile of site. Effects may last 10 yrs. or more.	Use concentrated within 3 miles of entry point and along road and trail corridors.	Use dispersed along road and trail corridors.
SEWAGE AND GARBAGE F	Must be removed or processed at least once weekly.	Removal or processing as needed, several times per season.	User-managed. Occasional agency cleanup (every few years).
RIPARIAN DAMAGE G	Need use control and engineered facilities to protect from long lasting damage.	Concentrated at access points. Noticeable but likely to heal in 5 to 7 years of non-use.	Small campsites, stream crossings. Not always noticeable. Would heal in 1 to 3 years of non-use.

Next, we assigned a numeric rating to most of the recreation activities listed in An Analysis of the Outdoor Recreation and Wilderness Situation in the United States: 1989-2040 (Cordell, et. al, 1990). The rating was compiled by assigning each activity the description of Level I, II, or III in the matrix, for each of the seven Impact Parameters, then averaging the seven numbers. This gave each activity a rating between a minimum of 1.0 (Level I) and 3.0 (Level III). Examination of the results led to the following groupings of activities: average scores less than 1.5 (Group I), between 1.5 and 2.5 (Group II), and greater than 2.5 (Group III). The overall average activity rating for Group I was 1.13; for Group II, 2.21; and for Group III, 2.69. We then selected those activities from Cordell (1990) that are likely to occur on Montana's forested state lands and listed them in Groups I, II, and III. Examination of the results prompted us to move several activities from Group II to Group III. The final grouping is as follows:

Recreation Use Groupings

GROUP I
VISITING MUSEUMS, HISTORIC SITES, OR INFORMATION CENTERS
CAMPING IN DEVELOPED CAMPGROUNDS
DOWNHILL SKIING
ORGANIZATION CAMPS
HOME SITES AND CABINSITES
COMMERCIAL LODGES

GROUP II
CAMPING IN PRIMITIVE CAMPGROUNDS
BICYCLE RIDING
PICNICKING
COMMUNITY RECREATION SITES
HUNTING
COMMERCIAL OUTFITTER LICENSES
FISHING
FISHING ACCESS SITES
HORSEBACK RIDING
SHOOTING SPORT SITES
COLLECTING FIREWOOD
VISITING PREHISTORIC SITES
DRIVING VEHICLES OR MOTORCYCLES OFF-ROAD
SNOWMOBILING

GROUP III
WILDLIFE OBSERVATION, PHOTOGRAPHY, AND NATURE STUDY
WALKING, RUNNING
DAY HIKING
BACKPACKING
COLLECTING BERRIES OR MUSHROOMS
CANOEING, KAYAKING, OR RAFTING
CROSS-COUNTRY SKIING AND SNOWSHOEING
DRIVING FOR PLEASURE AND SIGHTSEEING

We wrote Impact Profiles which described the nature of environmental impacts associated with each Group. These profiles are included in the Appendix SCN and used by resource specialists in their analyses.

Because of their relatively intense site development and geographically compact nature, Group I activities were best suited for a user fee collection mechanism. We assumed that revenue from Group I uses would come through lease fees, or their equivalent in on-site collections. Groups II and III had somewhat different environmental impacts, but both were best suited for fee collection through an area use permit such as our existing Recreation Use License. We assumed that such a fee collection mechanism would be used for Groups II and III.

This recreation use classification scheme met our objectives of:

1) minimizing the number of use categories;
2) correlating each category with a fee collection system; and
3) correlating each category with associated environmental impacts.

Later, we added Group IV, non-recreation special uses, and Group V, dispersed recreation leases. Both of these groups would use a Group I leasing fee collection mechanism.

Estimating Current Recreation Use

Developed Recreation Use: We have taken current developed recreation use as the total number of active leases that represent uses included in, or similar to, those included in Groups I and IV.[9]

Group IV is included here for convenience. It includes "Non-Recreation Special Leases" which cover a mixture of activities (electronics sites, parking lots, government or community use sites) whose environmental impacts and fee collection mechanisms make them similar to Group I type uses. The present value of accumulated revenue from Group IV uses is minor, in the range of one to two percent of the total from all "recreation" uses.

Dispersed Recreation Use: Dispersed recreation use estimates were based on three independent sources:

1) USFS RIM data, pro-rated on a per-acre basis using National Forests geographically closest to each Land Office (All);

2) BLM data, pro-rated in the same manner as USFS data (CLO, SLO, ELO, NELO); and

3) direct estimates by Area Managers (SWLO, CLO, SLO, ELO).

Area Manager Estimates: Unadjusted Area Manager estimates ranged from one percent to 56 percent of USFS estimates for all Land Offices, not including the Northwest Land Office. We had intended to assume NWLO dispersed recreation use was about 70 percent of the USFS level. However, numbers derived in that way were dramatically higher than Area Manager estimates for the other Land Offices.

We believed NWLO use could be substantially higher because of the scenic beauty of that area, the fact that we have more consolidated ownership there than in most other areas of the state (Swan Forest, Coal Creek Forest, and Stillwater Forest), and the related fact that there are fewer access limitations here than in other parts of the state. In our first round of estimates, we set NWLO use at 56 percent of USFS use on surrounding lands. The choice to use 56 percent was based on the highest percentage of USFS use reported by any other field unit (SLO).

9 The estimates are based on data from a PFS computer file called "FDLEAS94.PFS", maintained by Jan Sayles of the DNRC Trust Land Management Division in Missoula. Data are printed in an unpublished report called "1994 Forestry Leases and Licenses", referenced as File Page 1795 in the Project Record. Interpretive notes and calculations are found in File Pages 1796-1799 of the Project Record.

Subsequently, when the SLO figures were judged too high, we settled on 50 percent as a reasonable share of USFS use for the NWLO.

Area Manager estimates showed fishing use on SWLO and CLO to be zero. This seemed inconsistent with our land ownership pattern, which includes some fishing access sites and some proximity to popular fishing streams. For assessment purposes, we adjusted the Area Manager estimates of fishing use by assuming SWLO and CLO have 0.5 user days per forty acres per year.

In another adjustment, we assumed SLO to have 1.29 user days per forty acres per year of use gathering forest products (berries, mushrooms, etc.). This is the same as the highest use reported by any other Land Office for this category, and substantially lower than the 13.61 figure resulting from the Area Manager estimate. We used BLM data as a basis for guiding our adjustments for all Areas except the NWLO.

Fraction of USFS Estimates: Even after the adjustments noted, the Area Manager estimates had inconsistencies between land offices and between uses that were hard to explain. For example, estimated snowmobiling use in the SLO was forty-one times higher than in the SWLO while estimated bicycling use between the two Areas was nearly identical. Total estimated use in the more heavily forested and more densely populated SWLO was only 62 percent as great as in the NWLO.

A second approach to estimating was to observe the proportional relationship between Area Manager estimates and USFS estimates in each Area. Using those observed proportion (plus our knowledge of land ownership patterns, population density, accessibility, and character of the land) we arrived at estimates of use in each Area as a percentage of reported USFS use in nearby National Forests.

While USFS recreation use differed substantially from recreation use on state trust lands, this method still offered some distinct advantages. First, USFS data has been systematically collected for many years so, even though reliability varies from one Ranger District to another, the data base is large enough that the pattern of relative use estimates between different activities is probably more reliable than the relative use pattern based on our own one-time subjective estimates. The USFS data represents a bigger perspective, taken by many more estimators, over a much longer period of time.

Second, by using our own Area Manager estimates as a basis for developing adjustment factors for each Area, we are customizing the USFS data to more realistically represent our management situation, while still taking advantage of a larger and longer recreation use sample.

Final Estimates: We considered Garry Williams, of the CLO staff, to be the most appropriate member of our planning team for checking the above two sets of computations. Based on his experience and knowledge of field conditions, he recommended adopting the Area Manager estimates, with modifications. The following adjustments were agreed upon:

1) The SLO figures looked unreasonably high so we decided to replace them with an average figure for use on the CLO, NELO, and ELO.

2) Garry agreed that there should be some fishing use reported for the CLO and SWLO but our first estimate seemed a little high. We settled on 0.25 user days per 40 acres per year as a reasonable estimate.

3) The Area Manager hunting estimate for the CLO also seemed too high. It would be the equivalent of three hunters per day on each section of forested land, throughout the CLO. We agreed that 20 percent of estimated USFS use was a more reasonable approximation and decided to proceed with that figure.

The resulting final estimates for each type of Group II and Group III use are reported in Tables ECN-6 and ECN-7.

Table ECN- 6
CURRENT LEVELS OF DISPERSED RECREATION USE (GROUP II - FINAL)

LAND OFFICE	Motorcycle / Scooter	Snow-mobile	Bicycling	Hunting	Fishing	Gathering Products	TOTAL GROUP II
NWLO[10] 299,788[11]	1.35 10,118	1.60 11,992	0.55 4,122	2.10 15,739	4.70 35,225	1.15 8,619	11.45 85,815
SWLO 163,329	0.05 204	0.07 286	0.11 449	1.37 5,594	0.25 1,021	0.05 204	1.90 7,758
CLO 105,308	0.08 211	0.26 685	0.05 132	1.70 4,476	0.25 658	0.26 685	2.60 6,847
SLO 37,242	0.04 37	0.11 102	0.03 28	1.35 1,257	0.08 74	0.11 102	1.72 1,600
NELO 37,242	0.04 37	0.07 65	0.05 47	1.91 1,778	0.00 0	0.06 56	2.13 1,983
ELO 18,621	0.00 0	0.00 0	0.00 0	0.45 209	0.00 0	0.00 0	0.45 209

[10] Expressed as user days per 40 acres per year.

[11] Acres in Land Office that qualify for Plan jurisdiction with associated use levels in total user days per year.

Table ECN- 7
CURRENT LEVELS OF DISPERSED RECREATION USE (GROUP III - FINAL)

LAND OFFICE	Driving and View. Scenery	Hiking	X-C Skiing & Snowshoeing	Non-Consump. Wildlife Use	TOTAL GROUP III
NWLO 299,788	17.20 128,909	3.70 27,730	0.75 5,621	0.65 4,872	22.30 167,132
SWLO 163,329	0.49 2,001	0.33 1,347	0.19 776	0.37 1,511	1.38 5,635
CLO 105,308	1.16 3,054	0.38 1,000	0.08 211	0.24 632	1.86 4,897
SLO 37,242	0.55 512	0.22 205	0.05 47	0.19 177	1.01 941
NELO 37,242	0.48 447	0.24 223	0.07 65	0.29 270	1.08 1,005
ELO 18,621	0.00 0	0.03 14	0.01 5	0.03 14	0.07 33

Discussion of Our Estimates: While these estimates were very rough to begin with, and our assumptions and adjustments were equally rough, we accepted that the resulting use levels were suitable for a programmatic level assessment of environmental and economic effects.

Because we estimated effects for groups of similar types of use, rather than for individual uses, poor estimates for any single activity were partly compensated for by clustering multiple activities in each group. That is, overestimating some activities would be offset by underestimating others.

Also, once we projected future use levels for each group, (under each alternative), we bracketed our effects assessment between a low level of use equal to one-half the projected baseline estimate, and a high level at fifty-percent above the projected baseline.

We used a careful, informed estimating procedure which used several independent sources for checking our own estimates against reported use on lands administered by other agencies. Also, we constructed a generous margin for error by estimating effects for a wide bracket of use levels on either side of our projected estimates. Finally, variations in effects from the low end of the bracket to the high end could be used to get a rough idea of how sensitive economic and environmental effects are to changes in dispersed recreation use levels.

We concluded that this combination of care and built-in safeguards was an appropriate procedure for assessing the likely economic and environmental effects of dispersed recreation use at a programmatic planning level.

Predicting Future Use

It was difficult to find projections of future recreation use. A literature search using the University of Montana computerized database turned up only two articles with recreation use trend data (Murdock, et. al.; Hof and Kaiser). An additional relevant publication was also located (McCool and

Frost). None of these articles were sufficiently comprehensive or comparable to construct a usable schedule of future recreation use trends.

The University of Montana Institute of Travel and Tourism reported they had no trend research data though it is a high priority on their research agenda. The Bureau of Business and Economic Research reported that the only trend data available was from Forest Service RIM reports. Wendell Beardsley (USFS, R-1 Recreation Specialist) stated that his office was not trying to forecast recreation use farther than five years into the future. DFWP planner, Dana Dolsen, canvassed his colleagues and reported that no participation rate projections were available from his agency.

Greg Super (USFS Washington Office) reported only one source of recreation use trend data; the one used for updating RPA reports. Given our findings that the data is not available elsewhere, we used Cordell et al 1990 as the best available source of recreation use projections.

Short term regional trends will deviate from these long term national averages; however, we had no basis for confidently predicting the size, direction, or duration of those deviations. For long term programmatic planning, such as our State Forest Land Management Plan, this incongruence was acceptable as we believed that long term national trends would parallel our own regional trends, and our main interest was in comparing one alternative with another rather than predicting exact levels of recreation use for any particular alternative.

From Table 14 (p. 44) of Cordell et al 1990, we constructed average predicted growth rates of recreation use in our activity groups I, II, and III, for the planning period 1995-2020. Through consultation with Jeanne Fairbanks, DNRC Special Uses Supervisor, we modified these baseline rates to reflect the intent of each alternative. The resulting projected growth rates, and supporting logic, are as follows:

Baseline Trends: Based on data sources and estimating procedures referenced above, we have arrived at the following baseline trends in growth in recreation demand: (profiles and descriptive data on the three recreation Groups are presented in the Appendix SCN).

GROUP I:	1.74 %/yr
GROUP II:	1.18 %/yr
GROUP III:	1.46 %/yr
GROUP IV:	1.18%/yr (See discussion)

Alpha: Under Alpha, we would rarely initiate recreation projects. Proposals would come from outside the Department. They would be evaluated in light of their impact on timber management opportunities, and evaluations would be given low priority except in cases where recreation use offered possible revenues in excess of those expected from timber management.

Group I activities (mainly cabinsites) typically require more processing time than those in Groups II and III. Consequently, the low priority of recreation management and the greater processing times would result in relative small increases in Group I recreation use. We project increases at about half the baseline rate.

[GROUP I: 0.87%/yr]

Group II and III activities require less processing time but are also less likely than Group I activities to offer revenues in excess of those expected from timber harvest. Recent legislation affecting outfitting, plus new emphasis on state lands recreation under the Recreation Use License, are expected to exert some upward pressure on uses in these categories.

For analysis purposes, we estimated use in these groups to increase at about two-thirds the baseline rate. This was substantially lower than recent past trends in new Group II and III leases and licenses; however, we did not believe that growth rates approaching 20 percent in these categories were likely to be sustained for more than a few years. We used conservative estimates and discussed the implications of higher growth rates in our effects narrative.

[GROUP II: 0.79%/yr]
[GROUP III: 0.97%/yr]

Beta: Under Beta, we expected recreation to play a more important role than under Alpha because we would initiate new developments that were compatible with maintenance of healthy ecosystems. These recreation projects would be favored over other uses that offered higher short-term monetary returns, but which were not compatible with maintaining healthy ecosystems.

Maintaining healthy ecosystems would increase opportunities for cabinsite development and other Group I uses; however, expansion would be limited to additional uses that did not, themselves, diminish ecosystem health. We estimate that increase at about the baseline rate.

[GROUP I: 1.74%/yr]

Given our increased emphasis on recreation, the lesser complexity involved in initiating Group II and III recreation activities, and their relatively lower environmental impacts, we expect use in these categories to increase at about 50 percent above the baseline rate.

[GROUP II: 1.77%/yr]
[GROUP III: 2.19%/yr]

Gamma: Under Gamma, we would promote minimum impact recreation uses that were harmonious with maintenance of natural ecosystems; however, we would discourage concentrated recreation development, except in areas already unsuitable for restoration of natural conditions.

The net effect would be a slight to moderate reduction in Group I uses, no change or a slight reduction in Group II uses, and an increase in Group III uses at about twice the baseline rate. Reductions from current levels of leasing and licensing would be done through non-renewal of some contracts as their normal terms expired.

Estimated use levels under Gamma would be as follows:

[GROUP I: -1.0%/yr]
[GROUP II: -0.5%/yr]
[GROUP III: 2.92%/yr]

Delta: Potential high-income recreation uses would be actively promoted under Delta, though they would be competing for other, non-recreation, uses that also offered high monetary returns. The highest potential Group I, concentrated development, sites tend to be on water; whereas, potentially competing high-income uses, such as timber harvest, are less directly related to water frontage. Therefore, we expect a solid increase in Group I recreation development, at about 1.5 times the baseline rate.

[GROUP I: 2.61%/yr]

We would also promote Group II activities. While they are somewhat less separable from potentially competing uses and generally offer less income potential than Group I activities, their dependence on specific sites (campgrounds, trails, firing ranges) and/or specific supporting equipment (bicycles, firearms, off-road vehicles), makes them more amenable to fee discrimination than Group III activities. We estimate the range of growth in these uses to be 1.5 times the baseline rate, the same range as predicted for Group I.

[GROUP II: 1.77%/yr]

Group III activities, because they offer the least income potential and represent the most difficult fee collection challenge, would receive low priority for recreation development. However, enjoyment of these uses also tends to require little or no development and they would be influenced by increases in Group I and II uses so, even in the absence of agency-initiated improvements, some increased use would be expected. We estimate use to increase at a pace about equal to the baseline rate.

[GROUP III: 1.46%/yr]

Epsilon: Selection of Epsilon would be a formal commitment to timber management as our primary money-making activity. As under Alpha, recreation development would be limited to proposals from outside the agency and they would be given low priority for processing except in cases where projected revenues clearly exceeded those expected from timber harvest on the same lands.

Because of our formal commitment to timber management, the rate of increase in Group I uses could be slightly less than under Alpha. We expect growth in Group I activities at about one-fourth the baseline rate. Activities in Groups II and III would be expected to increase at roughly the same rates as under Alpha. That is, at about two-thirds the baseline rate.

[GROUP I: 0.44%/yr]
[GROUP II: 0.79%/yr]
[GROUP III: 0.97%/yr]

Zeta: Under Zeta, recreation and wildlife management would receive first attention in our search for revenue-generating land uses. Timber harvest and other uses would be considered only to the degree that they were compatible with, and/or clearly offered substantially higher monetary returns than recreation use of the same lands.

We would expect Group I developments to be limited mainly by market demand, including any additional demand we could create by innovative management and promotion. Estimated growth would be about 1.75 times the baseline rate.

[GROUP I: 3.05%/yr]

The generally lower income potential from Group II uses would be partially offset by possible offerings of some high-potential areas for leasing for hunting, fishing, or other recreation uses. Consequently, we assume growth in this category to be the same as for Group I, about 1.75 times the baseline rate.

[GROUP II: 2.07%/yr]

Group III uses would increase because of our general recreation emphasis and our development initiatives in Groups I and II; however, the lower income potential and more difficult fee collection would dampen the rate of increase in this category. We estimate use to grow at about 1.5 times the baseline rate.

[GROUP III: 2.19%/yr]

Omega: Under Omega, we expect recreation to play an important role because we would initiate new developments that were compatible with maintenance of biologically diverse ecosystems. These recreation projects would be favored over other uses that offered higher short-term monetary returns, but which were not compatible with maintaining biologically diverse ecosystems.

Maintaining biologically diverse ecosystems would increase opportunities for cabinsite development and other Group I uses; however, expansion would be limited to additional uses that did not, themselves, diminish ecosystem health. We estimate that increase at about the baseline rate.

[GROUP I: 1.74%/yr]

Given our increased emphasis on recreation, the lesser complexity involved in initiating Group II and III recreation activities, and their relatively lower environmental impacts, we expect use in these categories to increase at about 50 percent above the baseline rate.

[GROUP II: 1.77%/yr]
[GROUP III: 2.19%/yr]

Leases

Non-recreation Special Leases: Group IV, non-recreation special leases, is currently dominated by electronic facilities sites and other public or private utility support facilities. We have no research basis for predicting demand for these kinds of uses. The degree to which we would promote them is reflected by our stance on promotion of Group I and II recreation activities. The expected monetary return is better represented by Group II than by Group I; therefore, we assume the same growth rates applied to Group II recreation, under each alternative, will also be applied to Group IV.

Dispersed Recreation Leases: We estimated Group V, dispersed recreation leasing use, separately, through interdisciplinary group discussion and observation of current levels of outfitter leasing that excludes other outfitters but not other hunters or anglers. Further discussion of this topic follows.

Summary of Recreation Growth Rates

Table ECN- 8 summarizes our projected recreation growth rates.

Table ECN- 8
RECREATION AND SPECIAL LEASE GROWTH RATE PROJECTIONS
(percent per year)

GROUP	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
GROUP I	0.87	1.74	-1.0	2.61	0.44	3.05	1.74
GROUP II	0.79	1.77	-0.5	1.77	0.79	2.07	1.77
GROUP III	0.97	2.19	2.92	1.46	0.97	2.19	2.19
GROUP IV	0.79	1.77	-0.5	1.77	0.79	2.07	1.77
GROUP V	-	-	-	-	-	-	-

Adjustment Schedule

Once we estimated recreation use levels for each fully implemented alternative, adjusting from current use levels to predicted future levels was constrained by two things: the rate of increase in recreation demand; and our own adjustments in budgeting and staffing necessary to operate a revenue generating recreation program.

Expected changes in recreation demand were represented by the growth rates we assumed earlier, in the section entitled "Predicting Future Use". We assumed demand would grow in a linear fashion throughout the planning period, and that the Department would, on average, sell all the recreation opportunities it offers.

Dispersed Use Leasing: Under all alternatives, there could be some leasing of dispersed recreation use rights. This is currently done with commercial outfitter licenses, where the licensee has exclusive commercial outfitting rights, but individual hunting or fishing remain unrestricted.

Dispersed leasing can take many forms. Some of the variables between leases may be:

1) the specific uses to which the lessee has exclusive rights;
2) the time period (season, time of day, etc.) of exclusive use;
3) rules and regulations governing exclusive enjoyment;
4) terms of renewal; or
5) other types of uses that may be concurrently leased to different lessees (e.g., Lease A for hunting and Lease B for fishing).

Data from our outfitter license files indicated that the equivalent of roughly 11 percent of our State Forest acres are currently under leases that exclude other commercial users from engaging in the same type of activity, but do not exclude individual hunters or anglers. The type of "dispersed lease" expected under the more market-oriented alternatives would be offered, but at a substantially higher lease price than the approximately $.06 per acre realized now. Because of the more highly focused market orientation, we expect prices to range from $0.66 to $1.59 per acre.

We decided to estimate future dispersed leasing use on a per acre basis. In our planning team discussion, we estimated the percentage of State Forest acres that would be offered for dispersed leasing under each alternative. Not all leasing would take place on State Forest lands, and not all State Forest lands would be leased. However, we accepted State Forest acres as a proxy for leasable acres in general because we believe these lands, unlike many of our scattered parcels, are of such quality and character as to make them attractive for leasing. Our estimates of the percentage of State Forest acres that might be offered for leasing under each fully implemented alternative are presented below:

Alternative	Percent	Reasoning
Alpha	10	Based on current levels and alternative philosophy.
Beta	15	Slightly higher priority placed on recreation uses compatible with healthy ecosystems.
Gamma	20	Promotion of low-impact dispersed recreation use.
Delta	30	Active promotion of high-value opportunities which may include dispersed recreation.
Epsilon	10	Low priority. Must not interfere with timber management.
Zeta	70	Active promotion of high-value wildlife and recreation opportunities.
Omega	15	Development of recreation opportunities as guided by changing markets for new and traditional uses.

Recreation Use Schedule: The preceding assumptions and data lead us to the recreation use schedule shown in Table ECN- 9. In the recreation scenarios (see Appendix SCN) these values are expanded to give our range of high (50 percent above) and low (50 percent below) output estimates.

Table ECN- 9
RECREATION USE LEVELS

Units: Groups I & IV = No. of leases
Groups II & III = User days
Group V = No. of acres

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
1995-2000							
Group I	673	711	613	758	657	786	711
Group II	108471	115317	101365	114509	108471	116207	115317
Group III	188976	204798	216397	193426	188976	202019	204798
Group IV	52	56	49	56	52	57	56
Group V	0	0	0	0	0	0	0
2000-2005							
Group I	704	780	585	874	672	930	780
Group II	112991	126683	98778	125067	112991	128463	126683
Group III	198758	230402	253600	207658	198758	224845	230402
Group IV	54	61	48	61	54	63	61
Group V	5348	8020	10694	16041	5348	37428	8020
2005-2010							
Group I	735	850	556	991	686	1073	850
Group II	117512	138049	96192	135625	117512	140720	138049
Group III	208539	256007	290802	221889	208539	247670	256007
Group IV	56	67	46	67	57	70	67
Group V	10694	16041	21387	32081	10694	74855	16041
2010-2015							
Group I	766	919	528	1107	701	1217	919
Group II	122032	149415	93605	146183	122032	152976	149415
Group III	218321	281611	328005	236121	218321	270496	281611
Group IV	58	72	45	72	59	76	72
Group V	16040	24061	32081	48122	16040	112283	24061
2015-2020							
Group I	797	988	499	1223	716	1361	988
Group II	126552	160781	91019	156741	126552	165232	160781
Group III	228103	307215	365208	250353	228103	293321	307215
Group IV	61	78	44	78	61	83	78
Group V	21387	32081	42774	64162	21387	149710	32081

Timber

Five members of the planning team made independent estimates of probable future timber harvest levels. They considered recent estimates of current harvest potential made by our Area Managers, actual harvests in the recent past, newly updated timber inventory data, and the philosophy of each alternative.

Through group discussion of our independent estimates, and subsequent review by other team members, and allowing a five-year period to adjust from recent past levels to probable future levels under each alternative, we arrived at the schedule shown in Table ECN- 10.

Table ECN- 10
ANNUAL TIMBER HARVEST SCHEDULE
(MBF sold per year)

	ALPHA		BETA		GAMMA		DELTA		EPSILON		ZETA		OMEGA	
Period	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO	HI	LO
1995	40	20	40	20	40	20	40	20	40	20	40	20	40	20
1996	40	20	39	19	34	17	41	19	43	23	36	18	42	22
1997	40	20	38	18	28	14	42	18	46	26	32	16	44	24
1998	40	20	37	17	22	11	43	17	49	29	28	14	46	26
1999	40	20	36	16	16	8	44	16	52	32	24	12	48	28
2000	40	20	35	15	10	5	45	15	55	35	20	10	50	30
2001-2020	40	20	35	15	10	5	45	15	55	35	20	10	50	30

II. COST ASSUMPTIONS

Trying to predict costs for individual programs (timber, recreation, grazing, special uses) raised many questions for which we could not develop credible, consistent answers. Our solution was to estimate total cost for all programs that would be affected by the Plan, without attempting to isolate costs for individual programs. We then subtracted total discounted costs for each alternative from total discounted revenues (revenues are predicted for individual programs) to get net present value.

We arrived at total program costs by estimating changes in FTEs assigned to each affected program in order to fully implement the alternative. We made trial assumptions as to the rate of implementation so that costs could be specified for five-year time increments, throughout the planning period. However, we abandoned this approach in favor of assuming costs would increase linearly throughout the planning period in order to be consistent with our assumption that increases in output (i.e. revenue) would increase linearly. Table ECN- 11 (also shown as Table IV-E13 in the Chapter IV Economics discussion) displays our projected FTE changes and associated total program costs.

Table ECN- 11
FTE CHANGES FOR FULLY IMPLEMENTED ALTERNATIVES
(1995-2020)

Alternative	Forest Product Sales	Resource Mgmt.	Land Admin.	Forest Improv.	Forest Invtry.	Total	% +/- 1994
ALPHA	0.0	+3.0	+4.5	+1.5	+1.5	+10.5	+13.6
BETA	0.0	+5.0	+5.5	+3.5	+1.5	+15.5	+20.0
GAMMA	-25.0	+10.0	+2.5	-10.0	0.0	-22.5	-29.1
DELTA	0.0	+8.0	+6.0	0.0	+1.5	+15.5	+20.0
EPSILON	+8.0	+3.0	+2.5	+5.5	+3.0	+22.0	+28.4
ZETA	-18.0	+6.0	+8.0	0.0	+1.5	-2.5+	-3.2
OMEGA	+12.0	+5.0	+5.5	+4.5	+3.5	+30.5	+39.4

TOTAL COST AND IMPLEMENTATION RATE
(Based on 1994 Costs Totaling $3,359,540)

Alternative	Total Cost
ALPHA	$3816
BETA	$4031
GAMMA	$2382
DELTA	$4031
EPSILON	$4314
ZETA	$3252
OMEGA	$4684

Cost per FTE: Our estimated cost per FTE is based on FY 94 budgeting information. We observed the total budget and total number of FTEs (permanent plus seasonal) assigned to the Forest Product Sales, Resource Management, Land Administration, Forest Improvement, and Forest Inventory cost centers. Dividing total budget by number of FTEs gave us a cost of $43,427 per FTE. This number includes personal services, operating costs, and capital expenditures. It does not include unallocated administrative costs.

We did not know how to assign administrative costs to individual programs in a way we could be sure did not exert biases for or against particular programs. We accepted this difficulty by reasoning that administrative costs would remain relatively constant for all alternatives so that including or not including them would not change the relative profitability of one alternative compared to another. However, this means the resulting net present values can not be taken as hard numbers, they will only be meaningful as a basis for comparing one alternative with another.

The reasoning in support of our estimated changes in FTE staffing levels for each alternative is documented in the Project Record. The associated cost estimates presented in Table EC-1 are based on 1994 costs of $3,359,540.

III. REVENUE ASSUMPTIONS

Our baseline revenue assumptions are presented below. They represent our best estimates of how the future will unfold. All prices are expressed in constant 1994 dollars.

Grazing

Our current price for grazing is $4.09 per AUM. It is set by law according to a formula based on the previous year's beef price. Our price is substantially below the current market price of $8.00 estimated by Duffield (1993).

According to information in the Duffield report (pp. 55 and 62), real grazing market prices have declined from 1.5 to 3 percent per year over the last several decades. The 1990 RPA update used a real price increase of 0.6 percent per year between 1989 and 2000, increasing to 1.15 percent per year between 2000 and 2040. Based on these observations, we assumed that real market prices for grazing would increase at 0.6 percent per year over the planning period of 1995-2020. We used Duffield's average of $8.00 per AUM as the current market price for grazing.

We assumed that upward political pressure on state land grazing fees would continue. When the state of Oklahoma was sued in the early 1980's, its lease rates doubled, and current lease prices range from 75 to 135 percent of average market rates (Duffield, p. 64). In Nebraska, rates average 60 to 100 percent of market rates (vs. 50 percent in Montana). Given these circumstances, we assumed that DNRC grazing fees would reach 80 percent of market value by the year 2010.

We arrived at the following schedule of estimated grazing prices:

Table ECN- 12
ESTIMATED GRAZING FEE SCHEDULE
(Constant dollars)

YEAR:	1995	2000	2005	2010	2015	2020
$ per AUM:	4.09*	5.03	5.95	7.00	7.21	7.43

* Based on a 1994 DNRC minimum rate of $4.09/AUM, and a current market rate of $8.00/AUM.

Recreation

We made separate price assumptions for dispersed recreation use (Groups II and III), developed use (Groups I and IV), and dispersed leasing (Group V), partly because our data bases for the three categories were different. Developed site fees are expressed on a "per lease" basis, dispersed use fees are expressed on a "user day" basis, and dispersed leasing costs are expressed on a "per acre" basis. In the NPV calculations, Group I and IV use levels are expressed as "number of leases", Group II and III use is expressed in terms of "user days", and Group V use is expressed as "number of acres."

We assumed that all Group I and IV uses would be under lease or "other equivalent contract". This means that if we directly manage the activity ourselves; or operate under some alternative "contract", such as a cooperative agreement with another agency; we assumed the net revenues generated would be equivalent to the lease price if the activity had been under lease. Similarly, we assumed that any toll station revenues or other direct collection of fees would be associated with Group I uses and therefore, incorporated in lease fees. These two assumptions allowed us to use "number of leases" and "per lease" prices as bases for projecting Group I and IV revenues.

Cordell (1990) predicts excess future demand for some types of recreation use, and excess supply for others. Normally, these disequilibrium conditions would indicate rising or falling real recreation prices. However, the combination of a lack of research data for estimating price trends, and the availability of free substitute opportunities on adjoining Federal lands, left us with no sound basis for making regional estimates of recreation price trends. Consequently, we assumed that real price trends in recreation would match those projected for the 1990 RPA update.

Developed Use (Groups I and IV): Cabinsites account for 94.6 percent of current Group I revenues and 96.5 percent of all Group I leases. Under some alternatives, we would expect a larger share of camps, lodges, and campgrounds, however, cabinsites would probably remain the dominant revenue producer. For simplicity, we assumed all Group I leases would be sold at the cabinsite rate. We also assumed that all Group I activities would be under lease (DNRC initiated sites are assumed to be the equivalent of a lease to ourselves).

Our current cabinsite lease rate is 3.5 percent of appraised value, whereas, Duffield (1993) estimates current market value at about 8.0 percent of appraised value. Our current annual rate averages $768 per site. Because our current rates are substantially below market value, and because there is continuing pressure to move toward market value, we assumed that Group I rates would rise to 80 percent of market value by 2005.

Group IV, non-recreation special leases, are assumed to remain at roughly their present rate of about $400 per site per year.

Dispersed Use (Groups II and III): The most comprehensive studies on recreation prices report results in terms of consumers surplus, a measurement of total value received from a particular recreation usage, in excess of the amount actually paid. If we assume the amount paid is exactly equal to the cost of provision (no profit), then consumers surplus can be taken as an estimate of the potential revenue that might be collected if each recreationist could be charged individually at exactly the price she or he would be willing to pay.

In reality, such price discrimination did not seem feasible for us. In fact, the only feasible scheme for collecting recreation revenues from dispersed use of state lands seemed to be some type of permit system such as the Recreation Use License now in use. In the future, we may develop a system of different permits, at different prices, for different categories of uses (like our current system of differential pricing for permits to hunt different wildlife species). However, for the purpose of this analysis, we assumed there would be only one permit and we considered the price of that permit with respect to estimated open market value for the rights allowed under the permit.

Duffield, et. al. (1993) concludes that current market value for the Recreation Use License is about $25 for Montana residents and about $50 for non-residents. For this analysis, we assumed about a 50:50 distribution between resident and non-resident recreationists and took the average of Duffield's two rates, or $37.50 per year, as the "market price" for dispersed recreation on state lands.

DNRC records show RUL purchases of 29,003 in 1992 and 30,490 in 1993, approximately 30,000 licenses per year. Our dispersed recreation use estimates for 1995 show about 37 percent of total use in Group II and 63 percent in Group III. Pro-rating the annual fee on this basis gives us $13.88 per year for Group II and $23.62 per year for Group III. If 37 percent of our 30,000 license holders paid $13.88 per year to consume our estimated number of user days in Group II, the per unit price would be $1.48 per user day. Likewise, the Group III price would be $2.49 per day.

At the time of this assessment, the price for the RUL was $5.00 per year, or 13.3 percent of the estimated $37.50 market price. On this basis, our current "prices" are $0.20 per user day for Group II, and $0.33 per user day for Group III. For analysis purposes, we assumed that DNRC would increase its license fee to equal market value within ten years, by 2005.[12]

Dispersed use Leasing (Group V): A review of the literature on exclusive hunting leases showed prices ranging from as low as 13 cents per acre to as high as 13 dollars per acre. The overall average of sixteen samples is $2.13 per acre. With outliers (the two highest and the two lowest) dropped, the average is $1.59 per acre. Duffield (1993) found an average price of $0.66 per acre for exclusive hunting leases in Montana. We decided to use $0.66 per acre for our baseline calculations, and $1.59 per acre as an alternative assumption.

Recreation Price Schedule: From the above discussion, we arrived at the following schedule of recreation prices.

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12 The increase in the price of the RUL to $10.00 in 1996 is consistent with the assumptions in the assessment that the license fee would equal market value by 2005.

Table ECN- 13
RECREATION PRICE SCHEDULE

GROUP	1995-2000	2000-2005	2005-2010	2010-2015	2015-2020	$ PER
I (DNRC) (market)	768 (1755)	1086 (1755)	1404 (1755)	1404 (1755)	1404 (1755)	Lease
II (DNRC) (market)	0.20 (1.48)	0.85 (1.49)	1.50 (1.50)	1.51 (1.51)	1.52 (1.52)	User Day
III (DNRC) (market)	0.33 (2.49)	1.45 (2.53)	2.57 (2.57)	2.60 (2.60)	2.64 (2.64)	User Day
IV (DNRC) (market)	400 (400)	400 (400)	400 (400)	400 (400)	400 (400)	Lease
V (DNRC) (market)	0.04 (0.66)	0.36 (0.66)	0.67 (0.67)	0.67 (0.67)	0.68 (0.68)	Acre

Timber

We had two choices for real timber price trend, the 1990 RPA trend and regional trends based on research at the University of Montana.

In order to remain consistent with our baseline trends for grazing and recreation, we chose to use the RPA trend of 1.2 percent per year for the baseline timber calculations.

An alternative trend was based on the following projections compiled in 1994 by Darius Adams of the University of Montana Forestry School. Details are on file in the Project Record.

Table ECN- 14
REAL STUMPAGE PRICE TRENDS

PERIOD	1995-2000	2001-2005	2006-2010	2011-2015	2016-2020
%/Yr.	10.60	-0.33	-1.60	3.80	2.80

Because the large (10.6 percent) annual trend for the first five years of Adams' series had such a large short term effect on NPV calculations, we chose to convert these numbers to their uniform twenty-five year equivalent trend of 2.6 percent per year.

Current Stumpage Price: Future stumpage prices based on the above real price trend estimates will be strongly influenced by our choice of "current" stumpage price. Prices have fluctuated widely over the past several years and DNRC rates have differed substantially from USFS rates. Consequently, a simple average of recent past stumpage prices may not be the best way to establish our "current" stumpage price.

Using Forest Management Bureau annual summaries of total volume cut and associated dollar value received, and adjusting to constant 1994 dollars, we arrived at a ten-year (1985-94) average value of $157 per Mbf. Using only the most recent five years (1990-94), we got $213 per Mbf, and using the most recent five years with the lowest and highest year dropped, we got $192 per Mbf.

For comparison, during the period 1989-1992, USFS Northern Rockies stumpage averaged $81 per Mbf compared with $168 per Mbf for DNRC timber, during the same period. Based on projected prices, the USFS average for the past five years, with high and low value dropped, would be $91 per Mbf.

Given these circumstances, we chose to use $192 per Mbf, DNRC's most recent five years with highest and lowest value dropped, as a credible "current DNRC stumpage value" for projecting future prices.

IV. NET PRESENT VALUE COMPUTATIONS

Total present values were calculated for each activity group and time period by multiplying predicted use by predicted price, discounting to year zero, and summing the discounted values. The discount rate used is 4 percent. It is common practice to use low discount rates in public sector decision making where entities are assumed to have indefinite life and the future is given relatively high value.[13]

V. RESULTS

The accompanying spreadsheet tables summarize our net present value computations. Tables ECN-15 through ECN-18 (which appear in the Chapter IV Economics discussion as Tables IV-E14 through IV-E17) present:

1) total present revenue, broken down by grazing, recreation, and timber components;
2) total present cost for all programs combined;
3) net present value;
4) the equivalent annual return to net present value;
5) the present value of our expected residual timber at the end of the planning period; and
6) the sum of net present value plus remaining timber asset value.

Table ECN-15 reports this data for the baseline price assumptions. Table ECN- 16 assumes a higher initial value for exclusive dispersed recreation leasing ($1.59 per acre instead of $0.66); all other assumptions are the same.

Table ECN- 17 uses the baseline assumptions with the exception of a higher stumpage price trend (D. Adams' projected rate of 2.6 percent per year instead of the RPA rate of 1.2 percent). The last two tables (Tables ECN-18a and ECN-18b) display net present value and timber asset value for all three sets of price assumptions, on the same page. One table presents High output values and the second presents Low output values.

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13 We arrived at the 4 percent discount rate by adding a risk premium to the long term average yield on AAA corporate bonds. The risk premium of 0.54 percent is based on statistical variability in trended costs of stumpage, reforestation, and timber stand improvement. The 1960 to 1993 average AAA bond yield rate is 3.44 percent. These rates sum to 3.98 percent which we have rounded to 4 percent. See the appendix entitled "Support For 4% Discount Rate" for further discussion.

Table ECN-15
NET PRESENT VALUE SPREADSHEET
($1000)

(Baseline)

HIGH	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Grazing	3,029	2,463	2,221	2,236	2,544	2,236	2,463
Recreation	31,449	37,201	29,908	39,524	30,179	43,514	37,201
Timber	142,766	126,812	47,040	158,721	190,630	78,949	174,675
Total Revenue	177,244	166,476	79,169	200,481	223,353	124,699	214,339
Total Cost	58,981	60,458	49,127	60,458	62,396	55,104	64,945
Net Present Value	118,263	106,018	30,042	140,023	160,957	69,595	149,394
Equivalent Annual Return	7,570	6,786	1,923	8,963	10,303	4,455	9,563
Ending Timber Asset Value	276,750	291,307	364,092	262,193	233,079	334,978	247,636
Sum: NPV plus Asset Value	395,013	397,325	394,134	402,216	394,036	404,573	397,030

LOW	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Grazing	1,952	1,763	1,741	1,689	1,790	1,689	1,763
Recreation	10,483	12,400	9,969	13,175	10,060	14,505	12,400
Timber	71,383	55,429	23,520	55,429	119,246	39,474	103,292
Total Revenue	83,818	69,592	35,230	70,293	131,096	55,668	117,455
Total Cost	58,981	60,458	49,127	60,458	62,396	55,104	64,945
Net Present Value	24,837	9,134	(13,897)	9,835	68,700	564	52,510
Equivalent Annual Return	1,590	585	(890)	630	4,398	36	3,361
Ending Timber Asset Value	334,978	349,535	378,649	349,535	291,307	364,092	305,864
Sum: NPV plus Asset Value	359,815	358,669	364,752	359,370	360,007	364,656	358,374

* Current Timber Asset Value ($1000): $484,615

(2,524,038 Mbf @ $192/Mbf = $484,615,296)

HIGH + LOW AVERAGES	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Net Present Value	71,550	57,576	8,073	74,929	114,829	35,080	100,952
Sum: NPV plus Asset Value	377,414	377,997	379,443	380,793	377,022	384,615	377,702

Table ECN-16
NET PRESENT VALUE SPREADSHEET
($1000)

(Leased Recreation @ $1.59 vs. $0.66)

HIGH	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Grazing	3,029	2,463	2,221	2,236	2,544	2,236	2,463
Recreation	31,648	37,501	30,306	40,123	30,379	44,910	37,501
Timber	142,766	126,812	47,040	158,721	190,630	78,949	174,675
Total Revenue	177,443	166,776	79,567	201,080	223,553	126,095	214,639
Total Cost	58,981	60,458	49,127	60,458	62,396	55,104	64,945
Net Present Value	118,462	106,318	30,440	140,622	161,157	70,991	149,694
Equivalent Annual Return	7,583	6,806	1,949	9,001	10,316	4,544	9,582
Ending Timber Asset Value	276,750	291,307	364,092	262,193	233,079	334,978	247,636
Sum: NPV plus Asset Value	395,212	397,625	394,532	402,815	394,236	405,969	397,330
LOW	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Grazing	1,952	1,763	1,741	1,689	1,790	1,689	1,763
Recreation	10,549	12,500	10,102	13,374	10,126	14,970	12,500
Timber	71,383	55,429	23,520	55,429	119,246	39,474	103,292
Total Revenue	83,884	69,692	35,363	70,492	131,162	56,133	117,555
Total Cost	58,981	60,458	49,127	60,458	62,396	55,104	64,945
Net Present Value	24,903	9,234	(13,764)	10,034	68,766	1,029	52,610
Equivalent Annual Return	1,594	591	(881)	642	4,402	66	3,368
Ending Timber Asset Value	334,978	349,535	378,649	349,535	291,307	364,092	305,864
Sum: NPV plus Asset Value	359,881	358,769	364,885	359,569	360,073	365,121	358,474

* Current Timber Asset Value ($1000): $484,615

(2,524,038 Mbf @ $192/Mbf = $484,615,296)

HIGH + LOW AVERAGES	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Net Present Value	71,683	57,776	8,338	75,328	114,962	36,010	101,152
Sum: NPV plus Asset Value	377,547	378,197	379,709	381,192	377,155	385,545	377,902

Table ECN-17
NET PRESENT VALUE SPREADSHEET
($1000)

(Timber Trend @ 2.6%/yr vs. RPA of 1.2%/yr)

HIGH	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Grazing	3,029	2,463	2,221	2,236	2,544	2,236	2,463
Recreation	31,449	37,201	29,908	39,524	30,179	43,514	37,201
Timber	168,224	149,140	53,718	187,309	225,478	91,887	206,393
Total Revenue	202,702	188,804	85,847	229,069	258,201	137,637	246,057
Total Cost	58,981	60,458	49,127	60,458	62,396	55,104	64,945
Net Present Value	143,721	128,346	36,720	168,611	195,805	82,533	181,112
Equivalent Annual Return	9,200	8,216	2,351	10,793	12,534	5,283	11,593
Ending Timber Asset Value	390,175	410,698	513,313	369,652	328,605	472,267	349,128
Sum: NPV plus Asset Value	533,896	539,044	550,033	538,263	524,410	554,800	530,240

LOW	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Grazing	1,952	1,763	1,741	1,689	1,790	1,689	1,763
Recreation	10,483	12,400	9,969	13,175	10,060	14,505	12,400
Timber	84,112	65,028	26,859	65,028	141,366	45,943	122,281
Total Revenue	96,547	79,191	38,569	79,892	153,216	62,137	136,444
Total Cost	58,981	60,458	49,127	60,458	62,396	55,104	64,945
Net Present Value	37,566	18,733	(10,558)	19,434	90,820	7,033	71,499
Equivalent Annual Return	2,405	1,199	(676)	1,244	5,814	450	4,577
Ending Timber Asset Value	472,267	492,790	533,836	492,790	410,698	513,313	431,221
Sum: NPV plus Asset Value	509,833	511,523	523,278	512,224	501,518	520,346	502,720

* Current Timber Asset Value ($1000): $484,615

(2,524,038 Mbf @ $192/Mbf = $484,615,296)

HIGH + LOW AVERAGES	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Net Present Value	90,644	73,540	13,081	94,023	143,313	44,783	126,306
Sum: NPV plus Asset Value	521,865	525,284	536,656	525,244	512,964	537,573	516,480

Table ECN-18a
NET PRESENT VALUE and REMAINING TIMBER ASSET VALUE UNDER THREE SETS OF ASSUMPTIONS

High Output Ranges		Baseline	Leased Rec at $1.59/ac	Timber Price at 2.6%/yr
ALPHA	NPV	118,263	118,462	143,721
	Timber Asset	276,750	276,750	390,175
	Total	395,013	395,212	533,896
BETA	NPV	106,018	106,318	128,346
	Timber Asset	291,307	291,307	410,698
	Total	397,325	397,625	539,044
GAMMA	NPV	30,042	30,440	36,720
	Timber Asset	364,092	364,092	513,313
	Total	394,134	394,532	550,033
DELTA	NPV	140,023	140,622	168,611
	Timber Asset	262,193	262,193	369,652
	Total	402,216	402,815	538,263
EPSILON	NPV	160,957	161,157	195,805
	Timber Asset	233,079	233,079	328,605
	Total	394,036	394,236	524,410
ZETA	NPV	69,595	70,991	82,533
	Timber Asset	334,978	334,978	472,267
	Total	404,573	405,969	554,800
OMEGA	NPV	149,394	149,694	181,112
	Timber Asset	247,636	247,636	349,128
	Total	397,030	397,330	530,240

Table ECN-18b
NET PRESENT VALUE and REMAINING TIMBER ASSET VALUE
UNDER THREE SETS OF ASSUMPTIONS

Low Output Ranges		Baseline	Leased Rec at $1.59/ac	Timber Price at 2.6%/yr
ALPHA	NPV	24,837	24,903	37,566
	Timber Asset	334,978	334,978	472,267
	Total	359,815	359,881	509,833
BETA	NPV	9,134	9,234	18,733
	Timber Asset	349,535	349,535	492,790
	Total	358,669	358,769	511,523
GAMMA	NPV	(13,897)	(13,764)	(10,558)
	Timber Asset	378,649	378,649	533,836
	Total	364,752	364,885	523,278
DELTA	NPV	9,835	10,034	19,434
	Timber Asset	349,535	349,535	492,790
	Total	359,370	359,569	512,224
EPSILON	NPV	68,700	68,766	90,820
	Timber Asset	291,307	291,307	410,698
	Total	360,007	360,073	501,518
ZETA	NPV	564	1,029	7,033
	Timber Asset	364,092	364,092	513,313
	Total	364,656	365,121	520,346
OMEGA	NPV	52,510	52,610	71,499
	Timber Asset	305,864	305,864	431,221
	Total	358,374	358,474	502,720

PART III: IMPACTS ON THE REGIONAL ECONOMY

The regional economic analysis was intended to give us an idea of the scale of influence we may have, and not to generate precise answers. It was done by simply applying the best available multipliers to output levels estimated for our High and Low scenarios, and comparing the results to the Montana economy as a whole.

Outputs

Output levels, taken directly from the High and Low scenarios, are as follows:

Table ECN-19
OUTPUT RANGES FOR FULLY IMPLEMENTED ALTERNATIVES

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
Timber (MMBF)							
High:	40	35	10	45	55	20	50
Low:	20	15	5	15	35	10	30
Grazing (1000 AUM)							
High:	35	26	23	23	28	23	26
Low:	19	16	15	13	16	13	16
Recreation ($1000)							
High:	2013	2381	1914	2529	1932	2786	2381
Low:	671	794	638	843	644	929	794

Multipliers

Timber and grazing response coefficients were supplied by the USFS Intermountain Research Station. Timber multipliers were county aggregates representing the NWLO, SWLO, CLO, ELO, SLO, and NELO. They were weighted by average annual volume harvested (past six years) by each Land Office to arrive at a single set of multipliers for the entire state. This weighted averaging was necessary because our estimated future harvests are not disaggregated below the statewide level.

We used a similar process to arrive at statewide, weighted average multipliers for grazing. In this case, the county aggregates were weighted by the share of total direct grazing jobs reported for each sub-region.

The recreation multiplier is a multiplier of direct spending to arrive at total spending. It was taken from Moisey and Yuan (1991) and based on several types of wildland recreation economic impacts in Montana.[14]

The resulting values are shown in Table ECN- 20.

Table ECN-20
ECONOMIC RESPONSE COEFFICIENTS
(per each unit of output)

	Units of Output	Total Jobs Supported	Total Income Generated
TIMBER	MMBF	27.68	$1,763
GRAZING	million AUMs	1137	$12.43 million
RECREATION	$ of direct spending	n/a[15]	$2.40

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14 Moisey, Neil and Michael Yuan. (1991). Economic Significance and Characteristics of Select Wildland-Attracted Visitors to Montana, in Payne, Claire, et. al., The Economic Value of Wilderness: Proceedings of the conference; 1991 May 8-11; Jackson, WY. Gen. Tech. Rep. SE-78. Asheville, NC: USDA Forest Service, Southeastern Forest Experiment Station.

15 For recreation, we have only an expenditure multiplier.

Results

Combining outputs and multipliers (response coefficients) lead to the results shown in Table ECN-21.

Table ECN-21
ANNUAL REGIONAL ECONOMIC EFFECTS

HIGH OUTPUT ESTIMATES	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
TIMBER							
No. of Jobs	1,107	969	277	1,246	1,522	554	1,384
$1000 Income	70,520	61,705	17,630	79,335	96,965	35,260	88,150
GRAZING							
No. of Jobs	40	30	26	26	31	26	30
$1000 Income	732	328	283	286	343	286	323
RECREATION							
No. of Jobs[16]	442	523	420	555	424	612	523
$1000 Income	4,831	5,714	4,594	6,070	4,637	6,686	5,714
TOTAL JOBS	1,589	1,522	723	1,827	1,978	1,192	1,936
TOTAL INCOME	75,783	67,747	22,507	85,691	101,945	42,232	94,188

LOW OUTPUT ESTIMATES	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA	OMEGA
TIMBER							
No. of Jobs	554	415	138	415	969	277	830
$1000 Income	35,260	26,445	8,815	26,445	61,705	17,630	52,890
GRAZING							
No. of Jobs	21	18	17	15	19	15	18
$1000 Income	234	199	184	167	204	167	199
RECREATION							
No. of Jobs	147	174	140	185	141	204	174
$1000 Income	1,610	1,906	1,531	2,023	1,546	2,230	1,906
TOTAL JOBS	722	956	295	616	1129	496	1023
TOTAL INCOME	37,104	28,550	10,530	28,635	63,455	20,027	54,994

[16] In the absence of a recreation jobs multiplier, we estimated these numbers by assuming the same number of jobs per thousand dollars of total income as observed for grazing.

Statewide Economic Data

The most recent statewide jobs and income data were reported for 1993. The Montana Department of Labor and Industry (1993) reported a total of 326,400 non-farm wage and salary jobs, and $6,741,596,160 in total wage and salary income. [17] Total personal income (wages and salaries plus all other forms of personal income) was supplied by the Montana Department of Commerce, Census and Economic Information Center.[18] This source reported total personal income for 1993 of $14,616,978,000, and total wage and salary income of $6,997,368,000.

Our subsequent calculations are based on the following figures:

Total Jobs:	326,400
Total Personal Income:	$14,616,978,000

Impacts on the Regional Economy

Expressing jobs and incomes expected to be generated under each fully-implemented alternative as a share of total jobs and incomes lead to the results shown in Table ECN- 22. Table IV-E20 in Chapter IV is derived from Table ECN- 22.

Table ECN-22
RANGE OF ANNUAL REGIONAL ECONOMIC EFFECTS

TIMBER (MMBF)			NUMBER OF JOBS		$1000 INCOME	
	LOW OUTPUT	HIGH OUTPUT	LOW	HIGH	LOW	HIGH
ALPHA	20	40	554	1107	35260	70520
BETA	15	35	415	969	26445	61705
GAMMA	5	10	138	277	8815	17630
DELTA	15	45	415	1246	26445	79335
EPSILON	35	55	969	1522	61705	96965
ZETA	10	20	277	554	17630	35260
OMEGA	30	50	830	1384	52890	88150

17 Total income was derived by multiplying 326,400 jobs times the reported average wage of $9.93 per hour, times 2080 hours per year.

18 Data from the U.S. Bureau of Economic Analysis, Regional Economic Information System, supplied by fax from the Montana Department of Commerce.

Table ECN-22 (continued)
RANGE OF ANNUAL REGIONAL ECONOMIC EFFECTS

GRAZING (Thousand AUMs)			NUMBER OF JOBS		$1000 INCOME		JOBS PER $1000	
	LOW OUTPUT	HIGH OUTPUT	LOW	HIGH	LOW	HIGH	LOW	HIGH
ALPHA	19	35	21	40	234	432	0.0915	0.0915
BETA	16	26	18	30	199	328		
GAMMA	15	23	17	26	184	283		
DELTA	13	23	15	26	167	286		
EPSILON	16	28	19	31	204	343		
ZETA	13	23	15	26	167	286		
OMEGA	16	26	18	30	199	323		

RECREATION ($1000 Direct Spending)			NUMBER OF JOBS		$1000 INCOME		
	LOW OUTPUT	HIGH OUTPUT	LOW	HIGH	LOW	HIGH	
ALPHA	671	2013	147	442	1610	4831	NOTE: Recreation jobs estimated by assuming same jobs:income ratio as for grazing.
BETA	794	2381	174	523	1906	5714	
GAMMA	638	1914	140	420	1531	4594	
DELTA	843	2529	185	555	2023	6070	TOTAL JOBS: 326,400
EPSILON	644	1932	141	424	1546	4637	
ZETA	929	2786	204	612	2230	6686	TOTAL INCOME: $14,616,978.000
OMEGA	794	2381	174	523	1906	5714	

TOTAL REGIONAL JOBS & INCOMES	% OF TOTAL JOBS		NUMBER OF JOBS		$1000 INCOME		% OF TOTAL INCOME	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
ALPHA	0.22	0.49	722	1589	37104	75783	0.25	0.52
BETA	0.29	0.47	956	1522	18550	67747	0.20	0.46
GAMMA	0.09	0.22	295	723	10530	22507	0.07	0.15
DELTA	0.19	0.56	616	1827	28635	85691	0.20	0.59
EPSILON	0.35	0.61	1129	1978	63455	101945	0.43	0.70
ZETA	0.15	0.37	496	1192	20027	42232	0.14	0.29
OMEGA	0.31	0.59	1023	1936	54994	94188	0.38	0.64

SUPPLEMENT TO ECONOMICS APPENDIX
SUPPORT FOR CHOICE OF 4 PERCENT DISCOUNT RATE

THE PROPOSED DISCOUNT RATE FOR EVALUATING MONTANA DIVISION OF TRUST LAND MANAGEMENT DIVISION'S LONG TERM TIMBER INVESTMENTS

INTRODUCTION

Time preferences often enter into decisions made by individuals, corporations, and governments. These preferences are revealed or quantified in the form of discount rates. The decision individuals make to forego current consumption in favor of a 5 percent yield on a passbook savings account is similar to the decision corporations make to re-invest profits in capital goods. Both decision-makers have evaluated alternative uses of their money. The discount rates used by both the individual and the corporation to evaluate their investment have a profound impact on the relative attractiveness of a potential investment.

Several timber management decisions, when evaluated by a financial criterion, are affected by the discount rate applied. The choice of discount rate may impact the allocation of funds invested in different stands as well as the identification of the financially optimal regime for a single stand. For example, low productivity stands may represent marginal investments at a high discount rate but appear as favorable investments at a lower discount rate. Discount rate has a differential impact on the choice of a financially optimal regime for a single stand, depending on the type of analysis applied. If optimal rotation age and treatment intensity are both estimated a lower discount rate will theoretically lead to greater treatment intensity and shorter rotations. Conversely, if a lower discount rate will result in longer rotations if treatment intensity is assumed fixed.

ALTERNATIVE DISCOUNT RATES

Determining the appropriate discount rate to be used in evaluating public forestry investments is an inexact science, hence several rates have been proposed. The Office of Management and Budget (OMB) recommends all federal agencies use a 10 percent discount rate. The Water Resources Council (WRC) suggested in 1981 Federal water projects should be evaluated at a 7 3/8 percent rate. The USFS is using a 4 percent discount rate in their long term forest planning (Row and others, 1981), the state of Washington chose a 7 percent rate (Smego 1982) and Idaho a 5 percent rate. The Bonneville Power Administration (BPA) uses a 3 percent rate (Norman 1983) and the state of Montana, Energy Division a 4.3 percent rate (Nordel 1983).

Several criteria influence the choice of a discount rate for public agencies. These criteria have been interpreted differently by various agencies. This variability in interpretation led to the current discrepancy in discount rates used by public agencies.

DECISION CRITERIA

Real vs. Nominal Rates

Inflation is the difference between real and nominal discount rates. Real rates are adjusted for inflation and nominal rates are not. Real rates must be distinguished from nominal rates to avoid erroneous results.

It is somewhat unclear whether the OMB and WRC discount rates are, or are intended to be used as real or nominal rates. The other public agency rates mentioned previously all represent real discount rates. We also chose a real rate for analyzing the state's long term timber investments. By using a real rate in our analysis we have eliminated the uncertainty associated with inflation.

Opportunity Cost of Capital

A discount rate represents the opportunity cost of capital. It is however uncertain whose capital this opportunity cost rate should represent when public investments are being evaluated. Several cogent arguments have been presented for basing discount rates for public investments on the opportunity cost of capital in the private sector (Baumol 1977, Hirshleifer and Shapiro 1977, Hanke and Anwyll 1980, Row and others 1981). There is disagreement, however, on how to best measure the opportunity capital costs in the private sector. Hirshleifer and Shapiro (1977) suggest using the market rate of interest. The state of Washington has chosen what they consider a conservative corporate capital earnings rate as their discount rate (Smego 1982). Row and others (1981) and Hanke and Anwyll (1980) both use returns on Aaa corporate bonds as their measure of returns to private capital investment. Jackson (1983) suggests that expected average return to the state school trust represents the opportunity cost rate for long term timber investments on trust lands. His approach has merit given that timber revenues from trust lands are in part remitted to the trust.

AAA corporate bonds provide a return which is very low risk. We chose this low risk rate as the appropriate baseline for evaluating the state of Montana's long-term timber investments. This rate and expected yields will then be adjusted to account for the risks inherent in forestry investments.

Using the return on AAA corporate bonds as the baseline discount rate has two distinct advantages. The first is that it is an accepted measure of returns to private capital investment. The second is that it is a measure of the potential yield on the school trust and legacy account, which Jackson (1983) suggests as the best source of the state's opportunity cost rate.

Risk Considerations

The lands managed by the Trust Land Management Division can be thought of as one investment within the school trust and legacy portfolio. Cohen and others (1973) describe an efficient portfolio as one yielding the highest return given an acceptable level of risk predetermined by the decision maker. The predetermined level of risk for the school trust is mandated by law and that level of risk is low (i.e. the risk associated with AAA corporate bonds). Implicit in a corporate earnings rate is a corporate risk posture which is unique from that associated with the school trust account. It is, therefore, inappropriate to simply assume a corporate earnings rate as the discount rate to be used in the state's long-term timber investments.

The low level of risk mandated for the school trust and legacy portfolio must be considered in evaluating the management of school trust lands. We accounted for the low risk posture of the school trust by using the historical rate of return on permissible trust investments (I. e. AAA corporate bonds) as our baseline discount rate. By applying a risk premium to our baseline rate we accounted for the unique risk associated with forestry investment, while remaining consistent with the mandated risk posture of the school trust portfolio.

ESTIMATING DISCOUNT RATE

We used the average rate of return on Moody's AAA corporate bonds for 1960-1983 as our baseline, low risk discount rate. The returns were adjusted from nominal to real rates using the

GNP implicit price deflator (Table SUP-1). This baseline discount rate of 2.69 percent reflects one measure of the opportunity cost of capital in the private sector. It is also indicative of the expected returns on the school trust and legacy fund, given the mandated level of acceptable risk on the trust investments.

The inherent risk of forestry investments is addressed in our investment analyses in two ways. First, we accounted for the uncertainty associated with future stumpage prices and treatment costs by applying a direct adjustment to the discount rate. Our second risk adjustment was to reduce future yields by the amount of expected losses due to catastrophic events (e.g. fire, and insect and disease outbreaks).

We estimated a risk adjustment for stumpage prices and costs by multiplying the expected variability in prices and costs by the sensitivity of internal rate of return (IROR) to this variability. Our measure of variability in future prices and costs was the standard error as a percent of the response mean about a linear trend of historical prices and costs (Table SUP-2). The price trend was based on annual average stumpage prices for state sales over the past 36 years. We could not obtain good historical estimates of treatment costs on state lands. Instead we used 10 years of USFS cost data to derive the trend (Bourassa 1984). We assumed that although actual costs would be different for state and USFS treatments the variability associated with cost trends would be similar.

The sensitivity of IROR to price and cost variability was estimated by Mills and others (1976) for several timber types (Table SUP-3). They found stumpage prices could vary up to approximately 82 percent and result in only a 1 percent change to IROR. Reforestation costs could vary 101 percent and precommercial thinning 113 percent before altering IROR by 1 percent. The sensitivity multipliers used in Table SUP-4 were calculated by dividing the 1 percent change in IROR by 82 percent, 101 percent, and 113 percent. These multipliers represent the change in IROR resulting from a 1 percent change in stumpage prices, reforestation costs, and precommercial thinning costs.

Multiplying the price and cost variability information by the sensitivity multipliers resulted in a .54 percent risk premium adjustment (Table SUP-4). This premium was added to the 2.69 percent baseline discount rate to produce a final rate of 3.3 percent to be used in the evaluation of the state's long-term timber investments.

CONCLUSIONS

The proposed Trust Land Management Division discount rate of 3.3 percent is generally lower than those rates previously mentioned for other agencies. The use of a relatively low discount rate has important implications for Trust Land Management Division bureaus. For example, the impact of a lower discount rate on the Forest Management Bureau's choice of optimal regimes will depend on the type of analysis applied, as described in the introduction.

The examples of the impact of a 3.3 percent discount rate on bureau decisions suggest a broader conclusion: this relatively low rate will allow more liberal investment than a higher rate. Decision makers will not be highly constrained by a financial criterion in their management decisions if a 3.3 percent rate is applied.[19]

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[19] Adding risk premium of 0.54% to 1994 update of Aaa bond yield (3.44%) results in a real interest rate of 3.98%, or approximately 4.00%. See Table SUP-5.

Table SUP-1
RETURNS ON MOODY AAA CORPORATE BONDS IN CURRENT AND REAL DOLLARS[20]

YEAR	CURRENT RATE (%)	REAL RATE (%)
1960	4.40	2.80
1961	4.35	3.45
1962	4.32	2.52
1963	4.25	2.75
1964	4.40	2.90
1965	4.49	2.29
1966	5.12	1.92
1967	5.50	2.50
1968	6.17	1.77
1969	7.02	1.92
1970	8.04	2.64
1971	7.38	2.38
1972	7.21	3.01
1973	7.44	1.64
1974	8.56	-0.24
1975	8.82	-0.48
1976	8.43	3.23
1977	8.02	2.22
1978	8.72	1.32
1979	9.63	1.03
1980	11.94	2.64
1981	14.17	4.77
1982	13.79	7.79
1983	12.04	7.84[21]

20 The GNP implicit price delfator was used to adjust current dollars to real (1972) dollars.

21 Based on 1983 preliminary estimates.

Table SUP-2
TREND EQUATIONS FOR STUMPAGE PRICES AND TREATMENT COSTS[22]

DATA	EQUATION	STATISTICS
Stumpage prices		
	$Y= 11/1+ .97X_1$	R^2=.64; S.E.=7.86; $\bar{y}$=29.10
	Y= stumpage price($/MBF)	S.E. as a % of $\bar{y}$=27.0
	X_1= number of years since 1959	
Reforestation costs		
	$Y= 57.72+8.12X_1$	R^2=.87; S.E.=9.87; $\bar{y}$=102.37
	Y= reforestation costs ($/AC)	S.E. as a % of $\bar{y}$=9.60
	X_1=number of years since 1973	
TSI costs		
	$Y=102.20+1.74X$	R^2=.08; S.E.=19.03;$\bar{y}$=111.74
	Y= TSI costs ($/AC)	S.E. as a % of $\bar{y}$=17.00
	X_1= number of years since 1973	

22 The GNP implicit price deflator was used to adjust current dollars to real (1972) dollars.

Table SUP-3
SENSITIVITY OF INTERNAL RATE OF RETURN TO PRICE AND COST VARIABILITY[23]

Stumpage Price Variability

Case Type	Average % Sensitivity[24]
Douglas-fir	51.02
Ponderosa pine	93.38
Fir-spruce	76.00
Lodgepole pine	109.17
Mean	82.39

TSI Thinning Cost Variability

Case Type	Average % Sensitivity
Douglas-fir	40.54
Ponderosa pine	137.13
Lodgepole pine	126.28
Mean	101.32

Sensitivity multiplier = 1/101.21 = .01

Reforestation Cost Variability

Case Type	Average % Sensitivity
Douglas-fir	82.03
Ponderosa pine	190.31
Fir-spruce	101.18
Lodgepole pine-	77.38
Mean	82.39

23 From Mills and others, 1976

24 Averaged upper and lower sensitivity levels

Table SUP-4
ESTIMATING RISK PREMIUM FROM VARIABILITY AND SENSITIVITY INFORMATION

A. Variability measure X sensitivity multiplier = risk premium

B.

Data	Variability	Sensitivity Multiplier	Risk Premium
Reforestation costs	9.60	.01	.10
TSI costs	17.00	.01	.17
Stumpage prices	27.00	.01	.27
		Total	.54

C. Risk premium + baseline discount rate = discount rate to be used in the evaluation of the state's long-term timber investments.

.54 + 2.69 = 3.23% or 3.3%

D. 12/6/94: Adding risk premium of 0.54% to 1994 update of Aaa bond yield (3.44%) results in a real interest rate of 3.98% or approximately 4.00%.

Table SUP-5
DISCOUNT RATE CALCULATION 1960-1993
(AAA CORPORATE BOND YIELD)

INTEGRATES 1985-93 SERIES WITH OLDER SERIES COMPILED BY WILL WOOD IN 1987
(Older series has slightly different numbers in overlap years of 1985-87)

YEAR	AAA YIELD	GDP DFLTR	% INFLTN	REAL RETURN	
1960	4.40	26.00	-	-	
1961	4.35	26.30	1.15	3.20	
1962	4.32	26.90	2.28	2.04	
1963	4.25	27.20	1.12	3.13	
1964	4.40	27.70	1.84	2.56	
1965	4.49	28.40	2.53	1.96	
1966	5.12	29.40	3.52	1.60	
1967	5.50	30.30	3.06	2.44	
1968	6.17	31.80	4.95	1.22	
1969	7.02	33.40	5.03	1.99	
1970	8.04	35.20	5.39	2.65	
1971	7.38	37.10	5.40	1.98	
1972	7.21	38.80	4.58	2.63	
1973	7.44	41.30	6.44	1.00	
1974	8.56	44.90	8.72	-0.16	
1975	8.82	49.20	9.58	-0.76	
1976	8.43	52.30	6.30	2.13	
1977	8.02	55.90	6.88	1.14	
1978	8.72	60.30	7.87	0.85	
1979	9.63	65.50	8.62	1.01	
1980	11.94	71.70	9.47	2.47	
1981	14.17	78.90	10.04	4.13	
1982	13.79	83.80	6.21	7.58	
1983	12.04	87.20	4.06	7.98	
1984	12.71	91.00	4.36	8.35	
1985	11.37	94.40	3.74	7.63	
1986	9.02	96.90	2.65	6.37	
1987	9.38	100.00	3.20	6.18	
1988	9.71	103.90	3.90	5.81	
1989	9.26	108.50	4.43	4.83	
1990	9.32	113.30	4.42	4.90	
1991	8.77	117.70	3.88	4.89	
1992	8.14	121.10	2.89	5.25	
1993	7.22	124.20	2.56	4.66	
			---------	(1966-1993)	(1960-1987)
1960-1993 AVERAGE REAL RATE			3.44	3.60	3.09

"AAA YIELD" FROM SURVEY OF CURRENT BUSINESS, Table S-16
"GDP DFLTR" FROM ECONOMIC REPORT OF THE PRESIDENT, 1994, Table B-3
(Implicit GDP Price Deflator)

DISCOUNTED REVENUE SPREADSHEETS

DISCOUNTED REVENUE SPREADSHEET 1
GRAZING - ALPHA

DISC RATE: 0.04

	MARKET	DNRC	USE (AUM)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE	
YEAR	$/AUM	$/AUM	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	8.00	4.09	26776	26776	-	-	-	-	-	-
1996	8.05	4.09	26776	26776	110	110				
1997	8.10	4.09	26776	26776	110	110				
1998	8.14	4.09	26776	26776	110	110				
1999	8.19	4.09	26776	26776	110	110				
2000	8.24	5.03	30765	22788	155	115	664	622	546	511
2001	8.29	5.06	30765	22788	156	115				
2002	8.34	5.09	30765	22788	157	116				
2003	8.39	5.12	30765	22788	157	117				
2004	8.44	5.15	30765	22788	158	117				
2005	8.49	5.95	34753	18799	207	112	936	650	632	439
2006	8.54	5.98	34753	18799	208	112				
2007	8.60	6.02	34753	18799	209	113				
2008	8.65	6.05	34753	18799	210	114				
2009	8.70	6.09	34753	18799	212	114				
2010	8.75	7.00	34753	18799	243	132	1216	658	675	365
2011	8.80	7.04	34753	18799	245	132				
2012	8.86	7.09	34753	18799	246	133				
2013	8.91	7.13	34753	18799	248	134				
2014	8.96	7.17	34753	18799	249	135				
2015	9.02	7.21	34753	18799	251	136	1395	754	637	344
2016	9.07	7.26	34753	18799	252	136				
2017	9.13	7.30	34753	18799	254	137				
2018	9.18	7.34	34753	18799	255	138				
2019	9.24	7.39	34753	18799	257	139				
2020	9.29	7.43	34753	18799	258	140	1437	777	539	292
					TOTAL DISC REVENUE (ALPHA)				3029	1952

DISCOUNTED REVENUE SPREADSHEET 2
GRAZING - BETA

DISC RATE: 0.04

	MARKET	DNRC	USE (AUM)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE	
YEAR	$/AUM	$/AUM	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	8.00	4.09	26776	26776	-	-	-	-	-	-
1996	8.05	4.09	26776	26776	110	110				
1997	8.10	4.09	26776	26776	110	110				
1998	8.14	4.09	26776	26776	110	110				
1999	8.19	4.09	26776	26776	110	110				
2000	8.24	5.03	26577	21392	134	108	642	615	528	505
2001	8.29	5.06	26577	21392	134	108				
2002	8.34	5.09	26577	21392	135	109				
2003	8.39	5.12	26577	21392	136	110				
2004	8.44	5.15	26577	21392	137	110				
2005	8.49	5.95	26377	16007	157	95	786	600	531	406
2006	8.54	5.98	26377	16007	158	96				
2007	8.60	6.02	26377	16007	159	96				
2008	8.65	6.05	26377	16007	160	97				
2009	8.70	6.09	26377	16007	161	97				
2010	8.75	7.00	26377	16007	185	112	923	560	512	311
2011	8.80	7.04	26377	16007	186	113				
2012	8.86	7.09	26377	16007	187	113				
2013	8.91	7.13	26377	16007	188	114				
2014	8.96	7.17	26377	16007	189	115				
2015	9.02	7.21	26377	16007	190	115	1059	642	483	293
2016	9.07	7.26	26377	16007	191	116				
2017	9.13	7.30	26377	16007	193	117				
2018	9.18	7.34	26377	16007	194	118				
2019	9.24	7.39	26377	16007	195	118				
2020	9.29	7.43	26377	16007	196	119	1091	662	409	248
					TOTAL DISC REVENUE (BETA)				2463	1763

DISCOUNTED REVENUE SPREADSHEET 3
GRAZING - GAMMA

DISC RATE: 0.04

	MARKET	DNRC	USE (AUM)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE	
YEAR	$/AUM	$/AUM	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	8.00	4.09	26776	26776	-	-	-	-	-	-
1996	8.05	4.09	26776	26776	110	110				
1997	8.10	4.09	26776	26776	110	110				
1998	8.14	4.09	26776	26776	110	110				
1999	8.19	4.09	26776	26776	110	110				
2000	8.24	5.03	24782	21776	125	109	633	617	520	507
2001	8.29	5.06	24782	21776	125	110				
2002	8.34	5.09	24782	21776	126	111				
2003	8.39	5.12	24782	21776	127	111				
2004	8.44	5.15	24782	21776	128	112				
2005	8.49	5.95	22788	16776	135	100	722	614	488	415
2006	8.54	5.98	22788	16776	136	100				
2007	8.60	6.02	22788	16776	137	101				
2008	8.65	6.05	22788	16776	138	102				
2009	8.70	6.09	22788	16776	139	102				
2010	8.75	7.00	22788	14811	160	104	797	573	443	318
2011	8.80	7.04	22788	14811	160	104				
2012	8.86	7.09	22788	14811	161	105				
2013	8.91	7.13	22788	14811	162	106				
2014	8.96	7.17	22788	14811	163	106				
2015	9.02	7.21	22788	14811	164	107	915	594	417	271
2016	9.07	7.26	22788	14811	165	107				
2017	9.13	7.30	22788	14811	166	108				
2018	9.18	7.34	22788	14811	167	109				
2019	9.24	7.39	22788	14811	168	109				
2020	9.29	7.43	22788	14811	169	110	942	612	353	230
					TOTAL DISC REVENUE (GAMMA)				2221	1741

DISCOUNTED REVENUE SPREADSHEET 4
GRAZING - DELTA

DISC RATE: 0.04

	MARKET	DNRC	USE (AUM)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE	
YEAR	$/AUM	$/AUM	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	8.00	4.09	26776	26776	-	-	-	-	-	-
1996	8.05	4.09	26776	26776	110	110				
1997	8.10	4.09	26776	26776	110	110				
1998	8.14	4.09	26776	26776	110	110				
1999	8.19	4.09	26776	26776	110	110				
2000	8.24	5.03	24896	21776	125	109	633	617	520	507
2001	8.29	5.06	24896	21776	126	110				
2002	8.34	5.09	24782	21776	126	111				
2003	8.39	5.12	24896	21776	127	111				
2004	8.44	5.15	24896	21776	128	112				
2005	8.49	5.95	23016	16776	137	100	725	614	490	415
2006	8.54	5.98	23016	16776	138	100				
2007	8.60	6.02	23016	16776	138	101				
2008	8.65	6.05	23016	16776	139	102				
2009	8.70	6.09	23016	16776	140	102				
2010	8.75	7.00	23016	13444	161	94	805	563	447	312
2011	8.80	7.04	23016	13444	162	95				
2012	8.86	7.09	23016	13444	163	95				
2013	8.91	7.13	23016	13444	164	96				
2014	8.96	7.17	23016	13444	165	96				
2015	9.02	7.21	23016	13444	166	97	924	540	422	246
2016	9.07	7.26	23016	13444	167	98				
2017	9.13	7.30	23016	13444	168	98				
2018	9.18	7.34	23016	13444	169	99				
2019	9.24	7.39	23016	13444	170	99				
2020	9.29	7.43	23019	13444	171	100	952	556	357	209
					TOTAL DISC REVENUE (DELTA)				2236	1689

DISCOUNTED REVENUE SPREADSHEET 5
GRAZING - EPSILON

DISC RATE: 0.04

	MARKET	DNRC	USE (AUM)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE	
YEAR	$/AUM	$/AUM	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	8.00	4.09	26776	26776	-	-	-	-	-	-
1996	8.05	4.09	26776	26776	110	110				
1997	8.10	4.09	26776	26776	110	110				
1998	8.14	4.09	26776	26776	110	110				
1999	8.19	4.09	26776	26776	110	110				
2000	8.24	5.03	27175	21591	137	109	645	616	530	506
2001	8.29	5.06	27175	21591	137	109				
2002	8.34	5.09	27175	21591	138	110				
2003	8.39	5.12	27175	21591	139	111				
2004	8.44	5.15	27175	21591	140	111				
2005	8.49	5.95	27574	16406	164	98	807	607	545	410
2006	8.54	5.98	27574	16406	165	98				
2007	8.60	6.02	27574	16406	166	99				
2008	8.65	6.05	27574	16406	167	99				
2009	8.70	6.09	27574	16406	168	100				
2010	8.75	7.00	27574	16406	193	115	965	574	536	319
2011	8.80	7.04	27574	16406	194	116				
2012	8.86	7.09	27574	16406	195	116				
2013	8.91	7.13	27574	16406	197	117				
2014	8.96	7.17	27574	16406	198	118				
2015	9.02	7.21	27574	16406	199	118	1107	658	505	300
2016	9.07	7.26	27574	16406	200	119				
2017	9.13	7.30	27574	16406	201	120				
2018	9.18	7.34	27574	16406	203	120				
2019	9.24	7.39	27574	16406	204	121				
2020	9.29	7.43	27574	16406	205	122	1140	678	428	254
				TOTAL DISC REVENUE (EPSILON)					2544	1790

DISCOUNTED REVENUE SPREADSHEET 6
GRAZING - ZETA

DISC RATE: 0.04

	MARKET	DNRC	USE (AUM)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE	
YEAR	$/AUM	$/AUM	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	8.00	4.09	26776	26776	-	-	-	-	-	-
1996	8.05	4.09	26776	26776	110	110				
1997	8.10	4.09	26776	26776	110	110				
1998	8.14	4.09	26776	26776	110	110				
1999	8.19	4.09	26776	26776	110	110				
2000	8.24	5.03	24896	21776	125	109	633	617	520	507
2001	8.29	5.06	24896	21776	126	110				
2002	8.34	5.09	24896	21776	127	111				
2003	8.39	5.12	24896	21776	127	111				
2004	8.44	5.15	24896	21776	128	112				
2005	8.49	5.95	23016	16776	137	100	726	614	490	415
2006	8.54	5.98	23016	16776	138	100				
2007	8.60	6.02	23016	16776	138	101				
2008	8.65	6.05	23016	16776	139	102				
2009	8.70	6.09	23016	16776	140	102				
2010	8.75	7.00	23016	13444	161	94	805	563	447	312
2011	8.80	7.04	23016	13444	162	95				
2012	8.86	7.09	23016	13444	163	95				
2013	8.91	7.13	23016	13444	164	96				
2014	8.96	7.17	23016	13444	165	96				
2015	9.02	7.21	23016	13444	166	97	924	540	422	246
2016	9.07	7.26	23016	13444	167	98				
2017	9.13	7.30	23016	13444	168	98				
2018	9.18	7.34	23016	13444	169	99				
2019	9.24	7.39	23016	13444	170	99				
2020	9.29	7.43	23016	13444	171	100	952	556	357	209
					TOTAL DISC REVENUE (ZETA)				2236	1689

DISCOUNTED REVENUE SPREADSHEET 7
GRAZING - OMEGA

DISC RATE: 0.04

	MARKET	DNRC	USE (AUM)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE	
YEAR	$/AUM	$/AUM	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	8.00	4.09	26776	26776	-	-	-	-	-	-
1996	8.05	4.09	26776	26776	110	110				
1997	8.10	4.09	26776	26776	110	110				
1998	8.14	4.09	26776	26776	110	110				
1999	8.19	4.09	26776	26776	110	110				
2000	8.24	5.03	26577	23192	134	108	642	615	528	505
2001	8.29	5.06	26577	21392	134	108				
2002	8.34	5.09	26577	21392	135	109				
2003	8.39	5.12	26577	21392	136	110				
2004	8.44	5.15	26577	21392	137	110				
2005	8.49	5.95	26377	16007	157	95	786	600	531	406
2006	8.54	5.98	26377	16007	158	96				
2007	8.60	6.02	26377	16007	159	96				
2008	8.65	6.05	26377	16007	160	97				
2009	8.70	6.09	26377	16007	161	97				
2010	8.75	7.00	26377	16007	185	112	923	560	512	311
2011	8.80	7.04	26377	16007	186	113				
2012	8.86	7.09	26377	16007	187	113				
2013	8.91	7.13	26377	16007	188	114				
2014	8.96	7.17	26377	16007	189	115				
2015	9.02	7.21	26377	16007	190	115	1059	642	483	293
2016	9.07	7.26	26377	16007	191	116				
2017	9.13	7.30	26377	16007	193	117				
2018	9.18	7.34	26377	16007	194	118				
2019	9.24	7.39	26377	16007	195	118				
2020	9.29	7.43	26377	16007	196	119	1091	662	409	248
					TOTAL DISC REVENUE (OMEGA)				2463	1763

DISCOUNTED REVENUE SPREADSHEET 8
GRAZING FEE SCHEDULE - REVISED

RPA PRICE TREND: 0.6%/YEAR

PERIOD	DEPARTMENT OF NATURAL RESOURCES & CONSERVATION	MARKET
1995-2000	4.09 (.51 * MARKET)	8.00
2000-2005	5.17 (.61 * MARKET)	8.48
2005-2010	6.29 (.70 * MARKET)	8.99
2010-2015	7.62 (.80 * MARKET)	9.53
2015-2020	8.08 (.80 * MARKET)	10.10

DISCOUNTED REVENUE SPREADSHEET 9
RECREATION - ALPHA

* UNITS: Groups I & IV = No. of Leases
Groups II & III = User Days
Group V = No. of Acres

	Level*	Price	Revenue	N	n	Present Value
1995-2000						
GROUP I	673	768.00	516864	5	0	2300987
GROUP II	108471	.020	21694	5	0	96579
GROUP III	188976	.033	62362	5	0	277625
GROUP IV	52	400.00	20800	5	0	92598
GROUP V	0	0.66	0	5	0	0
2000-2005						
GROUP I	704	1086.00	764544	10	5	2797523
GROUP II	112991	0.85	96042	10	5	351426
GROUP III	198758	1.45	288199	10	5	1054542
GROUP IV	54	400.00	21600	10	5	79036
GROUP V	5348	0.66	3530	10	5	12915
2005-2010						
GROUP I	735	1404.00	1031940	15	10	3103551
GROUP II	117512	1.50	176268	15	10	530125
GROUP III	208539	2.57	535945	15	10	1611851
GROUP IV	56	400.00	22400	15	10	67368
GROUP V	10694	0.67	7165	15	10	21549
2010-2015						
GROUP I	766	1404.00	1075464	20	15	2658481
GROUP II	122032	1.51	184268	20	15	455500
GROUP III	218321	2.60	567635	20	15	1403158
GROUP IV	58	400.00	23200	20	15	57349
GROUP V	16040	0.67	10747	20	15	26565
2015-2020						
GROUP I	797	1404.00	1118988	25	20	2273508
GROUP II	126552	1.52	192359	25	20	390826
GROUP III	228103	2.64	602192	25	20	1223506
GROUP IV	61	400.00	24400	25	20	49575
GROUP V	21387	0.68	14543	25	20	29548
TOTAL PRESENT VALUE						20965689

High NPV ($1000):	31449
Low NPV ($1000):	10483

DISCOUNTED REVENUE SPREADSHEET 10
RECREATION - BETA

* UNITS Groups I & IV = No. of Leases
Groups II & III = User Days
Group V = No. of Acres

	Level*	Price	Revenue	N	n	Present Value
1995-2000						
GROUP I	711	768.00	546048	5	0	2430909
GROUP II	115317	.020	23063	5	0	102674
GROUP III	204798	.033	67583	5	0	300869
GROUP IV	56	400.00	22400	5	0	99721
GROUP V	0	0.66	0	5	0	0
2000-2005						
GROUP I	780	1086.00	847080	10	5	3099528
GROUP II	126683	0.85	107681	10	5	394011
GROUP III	230402	1.45	334083	10	5	1222434
GROUP IV	61	400.00	24400	10	5	89281
GROUP V	8020	0.66	5293	10	5	19368
2005-2010						
GROUP I	850	1404.00	1193400	15	10	3589141
GROUP II	138049	1.50	207074	15	10	622772
GROUP III	256007	2.57	657938	15	10	1978743
GROUP IV	67	400.00	26800	15	10	80601
GROUP V	16041	0.67	10747	15	10	32323
2010-2015						
GROUP I	919	1404.00	1290276	20	15	3189483
GROUP II	149415	1.51	225617	20	15	557711
GROUP III	281611	2.60	732189	20	15	1809925
GROUP IV	72	400.00	28800	20	15	71192
GROUP V	24061	0.67	16121	20	15	39850
2015-2020						
GROUP I	988	1404.00	1387152	25	20	2818351
GROUP II	160781	1.52	244387	25	20	496534
GROUP III	307215	2.64	811048	25	20	1647849
GROUP IV	78	400.00	31200	25	20	63391
GROUP V	32081	0.68	21815	25	20	44323
TOTAL PRESENT VALUE						24800983

High NPV ($1000):	37201
Low NPV ($1000):	12400

DISCOUNTED REVENUE SPREADSHEET 11
RECREATION - GAMMA

* UNITS: Groups I & IV = No. of Leases
Groups II & III = User Days
Group V = No. of Acres

	Level*	Price	Revenue	N	n	Present Value
1995-2000						
GROUP I	613	768.00	470784	5	0	2095847
GROUP II	101365	.020	20273	5	0	90252
GROUP III	216397	.033	71411	5	0	317909
GROUP IV	49	400.00	19600	5	0	87256
GROUP V	0	0.66	0	5	0	0
2000-2005						
GROUP I	585	1086.00	635310	10	5	2324646
GROUP II	98778	0.85	83961	10	5	307221
GROUP III	253600	1.45	367720	10	5	1345514
GROUP IV	48	400.00	19200	10	5	70254
GROUP V	10694	0.66	7058	10	5	25826
2005-2010						
GROUP I	556	1404.00	780624	15	10	2347720
GROUP II	96192	1.50	144288	15	10	433945
GROUP III	290802	2.57	747361	15	10	2247682
GROUP IV	46	400.00	18400	15	10	55338
GROUP V	21387	0.67	14329	15	10	43095
2010-2015						
GROUP I	528	1404.00	741312	20	15	1832478
GROUP II	93605	1.51	141344	20	15	349393
GROUP III	328005	2.60	852813	20	15	2108102
GROUP IV	45	400.00	18000	20	15	44495
GROUP V	32081	0.67	21494	20	15	53133
2015-2020						
GROUP I	499	1404.00	700596	25	20	1423438
GROUP II	91019	1.52	138349	25	20	281091
GROUP III	365208	2.64	964149	25	20	1958913
GROUP IV	44	400.00	17600	25	20	35759
GROUP V	42774	0.68	29086	25	20	59096
TOTAL PRESENT VALUE						19938403

High NPV ($1000): 29908
Low NPV ($1000): 9969

DISCOUNTED REVENUE SPREADSHEET 12
RECREATION - DELTA

* UNITS: Groups I & IV = No. of Leases
Groups II & III = User Days
Group V = No. of Acres

	Level*	Price	Revenue	N	n	Present Value
1995-2000						
GROUP I	758	768.00	582144	5	0	2591602
GROUP II	114509	.020	22902	5	0	101955
GROUP III	193426	.033	63831	5	0	284162
GROUP IV	56	400.00	22400	5	0	99721
GROUP V	0	0.66	0	5	0	0
2000-2005						
GROUP I	874	1086.00	949164	10	5	3473061
GROUP II	125067	0.85	106307	10	5	388985
GROUP III	207658	1.45	301104	10	5	1101762
GROUP IV	61	400.00	24400	10	5	89281
GROUP V	16041	0.66	10587	10	5	38739
2005-2010						
GROUP I	991	1404.00	1391364	15	10	4184516
GROUP II	135625	1.50	203438	15	10	611837
GROUP III	221889	2.57	570255	15	10	1715036
GROUP IV	67	400.00	26800	15	10	80601
GROUP V	32081	0.67	21494	15	10	64644
2010-2015						
GROUP I	1107	1404.00	1554228	20	15	3841957
GROUP II	146183	1.51	220736	20	15	545647
GROUP III	236121	2.60	613915	20	15	1517559
GROUP IV	72	400.00	28800	20	15	71192
GROUP V	48122	0.67	32242	20	15	79700
2015-2020						
GROUP I	1223	1404.00	1717092	25	20	3488708
GROUP II	156741	1.52	238246	25	20	484058
GROUP III	250353	2.64	660932	25	20	1342851
GROUP IV	78	400.00	31200	25	20	63391
GROUP V	64162	0.68	43630	25	20	88646
	TOTAL PRESENT VALUE					26349608

High NPV ($1000):	39524
Low NPV ($1000):	13175

DISCOUNTED REVENUE SPREADSHEET 13
RECREATION - EPSILON

* UNITS: Groups I & IV = No. of Leases
Groups II & III = User Days
Group V = No. of Acres

	Level*	Price	Revenue	N	n	Present Value
1995-2000						
GROUP I	657	768.00	504576	5	0	2246283
GROUP II	108471	.020	21694	5	0	96579
GROUP III	188976	.033	62362	5	0	277625
GROUP IV	52	400.00	20800	5	0	92598
GROUP V	0	0.66	0	5	0	0
2000-2005						
GROUP I	672	1086.00	729792	10	5	2670363
GROUP II	112991	0.85	96042	10	5	351426
GROUP III	198758	1.45	288199	10	5	1054542
GROUP IV	54	400.00	21600	10	5	79036
GROUP V	5348	0.66	3530	10	5	12915
2005-2010						
GROUP I	686	1404.00	963144	15	10	2896648
GROUP II	117512	1.50	176268	15	10	530125
GROUP III	208539	2.57	535945	15	10	1611851
GROUP IV	57	400.00	22800	15	10	68571
GROUP V	10694	0.67	7165	15	10	21549
2010-2015						
GROUP I	701	1404.00	984204	20	15	2432892
GROUP II	122032	1.51	184268	20	15	455500
GROUP III	218321	2.60	567635	20	15	1403158
GROUP IV	56	400.00	22400	20	15	55371
GROUP V	16040	0.67	10747	20	15	26565
2015-2020						
GROUP I	716	1404.00	1005264	25	20	2042449
GROUP II	126552	1.52	192359	25	20	390826
GROUP III	228103	2.64	602192	25	20	1223506
GROUP IV	61	400.00	24400	25	20	49575
GROUP V	21387	0.68	14543	25	20	29548
TOTAL PRESENT VALUE						20119499

High NPV ($1000):	30179
Low NPV ($1000):	10060

DISCOUNTED REVENUE SPREADSHEET 14
RECREATION - ZETA

* UNITS: Groups I & IV = No. of Leases
Groups II & III = User Days
Group V = No. of Acres

	Level*	Price	Revenue	N	n	Present Value
1995-2000						
GROUP I	786	768.00	603648	5	0	2687334
GROUP II	116207	.020	23241	5	0	103467
GROUP III	202019	.033	66666	5	0	296786
GROUP IV	57	400.00	22800	5	0	101502
GROUP V	0	0.66	0	5	0	0
2000-2005						
GROUP I	930	1086.00	1009980	10	5	3695591
GROUP II	12863	0.85	109194	10	5	399547
GROUP III	224845	1.45	326025	10	5	1192950
GROUP IV	63	400.00	25200	10	5	92209
GROUP V	37428	0.66	24702	10	5	90388
2005-2010						
GROUP I	1073	1404.00	1506492	15	10	4530762
GROUP II	140720	1.50	211080	15	10	634821
GROUP III	247670	2.57	636512	15	10	1914304
GROUP IV	70	400.00	28000	15	10	84210
GROUP V	74855	0.67	50153	15	10	150834
2010-2015						
GROUP I	1217	1404.00	1708668	20	15	4223723
GROUP II	152976	1.51	230994	20	15	571002
GROUP III	270496	2.60	703290	20	15	1738489
GROUP IV	76	400.00	30400	20	15	75147
GROUP V	112283	0.67	75230	20	15	185963
2015-2020						
GROUP I	1361	1404.00	1910844	25	20	3882364
GROUP II	165232	1.52	251153	25	20	510280
GROUP III	293321	2.64	774367	25	20	1573324
GROUP IV	83	400.00	33200	25	20	67454
GROUP V	149710	0.68	101803	25	20	206383
TOTAL PRESENT VALUE						29009290

High NPV ($1000):	43514
Low NPV ($1000):	14505

DISCOUNTED REVENUE SPREADSHEET 15
RECREATION - OMEGA

* UNITS: Groups I & IV = No. of Leases
Groups II & III = User Days
Group V = No. of Acres

	Level*	Price	Revenue	N	n	Present Value
1995-2000						
GROUP I	711	768.00	546048	5	0	2430909
GROUP II	115317	.020	23063	5	0	102674
GROUP III	204798	.033	67583	5	0	300869
GROUP IV	56	400.00	22400	5	0	99721
GROUP V	0	0.66	0	5	0	0
2000-2005						
GROUP I	780	1086.00	847080	10	5	3099528
GROUP II	126683	0.85	107681	10	5	394011
GROUP III	230402	1.45	334083	10	5	1222434
GROUP IV	61	400.00	24400	10	5	89281
GROUP V	8020	0.66	5293	10	5	19368
2005-2010						
GROUP I	850	1404.00	1193400	15	10	3589141
GROUP II	138049	1.50	207074	15	10	622772
GROUP III	256007	2.57	657938	15	10	1978743
GROUP IV	67	400.00	26800	15	10	80601
GROUP V	16041	0.67	10747	15	10	32323
2010-2015						
GROUP I	919	1404.00	1290276	20	15	3189483
GROUP II	149415	1.51	225617	20	15	557711
GROUP III	281611	2.60	732189	20	15	1809925
GROUP IV	72	400.00	28800	20	15	71192
GROUP V	24061	0.67	16121	20	15	39850
2015-2020						
GROUP I	988	1404.00	1387152	25	20	2818351
GROUP II	160781	1.52	244387	25	20	496534
GROUP III	307215	2.64	811048	25	20	1647849
GROUP IV	78	400.00	31200	25	20	63391
GROUP V	32081	0.68	21815	25	20	44323
TOTAL PRESENT VALUE						24800983

High NPV ($1000): 37201
Low NPV ($1000): 12400

DISCOUNTED REVENUE SPREADSHEET 16
TIMBER - ALPHA

DISCOUNT RATE: 0.04

	RPA (1.2)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	-	-	-	-	-	-	-	-		
	192.00										
1996	194.30	40	20	7772	3886						
1997	196.64	40	20	7865	3933						
1998	199.00	40	20	7960	3980						
1999	201.38	40	20	8055	4028						
2000	203.80	40	20	8152	4076	44802	22401	36824	18412		
2001	206.25	40	20	8250	4125						
2002	208.72	40	20	8349	4174						
2003	211.23	40	20	8449	4225						
2004	213.76	40	20	8550	4275						
2005	216.32	40	20	8653	4326	47555	23778	32127	16063		
2006	218.92	40	20	8757	4378						
2007	221.55	40	20	8862	4431						
2008	224.21	40	20	8968	4484						
2009	226.90	40	20	9076	4538						
2010	229.62	40	20	9185	4592	50478	25239	28029	14014		
2011	232.38	40	20	9295	4648						
2012	235.16	40	20	9407	4706					MBF	
2013	237.99	40	20	9519	4760					2851723	3451723
2014	240.84	40	20	9634	4817						
2015	243.73	40	20	9749	4875	53580	26790	24453	12227	$	
2016	246.66	40	20	9866	4933					737770659	892996594
2017	249.62	40	20	9985	4992						
2018	252.61	40	20	10104	5052					Disc Asset $	
2019	255.64	40	20	10226	5113					276750171	334978162
2020	258.71	40	20	10348	5174	56873	28437	21334	10667		
										Disc Revenue	
		TOTAL DISC REVENUE (ALPHA)						142766	71383	142766	71383
		TOTAL GROSS DISCOUNTED VALUE:								276892937	335049545

DISCOUNTED REVENUE SPREADSHEET 17
TIMBER - ALPHA
ADAMS PROJECTIONS

DISCOUNT RATE: 0.04

	ADAM (2.6)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	-	-	-	-	-	-	-	-		
	192.00										
1996	196.99	40	20	7880	3940						
1997	202.11	40	20	8085	4042						
1998	207.37	40	20	8295	4147						
1999	212.76	40	20	8510	4255						
2000	218.29	40	20	8732	4366	46661	23330	38352	19176		
2001	223.97	40	20	8959	4479						
2002	229.79	40	20	9192	4596						
2003	235.77	40	20	9431	4715						
2004	241.90	40	20	9676	4838						
2005	248.18	40	20	9927	4964	53051	26525	35839	17920		
2006	254.64	40	20	10185	5093						
2007	261.26	40	20	10450	5225						
2008	268.05	40	20	10722	5361						
2009	275.02	40	20	11001	5500						
2010	282.17	40	20	11287	5643	60315	30158	33491	16745		
2011	289.51	40	20	11580	5790						
2012	297.03	40	20	11881	5941					MBF	
2013	304.76	40	20	12190	6095					2851723	3451723
2014	312.68	40	20	12507	6254						
2015	320.81	40	20	12832	6416	68575	34287	31297	15648	$	
2016	329.15	40	20	13166	6583					1040141888	1258986823
2017	337.71	40	20	13508	6754						
2018	346.49	40	20	13860	6930					Disc Asset $	
2019	355.50	40	20	14220	7110					390174699	472267111
2020	364.74	40	20	14590	7295	77965	38983	29246	14623		
										Disc Revenue	
			TOTAL DISC REVENUE (ALPHA)					168224	84112	168224	84112
			TOTAL GROSS DISCOUNTED VALUE:							390342923	472351223

DISCOUNTED REVENUE SPREADSHEET 18
TIMBER - BETA

DISCOUNT RATE: 0.04

	RPA (1.2)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	194.30	39	19	7578	3692						
1997	196.64	38	18	7472	3539						
1998	199.00	37	17	7363	3383						
1999	201.38	36	16	7250	3222						
2000	203.80	35	15	7133	3057	41503	19102	34112	15700		
2001	206.25	35	15	7219	3094						
2002	208.72	35	15	7305	3131						
2003	211.23	35	15	7393	3168						
2004	213.76	35	15	7482	3206						
2005	216.32	35	15	7571	3245	41611	17833	28111	12047		
2006	218.92	35	15	7662	3284						
2007	221.55	35	15	7754	3323						
2008	224.21	35	15	7847	3363						
2009	226.90	35	15	7941	3403						
2010	229.62	35	15	8037	3444	44168	18929	24525	10511		
2011	232.38	35	15	8133	3486						
2012	235.16	35	15	8231	3527					MBF	
2013	237.99	35	15	8329	3570					3001723	3601723
2014	240.84	35	15	8429	3613						
2015	243.73	35	15	8531	3656	46883	20093	21397	9170	$	
2016	246.66	35	15	8633	3700					776577233	931803528
2017	249.62	35	15	8737	3744						
2018	252.61	35	15	8841	3789					Disc Asset $	
2019	255.64	35	15	8947	3835					291307168	349535160
2020	258.71	35	15	9055	3881	49764	21327	18667	8000		
										Disc Revenue	
TOTAL DISC REVENUE (BETA)								126812	55429	126812	55429
TOTAL GROSS DISCOUNTED VALUE:										291433980	349590589

DISCOUNTED REVENUE SPREADSHEET 19
TIMBER - BETA
ADAMS PROJECTIONS

DISCOUNT RATE: 0.04

	ADAM (2.6)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	196.99	39	19	7683	3743						
1997	202.11	38	18	7680	3638						
1998	207.37	37	17	7673	3525						
1999	212.76	36	16	7659	3404						
2000	218.29	35	15	7640	3274	43193	19862	35501	16326		
2001	223.97	35	15	7839	3360						
2002	229.79	35	15	8043	3447						
2003	235.77	35	15	8252	3536						
2004	241.90	35	15	8466	3628						
2005	248.18	35	15	8686	3723	46419	19894	31359	13440		
2006	254.64	35	15	8912	3820						
2007	261.26	35	15	9144	3919						
2008	268.05	35	15	9382	4021						
2009	275.02	35	15	9626	4125						
2010	282.17	35	15	9876	4233	52776	22618	29305	12559		
2011	289.51	35	15	10133	4343						
2012	297.03	35	15	10396	4456					MBF	
2013	304.76	35	15	10666	4571					3001923	3601723
2014	312.68	35	15	10944	4690						
2015	320.81	35	15	11228	4812	60003	25715	27384	11736	$	
2016	329.15	35	15	11520	4937					1094853122	1313698056
2017	337.71	35	15	11820	5066						
2018	346.49	35	15	12127	5197					Disc Asset $	
2019	355.50	35	15	12442	5332					410697802	492790214
2020	364.74	35	15	12766	5471	68219	29237	25590	10967		
										Disc Revenue	
	TOTAL DISC REVENUE (BETA)							149140	65028	149140	65028
	TOTAL GROSS DISCOUNTED VALUE:									410846942	492855242

DISCOUNTED REVENUE SPREADSHEET 20
TIMBER - GAMMA

DISCOUNT RATE: 0.04

	RPA (1.2)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20			-	-	-	-		
	192.00										
1996	194.30	34	17	6606	3303						
1997	196.64	28	14	5506	2753						
1998	199.00	22	11	4378	2189						
1999	201.38	16	8	3222	1611						
2000	203.80	10	5	2038	1019	25008	12504	20555	10277		
2001	206.25	10	5	2062	1031						
2002	208.72	10	5	2087	1044						
2003	211.23	10	5	2112	1056						
2004	213.76	10	5	2138	1069						
2005	216.32	10	5	2163	1082	11889	5944	8032	4016		
2006	218.92	10	5	2189	1095						
2007	221.55	10	5	2215	1108						
2008	224.21	10	5	2242	1121						
2009	226.90	10	5	2269	1134						
2010	229.62	10	5	2296	1148	12619	6310	7007	3504		
2011	232.38	10	5	2324	1162						
2012	235.16	10	5	2352	1176					MBF	
2013	237.99	10	5	2380	1190					3751723	3901723
2014	240.84	10	5	2408	1204						
2015	243.73	10	5	2437	1219	13395	6698	6113	3057	$	
2016	246.66	10	5	2467	1233					970610102	1009416676
2017	249.62	10	5	2496	1248						
2018	252.61	10	5	2526	1263					Disc Asset $	
2019	255.64	10	5	2556	1278					364092158	378649156
2020	258.71	10	5	2587	1294	14218	7109	5334	2667		
										Disc Revenue	
TOTAL DISC REVENUE (GAMMA)								47040	23520	47040	23520
TOTAL GROSS DISCOUNTED VALUE:										364139198	378672676

DISCOUNTED REVENUE SPREADSHEET 21
TIMBER - GAMMA
ADAMS PROJECTIONS

								DISCOUNT RATE:		0.04	
	ADAM (2.6)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	196.99	34	17	6698	3349						
1997	202.11	28	14	5659	2830						
1998	207.37	22	11	4562	2281						
1999	212.76	16	8	3404	1702						
2000	218.29	10	5	2183	1091	25853	12927	21249	10625		
2001	223.97	10	5	2240	1120						
2002	229.79	10	5	2298	1149						
2003	235.77	10	5	2358	1179						
2004	241.90	10	5	2419	1209						
2005	248.18	10	5	2482	1241	13263	6631	8960	4480		
2006	254.64	10	5	2546	1273						
2007	261.26	10	5	2613	1306						
2008	268.05	10	5	2681	1340						
2009	275.02	10	5	2750	1375						
2010	282.17	10	5	2822	1411	15079	7539	8373	4186		
2011	289.51	10	5	2895	1448						
2012	297.03	10	5	2970	1485					MBF	
2013	304.76	10	5	3048	1524					3751723	3901723
2014	312.68	10	5	3127	1563						
2015	320.81	10	5	3208	1604	17144	8572	7824	3912	$	
2016	329.15	10	5	3292	1646					1368409290	1423120523
2017	337.71	10	5	3377	1689						
2018	346.49	10	5	3465	1732					Disc Asset $	
2019	355.50	10	5	3555	1777					513313317	533836420
2020	364.74	10	5	3647	1824	19491	9746	7312	3656		
										Disc Revenue	
		TOTAL DISC REVENUE (GAMMA)						53718	26859	53718	26859
		TOTAL GROSS DISCOUNTED VALUE:								513367035	533863279

DISCOUNTED REVENUE SPREADSHEET 22
TIMBER -DELTA

									DISCOUNT RATE:	0.04	
	RPA (1.2)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	194.30	41	19	7966	3692						
1997	196.64	42	18	8259	3539						
1998	199.00	43	17	8557	3383						
1999	201.38	44	16	8861	3222						
2000	203.80	45	15	9171	3057	48101	19102	39535	15700		
2001	206.25	45	15	9281	3094						
2002	208.72	45	15	9392	3131						
2003	211.23	45	15	9505	3168						
2004	213.76	45	15	9619	3206						
2005	216.32	45	15	9735	3245	53500	17833	36142	12047		
2006	218.92	45	15	9851	3284						
2007	221.55	45	15	9970	3323						
2008	224.21	45	15	10089	3363						
2009	226.90	45	15	10210	3403						
2010	229.62	45	15	10333	3444	56788	18929	31532	10511		
2011	232.38	45	15	10457	3486						
2012	235.16	45	15	10582	3527					MBF	
2013	237.99	45	15	10709	3570					2701723	3601723
2014	240.84	45	15	10838	3613						
2015	243.73	45	15	10968	3565	60278	20093	27510	9170	$	
2016	246.66	45	15	11100	3700					698964086	931803528
2017	249.62	45	15	11233	3744						
2018	252.61	45	15	11368	3789					Disc Asset $	
2019	255.64	45	15	11504	3835					262193173	349535160
2020	258.71	45	15	11642	3881	63982	21327	24001	8000		
										Disc Revenue	
				TOTAL DISC REVENUE (DELTA)				158721	55429	158721	55429
				TOTAL GROSS DISCOUNTED VALUE:						262351893	349590589

DISCOUNTED REVENUE SPREADSHEET 23
TIMBER - DELTA
ADAMS PROJECTIONS

DISCOUNT RATE: 0.04

	ADAM (2.6)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	196.99	41	19	8077	3743						
1997	202.11	42	18	8489	3638						
1998	207.37	43	17	8917	3525						
1999	212.76	44	16	9361	3404						
2000	218.29	45	15	9823	3274	50129	19862	41202	16326		
2001	223.97	45	15	10079	3360						
2002	229.79	45	15	10341	3447						
2003	235.77	45	15	10609	3536						
2004	241.90	45	15	10885	3628						
2005	248.18	45	15	11168	3723	59682	19894	40319	13440		
2006	254.64	45	15	11459	3820						
2007	261.26	45	15	11757	3919						
2008	268.05	45	15	12062	4021						
2009	275.02	45	15	12376	4125						
2010	282.17	45	15	12698	4233	67855	22618	37677	12559		
2011	289.51	45	15	13028	4343						
2012	297.03	45	15	13367	4456					MBF	
2013	304.76	45	15	13714	4571					2701723	3601723
2014	312.68	45	15	14071	4690						
2015	320.81	45	15	14436	4812	77146	25715	35209	11736	$	
2016	329.15	45	15	14812	4937					985430655	1313698056
2017	337.71	45	15	15197	5066						
2018	346.49	45	15	15592	5197					Disc Asset $	
2019	355.50	45	15	15997	5332					369651596	492790214
2020	364.74	45	15	16413	5471	87711	29237	32902	10967		
										Disc Revenue	
TOTAL DISC REVENUE (DELTA)								187309	65028	187309	65028
TOTAL GROSS DISCOUNTED VALUE:										369838905	492855242

DISCOUNTED REVENUE SPREADSHEET 24
TIMBER - EPSILON

DISCOUNT RATE: 0.04

	RPA (1.2)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	194.30	43	23	8355	4469						
1997	196.64	46	26	9045	5113						
1998	199.00	49	29	9751	5771						
1999	201.38	52	32	10472	6444						
2000	203.80	55	35	11209	7133	54699	32298	44959	26547		
2001	206.25	55	35	11343	7219						
2002	208.72	55	35	11480	7305						
2003	211.23	55	35	11617	7393						
2004	213.76	55	35	11757	7482						
2005	216.32	55	35	11898	7571	65389	41611	44174	28111		
2006	218.92	55	35	12041	7662						
2007	221.55	55	35	12185	7754						
2008	224.21	55	35	12331	7847						
2009	226.90	55	35	12479	7941						
2010	229.62	55	35	12629	8037	69407	44168	38539	24525		
2011	232.38	55	35	12781	8133						
2012	235.16	55	35	12934	8231					MBF	
2013	237.99	55	35	13089	8329					2401723	3001723
2014	240.84	55	35	13246	8429						
2015	243.73	55	35	13405	8531	73673	46883	33623	21397	$	
2016	246.66	55	35	13566	8633					621350938	776577233
2017	249.62	55	35	13729	8737						
2018	252.61	55	35	13894	8841					Disc Asset $	
2019	255.64	55	35	14060	8947					233079177	291307168
2020	258.71	55	35	14229	9055	78200	49764	29334	18667		
										Disc Revenue	
				TOTAL DISC REVENUE (EPSILON)				190630	119246	190630	119246
				TOTAL GROSS DISCOUNTED VALUE:						233269807	291426415

DISCOUNTED REVENUE SPREADSHEET 25
TIMBER - EPSILON
ADAMS PROJECTIONS

DISCOUNT RATE: 0.04

	ADAM (2.6)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	196.99	43	23	8471	4531						
1997	202.11	46	26	9297	5255						
1998	207.37	49	29	10161	6014						
1999	212.76	52	32	11064	6808						
2000	218.29	55	35	12006	7640	57065	33734	46903	27727		
2001	223.97	55	35	12318	7839						
2002	229.79	55	35	12638	8043						
2003	235.77	55	35	12967	8252						
2004	241.90	55	35	13304	8466						
2005	248.18	55	35	13650	8686	72945	46419	49279	31359		
2006	254.64	55	35	14005	8912						
2007	261.26	55	35	14369	9144						
2008	268.05	55	35	14743	9382						
2009	275.02	55	35	15126	9626						
2010	282.17	55	35	15519	9876	82933	52776	46050	29305		
2011	289.51	55	35	15923	10133						
2012	297.03	55	35	16337	10396					MBF	
2013	304.76	55	35	16762	10666					2401723	3001723
2014	312.68	55	35	17197	10944						
2015	320.81	55	35	17645	11228	94290	60003	43033	27384	$	
2016	329.15	55	35	18103	11520					876008187	1094853122
2017	337.71	55	35	18574	11820						
2018	346.49	55	35	19057	12127					Disc Asset $	
2019	355.50	55	35	19552	12442					328605390	410697802
2020	364.74	55	35	20061	12766	107202	68219	40213	25590		
										Disc Revenue	
		TOTAL DISC REVENUE (EPSILON)						225478	141366	225478	141366
		TOTAL GROSS DISCOUNTED VALUE:								328830868	410839168

DISCOUNTED TIMBER SPREADSHEET 26
TIMBER - ZETA

DISCOUNT RATE: 0.04

	RPA (1.2)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	194.30	36	18	6995	3497						
1997	196.64	32	16	6292	3146						
1998	199.00	28	14	5572	2786						
1999	201.38	24	12	4833	2417						
2000	203.80	20	10	4076	2038	31606	15803	25978	12989		
2001	206.25	20	10	4125	2062						
2002	208.72	20	10	4174	2087						
2003	211.23	20	10	4225	2112						
2004	213.76	20	10	4275	2138						
2005	216.32	20	10	4326	2163	23778	11889	16063	8032		
2006	218.92	20	10	4378	2189						
2007	221.55	20	10	4431	2215						
2008	224.21	20	10	4484	2242						
2009	226.90	20	10	4538	2269						
2010	229.62	20	10	4592	2296	25239	12619	14014	7007		
2011	232.38	20	10	4648	2324						
2012	235.16	20	10	4703	2352					MBF	
2013	237.99	20	10	4706	2380					3451723	3751723
2014	240.84	20	10	4817	2408						
2015	243.73	20	10	4875	2437	26790	13395	12227	6113	$	
2016	246.66	20	10	4933	2467					892996954	970610102
2017	249.62	20	10	4992	2496						
2018	252.61	20	10	5052	2526					Disc Asset $	
2019	255.64	20	10	5113	2556					334978162	364092158
2020	258.71	20	10	5174	2587	28437	14218	10667	5334	Disc Revenue	
		TOTAL DISC REVENUE (ZETA)						78949	39474	78949	39474
		TOTAL GROSS DISCOUNTED VALUE:								335057111	364131632

DISCOUNTED REVENUE SPREADSHEET 27
TIMBER - ZETA
ADAMS PROJECTIONS

								DISCOUNT RATE:		0.04	
	ADAM (2.6)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	196.99	36	18	7092	3546						
1997	202.11	32	16	6468	3234						
1998	207.37	28	14	5806	2903						
1999	212.76	24	12	5106	2553						
2000	218.29	20	10	4366	2183	32789	16395	26950	13475		
2001	223.97	20	10	4479	2240						
2002	229.79	20	10	4596	2298						
2003	235.77	20	10	4715	2358						
2004	241.90	20	10	4838	2419						
2005	248.18	20	10	4964	2482	26525	13263	17920	8960		
2006	254.64	20	10	5093	2546						
2007	261.26	20	10	5225	2613						
2008	268.05	20	10	5361	2681						
2009	275.02	20	10	5500	2750						
2010	282.17	20	10	5643	2822	30158	15079	16745	8373		
2011	289.51	20	10	5790	2895						
2012	297.03	20	10	5941	2970					MBF	
2013	304.76	20	10	6095	3048					3451723	3751723
2014	312.68	20	10	6254	3127						
2015	320.81	20	10	6416	3208	34287	17144	15648	7824	$	
2016	329.15	20	10	6583	3292					1258986823	1368409290
2017	337.71	20	10	6754	3377						
2018	346.49	20	10	6930	3465					Disc Asset $	
2019	355.50	20	10	7110	3555					472267111	513313317
2020	364.74	20	10	7295	3647	38983	19491	14623	7312		
										Disc Revenue	
		TOTAL DISC REVENUE (ZETA)						91887	45943	91887	45943
		TOTAL GROSS DISCOUNTED VALUE:								472358997	513359260

DISCOUNTED REVENUE SPREADSHEET 28
TIMBER - OMEGA

DISCOUNT RATE: 0.04

	RPA (1.2)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	194.30	42	22	8161	4275						
1997	196.64	44	24	8652	4719						
1998	199.00	46	26	9154	5174						
1999	201.38	48	28	9666	5639						
2000	203.80	50	30	10190	6114	51400	28999	42247	23835		
2001	206.25	50	30	10312	6187						
2002	208.72	50	30	10436	6262						
2003	211.23	50	30	10561	6337						
2004	213.76	50	30	10688	6413						
2005	216.32	50	30	10816	6490	59444	35666	40158	24095		
2006	218.92	50	30	10946	6568						
2007	221.55	50	30	11077	6646						
2008	224.21	50	30	11210	6726						
2009	226.90	50	30	11345	6807						
2010	229.62	50	30	11481	6889	63097	37858	35036	21021		
2011	232.38	50	30	11619	6971						
2012	235.16	50	30	11758	7055					MBF	
2013	237.99	50	30	11899	7140					2551723	3151723
2014	240.84	50	30	12042	7225						
2015	243.73	50	30	12187	7312	66975	40185	30567	18340	$	
2016	246.66	50	30	12333	7400					660157512	815383807
2017	249.62	50	30	12481	7488						
2018	252.61	50	30	12631	7578					Disc Asset $	
2019	255.64	50	30	12782	7669					247636175	305864166
2020	258.71	50	30	12936	7761	71091	42655	26668	16001		
										Disc Revenue	
				TOTAL DISC REVENUE (OMEGA)				174675	103292	174675	103292
				TOTAL GROSS DISCOUNTED VALUE:						247810850	305967458

DISCOUNTED REVENUE SPREADSHEET 29
TIMBER - OMEGA
ADAMS PROJECTIONS

								DISCOUNT RATE:		0.04	
	ADAM (2.6)	VOLUME (MBF)		REVENUE ($1000)		ACCUM REVENUE		DISC REVENUE		RESIDUAL TIMBER ASSET	
YEAR	$/MBF	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
1995	192.00	40	20	-	-	-	-	-	-		
	192.00										
1996	196.99	42	22	8274	4334						
1997	202.11	44	24	8893	4851						
1998	207.37	46	26	9539	5392						
1999	212.76	48	28	10212	5957						
2000	218.29	50	30	10915	6549	53597	30266	44053	24877		
2001	223.97	50	30	11918	6719						
2002	229.79	50	30	11490	6894						
2003	235.77	50	30	11788	7073						
2004	241.90	50	30	12095	7257						
2005	248.18	50	30	12409	7446	66313	39788	44799	26879		
2006	254.64	50	30	12732	7639						
2007	261.26	50	30	13063	7838						
2008	268.05	50	30	13403	8042						
2009	275.02	50	30	13751	8251						
2010	282.17	50	30	14109	8465	78394	45236	41864	25118		
2011	289.51	50	30	14475	8685						
2012	297.03	50	30	14852	8911					MBF	
2013	304.76	50	30	15238	9143					2551723	3151723
2014	312.68	50	30	15634	9380						
2015	320.81	50	30	16041	9624	85718	51431	39121	23472	$	
2016	329.15	50	30	16458	9875					930719421	1149564355
2017	337.71	50	30	16885	10131						
2018	346.49	50	30	17324	10395					Disc Asset $	
2019	355.50	50	30	17775	10665					349128493	431220905
2020	364.74	50	30	18237	10942	97456	58474	36558	21935	Disc Revenue	
			TOTAL DISC REVENUE (OMEGA)					206393	122281	206393	122281
			TOTAL GROSS DISCOUNTED VALUE:							349334886	431343186

APPENDIX RSP

RESPONSES TO PUBLIC COMMENTS ON THE SFLMP DRAFT ENVIRONMENTAL IMPACT STATEMENT

PUBLIC PARTICIPATION BETWEEN THE DEIS AND FEIS

During the course of the development of the State Forest Land Management Plan (Plan), a mailing list was compiled of those interested in participating in the public involvement process. On January 19, 1995, we mailed a request form to the over 600 people on our mailing list, asking if the interested party wanted to receive the DEIS Executive Summary only (they could still ask for the full EIS later), the entire DEIS (including Appendixes), or if they wished to be removed from the mailing list.

The results of this request were then compiled into a separate database, and the DEIS was mailed to recipients as indicated. Copies of the document were also mailed to other interested parties upon request.

The State Forest Land Management Plan DEIS was released to the public for review on June 19, 1995. A press release was issued announcing the availability of the document and request for comments. The comment period lasted for 45 days and closed on August 4, 1995.

On June 30, 1995, at the request of the Montana Wood Products Association, a letter was sent to each state institution that is a designated beneficiary of forested trust lands announcing the availability of the DEIS.

SUMMARY OF PUBLIC COMMENTS ON THE DEIS

One hundred and seventy-four responses were received (145 letters, 3 phone calls, testimony from 13 people during public hearings, and an additional 13 comments came from those who both spoke at a public hearing and sent in a letter). Comments came from 98 individuals, 51 organizations, 12 agencies (federal, state, local government), 8 schools, and 3 legislators.

All the comments received were from within the state of Montana, except for one each from Madison, Wisconsin and Seattle, Washington. Responses came from the following counties: Beaverhead (2), Broadwater (1), Cascade (3), Fergus (1), Flathead (69), Gallatin (9), Granite (1), Lake (4), Lewis and Clark (13), Lincoln (5), Madison (2), Missoula (35), Park (2), Ravalli (8), Sanders (4), Silver Bow (3), Teton (1), and Yellowstone (9).

Each letter, phone call and individual hearing testimony was assigned a three-digit comment number (see List of Commenters at the end of this chapter), primarily based on their order of receipt, with the hearings transcripts assigned numbers last. The letters, the text of the phone calls and the hearing transcripts were reviewed in two ways: 1) a database was compiled which included the comment author's name, title, affiliation, comment number, alternative preference, and issues of concern; and 2) a written summary was also compiled by resource area and distributed to the planning team, along with copies of individual comments relating specifically to their resource area. Both the database and the summary have been added to the Project Record.

Substantive comments were received regarding almost every resource area and issue category covered in the Plan. Of particular concern were the method of our economic analysis, impacts of management activities on threatened and endangered wildlife and fisheries, protection of watersheds (particularly in Northwestern Montana) and riparian areas, road density, recreational access, forest health, old-growth, control of noxious weeds, and the merit of specific Resource Management Standards presented in the DEIS.

Please note that we have limited our responses in this section to the material included in the DEIS. As such, we have not included any information about Alternative Omega in these responses. Omega was developed after the DEIS was issued and after we received the public's comments on Alternatives Alpha, Beta, Gamma, Delta, Epsilon and Zeta. We felt that it would be more informative to our readers to respond only to the issues they read in the DEIS, even though the development of Omega was, in part, in response to the public comments we received on the other alternatives.

RESPONSE TO PUBLIC COMMENTS

A note about page/section references in this section. In an effort to provide a better and updated document to our readers, we have made some changes between the DEIS and FEIS. For example: (1) we have changed the order of the Resource Management Standards as they appear in Appendix RMS. We felt it made more sense to introduce forest concepts (such as biodiversity and silviculture) first and then follow with specific resources; (2) we have corrected a misnomer from the DEIS, changing "figures" to "tables", where appropriate; and (3) we have updated the text to include the Omega alternative, new legislation and new reference material.

What this means is that we were faced with a difficult way to provide specific page references in response to your comments. While it would have been easy just to stick with referencing the DEIS only, this would have been confusing for FEIS readers when the page numbers were different. And it would have been equally cumbersome if all of our responses included page numbers for both the DEIS and FEIS.

As such, we decided to adopt the following protocol in this section: In cases where we took a direct quote from the DEIS, the DEIS page reference will follow that quote. For non-quote references, we have provided you with the subsection title, chapter, and section title (e.g., Road Density, Chapter IV: Wildlife). We felt the subsection reference would be easiest to track, regardless of which document you are referring back to (the DEIS or the FEIS) for information. The subsection title will not be included if the reader is being referred to a whole section or to general information within a chapter.

Individual comments were first categorized by **resource** and then grouped into broad substantive **issues areas** and **specific issues** for response.

For example:	Resource Category	=	Fisheries
	Issue Area	=	Species of Special Concern
	Specific Issue	=	Impacts to Yellowstone Cutthroat

The comments and responses are presented by Resource Category in the same order as they appear in the DEIS. Each comment is presented in italic-boldface type and is followed by the commenters' number in parentheses. Some of the comments are direct quotes; some have been grouped together and some are paraphrased. Every attempt was made to accurately capture and display each substantive comment. The DNRC response appears in regular typeface below each comment or group of comments.

Physical and Biological Environment

FOREST SOILS

Issue - Impacts to Soils

COMMENT: Epsilon would have greatest impact on soils in terms of compaction, nutrient loss, erosion, slope stability, and silt transport. (130)

RESPONSE: This is correct. Epsilon would cause impacts to the greatest area of soils. Best Management Practices (BMPs) and mitigation measures to maintain long term soil productivity would be implemented on all projects.

Issue - Soils and Roads

COMMENT: Minimize soil disturbance through fewer and better roads, using low disturbance logging and site preparation equipment and winter logging. (100)

RESPONSE: Under all alternatives, we would limit the number of roads to the minimum needed for access. Gamma and Zeta would promote the least number of roads. Alpha, Beta, Delta and Epsilon would allow development of more roads. Some roads would be for temporary use or construction would occur in winter to minimize effects. Some existing roads that are poorly located may need to be closed and relocated on more stable ground to reduce erosion, improve road grades, to provide for safety and reduce maintenance.

Issue - Soil analysis

COMMENT: How were the long-term soil effects presented in Table III-S1 determined? What criteria were used? (030)

RESPONSE: The area of long term soil effects is expressed as a percentage of the acres logged. This category includes the expected area in system roads; in main, heavily used skid trails; and in landings.

WATERSHED

Issue - Watershed Protection

COMMENT: DNRC should protect watersheds and water quality. We recommend proactive watershed and riparian protection, rather than just mitigation of impacts of forest management activities. (020, 025, 027, 028, 032, 035, 038, 039, 041, 043, 044, 046, 047, 048, 049, 051, 055, 059, 060, 062, 063, 064, 070, 072, 074, 075, 080, 090, 095, 096, 097, 101, 102, 103, 108, 111, 112, 116, 117, 119, 122, 127, 130, 137, 140, 146, 149, 151, 153, 154, 158, 159, 172, 175)

RESPONSE: Under all alternatives, DNRC would comply with all applicable State and Federal laws and regulations. These include the Montana Streamside Management Zone Law, the Federal Clean Water Act, the Montana Water Pollution Control Act, and others as listed in Appendix LGL. Protection of the water resource and mitigation of damage from past activities are now, and would continue to be, management priorities.

COMMENT: We recommend the following criteria for watersheds (others listed under fisheries section):

1) maintain peak water yields within the range of naturally occurring variability;

2) maintain water quality - measured as TSS, turbidity, conductivity, nutrient concentrations, temperature and selected biological criteria - at or near background levels after the application of appropriate management practices; and

3) ensure that no beneficial uses of any state water becomes partially or fully impaired. (060, 103)

RESPONSE: 1) Through a cumulative effects analysis, DNRC hydrologists are able to determine potential consequences arising from proposed projects (see Appendix RMS: Watershed). Using tools such as water yield models and channel stability surveys, we can characterize the runoff from a watershed. Activities which would bring about unacceptable risk to channel stability would be modified or dropped from consideration.

2) Under all alternatives, DNRC would comply with all applicable State and Federal laws and regulations. These include the Montana Streamside Management Zone Law, the Federal Clean Water Act, the Montana Water Pollution Control Act, and others as listed in Appendix LGL. Research has shown that properly applied BMPs can be an effective mitigation measure for impacts to water quality. Protection of the water resource and mitigation of damage from past activities are now, and would continue to be, management priorities.

3) As mentioned above, DNRC would comply with all applicable water quality laws. The protection of beneficial uses on State Land is a management priority which is addressed, where pertinent, in all DNRC MEPA documents.

COMMENT: DNRC should look at watershed management as a whole view of the watershed. (162)

RESPONSE: DNRC already incorporates this analysis method in watershed management. When conducting a cumulative effects analysis we do so on the scale of a watershed, usually third order drainages.

COMMENT: Given our concerns for maintaining healthy watershed systems, it would be beneficial to move watershed management closer to the ranges of natural variation on isolated sections of state lands. (145)

RESPONSE: Through a cumulative effects analysis, DNRC hydrologists are able to determine potential consequences arising from proposed projects (see Appendix RMS: Watershed). A part of this analysis may involve the evaluation of the potential for increased water yield which can bring about potentially damaging peak flows. However, assuring that runoff and other watershed parameters are within the "range of natural variability" is difficult.

Another factor which adds to the complexity of this comment is the effect of scale. When talking about ranges of natural variation in, say, peak streamflows, it is inappropriate to look at the historical range of conditions on one State section. The best approach would be to look at historical flood levels over several scales (that is, for example, Upper Clark Fork, Blackfoot, North Fork of the Blackfoot). This, however, is not feasible for DNRC given our generally scattered ownership. A more illustrative scale would be that of a third or fourth order drainage.

For this reason, we commonly consider the potential hydrologic effects of proposed activities on the scale of first through third order drainages. One of our management priorities is preventing our activities from contributing to a situation in which beneficial uses are not maintained.

COMMENT: Delta and Epsilon pose a high degree of risk for watersheds. (020, 059, 103)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Protection of Riparian Areas

COMMENT: The descriptions regarding riparian areas need significant improvement and should be addressed in such a manner as to highlight the importance these biological communities provide. (083)

RESPONSE: The importance of riparian areas is irrefutable. In the DEIS, we stated that, "The importance of maintaining high water quality is self-evident, and riparian zones are critical habitat for more animal species than any other geography. Although the trend in watershed health has been downward for many years, state and federal governments have already taken steps towards slowing and perhaps reversing degradation in this resource. Through laws, regulations, and education, landowners and users have been encouraged to minimize their impact on streams, lakes, and riparian areas" (DEIS, page III-11). See also Status of Riparian Areas and Wetlands, Chapter III: Watershed, which states, "At the present time, a complete assessment of Montana's wetland and riparian resources is not available, but a broad scale description of the condition of the state's wetland and riparian conditions can be made." In this section, we also describe the condition of riparian areas and wetlands in eastern, southwestern and northwestern Montana. In addition, Streamside and Riparian Management standards for logging are provided for all of the alternatives (Appendix RMS: Watershed).

COMMENT: We recommend fencing riparian areas and regulation of grazing practices to avoid overgrazing. (020, 062, 140)

RESPONSE: Under all alternatives, the lessee or licensee would be required to meet the criteria outlined in the Grazing RMS. Fencing of riparian areas is one of several mitigation measures that may be applied to grazing leases/licenses under the Grazing RMS. Others may include herding, adjustment of season of use, or some combination of these.

Issue - Whitefish Lake / Swan Lake

COMMENT: DNRC should protect watershed of Whitefish Lake (064, 086, 095, 098, 103, 111, 137, 149, 153, 154) and Swan Lake (103, 106, 113, 140) - these watershed should be specifically discussed in the EIS because they are located in the two largest states forest units. Increased siltation and accelerated nutrification reduces Whitefish Lake's value for tourism. (129)

RESPONSE: We agree that in these areas we have a great responsibility due to our blocks of ownership. The scope of this management plan, however, precludes the incorporation of such site-specific analysis. Site-specific issues, including those affecting these watersheds, will be addressed in our MEPA analyses at the project level.

COMMENT: We are concerned with DOD (dissolved oxygen deficit) and water quality risks in Swan Lake and the Whitefish Lake watershed possibly due to timber harvest activities. (086, 113, 140)

RESPONSE: We have conferred with Dr. Nancy Butler at the Flathead Lake Biological Station regarding the depressed dissolved oxygen levels in both Swan and Whitefish Lake. The recently released study does seem to indicate a serious dissolved oxygen sag in Swan Lake. The cause of this sag, however, has not been thoroughly investigated. The weight of scientific literature indicates that silvicultural activities pose little long-term nutrient threat to water resources.

DNRC is concerned about the oxygen sag that is observed in Dr. Butler's study. Our understanding is that the source of the increased nutrients is far from clear. Though some evidence might suggest that the nutrients are terrestrial in origin, there is little to indicate when they were deposited. In fact, the commenter's implication of recent silvicultural activities as the source goes against the weight of scientific evidence (there is an excellent review of research on phosphorus in forest streams by Salminen and Beschta from the Department of Forest Engineering at Oregon State; Salminen, E.M., R.L. Beschta. 1991. <u>Phosphorus and forest streams: The effects of environmental conditions and management activities</u>. Department of Forest Engineering Oregon State Univ. Corvallis, OR. 185 p.). Several studies have observed only a small, short-term increase in nutrient levels following logging.

Issue - Best Management Practices (BMPs)

COMMENT: BMPs fall far short of "best" when compared to Montana's non-degradation standard. (138)

RESPONSE: We have complied with all water quality laws in the development of the alternatives presented in the EIS. Montana's Water Quality Non-degradation Policy is set out within § 75-5-303, MCA. It provides, in part, that the Department of Environmental Quality cannot authorize the degradation of high-quality waters without previously finding that a four element test has been satisfied. Section 75-5-317, MCA, lists those activities which may cause changes in water quality, but because of their low potential to cause harm to human health or the environment, we are exempt from the provisions of Montana's Water Quality Non-degradation Policy under § 77-5-303, MCA.

Section 75-5-317(b) exempts from the non-degradation policy all "activities that are nonpoint sources of pollution initiated after April 29, 1993, when reasonable land, soil, and water conservation practices are applied and existing and anticipated beneficial uses will be fully protected."

Section 75-5-317(l) exempts from the non-degradation policy "short-term changes in existing water quality resulting from ordinary and everyday activities of humans or domesticated animals, including but not limited to:

(I) recreational activities such as boating, hiking, fishing, wading, swimming and camping;
(ii) fording of streams or other bodies of water by vehicular or other means; and
(iii) drinking from or crossing of streams or other bodies of water by livestock and other domesticated animals.

Because BMPs will be applied to all timber harvests, no violation of Montana's Non-degradation Water Quality Policy as stated in § 75-5-303, MCA, will occur.

COMMENT: BMPs reduce but don't eliminate environmental degradation. Cumulative effects of timber harvest, road building and grazing in a watershed will result in significant degradation even with BMPs. (109, 126)

RESPONSE: In the Biennial BMP Audit Report it was observed that BMP compliance has improved over the years and in many cases the guidelines are exceeded [Frank, G. 1994. Montana Forestry Best Management Practices Implementation Monitoring - The 1994 Forestry BMP Audits Final Report. Montana Department of State Lands (now DNRC), Forestry Division (now Trust Land Management Division, Missoula, MT. 31 p.]. It is true, however, that BMPs do not eliminate the potential for nonpoint source pollution. Cumulatively, activities in a particular basin could result in degradation of aquatic health. Because of this possibility, we conduct a cumulative watershed effects (CWE) analysis for each project. This analysis, which would continue under all alternatives, takes into account all past and proposed disturbance activities on a scale deemed appropriate (usually a second or third order drainage) and includes an evaluation of stream health parameters such as large woody debris, channel morphology, riparian vegetation, etc. This analysis is a tool which is used to evaluate the potential for damage to aquatic systems as a result of the proposed activities. Where the results of the CWE analysis indicate risk of damage, the activities are modified or deferred. With this procedure, we intend to avoid any long-term degradation of aquatic resources.

COMMENT: Given the long history of abusive forest management practices, how can BMPs be set at a minimum for Beta, Delta and Epsilon? (083) DNRC needs to evaluate whether BMPs are really doing what we want them to. (140)

RESPONSE: Best Management Practices are the minimum mitigation actions which are taken on any given project. The 1994 BMP Audit Report shows that compliance with these BMPs often exceeds the guidelines. In some instances, the application of minimum BMPs will completely eliminate the impacts of our activities on aquatic systems. In other cases, additional steps may need to be taken. The BMP guidelines are our minimum requirements but protection of the resource is our goal. If we can meet the BMP guidelines but still anticipate problems, we will go beyond the minimum necessary mitigation.

Regarding the effectiveness of BMPs for protecting aquatic systems, there are very few quantitative studies. We look to published research from Burroughs and King (1989), Lynch and Corbett (1990) and Curtis et al (1990), to gauge the effectiveness of our mitigation measures (see Bibliographical References: Watershed for complete references). In addition, all alternatives except Alpha, call for an inventory of existing watershed impacts on State land. Those BMPs which are determined to be insufficient in providing resource protection will be revised.

Issue - Streamside Management Zones (SMZs)

COMMENT: The SMZ width requirements in Beta should be replaced with those in Alpha. The existing SMZ law and rules are an excellent realistic tool for riparian vegetation management and do not need to be augmented or changed except in cases of steep slopes, erosive soils or sensitive streams. (061)

RESPONSE: The Resource Management Standards regarding streamside management zones in all alternatives are within a prudent scientific range and are consistent with the management philosophy of each alternative.

COMMENT: It is important to distinguish between riparian management and watershed protection. SMZs and BMPs by themselves do little to protect watersheds if peak flows exist due to excessive forest removal in the headwaters or excessive road densities. (103)

RESPONSE: Under all alternatives, we will conduct a cumulative watershed effects analysis to address the potential for increased peak flows. Implicit in this analysis is the evaluation of stream health indicators such as large woody debris, stream morphology, and riparian vegetation (see Appendix RMS: Watershed).

Issue - Water Rights

COMMENT: Zeta is likely to produce water rights issues with water development projects. (006)

RESPONSE: Zeta may involve water development. Water rights would be secured as necessary or the projects would be modified.

Issue - Watersheds and Roads

COMMENT: Montana already has too many roads and road construction is producing too much sediment yield to streams. (048, 068)

RESPONSE: Evident in the range of alternatives in the EIS is a roading philosophy consistent with each of the management scenarios. Alternatives Beta and Gamma would seek to minimize roads while achieving all management goals; while the other alternatives would build roads consistent with supporting management activities. Each of the alternatives includes some consideration for road closures and/or obliteration. Under all alternatives, DNRC would comply with all applicable State and Federal laws and regulations. These include the Montana Streamside Management Zone Law, the Federal Clean Water Act, the Montana Water Pollution Control Act, and others as listed in Appendix LGL.

Issue - Watershed Analysis in DEIS

COMMENT: The EIS needs more explicit definitions for cumulative watershed effects. Under 'cumulative watershed effects' (Appendix RMS: Watershed), statements include "substantial vegetation removal" and "small-scale projects." What is "substantial" and "small-scale"? (109)

RESPONSE: What constitutes "substantial" and "small scale" is somewhat variable depending on the type and location of a particular activity. These terms will be further defined in implementation guidance, however, DNRC's water resource professionals will retain some latitude in determining how projects are analyzed.

COMMENT: The EIS needs thresholds for acres disturbed, miles or percent of roads affected, etc. Give examples of threshold values for several scenarios. (109)

RESPONSE: Cumulative effects thresholds will be set based on the type of analysis. For example, as part of the analysis, a threshold of concern may be set for water yield increase. This measure is used because it is proportional to vegetation removal. There is no scientific evidence that a single threshold is applicable for water yield increases on different sites, so we establish the threshold based on specific stream conditions. However, if the threshold is exceeded, the proposed project is subject to additional evaluation by the resource professionals.

COMMENT: "At risk" watersheds are not listed in DEIS even though the information is available in SS305(b). This is an enormous amount of data not being used to establish baseline evaluation of water quality. There is no meaningful analysis of water quality in DEIS. (138)

RESPONSE: The 305(b) report was used extensively in describing the water quality impairment status in our analysis (Water Quality Impairment Status, Chapter III: Watershed). The sources of impairment and causes of impairment for lakes and streams are presented in tables in this section. The individual stream names are not listed, but will be used in project level evaluations. Potential impacts to water quality are evaluated by analysis of proposed amount of timber harvest, amount of clearcut and seed tree harvest, amount of roads (road density), number of AUMs, and amount of recreation development.

Issue - Watershed Mitigation

COMMENT: Mitigation that includes "engineering solutions" are short-sighted, ineffective and assumes humans can duplicate naturally occurring systems. (140)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: The DEIS is unclear on how much watershed protection, versus mitigation, is to be done in Beta. (020)

RESPONSE: Under all alternatives, DNRC would comply with all applicable State and Federal laws and regulations. These include the Montana Streamside Management Zone Law, the Federal Clean Water Act, the Montana Water Pollution Control Act, and others as listed in Appendix LGL: Legal Framework. Protection of the water resource and mitigation of damage from past activities are now, and would continue to be management priorities. The Resource Management Standards regarding streamside management zones in all alternatives are within a prudent scientific range.

Issue - Watershed Restoration

COMMENT: I want to encourage scenarios or alternatives that would invest money in the future in the form of watershed restoration. We need to invest some of the current dollars generated from these lands in assuring the long-term productivity of all the values that these lands generate -- not just timber, but also wildlife and water quality and scenic beauty and so on. (109)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Watershed Resource Management Standards

COMMENT: I strongly urge that the Gamma RMS for riparian areas and SMZs be used regardless of what alternative is adopted. These standards have the best chance of protecting stream temperatures, shading, flows, woody debris, and streambank integrity. (109)

RESPONSE: Riparian areas and streamside management zones receive the highest level of protection under alternative Gamma. However, all alternatives provide a level of protection that meets or exceeds all applicable laws and regulations. Also, please note that the Fisheries RMS stipulates adherence to the Bull Trout Immediate Actions (Summary of Bull Trout Immediate Actions, Appendix RMS: Watershed). As part of our commitments, we will conduct comprehensive sediment-source surveys and conduct bull trout presence/absence surveys (where they have not already been conducted) in streams which are involved in proposed projects. In addition, the Immediate Actions call for elimination of grazing in SMZs along bull trout streams unless a fisheries biologist "reviews the licensed area and agrees in writing to a management plan that allows some use of the SMZ by cattle, without having any detrimental impact to bull trout" (MDFWP Internal Memo 1994).

COMMENT: DNRC needs to monitor disturbances to watershed and compliance with RMS for SMZs and grazing. Use the SMZs and RMS in Gamma for whatever alternative is chosen; they provide the best chance to protect streams with "no net impact." (083, 109, 139)

RESPONSE: Riparian areas and streamside management zones receive the highest level of protection under alternative Gamma. However, all alternatives provide a level of protection that meets or exceeds all applicable laws and regulations.

Monitoring emphasis will be on evaluating the application of the standards and mitigation measures that are prescribed. On selected sites, projects with a high potential to impact water quality will be monitored through a combination of stream channel measurements, water quality parameters, aquatic habitat parameters, and other qualitative measurements appropriate to assess the effectiveness of mitigation measures and impacts of activities. We have supported such studies in the past, such as the Flathead Basin Watershed and Fisheries Study. We will continue to support such efforts as priorities allow. However, given our mandate to generate revenue for the school trust, and our limited budget, we are unable to fund extensive research projects. As part of our commitment to the Bull Trout Immediate Actions, we will determine the presence/absence of bull trout in streams adjacent to our proposed management activities. Where information does not exist, we will arrange to conduct surveys.

COMMENT: Beta should include monitoring of BMPs and SMZs. (020)

RESPONSE: The Governor requested that the Trust Land Management Division of DNRC evaluate forest practices for BMP implementation and report the findings to the Environmental Quality Council (Frank, 1994). Such studies and reports have been conducted in 1990, 1992 and 1994. The interdisciplinary audit teams evaluated timber harvest sites most sensitive to the practices that affect water quality. The audit teams also evaluated application and implementation of the Montana Streamside Management Laws and Rules. The 1994 audit team recommended in its report that the audits were a fundamental educational tool that should be conducted every two years. State land will continue to be monitored through the Audit process, both by our own employees and those from other agencies and companies. A copy of the 1994 Forestry BMP Audits Final Report is available from the Forest Management Bureau of DNRC. These biennial BMP audits will continue under all alternatives.

COMMENT: BMPs should be monitored for their effectiveness, not just implementation. The only way to do this is by implementing focused, critical, scientific research projects designed to answer specific questions about the effectiveness of BMPs. (140)

RESPONSE: DNRC is already undergoing an evaluation of the effectiveness of BMPs through our biennial audit process. The 1994 BMP Audit Report states, "The BMP audit process is used to evaluate whether BMPs are being applied and whether they are effectively limiting non-point source pollution." [Frank, 1994, p. 5.] We agree that it would be desirable to undertake critical scientific research projects for various aspects of our management activities. We have supported such studies in the past, such as the Flathead Basin Watershed and Fisheries Study. We will continue to support such efforts as priorities allow. However, given our mandate to generate revenue for the school trust, and our limited budget, we are unable to fund extensive research projects. To help ensure that we are implementing practices that are effective in protecting watershed values, our professional staff attends continuing education courses as available and continually reviews the best available literature in all relevant fields that is produced by other agencies and the education / scientific community.

COMMENT: DNRC should maintain, measure and monitor water quality. (103) Adequate monitoring should be a BMP. The EIS must include monitoring of watersheds for bull trout / cutthroat trout and where streams are not fully supporting beneficial uses due to forestry/grazing practices. (109)

RESPONSE: Monitoring emphasis will be on evaluating the application of the standards and mitigation measures that are prescribed. Some water quality monitoring will be conducted in areas of contiguous ownership. Potential bull trout habitat will be monitored for absence/presence of bull trout and habitat condition as prescribed in the Fisheries RMS.

COMMENT: The RMS for all alternatives state that "DNRC would cooperate with other landowners in watersheds with mixed ownership to manage cumulative watershed effects within prescribed thresholds (Appendix RMS: Watershed). Does this mean if private landowners exceed threshold values, DNRC will not harvest or road? (109)

RESPONSE: Yes, there have been and will likely continue to be cases where the DNRC has modified or deferred a proposed timber harvest because of activities on other ownerships.

COMMENT: DNRC should adopt Thresholds of Concern for most and least sensitive watersheds based on SEQUOIA (risk assessment model that accounts for areal disturbance). I'd like also to see watershed protection standards that limit timber harvesting's impact on water yield; I realize there's some rules of thumb that are used, and I'd like to see those being considered to be very important BMPs that are always followed. (109)

RESPONSE: The common use of the value 12% of watershed area as a threshold for detrimental changes in streamflow arose from work done by Dennis Harr in the late 1970's in western Oregon. In a 1986 paper (presented at the California Watershed Management Conference, November 18-20, 1986, West Sacramento, CA) Harr himself criticizes this approach as simplistic and misguided. Nevertheless, cumulative watershed effects should be quantified and at some predetermined point activities may need to be modified or removed from consideration. This predetermined point is a watershed-specific decision, based on specific watershed conditions and recommendations of the hydrologist and other resource specialists.

Increased peak flows and their effects on channel stability are major factors considered in many environmental analyses conducted on State Lands. Peak stream discharge, unlike disturbed watershed area (as in SEQUOIA) has been shown to affect channel stability at a particular threshold. For this reason, we do set water yield increase thresholds above which the proposed activity is seriously scrutinized. Based on the professional judgement of the hydrologist and soil scientist, the project may be modified or dropped from consideration.

COMMENT: State standards for water quality are not well designed to protect state waters from nonpoint source pollution and habitat degradation associated with forestry activities, so meeting/exceeding state standards is not good enough. (109)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: We appreciate the flexibility designed into target outputs that are consistent with existing stream riparian zone and water quality protection laws under all alternatives. (145)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: Include downstream users in impact statements and monitoring reports. (103)

RESPONSE: The protection of downstream beneficial uses is not only a legal mandate but a management priority as well. During our watershed analyses (which are included in the environmental analysis documentation) for proposed projects, we discuss downstream uses and potential water quality impacts. If there is the possibility for impairment of the beneficial uses we modify the activities or remove them from consideration. In addition, monitoring the application of contract provisions aimed at protecting water quality is a priority.

AIR QUALITY

Issue - Public Health

COMMENT: What effects will prescribed burning have on public health? Public health concerns in respect to smoke from prescribed burning needs to be addressed in this management plan. (022)

RESPONSE: The Montana-Idaho Smoke Management Group provides for the consideration of public health through controls on prescribed burning by major burners (state and federal agencies and private companies) in the fall burning season. This information should have been provided in the DEIS. We have corrected this oversight and discuss this issue in the FEIS in the section Particulate from Prescribed Burning, Chapter III: Air Quality.

Issue - National Ambient Air Quality Standards

COMMENT: The Clean Air Act Amendments of 1990 established a classification system whereby communities that fail National Ambient Air Quality Standards (NAAQS) for certain pollutants are classified as "nonattainment areas." This designation requires the area to demonstrate progress in controlling the identified pollutants over time. Mention of nonattainment areas, or the regulations that govern them, are not found in this management plan. (022)

RESPONSE: The Montana-Idaho Smoke Management Group also addresses DNRC's compliance with NAAQS regulations. As discussed in the above response, we have added information to Particulate from Prescribed Burning, Chapter III: Air Quality, to address this issue.

Issue - Air Quality and Wildfire

COMMENT: The DEIS states that wildfire will be suppressed under all alternatives, but that particulates from wildfire will increase with Gamma. How significant is the increase, if all fires will be suppressed? How does this balance overall when particulate increases estimated from prescribed burning associated with timber sales are added to the equation? How will the use of prescribed natural fires or management-ignited fires reduce the impact of increased particulates as estimated in DEIS? (122)

RESPONSE: The increase in particulate from wildfire is expected under Gamma because the basic philosophy will prevent us from utilizing much of the combustible material we would under the other alternatives. Particulate increases when there is more to burn, regardless of our efforts to suppress the fires.

With timber sales, much of the material is removed and not burned, thus reducing the potential for particulate. The Montana-Idaho Smoke Management Group coordinates prescribed burning activities in both states and prevents burning when dispersal conditions are inappropriate. With wildfire we cannot control when the fires burn. Consequently, the potential exists for increases in particulate.

FOREST VEGETATION

Issue - Forest Health

COMMENT: Any alternative selected should optimize long-term sustained yield on forested land. It should favor early successional species and even-aged management, as this would best provide for maintaining forest health. (100)

RESPONSE: The selection of harvest or regeneration method will still be based on the appropriate considerations of site and species. Some of the alternatives do favor even versus uneven-aged management as described in the Summary of Alternatives Table (Executive Summary) and in Methodology, Chapter IV: Forest Vegetation.

COMMENT: We should intensely manage the forest through selective harvest so that the trees that are left will be a healthy, vigorously growing stand that we can sustainable harvest forever. We should concentrate on managing and improving stand health on all state forest lands bringing them all to a healthy condition. (016, 123)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: There are conflicting definitions of forest health in the DEIS, one in terms of ecological integrity and the other in terms of management objectives. The definition should be based on the forests' ability to sustain complex, natural functions and biological diversity. The analysis seems to be weighted more heavily towards the forest's ability to meet current and future management objectives. The DEIS predicts in the summary that Delta and Epsilon will benefit forest health and Gamma and Zeta will produce a decline in forest health. Yet Gamma and Zeta provide an increase in patch size, an increase in snags, and an increase in old-growth, all of which will decrease in Delta and Epsilon. We suggest that the decision with regard to forest health should be based more on the criteria relative to ecological integrity rather than simply ability to produce timber. (145)

RESPONSE: The components of forest health mentioned are just that, components. Excessive emphasis on some components of forest health while ignoring others would not be appropriate, hence our decision to not over emphasize the factors mentioned. Gamma and Zeta will increase patch size and old-growth as mentioned. However, Gamma and Zeta will likely have an overall negative impact on forest health because we will only be limiting our ability to influence factors that affect forest health (such as controlling stand density, restoring tree vigor, structural diversity, and appropriate age distributions), and not the negative impacts that humans may have, such as suppressing fire. The analysis presented in Chapter IV: Forest Vegetation shows that our forests are under-represented in the earlier successional stages and younger age classes. The definition of forest health is primarily based on restoring ecosystem function.

COMMENT: The forest health criteria aren't really quantified. (131)

RESPONSE: The forest health criteria are quantified in Current Conditions, Chapter III: Forest Vegetation. The basis for quantification is departure from historical conditions for various stand and forest criteria. The implicit assumption is that pre-historic conditions represented a healthy forested ecosystem without the impacts put on the ecosystems by modern humans, i.e., fire suppression, harvesting, road building, etc.

COMMENT: While we are impressed with the definition of "forest health" that appears in the glossary, we feel that this definition has not been adequately incorporated into the analysis. The definition of forest health in the glossary states that, "In terms of ecological integrity, a healthy forest is one that maintains all of its ecological functions. In relations to management objectives, forest health represents a condition which meets current and potential future management objectives." However, based on the summary table (Executive Summary) and the description of the effects on forest vegetation (Chapter IV: Forest Vegetation), "forest health," as applied in the DEIS analysis, appears to be determined by how well the distribution of sizes and species of trees mimics historic distributions. While this may be a good indication of current and future potential for timber management, it is completely inadequate to determine whether the ecological function of forests is maintained. (140, 145)

RESPONSE: The definition of forest health incorporates ecological function and management objectives. Forest health is not simply a function of tree size and species. In order to maintain ecosystem functions across a range of sites, it is important that the forests represent what 'should' be there. The definition of forest health in no way diminishes the importance of ecological function.

COMMENT: Because forest health will not be a driving force behind Delta and Epsilon there is reason to assume that forest health will continue to decline under these alternatives. Possible consequences of that are increased fire hazard, increased insects and disease, and degraded wildlife habitat. (026)

RESPONSE: Maintaining forest health is not stated as the foundational philosophy of Delta or Epsilon; however the primary tool to be used under Beta to promote forest health is timber harvesting. Given the role of timber harvest in maintaining or restoring forest health it is a more reasonable assumption that forest health will improve under Delta or Epsilon rather than decline. An often forgotten piece of the forest health puzzle is that only recently have resource managers agreed that there is a problem. As such, it is highly unlikely that the same practices that created the health problem, especially fire suppression and selective logging (high grading) will continue to be practiced exactly as they have in the past. We recognize that forest health is a multi-faceted concept, and that while Epsilon and Delta improve some aspects of forest health, others will probably respond in a negative way.

COMMENT: A healthy forest can only exist if trees and their associated plant communities live FOREVER. Even under ecosystem management, it is recognized that forests have a life cycle just as we humans do. For your Plan to be proven on the ground, it must recognize the net unharvested growth on state lands. (013)

RESPONSE: Forest health as used in the EIS is different than stand health. While a stand has a life span measurable in years, as do humans, a forest or forested ecosystem may exist for millennia. Individual stands within a healthy forest may be considered unhealthy. When considering forest health, it is important to remember that a forest is composed of a mosaic of timber stands whose spatial representation shifts over time. To maintain forest health, it is important that we maintain the various pieces making up the forest. This may mean that some stands become decadent, die and are replaced by other stands, or that they are harvested. Maintaining forest health does not require that each stand within the forest be healthy, at all times.

In fact, some necessary components of forest health may require that unhealthy stands be represented.

Issue - Vegetation Analysis in DEIS

COMMENT: DNRC needs to include a site index with the Plan. (009)

RESPONSE: This programmatic plan presents several 'guiding philosophy' alternatives on which to base site specific considerations. Without a guiding philosophy it is impossible to determine a sustained yield. After selection of a preferred alternative, the sustained yield study mandated by HB 201 will determine a sustained yield by considering site productivity and the constraints on harvesting that accompany the selected alternative.

COMMENT: The DEIS needs to develop an analysis and an alternative that would significantly address the cumulative adverse impacts of management actions on fragmentation and patches. The DEIS states "In spite of concerns about the fragmentation caused by dispersed-patch timber harvests... the harvest of timber in dispersed 10 to 80 acre patches will probably continue to a large extent under all alternatives" (DEIS, page IV-70). DNRC should significantly reevaluate their proposed continuation of harmful practices, such as the fragmentation issue, in conjunction with attempting to develop an analysis which is not so heavily weighted to support only the status quo. (141)

RESPONSE: The table "Descriptor: Patch Sizes and Shapes," proposes that we will continue to harvest in 10 to 80 acre blocks. Then, the remainder of the discussion describes some of the reasons. The next paragraph states that over time all alternatives will tend to reduce fragmentation. We approach fragmentation in different ways among the alternatives, with Beta probably approaching 'historic' conditions most rapidly. Gamma and Zeta would have a lesser impact on restoring historic conditions due to the lack of management options.

COMMENT: Relying on the Flathead National Forest's (FNF) interpretation of the Ayers report to determine pre-settlement conditions in the Swan Valley in scientifically invalid. This has been amply demonstrated by the scientific community's response to the FNF DEIS for Amendment 16 to the Forest Plan. (142)

RESPONSE: We would not rely solely on the Ayers' report to determine historical conditions in the Swan Valley, nor have we indicated this in the EIS. As stated in Old-Growth, Chapter IV: Forest Vegetation, historic information on old-growth is limited and we would use the best information available.

COMMENT: The DEIS evaluation of environmental consequences on diversity and old-growth is inadequate. The analysis procedure of including stands older than 140 years exaggerates the amount of old-growth. In western Montana 200 years plus is where old-growth begins, except in lodgepole stands. The definition is incorrect, thus, the analysis is skewed and meaningless. It appears that most or all 200+ year stands will be cut down. By fiat, stands will be called "old-growth" at 115-140 years of age. This is unacceptable. (138, 138a)

RESPONSE: Stand age is estimated as the weighted average age of trees in the stand from field reconnaissance. For example, a stand consisting of 40% 300 year-old trees, 40% 20 year-old trees, and 20% 160 year-old trees would have a stand age of 160 years, even though it has been 300 years since the stand started growing. A stand with 40% 300 year-old trees and 60% 10 year-old trees would have a stand age of 126 years. Consequently, based on our inventory, a 140 year average stand age was selected as being representative of an age where many old-growth characteristics may be present in a forest. The 140 year age also prevents us from seriously underestimating old-growth and the conditions of concern, as would occur when using a stand age of 200 years. The important issue is whether certain characteristics are present, not necessarily the age of the trees. We consider this method of defining old-growth as appropriate and consistent with our analysis.

COMMENT: There are no maps in the DEIS which show past timber harvest units in relation to the expected volume from each alternative. (138)

RESPONSE: The provision of maps of past timber harvest units on all state lands is beyond the scope of this programmatic plan. We believe that this level of evaluation can be done effectively at the project level. When reviewed in conjunction with the Biodiversity Resource Management Standards, both land managers and the public will be able to assess the impacts of past management activities.

Issue - Alternatives Regarding Timber Management

COMMENT: Beta appears to be the best alternative in terms of the three selection criteria in the DEIS. With a modification of the annual timber harvest to the 45-55 MMBF range, and adhering to the excellent principles of resource stewardship outlined in Beta, a win-win situation for the State of Montana would be possible. The diligent implementation of BMPs, wildlife guidelines, SMZ rules and sound silviculture, as outlined in Beta, coupled with the mandate of HB 201, is realistic. (061)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: The statement that you "would meet the minimum acceptable standards of environmental protection" [for Epsilon] is misleading. None of the alternatives would be viable if the minimum environmental standards were not met. Water quality degradation and wildlife losses are not synonymous with timber harvest. Forest health would be the end product of all silvicultural treatments. (021, 023, 037, 061, 087, 091, 125, 143, 148)

RESPONSE: The language in the EIS describes a range of specific land management philosophies. Under some of the alternatives, meeting the minimum legal requirements was described as the operating philosophy. While it is true that timber harvest is not synonymous with water quality degradation and wildlife loss, there are more restrictive measures that can be taken than those required by law, and the range of these measures is reflected in the alternatives presented in the EIS.

COMMENT: You have stated that the Epsilon alternative will result in some environmental damage if implemented. What scientific facts are being used to support this belief? (013)

RESPONSE: The description of alternatives in the Executive Summary states that "we would accept some adverse environmental effects in order to earn larger monetary returns to the school trust." We would uphold our lawful obligations under any alternatives, however some alternatives would require that we be more restrictive in our activities to prevent environmental damage. This is based on existing laws which list legal limits to resource degradation, such as water quality. The assumption is that limits are stated for legal reasons but that adverse effects may begin with lesser impacts. Under most environmental laws it can be shown that the limit imposed is less strict than a no effects level.

COMMENT: Gamma would really generate a larger, longer term yield than the 5-10 MMBF specified in the DEIS. (019)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Timber Growth

COMMENT: In 1988, the Intermountain Research Bulletin INT-81 shows the net growth of 97.4 MMBF per year. Harvest for 1988 was 39.1 MMBF. The difference shows a balance of 58.3 MMBF per year in harvested growth. Yet under Epsilon, the highest purposed harvest, removes less than 50% of that growth. A short-term accelerated effort is just common sense. (013, 016, 091, 148)

RESPONSE: Net growth should not be confused with growth available for harvest. The total and net growth numbers shown for state lands by the 1988 Intermountain Research Station report do not take into account any constraints on harvesting. For example, access to a tract, operability, threatened and endangered species considerations, and watershed factors can all act to reduce the timber available for harvest. Our estimated harvest scenarios for each alternative were based on calculations by forest management staff while considering these and other constraints.

Perhaps, more importantly, the numbers from that report tend to inflate growth for the period by the treatment of volume growth on small trees. Due to naturally occurring stand age and size class distributions, an uncharacteristically large number of stands reached merchantable size during the decade. When stands reach merchantable size all the volume accumulated since stand establishment is included as 'growth'. The effect is to inflate the actual growth. Consequently, the numbers from that report are probably not sustainable, and do not reflect our long-term potential growth.

Issue - Timber Inventories

COMMENT: Recent timber inventories are adequate. The missing link is the sustained yield study and implementation of a productive program. (016)

RESPONSE: The programmatic plan presented is designed to provide a guiding philosophy for the management of state forested lands. As such, a sustained yield study can only be conducted when the boundaries of the guiding philosophy are known. Please see the response to comments regarding HB 201 and HB 263 under the category of Program Management in this chapter for more information on the annual sustainable yield study.

COMMENT: I would hope that the numbers used in this management plan are the best your group can do; inventories are not subjective, but constraints are. I recommend that DNRC really look hard to ensure your constraints are real. (080)

RESPONSE: Inventories are estimates based on our current information. Constraints to harvesting that inventory are also estimates based on current information. The level of constraint attached to each alternative is primarily a function of the guiding philosophy of that alternative. Constraints are very real under any of the alternatives due to state and federal laws.

Issue - Timber Harvest Levels

COMMENT: Are harvest volumes listed under Delta and Epsilon truly sustainable? They certainly aren't if one wants to maintain all biological parts and processes, and doubt if they are from the pure timber harvest perspective. Many more acres are deferred from harvest than are estimated in the DEIS. (026, 122)

RESPONSE: Sustainable harvest scenarios were estimated, taking into account deferred acreage, for each alternative by Forest Management Bureau staff. Constraints to harvest posed by the guiding philosophies of the alternatives were used to adjust the estimated harvest downward from the timber management level presented in Epsilon.

COMMENT: We are concerned that the high timber harvest levels required by Delta and Epsilon are not sustainable and will not provide watershed, wildlife or other protections nor long-term revenue. A study by Donald Leal of the Political Economy Research Center in Baseman estimated the potential annual sustainable timber harvest off of state lands to be 38 MBF per year. (122)

RESPONSE: We disagree with the commented's suggestion that the Leal study estimates a potential annual sustainable yield of 38 MBF (*sic*, it is assumed that the commented meant 38MMbf, not 38Mbf). Using a conservative conversion ratio of 3.3 to express cubic feet per acre per year in board feet per acre per year, and multiplying the estimated growth rates by the appropriate non-deferred acres from each region will give one an estimate of net annual sustainable yield. The tables the commented refers to in the Leal study indicate that state lands are capable of producing approximately 82 million board feet per year. However, this estimate does not consider any of the very real constraints to harvesting that exist.

The sustainable yield study mandated by HB 201 will give us an estimate of sustained yield that will become our legislatively mandated harvest level. The study will use the philosophy of the alternative selected from this programmatic plan to determine a sustained yield that will protect watersheds, wildlife, and long-term school trust revenues.

COMMENT: DNRC prejudiced the alternative selection before making final decision when it increased the timber target for NWLO by 44% on 7/31/95. (138, 139) It seems to me, increasing the cutting of state forest lands [we are assuming that the commented is also referring here to the increase in NWLO's timber target] while a study is completed might have undesirable side effects which might not be correctable for a long period of time, if at all. (129)

RESPONSE: We do not agree with this comment. The selection of a final alternative in this programmatic plan has not been prejudiced by any of our current harvest levels or output targets. The alternative selection will still be based on the criteria listed in the DEIS: monetary return to the school trust; long term health of our forest resource; and effect on the biological and physical environment (Preferred Alternative, Executive Summary). The increased harvest levels were mandated by law following passage of HB 201.

COMMENT: Increasing the harvest levels in the NWLO constitutes a slap in the face of the NEPA/MEPA process. It makes the public feel like fools for even thinking for a moment that DNRC actually values and uses public involvement. Since the level of sustainable harvest has not yet been determined (hence the HB 201 study) and since sustainability of the school trust will depend on the future value of these lands, and since the DEIS indicated that the future value has not been adequately determined and is very difficult to determine, this underhanded concession to timber interests is really shoddy management and reflects the state's attitude toward the environment and toward education. (139)

RESPONSE: DNRC does value the opinion of the public and has made several changes in the EIS based on public input. However, the final approval of this programmatic plan rests with the State Land Board, which consists of Montana's five highest elected officials. The Land Board has a constitutional fiduciary duty to select those policies for the management of these lands which best favor the trust beneficiaries who are described in the state's Enabling Act.

As indicated in the response to the previous comment, the selection of a final alternative has not been prejudiced by our current harvest levels or the increase in NWLO's harvest target. The study mandated by HB 201, which will determine the annual sustained yield on forested state lands, will be based on the selected alternative and its provision for the protection of watershed, wildlife, vegetation, and fisheries, etc. Then, once this programmatic plan is implemented, the harvest levels for each area office will be set according to the sustainable yield study and the management direction outlined in the final alternative.

We take our obligation as trust managers of state lands very seriously. This includes our mandate to generate revenue for trust beneficiaries, hence supporting education, and complying with federal and state environmental protection laws and regulations. In this EIS, we have attempted to present a range of management options that are reflective of various philosophies in our society. We recognize and appreciate that not everyone will agree with our management direction; however, we are also hopeful that the public is aware that we are committed to managing state lands for the long-term.

COMMENT: Delta, Epsilon and Beta all have similar harvest levels as Alpha; Gamma and Zeta, which have lower cut levels, were not given equal treatment in the DEIS analysis process. (138)

RESPONSE: All efforts were made to ensure that each of the alternatives received equal treatment in the analysis.

COMMENT: What adjustments to harvest levels will be made if an area has a fire? (115)

RESPONSE: On the average, fire burns less than one half of one percent of State Forests annually. Salvage efforts may be made to capture some of the potentially lost revenue. If so, it is expected that the salvage volume would reduce the volume of green logs cut.

Issue - Timber Management

COMMENT: Choose a management scheme that seeks to maintain native species and the habitat that they are dependent upon. The management direction should also seek to eliminate or reduce the occurrence of exotic species that have no place in our native ecosystem and can only degrade and alter them. (144)

RESPONSE: Under all alternatives, silvicultural methods seek to minimize soil impacts, scarification and land disturbance to reduce effects to native plants. Grass seed mixes used for revegetation typically include native grass species, but not exclusively due to the typically low seed availability, mediocre germination and slow revegetation. As part of grass mix, non-native grass species are selected for fast establishment, erosion control and weed competition, yet allow native species to fill in over time.

COMMENT: DNRC needs to incorporate a policy of no loss of existing snags on state lands. (141)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: An acceptable management option is one that views DNRC timbered acres as a large, somewhat scattered "woodlot", where intensive management nearly mimics the timber removal strategies successfully applied by many tree farm operators managing 50-100 acre tracts. In this case, a steady (even predictable) flow of product is removed, and a steady (and predictable) flow of income is achieved, while still maintaining an intact forest structure at any one time. (010, 019, 123)

RESPONSE: Each of the alternatives call for an even flow of products from state forest lands. The amount of timber differs under each alternative according to a set of guiding philosophies on land management.

COMMENT: Develop public sorting yards for logs. Sell timber as sorted products rather than in a lump sum. DNRC will generate more revenue this way. (103)

RESPONSE: We have considered the concept of selling sorted products rather than stumpage. However, this is not a programmatic level decision and is outside the scope of this Plan.

While serious consideration of this concept would be more likely under some alternatives than others, no alternative would prevent DNRC from considering alternative ways of marketing forest products so as to increase trust revenue.

COMMENT: Don't turn state forests into unnaturally simplified tree farms. Manage for diversity, not uniformity. (103, 151) Epsilon almost exclusively emphasizes maximum timber output, mandates up to 50 percent even-aged management, and would have the greatest impact on soil condition. It would be a throwback to the unsustainable, destructive, tax-payer-subsidized practice of transforming Montana's forests into sterile perpetually young tree farms. (130)

RESPONSE: Even-aged management does not necessarily imply negative impacts on other forest resources. Nor does it represent a throwback to improper management. Even-aged systems are simply one of the systems used to derive value from the forests to meet our trust obligations while also ensuring future returns. There are situations where even-aged systems are the most appropriate and others where they are not. The Resource Management Standards developed for all the alternatives provide protection of soil resources, stating that, "All prescribed silvicultural treatments would maintain the long-term productivity of the soil and site to ensure the long-term capability to produce trust revenue and maintain soil hydrologic function." (Appendix RMS: Silviculture).

COMMENT: Epsilon provides no mechanism for changing priorities from timber to other management; Delta provides a mechanism, however, once intensive timber management was established, it would likely be economically unfeasible to ever change to other management. (020)

RESPONSE: The philosophy of Epsilon clearly states that we assume the best way to produce long term trust income is through timber production, while also meeting DNRC standards for environmental protection. However, we do not assume that timber harvest precludes all future alternative activities. Timber harvest can, and have been, successfully utilized to improve conditions of other resources.

DNRC already pursues other uses, such as cabinsites and recreation leases, as part of ongoing management. The other alternatives, notably Delta, provide some range of opportunity for generating revenue through activities other than timber harvest. These opportunities would vary based on how they fit with the philosophy of the selected alternative, as well as their ability to generate income for the trust.

COMMENT: If some form of timber management is not used to restore a more historic balance it becomes obvious that there are not sufficient young trees to replace those that are moving towards maturing. If the overstocking of mature trees is allowed to continue without some management, we will actually experience an overstocking of old-growth. While this may be beneficial for a limited number of species, it will not contribute to long term forest health or long range goals of revenue stability for the school trust. (148)

RESPONSE: The issue of stand age distributions is discussed in Stand Age Distribution, Chapter IV: Forest Vegetation. Over the planning horizon, our activities will have the greatest impacts on the youngest and oldest age classes. However, depending on the alternative, we would target different types of stands for harvesting. Beta with its emphasis on biodiversity and forest health and Epsilon with its higher harvest levels would do the most towards restoring a semblance of the historical age distribution. Gamma and Zeta would likely result in the over-representation of older age classes that the commented mentions.

COMMENT: We caution you not to get caught up in mining timber. You, as land managers, have the discretion to follow a true sustained yield management strategy. If you are going to harvest timber from a site, make sure it is capable of growing another crop of trees in a period of time that beats the return we taxpayers would receive if the money necessary to conduct the harvest was put in the bank to draw interest. (009)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Even-aged Management / Clearcutting

COMMENT: DNRC should avoid clearcuts; emphasize selective logging. (038, 039, 043, 044, 047, 049, 050, 058, 059, 063, 066, 069, 070, 072, 075, 078, 081, 090, 095, 096, 103, 104, 108, 117, 112, 119, 127, 130, 147, 151, 158)

RESPONSE: We recognize that there is strong public sentiment regarding the use of clearcutting as a silvicultural method. Even-aged systems (such as clearcutting) are one of the systems used to derive value from the forests to meet our trust obligations while also ensuring future returns. There are situations where even-aged systems are the most appropriate and others where they are not.

Clearcutting and other even-aged systems provide short-term revenue and insure revenue for long-term through regeneration. Even-aged systems can be very effective at reducing fire hazard and the risk of insect and disease attacks, restoring stand health, and replacing historic conditions to altered forest landscapes.

All of the alternatives presented in the EIS include a variety of silvicultural tools, including clearcuts, to support each particular philosophy. Alpha, Delta and Epsilon have no formal policy favoring either even-aged or uneven-aged management; Beta and Gamma would use even-aged management (among other methods) to enhance biodiversity; and Zeta would use even-aged management when compatible with wildlife needs.

COMMENT: Even-aged management in general can reduce an area's future value for timber and also its present and future value for recreation-derived revenue. (139)

RESPONSE: There is nothing intrinsic to even-aged management that reduces future value. In fact, many instances can be shown where even-aged management increases both short and long term revenue. For example, even aged systems can improve value when replacing existing even-aged stands, when attempting to control insect or disease infestations, when replacing slow growing over mature trees with fast growing young trees, etc. We recognize that many people find the appearance of clearcuts to be detrimental to their recreational experience. All of the alternatives presented in the EIS include a variety of silvicultural tools, including clearcuts, to support each particular philosophy.

COMMENT: Increasing scientific evidence indicates clearcutting is a destructive timber management practice, undermining the long term health of the forest. Forest health and diversity can go hand in hand with economic return if forests are managed to encourage diversified economic and social activities on state forest lands. (107)

RESPONSE: Opinion varies as to the long term effects of clearcutting. There exists ample research describing poorly and inappropriately executed clearcuts and their detrimental effects. There also exists ample evidence that clearcuts can be appropriately designed and used so as to not undermine either short or long term forest health. The same could be said for selection harvest methods. With either system it is possible for destructive activities to occur, however they are not intrinsic to the system employed. We agree that forest health and diversity go hand in hand, and have made every attempt to be cognizant of that in the development of the alternatives presented in this programmatic plan. We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: There are no figures in the DEIS which show what percentage of the harvest volume comes from clearcuts per alternative. (138)

RESPONSE: Please refer to Table IV-V2, Predicted Distribution of Harvest Acreage by Cutting Method for Each Alternative, in Methodology, Chapter IV: Forest Vegetation.

COMMENT: Table III-V2 shows only FY90-FY94 totals and acreages, when in fact Epsilon and other alternatives that increase harvest levels will rely more heavily on clearcutting than is reflected in their figures. It is reasonable to estimate the programmatic, cumulative environmental effects of clearcutting under each alternative. The past effects of clearcutting is misrepresented in the DEIS ... Clearcuts are also used in sanitation and salvage cutting. It is unfair and misleading to lump these in an "intermediate" category. (138)

RESPONSE: Refer to Table IV-V2 (Methodology, Chapter IV: Forest Vegetation) for an estimate of the amount of harvest by cutting method for each alternative. We disagree with the commenter's assumption that increased harvest will rely more heavily on clearcutting than estimated by our specialists.

Issue: Salvage Harvesting

COMMENT: Salvage sales are not discussed in DEIS. (020, 115, 140)

RESPONSE: The Department's salvage program is well-defined in § 77-5-201 and § 77-5-207, MCA (see Appendix LGL). All alternatives are bound by these laws. There would be only slight differences in how we would comply with these laws based on the different management philosophies of each alternative.

COMMENT: There's a large missing section regarding the harvesting of birding wood, which is commonly and misappropriately called "salvage." That's a practice that has to be dealt with in a straightforward and up front manner. (140)

RESPONSE: We appreciate your comments, however, salvage appropriately describes the activities that take place when harvesting recently killed trees. Most of our salvage situations occur with bug infestation or blowdown. Notwithstanding the differences between harvesting or leaving dead trees, the magnitude of the activity is extremely small.

COMMENT: Harvesting of burned areas is one of the most ecologically damaging practices we can conduct. Not only are soils and remaining vegetation fragile, but aggressive invasive species more easily invade after a fire, and the flora and fauna in this area have adapted to stands of burned timber, not just fire, what's left over after fire, and when we alter that, we're altering a large part of this ecosystem. (140)

RESPONSE: On the average, less than one half of one percent of state lands burn annually. As such the ecological effects are quite small.

Issue - Old-Growth

COMMENT: DNRC should preserve old-growth; do not cut existing old-growth, only cut new old-growth predicted by DEIS to develop in the next 25 years. (020, 025, 027, 028, 032, 041, 046, 051, 055, 062, 122, 140, 141, 144)

RESPONSE: Addressing old-growth on a case-by-case basis is not within the scope of this programmatic plan. Old-growth issues will be analyzed at the project level according to the management direction provided in the final alternative of this Plan.

COMMENT: Old-growth under Beta states that approximately 15-40% of existing old-growth would be harvested by the year 2020, yet DNRC also states that there would be a potential net increase in old-growth. DNRC's thinking is flawed if they think 40% (or even 15%) of old-growth forests can be replaced in 25 years. (020, 122, 140)

RESPONSE: The increase in older forests reflects our inventory which shows significant additions to the older forest age classes over the planning horizon.

The increase is expected in older forests, i.e., those meeting stand age criteria for older forest, not in old-growth forests specifically. Refer to Tables IV-V7, IV-V21 and IV-V22 (Stand Age Distribution and Old-Growth, Chapter IV: Forest Vegetation) for more information. The Tables use data from the state's forest land to determine stand age class distributions. From these age class distributions we can project the consequences of various harvest levels into the future (for example the 25 year projection used in the DEIS). The data show that there will be an increase in the amount of older forest, i.e. those over 140 years.

COMMENT: The old-growth analysis in the DEIS is inadequate and confusing (020, 122) Where is the analysis that supports the assumptions made about old-growth? (122)

RESPONSE: Refer to the literature referenced throughout the discussion on old-growth for support of our assumptions. Chapter IV: Forest Vegetation, contains numerous citations that provide the requested information.

The old-growth analysis may appear confusing for several reasons including: the lack of an all encompassing old-growth definition, a lack of stand age information, and a lack of information regarding historic levels of old-growth presence. Refer to the previous response for some additional insight into the analysis.

COMMENT: Why cut old-growth as a policy? Why not aim towards an old-growth system? (115)

RESPONSE: The forests of Montana never existed as an old-growth system. Disturbance, predominantly from fire, has played a major role in shaping the forests we see today. Furthermore, old-growth is often high value timber that may be cut to meet our trust obligations.

COMMENT: Both Delta and Epsilon seem to require clearcutting as the most cost effective way to cut timber. Neither alternative provides any protection of old-growth without compensating the trust. This means that under Epsilon, all remaining old-growth could be harvested by 2020. (020) Beta provides virtually no protection of old-growth. (122)

RESPONSE: The choice of harvest or regeneration method would be based on site specific conditions. Clearcutting would be considered and utilized where appropriate as would various partial harvesting techniques. It is true that all old-growth could theoretically be harvested under Epsilon. However, realistically there are other constraints to harvest that may protect old-growth from harvest under any of the alternatives. Beta provides for maintenance of old-growth at levels representing 50% of historical levels.

COMMENT: The DEIS does not consider the loss of old-growth to natural wildland fire. (020, 140)

RESPONSE: No allowance is made for fire in old-growth given that less than one half of one percent of state forests burn annually and that very little, if any, of what does burn is old-growth forest (Fire Management Bureau estimates, January, 1996). Under Beta, Gamma, and Zeta there are provisions for replacement old-growth. Refer to Tables IV-V7, IV-V21 and IV-V22 (Stand Age Distribution and Old-Growth, Chapter IV: Forest Vegetation) for more information regarding the progression of stands through various age classes. Table IV-V22 shows considerably more forest becoming older than we will be cutting under any of the alternatives.

COMMENT: The DEIS "estimates" that currently approximately 14.6% is classified as old-growth (page IV-54, 56). In approximately 25 years, the DEIS estimates that old-growth will be substantially further reduced in the various alternative's high range of cutting which is a likely scenario given the State's apparent focus on strictly cash flow. In 2020, Alpha will further reduce old-growth from 14.6% to 8.1%; Beta will reduce old-growth to 9.0%; Delta will have reduced old-growth to 7.2%; and Epsilon will reduce old-growth to 5.3%. The ecologically critical old-growth component was "estimated" to be approximately 23.4% in 1990 sic 1900 (DEIS, page IV-54 sic 56). (141)

RESPONSE: The figure of 14.6% is indeed the estimated amount of old-growth currently on state lands. This figure is based on DNRC Stand-Level inventory data, with adjustments based on limited field verification from the SWLO and NWLO and extrapolated to the other land offices. We indicated in the DEIS that since it was necessary to make some assumptions from stand age data, that these numbers should be used with caution.

We wish to clarify for the commenter that the percentages for 2020 presented in the comment from Table IV-V21 (Old-Growth, Chapter IV: Forest Vegetation) represent the percent of forested acres on state lands predicted to consist of existing old-growth in 2020. The key here is "existing" or current old-growth stands. Table IV-V22 shows the amount of older forest predicted for the future. The estimate from the DEIS (Losensky 1993), page IV-54 refers to potential old-growth and not how much actually existed.

The differences in these Tables stem from differences in the definition of 'old-growth', 'older forest', and 'potential old-growth'. The old-growth numbers from Table IV-V21 show the percent of 'existing old-growth' that is likely to remain after 25 years. In the case of older forest (as in Table IV-V22) we are estimating the changes that may occur over the planning horizon. Given the large number of stands in the 120 to 140 year old age class we predict a corresponding increase in the amount of older forest following 25 years of growth. Potential old-growth is an estimate of the potential for various forest types to develop old-growth. That is, the 23.4% in Table IV-20 is an estimate of the percentage of forested lands that 'may' have existed as old-growth.

Actual amounts of old-growth are expected to range between the numbers shown in Tables IV-V21 and IV-V22. At a minimum, we expect that today's old-growth that is not cut will still be old-growth after 25 years (Table IV-V21). Although we admit that not all the stands passing from the 120 - 140 year age class to the next will exhibit old-growth qualities, we show the numbers from Table IV-V22 as an upper limit of old-growth that might exist in 2020.

COMMENT: Old-growth retention should be addressed on a case-by-case basis where it is an issue without setting a predetermined amount. (157)

RESPONSE: Addressing old-growth on a case-by-case basis is not within the scope of this programmatic plan. Old-growth issues will be analyzed at the project level according to the management direction provided in the final alternative of this Plan.

COMMENT: The DEIS fails entirely in its protection of old-growth habitat by its lack of management standards (138a, 142, 162). For instance, the DEIS states "Biological Diversity for Forest Type Groups" or other current references would be used for guidance to resolve biodiversity-related issues on a project specific basis." This reference therefore is merely "guidance," and, in fact, may not be used at all. What may be used in its place is unknown. (142, 162)

RESPONSE: When stated as a Resource Management Standard, "Biological Diversity for Forest Type Groups" and other current references will be used as guidance. We have included the text of this reference in Appendix RMS of this FEIS.

COMMENT: The USFS Region One Old-growth Committee "draft" definition of old-growth habitat lacks scientific credibility for the reasons demonstrated by the documents enclosed with this comment. Nevertheless, this definition has been used repeatedly in Region One as if it were scientific fact. Therefore, to properly analyze the biological and statistical reliability of DNRC's proposed management of old-growth, it is necessary to present exactly how this definition will be used and what are the methods and procedures by which it will field verify old-growth stands. (142)

RESPONSE: We have chosen not to use the USFS Region One's definition of old-growth. Rather, we provide a characterization of old-growth in Old-Growth, Chapter IV: Vegetation. We recognize there are many complexities associated with defining old-growth. The characteristics of old-growth differ with the type of old-growth. Some types have large amounts of down woody debris, while others have very little. Some are dominated by large individuals of seral species while others are composed mostly of climax species. The all-encompassing definition the commenter asks for is beyond the scope of this document. The biological and statistical reliability called for would be desirable, but as with any natural system, it is impossible.

COMMENT: The paper, "Biological Diversity Strategies for Forest Type Groups," referenced in the DEIS states: "At least 10% of the forested State ownership would be maintained as old-growth, unless different amounts are specified in landscape-biodiversity plans." This statement is so vague as to make the 10% requirement meaningless. (142)

RESPONSE: As stated in the Biological Diversity Strategies for Forest Type Groups (see Appendix RMS) old-growth maintenance will be based on the direction provided by the selected alternative. The EIS, as presented, addresses old-growth differently in different alternatives. In Epsilon, we may cut it all to meet our legal trust requirements. Under Beta we seek to maintain or restore amounts of old-growth based on historical or appropriate levels. Consequently, when viewed out of context the 10% rule may seem vague. Additionally, none of the alternatives considered use of the 10% figure.

COMMENT: DNRC should set aside old-growth retention areas to allow for development of the later stages of old-growth characteristics. In addition, cutting is allowed in all old-growth blocks, which is inappropriate. (142)

RESPONSE: It is not within the scope of this programmatic EIS to target individual stands for treatment. However, we appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: Old-growth forests provide little or no return to public schools. It provides only an opportunity to manage and perpetuate a decadent forest until it is destroyed by fire and no financial return will accrue to the intended beneficiaries. (021)

RESPONSE: The evolving concept of forest health suggests that a healthy forest is one that maintains all the components that would have been naturally represented. Old-growth is one component of a healthy forest. By maintaining each of the components, a direct return to the school trust, can accrued by allowing harvest on lands that may otherwise be restricted from entry.

COMMENT: I could find no comments relative to old-growth versus young growth in the matter of converting CO^2 to O^2. Maybe on small acreages, this impact is negligible. (031)

RESPONSE: Discussions of the relative value of old-growth versus young growth in the conversion of carbon dioxide to oxygen was not within the scope of this programmatic EIS.

COMMENT: Old-growth can easily be provided on adjacent federal lands, and should not be a significant concern on state lands set aside for providing revenue to the schools. (100)

RESPONSE: The evolving concept of forest health suggests that a healthy forest is one that maintains all the components that would have been naturally represented. Old-growth is one component of a healthy forest. We cannot make the assumption in our management plan that the old-growth component is being provided for on adjacent federal lands. Each of the alternatives presented in this Plan deal with old-growth in a manner consistent with their management philosophy. See Appendix RMS: Biodiversity, for management standards on old-growth and Old-Growth, Chapter IV: Forest Vegetation, for a discussion of the impacts of each alternative on old-growth.

COMMENT: All old-growth is not equal and there should be a provision to assure that the highest quality examples of the remaining old-growth are retained. (142)

RESPONSE: Addressing old-growth on a case-by-case basis is not within the scope of this programmatic plan. Old-growth issues will be analyzed at the project level according to the management direction provided in the final alternative of this Plan.

COMMENT: "Replacement" old-growth stands are not defined in the DEIS. Apparently they may be even pole-sized stands, instead of high quality, mature or older stands. (142)

RESPONSE: Stands develop over time, moving from one size class to the next. In order to achieve desired characteristics for old-growth, stands must, at some time, pass through the pole size stage. Given this normal progression, it is essential that some stands exist in the pole size stage to maintain the amounts of old-growth we would plan to maintain under any of the alternatives. Under Beta, replacement old-growth would likely be mature sawtimber stands that have the potential to develop into quality old-growth stands. We would allow these sawtimber stands to develop into old-growth to prevent falling below the 50% of historic levels called for in that alternative.

COMMENT: Without maps of old-growth habitat, the Plan cannot insure the ecological integrity of old-growth habitat on a landscape scale. Performing this only on a site specific basis precludes the kind of analysis that is needed by managers and the public to assess the impacts of any future cutting of old-growth habitat. (142)

RESPONSE: The provision of maps of old-growth on all state lands is beyond the scope of this programmatic plan. We believe that this level of evaluation can be done effectively at the project level. When reviewed in conjunction with the Biodiversity Resource Management Standards, both land managers and the public will then be able to assess the impacts of management activities on old-growth.

COMMENT: We are discouraged by the definition of "old-growth" which appears in the glossary. While stand structure is an indicator of old-growth, the definition ignores the ecological role of old-growth. Given the definition of "forest health" in the glossary, we believe a more process-based definition of old-growth is necessary to analyze the role of old-growth in maintaining forest health. The definition of old-growth must include wildlife habitat, nutrient cycling, understory composition, down wood debris, etc. (140) Neither the actual landscape percentage, nor old-growth distribution and quality with respect to age, elevation, slope, forest type, levels of snags and downed logs, patch size and connectivity via biological corridors, was ever defined. (138a, 162)

RESPONSE: Given the diverse array of characteristics represented by old-growth for different species on different sites it is not within the scope of this programmatic plan to offer a definition meeting the commenters' desired level of specificity. It is also not within the scope of this Plan to determine specific 'new' or 'old' old-growth stands to harvest. Further, it is beyond the scope of this EIS to describe old-growth distribution and quality with respect to the factors mentioned. We do however, describe current old-growth levels by land office and historic levels by forest type (Old Growth, Chapter IV: Forest Vegetation).

COMMENT: According to the 7/31/95 Daily Interlake, there are plans to conduct major timber sales in the Coal Creek State Forest. This is of great concern to us. Is there any way to meet short term timber mandates without significant logging efforts on the North Fork? Depending on the outcome of the DEIS, areas that have never been logged may be the only avenue available for yielding some potential products from state lands especially with respect to maintaining long-term forest health. (140)

RESPONSE: We appreciate your concern, however in this programmatic plan we are not setting aside nor focusing our harvest on specific areas.

Issue - Special Forest Products

COMMENT: Please refer to the enclosed article regarding "special forest products." (107)

RESPONSE: Thank you for the informative article on morel mushroom harvesting. Some of the alternatives presented in the EIS include provisions for pursuing other income producing uses. Delta specifically states that "relying on a diversified mix of resources to produce income would allow DNRC to take advantage of market conditions and changing resource values" (Summary of Alternatives Table, Executive Summary). We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Prescribed Fire / Wildfire

COMMENT: DNRC should consider the use of fire/prescribed burns as a management tool. (001, 019, 020, 025, 027, 028, 032, 041, 046, 051, 055, 062, 115, 122, 126, 131, 140, 141, 145)

RESPONSE: Prescribed fire is discussed in the section on air quality. The specifics of seasonality of burning are not discussed within the Plan. It is doubtful that burning during the summer will be considered as a management tool. The Department is under legal obligation to suppress wildfires on our own and other landowners property. However, properly planned spring or fall burning can achieve desired stocking and slash reduction objectives. The EIS does not dismiss the use of prescribed fire.

COMMENT: I have heard much argument that timber harvesting is the same as natural fires, but that is not true. There are many studies, both here in the U.S. and in similar forests in Canada, that show the species mix and genetic diversity of the next growth are not at all equivalent. Please consider the use of prescribed burns as part of your management plan and factor in that natural burns are sure to occur. (020, 032, 051, 062, 122, 141, 145) Prescribed fire needs to be evaluated as a tool for reversing some of the negative impacts of fire suppression. It is simply impossible to mimic fire by harvesting trees if you are interested in maintaining ecological function. While the distribution of tree size and species can be approximated, the ecological functions initiated by wildfire are still lost from the system. (140)

RESPONSE: Timber harvest and wildfire are not the same. However, species mix and genetic diversity can be managed to reflect what was on a tract prior to timber harvest. Harvesting followed by prescribed fire can help to maintain a closer semblance to natural wildfire regarding ecological function.

Presently, the preponderance of public opinion is that we control fire in the forests, regardless of its ecological benefits. The Department is under legal obligation to suppress wildfires on our own and other landowners property. However, properly prescribed spring or fall burning can achieve desired stocking and slash reduction objectives.

The EIS does not dismiss the use of prescribed fire. Prescribed fire is discussed in the section on air quality. The specifics of seasonality of burning are not discussed within the Plan. However, it is doubtful that burning during the summer will be considered as a management tool.

COMMENT: The theory of "natural regulation" has been emphasized and abused until all management has been stymied on federal and some state land. This has allowed our forests to become decadent, dead and not biodiverse. This is leading to an explosive unnatural disaster that will have two devastating results: (1) massive fires that will destroy forest resources; and 2) hot fires that will destroy the seeds of biodiversity and lead to massive soil erosion. (004)

RESPONSE: Catastrophic wildfire is one of the major concerns of DNRC. In the Silviculture RMS, each of the alternatives address processes for us to reduce the likelihood of these fires occurring. Stocking control and use of prescribed fire is discussed in the air quality section. Some of the alternatives specifically address how stocking control and fire will be used to help return forests to pre-fire exclusion conditions.

Due to our legal obligations to control wildfire, tree cover is increasing in some of the historically more open areas. Alternatives Beta and Gamma would do the most to returning these types of stands to a more historical stocking level. However, prescribed naturally occurring fires are beyond our scope of consideration due to state law.

COMMENT: The DEIS should evaluate the opportunities for allowing prescribed natural fires, and even management-ignited fires, to decrease the risk of large-scale catastrophic fire, even if this means suggesting a change in statute or regulation. (122) DNRC should re-examine its policy of fire suppression to allow fires to burn in some areas. (138)

RESPONSE: DNRC is under legal obligation to suppress wildfires on our own and other landowners property. Also, we state in the EIS that "certain matters of significant concern to Montanans are outside the Forestry (now Trust Land Management) Division's decision-making authority and will not be addressed by this planning effort" (Chapter I). We considered major changes in statute or regulation to be outside the scope of this programmatic plan.

Issue - Fire Suppression

COMMENT: If fire suppression were modified, would not natural conditions eventually result? (131)

RESPONSE: Due to our considerable impact on the forested ecosystems of Montana, it is doubtful that modification of fire suppression activities would eventually result in 'natural conditions'. People would still be here, buildings and human lives would still need protection, and other uses of the forested resource would continue.

COMMENT: DNRC should discuss the impact of fire in the urban interface. (006)

RESPONSE: This is an increasing concern for all alternatives given the continued development of the urban-forest interface. Although it is beyond the scope of this document to address the issue it is doubtful that any of the alternatives would differ in their approach to controlling fire at the urban-forest interface. That is, according to state law, wildfires will be aggressively suppressed.

Issue - Biodiversity / Silviculture Resource Management Standards

COMMENT: The Resource Management Standards are vague. Page II-15 of the DEIS states, "We would seek to maintain and restore old-growth in at least half the amounts expected to occur on state lands with natural processes in similar types of forest." The DEIS does not state what that amount would be, or how it would be determined. Without these critical pieces of information, this standard is meaningless and cannot be reasonably evaluated. (142)

RESPONSE: We understand that specifically articulated standards and guidelines in this Plan are desired by some members of the public, and would serve to provide clear accountability of our actions. However, in this programmatic and philosophical plan, treating as it does, lands distributed across the entire state, such specificity would be inappropriate. Instead, we have chosen to adopt a coherent management policy with the assistance of public input, while allowing for flexibility in the standards and guidelines to respond to new and best available information over time.

PLANT SPECIES OF SPECIAL CONCERN

Issue - Protection of Plants Species of Special Concern

COMMENT: There is no specific state law that protects Threatened and Endangered Plant Species (ESA won't protect plants on state land unless federal funding involved). (118)

RESPONSE: This is correct. However, if a plant does become listed under the federal Endangered Species Act, we will comply with the protection requirements under federal law. In addition, project level MEPA review can require mitigation measures under all alternatives that would provide some level of protection for plant species of special concern, in an effort to prevent them from becoming threatened or endangered. It is possible that unidentified plants may be inadvertently affected by land management activities. The highest level of protection may not be provided under the Alpha, Delta, Epsilon or Zeta alternatives unless federal or other funding would offset revenues.

COMMENT: The unabridged Plan, in addressing potential impacts to plant species of special concern, infers that the management activities under consideration are categorically harmful or not harmful for a given species. On the contrary, there are many cases where potential impacts can be avoided altogether by minor modifications in timing, intensity or location. (155)

RESPONSE: The subsection entitled Current Conditions in Chapter III: Plant Species of Special Concern presents a description of existing conditions based on available information. Table III-F2 (Chapter III: Plant Species of Special Concern) does not infer whether management activities are harmful or not, but estimates the plant species of special concern by habitat for areas of the state and types of land management activities most likely to affect those plants. Project planning would consider Sensitive Species RMS to identify and mitigate project effects to sensitive species. For example, "Mitigation efforts could include limitations on activity, buffer areas of no action, special precautions to limit disturbance, seasonal restrictions, or other measures suggested by specialists" (Appendix RMS: Sensitive Species).

Issue - *Silene spaldingii*

COMMENT: A second species petitioned for federal listing,* Silene spaldingii, *is not mentioned in the DEIS. (118)

RESPONSE: At the time of DEIS printing, Howelli aquatilis was the only USFWS listed threatened plant species in Montana. Although *Silene spaldingii* is not specifically referred to, this plant is included in the category of plants "possibly appropriate for federal listing under the ESA(C2)" in Table III- F1 "Occurrence of Plant Species of Special Concern Within Land Office Boundaries" (Chapter III: Plant Species of Special Concern). (Please note that since the printing of the DEIS, the USFWS has eliminated C2 species from their listing. C2 species were candidate species being considered for protection by the USFWS. Despite the elimination of this category, we have retained the information on C2 species in this EIS because we feel it provides useful information in assessing the impacts of management activities on sensitive and threatened species.) DNRC recognizes that plant inventories will be updated and change as additional plant species become more rare or stable in population and extent. Under all alternatives, DNRC projects will reference most current databases.

Issue - Water Howellia

COMMENT: The Threatened and Endangered Species RMS must include a scientifically based standard for Water Howellia. (138, 162)

RESPONSE: For the broad scale of programmatic level of analysis, no standards were established for individual plant species of special concern. There are currently no interagency working groups developing accepted standards for management of plant species of special concern. A very detailed survey of the Swan valley has not discovered *Howellia aquatilis* on State Lands (Shelly, J.S., & R. Mosely, 1988. Report on conservation status of *Howellia aquatilis*, A candidate for threatened species status. Unpublished report to the USFWS, Denver, CO. 166 pages. Continuing survey and subsequent reports in 1989, 1990, 1991.). If *Howellia aquatilis* or other plants listed in the future are discovered on a proposed project area of state forest lands, then management activities may be modified or mitigated based on project level analysis and Sensitive Species RMS.

Issue - Sensitive Plants and Forest Health

COMMENT: Incorporate sensitive plants as an indicator of forest health, not an indicator of physical and biological environment. (140)

RESPONSE: We recognize that some sensitive species can be considered as indicators of changes in forest health. Yet for many plant species of special concern little is known about their biology and ecology which makes plant species of special concern a difficult and vague measure to compare forest conditions. Noxious weeds were not considered as indicators of forest health, but are a threat to native plant communities. Environmental effects on native plant communities are discussed in Exotic Species Infringement, Chapter IV: Plant Species of Special Concern and Chapter IV: Noxious Weeds.

NOXIOUS WEEDS

Issue - Control of Noxious Weeds

COMMENT: DNRC should require that contractors be responsible for weed control for two years after harvesting on all weed-free sites, not just "where stipulated." (020, 025, 027, 028, 032, 046, 051, 055, 062, 115, 140)

RESPONSE: In weed free areas where ground disturbing activities occur, a contract agreement may require weed control of new infestations for up to 2 years following the activity. There is considerable public support for requiring noxious weed control on all weed free sites that are disturbed during land management activities. The monitoring for new weeds and follow-up weed control efforts could be handled by the contractor, agreements with weed districts, weed control companies, or State personnel.

COMMENT: Two year weed control stipulation for contractors is not realistic. (061)

RESPONSE: There is some public concern that weed control efforts be applied realistically. Weed control would depend in part on the success of revegetation on disturbed sites such as roads. Prevention of weed spread into weed-free areas by controlling spot infestations while competing vegetation establishes is a highly cost effective and long term weed control. Implementation of the Gamma, Beta or Zeta alternatives could require monitoring and weed control efforts on weed free sites for up two years following disturbance. To feasibly maintain weed free sites the monitoring for new weeds and follow-up weed control efforts could be handled by the contractor, agreements with weed districts, right-of-way lessees, weed control companies and State personnel.

COMMENT: We need an integrated weed/pest management program that is cooperative with adjacent landowners. (083)

RESPONSE: Noxious weed management is considered during site specific project developments, road access and maintenance based on weed occurrences and most feasible methods of control. Integrated pest management control methods will be considered as required by HB 395 (§ 7-22-2151, MCA, as amended 1995). Weed Management RMS state "In areas where weeds are wide-spread across state and adjacent ownerships, DNRC would cooperate with weed districts for control projects across all ownerships (Appendix RMS: Weed Management).

COMMENT: Gamma and Zeta are the best alternatives to deal with weeds due to less timber harvesting and less road building. (139)

RESPONSE: The Gamma and Zeta alternatives involve the least amount of disturbance associated with timber harvest and road construction and would have lower risks of noxious weed spread. Weeds would continue to spread onto undisturbed sites where the weeds have adapted to those sites.

COMMENT: DNRC should incorporate weeds as an indicator of forest health, not an indicator of physical and biological environment. (140)

RESPONSE: Weeds would not be a very accurate or consistent indicator of forest health since the occurrence and spread of noxious weeds depends on weed seed availability, site adaptability and soil disturbance to provide a niche to establish. Noxious weeds rarely effect the establishment and growth of trees, but may affect the vigor or distribution of understory vegetation. Noxious weeds were not considered as indicators of forest health, but are a threat to native plant communities. Environmental effects on native plant communities are discussed in Exotic Species Infringement, Chapter IV: Plant Species of Special Concern and Chapter IV: Noxious Weeds.

WILDLIFE

Issue - Wildlife Protection

COMMENT: We support the wildlife and sensitive species program in Beta. DNRC would manage for all wildlife, including nongame. Sensitive species would be of primary concern in management activities, and recovery of threatened and endangered species would be promoted. (020)

RESPONSE: This is correct. Under Beta, the focus is on managing for a diversity of forest conditions, which should serve to provide at least some amount of habitat for all indigenous species, including sensitive species. The words "primary concern" are those of the commenter, and do not appear in the Plan in relation to sensitive species. Rather, DNRC's position regarding sensitive species under Beta is summarized by: "Appropriate measures would be taken to ensure adequate conditions to support these species or contribute to their habitats" (Appendix RMS: Sensitive Species).

COMMENT: Under Delta and Epsilon, wildlife (including sensitive species) is only considered when trust revenues would not be reduced. Meeting only the minimum legal requirements for wildlife under Delta and Epsilon is unacceptable. (020)

RESPONSE: The first sentence of the comment is basically correct. However, while the Plan is clear in stating that sensitive species "would not be a primary consideration", it does allow for "limitations on activity, buffer areas of no action, special precautions to limit disturbance, seasonal restrictions, or other measures", as long as these would not "substantially reduce trust revenue" (Appendix RMS: Sensitive Species).

Issue - Wildlife Habitat

COMMENT: DNRC should avoid the notion that management-induced successional stages mimic naturally occurring forest succession through natural disturbance regimes. In general, the goal should be to maintain habitat components, function and structure similar to historic distribution. (103)

RESPONSE: We agree that management-induced changes are not identical to changes that occur due to natural disturbance agents such as fire, insects, and wind-throw. The word "mimic" is not used in the Wildlife sections. The DEIS states that, "Wildlife using managed forests face a different set of perturbations than do those living entirely within wilderness areas." And, "Under the current legal situation, fire suppression will continue as Department policy under all alternatives. In general, this will diminish habitat effectiveness for those species for which human-caused disturbances cannot adequately substitute for the effects of fire (e.g., many standing snags with charred bark, often harboring temporary flushes of unique insect assemblages)" (DEIS, page IV-141). We note that the goal of maintaining habitat components is made explicit in Beta. It would be achieved to lesser degrees under the other alternatives.

COMMENT: Wildlife must continue to be emphasized as a public resource and appropriate measures taken to protect their habitat. (127)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Wildlife Habitat Standards

COMMENT: The DEIS does not contain habitat standards which will ensure long-term viability of vulnerable wildlife species on state forest lands. (138, 138a) The impacts of each alternative on wildlife are never defined in relation to landscape viability. (138a)

RESPONSE: "Viability" is a term that has meaning to population biologists (and perhaps a different meaning in common usage), but does not lend itself to direct interpretation into management standards. Analyses of viability are conceptual and/or qualitative in nature; useful for forming a conceptual backdrop, but not for designing specific standards. The Forest Service has, in the past, used the criteria of ensuring species' "viability" to assess their management practices (although they are now considering modifying that policy), but there exist no laws or regulations requiring DNRC to include similar language.

Clearly, the alternatives considered in the EIS vary in the strength of protection provided to vulnerable wildlife species. Long-term viability of these populations was an important consideration, particularly in alternatives Gamma and Beta, which include emphases on landscape level planning, maintenance of connectivity, and reduction of fragmentation. However, explicit treatment of "viability" is not useful in designing our management standards, even where support of such vulnerable species is an explicit management objective.

Impacts are projected for each species under each alternative. Landscape issues are discussed in various places. However, we are unaware of an accepted definition for the concept of "landscape viability".

We understand that specifically articulated standards and guidelines in this EIS are desired by some members of the public, and would serve to provide clear accountability of our actions. However, in this programmatic and philosophical plan, treating as it does, lands distributed across the entire state, such specificity would be inappropriate. Instead, we have chosen to adopt a coherent management policy with the assistance of public input, while allowing for flexibility in the standards and guidelines to respond to new and best available information over time.

Issue - Wildlife Corridors

COMMENT: DNRC should maintain wildlife corridors for healthy gene pools and protection from predation. (108) Corridors must be wider than SMZs which are often too narrow and may, in fact, serve as habitat "sinks". (142)

RESPONSE: Corridors are given more emphasis in alternatives that involve landscape planning (i.e., Beta and Gamma) than those that do not. However, at this programmatic stage, precise widths of corridors are, appropriately, not determined. We appreciate your opinion on this issue, and will consider it when designing site-specific projects.

Issue - Wildlife Data

COMMENT: The results of data base searches performed by the Montana Natural Heritage Program (MNHP) are not intended as a final statement on sensitive species within a given area, or as a substitute for on-site surveys which may be required to adequately assess an area. (082, 091, 148) DNRC should only use state field personnel for sensitive species data. (091, 148)

RESPONSE: We have modified the wording of Sensitive Species RMS under all alternatives to reflect this concern. Depending on the selected alternative, site-specific surveys for sensitive plant species may be conducted. For sensitive animal species, Forest Service Region 1 lists will be considered as well as MNHP lists. Sensitive animal species will be considered if the project falls within the general area and habitat conditions for that species, regardless of whether that species has been documented from the site. We note, additionally, that field surveys are contemplated only for sensitive plant species, not for sensitive animal species. With our limited staff, surveys conducted by our own personnel would be incapable of generating reliable data on distribution of sensitive animal species on Trust lands. Thus, we must rely on published lists and compilations from other sources.

Issue - Big Game Management

COMMENT: Alternative Alpha places too much emphasis on big game management, with little or no attention to nongame species. (020) DNRC should manage for wildlife diversity, not just big game. (052)

RESPONSE: Under Alpha (the way we currently do business), most attention has been paid to big-game, and considerably less to nongame species. This is reflected in the RMS for Alpha. In part, this stems from the traditional reliance of DNRC foresters on MDFWP biologists for input.

COMMENT: We are interested in timber management only from the perspective of its impact on game management. We are not opposed to good timber management that recognizes the value of maintaining some security and thermal cover for deer and elk. State forests must be managed in such a way as to maintain healthy and high populations of game animals. (036)

RESPONSE: Big game is recognized as an important value, and is thus accorded separate RMS under each alternative.

COMMENT: Harvest benefits big game. (091, 128, 148) Epsilon is compatible with enhancing big game wildlife value for hunting. (148)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: Beta is likely to have an increased impact on big game populations, especially in low elevation forests, without realizing the wildlife benefits presumed from an approach that would create ecologically diverse forests. (145)

RESPONSE: The comment does not explain why the commenter believes that other wildlife benefits claimed by Beta would not be realized. It is correct that the RMS under Beta gives less weight than Alpha (current management) to big game concerns, largely by allowing more removal of thermal and hiding cover in forest types where a more naturally open canopy prevailed prior to modification by industrialized mankind.

Issue - Wildlife and Old-growth

COMMENT: The DEIS contains no alternative with protection of a 10% per drainage minimum of 200+ age stands. An old-growth alternative is feasible, reasonable and necessary to maintain populations of old-growth dependent species. (138)

RESPONSE: We agree that no alternative included provision for protecting 10% per drainage old-growth. However, Gamma includes provisions maintaining "old-growth in the landscape in amounts consistent with natural processes in similar forest types" and for developing or maintaining old-growth "...on enough additional acres to provide for replacement of existing old-growth over time" (Appendix RMS: Biodiversity). Under Beta, "Within an appropriate ecosystem analysis area, DNRC would seek to maintain or restore old-growth forest in amounts of at least half the average proportion that would be expected to occur with natural processes in similar forest types" (Appendix RMS: Biodiversity). Because the amount of old-growth per drainage in various forest types varies under natural processes, it is unclear how the effects of either of these two alternatives would compare with the provision of 10% per drainage.

COMMENT: The biological basis for the various old-growth standards was never disclosed in the DEIS. The apparent arbitrary selection of old-growth habitat levels per alternative indicates little effort has been made to identify critical threshold levels of old-growth habitat that will be required to maintain viable populations of associated species. (138a)

RESPONSE: We agree that biological information should be used as the basis for resource standards. Unfortunately, there exist no data that are capable of informing a decision on "critical threshold" levels of old-growth habitat to maintain. The commenter thus chooses to characterize such selection as "arbitrary", but another, equally valid characterization would be "best judgement".

COMMENT: The paradox of the DEIS, that although older forest habitat is being removed and fragmented, it is also increasing, appears to be based on a flawed analysis procedure whereby all older forest habitat is considered to be of equal value, regardless of age, elevation and patch size. (138a)

RESPONSE: The analysis procedure is qualitative, based on limited data, and thus, by it's nature, relatively insensitive to such attributes as elevation and patch size. The "flaw" referred to by the commenter is a characteristic of any analysis that would attempt to project effects on all species on all parcels of forested state land. See, particularly, Introduction, Chapter IV: Wildlife, for a fuller exposition of the rationale (and drawbacks) of the analysis approach chosen.

Issue - Wildlife and Roads

COMMENT: High road densities adversely affect wildlife, even with restricted access. Road closures are not fully adequate to protect wildlife. Biologists are in near-unanimous agreement that high road densities and hence increased human access adversely affect wildlife. (068, 119, 122, 138)

RESPONSE: We agree that even road closures may not be fully adequate to protect wildlife. We state in the DEIS that, "The extent of road development may affect wildlife security and is often used as a key element for defining effective habitat for various species...the existence of roads and trails, even if closed to motor vehicles by barriers, increases access to an area and thereby reduces security" (DEIS, page III-42). Also, "Many closed roads are closed only by administrative rules and include no physical barriers or signs to discourage use. Even if roads are not accessible to the general public, they may be accessed by surrounding landowners and anyone they allow through their property" (DEIS, page IV-139). And, "The predicted increases in road density...under most alternatives will be added to existing roads and human pressures that have developed over the past century. This suggests that long-term increases in disturbances from contact with humans are likely to continue for species sensitive to these pressures. Thus, regardless of alternative chosen, road management will be crucial for ensuring the security of many species" (DEIS, page IV-141).

COMMENT: Road management is critical for both watershed and wildlife values. (103, 145)

RESPONSE: We agree with this statement. The DEIS states that, "The predicted increases in road density and recreational uses under most alternatives will be added to existing roads and human pressures that have developed over the past century. This suggests that long-term increases in disturbances from contact with humans are likely to continue for species sensitive to these pressures. Thus, regardless of Alternative chosen, road management will be crucial for ensuring the security of many species (and thus of ecosystem integrity)" (DEIS, page IV-141).

COMMENT: One of the most over-looked impacts of road closures is increased human usage of the forest. As more and more roads are locked up it forces an increasing number of people into a smaller and smaller area. This idea greatly increases negative environmental impacts...Keeping more roads open should lessen user conflicts, wildlife disturbances, and other environmental impacts. (148)

RESPONSE: We note that the preponderance of published literature on the subject indicates that open roads create more disturbance to many species of wildlife than do closed or restricted roads. We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: The impact of road access and habitat fragmentation of road corridors needs to be correctly addressed in the DEIS. The fragmentation impacts of roads will remain whether the road is open or closed, so there will be no difference in effects between alternatives. (138a)

RESPONSE: There is no direct treatment of possible fragmentation effects produced by the road-bed itself. Few data are available upon which to base such projections; as well, none was included in the database (Prather and Burbridge 1979) upon which the numerical (species richness) analysis was based. As indicated earlier, neither patch size nor fragmentation per se were made explicit descriptors in the analysis, again, because data were lacking with which to treat all native terrestrial vertebrates. There are numerous, additional impacts to wildlife habitat that arise from management activities not explicitly treated here. We selected the eight that appeared to be the most important and that most sensitively portrayed differences among the alternatives. See also our response to other comments in this section regarding roads and wildlife.

COMMENT: The DEIS avoids its most crucial duty to analyze the effects of roads on wildlife. (138)

RESPONSE: Road densities are used as one of the nine descriptors in the wildlife analysis. Please refer to Road Density, Chapter IV: Wildlife, for a discussion of the effects of roads on wildlife.

Issue - Wildlife Analysis in the DEIS

COMMENT: We are disappointed that the tables in the appendixes showing the relation of various forest conditions to different species of wildlife include so many question marks, thus indicating no information. (052, 083, 139)

RESPONSE: Question marks in the Appendixes do not necessarily indicate "no information" (although that is sometimes the case); the "?" symbol is short-hand for "uncertain", not "no information". In some cases, there were data, but of insufficient quality or specificity to allow a

meaningful projection of impacts. In more cases, however, question marks resulted from uncertainty about forest conditions that would result from adoption of an alternative as written, or from inability to confidently project site-specific (or habitat-specific) changes. In other cases, a question mark resulted for species that have affinities for multiple forest conditions when these conditions were projected to respond in opposite directions to management actions under a given alternative (and thus we could not confidently project an "overall" effect). In yet other cases, question marks resulted from differences between the "high" and "low" harvest projections under an alternative, where impacts to a given species were in opposing directions depending on which scenario might apply.
We state in the Plan that, "In some cases, even the direction of change for a component of habitat could not be projected with certainty. In these cases, we were similarly uncertain about the consequences for wildlife. Uncertainty about the qualitative change in habitat effectiveness associated with a given descriptor for a given alternative should not be equated with lack of change, however. That is, it would be erroneous to infer from a categorization of a descriptor's effect on a given species as "uncertain" that complacency is in order. The correct interpretation of our "uncertain" category is that there may well be adverse or beneficial effects, locally or even statewide, but that we cannot confidently project which might apply given the necessarily crude sieve through which we must view species and their habitats in this programmatic-level analysis." (Methodology, Chapter IV: Wildlife).

See also the wording in the DEIS, repeated for the analyses of Environmental Consequences under each Descriptor, that precedes each "Expected Future Conditions" section. For example, "Species were categorized as beneficially affected if both their primary feeding and breeding affinities were associated with successional stages projected to increase, but neither were associated with stages projected to decrease. Species were categorized as adversely affected if both their primary feeding and breeding affinities were associated with successional stages projected to decrease, but were not also associated with stages projected to increase. "*We categorized effects as "uncertain" if either breeding or feeding habitat affinities were associated with successional stages that we could not project confidently, or if primary affinities were associated with multiple successional stages which were projected to change in opposing directions*" (Emphasis added) (DEIS, page IV-110).

COMMENT: The analysis procedures utilized in the DEIS for disclosure of wildlife impacts have provided misleading results...the DEIS implies that wildlife species associated with older forest habitats will benefit from proposed logging of old-growth. (138a)

RESPONSE: We agree that misinterpretation of the numerical results is a possibility; thus we have attempted to provide narrative descriptions to supplement them. In particular, because there is no separate descriptor for old-growth habitats, species' response to changing patterns of Forest Successional Stage are complex (often because species respond to more than one stage). For example, the DEIS states that, "Effects of Epsilon...Existing old-growth forest would experience corresponding decreases. Thus, such old-growth obligates as the three-toed woodpecker would be adversely affected, while species associated with younger stands...would benefit" (DEIS, page IV-113).

COMMENT: The analysis of wildlife in the DEIS fails to identify the conservation concern for vulnerable wildlife species. The analysis method implies that all wildlife species currently have equal viability on this landscape, which is not the case. (138a)

RESPONSE: The fact that effects are projected for all native, terrestrial vertebrate species provides no basis for assuming that populations of all species are currently equally viable. In fact, the DEIS specifically highlights effects on species categorized as meriting "special concern" by the Montana Natural Heritage Program. For example, in Sensitive, Threatened, or Endangered Species, Chapter III: Wildlife, it states, "The Montana Natural Heritage Program lists 66 wildlife species as species of special concern. Listed species may be either very rare, or locally abundant but occupying a very restricted range. In either case, they are especially vulnerable to extinction. Listed species are facing current or anticipated major declines in population or habitat capability which could be accelerated by land management activities. The Heritage Program list includes species designated by the U.S. Fish and Wildlife Service as Threatened, Endangered, or candidates for Threatened status[1], under the Endangered Species Act, as well as most species on the U.S. Forest Service sensitive species list.[2]

Of Montana's 66 species of special concern, five are classified as Endangered, three are Threatened, and 17 may be appropriate for listing under the Endangered Species Act. Ten species in Montana are considered vulnerable to extinction throughout their entire global range. The Central Land Office has the most species of special concern, presumably because that administrative region includes all of the major habitat groups from both eastern and western portions of the state."

Also, in Ecosystem Integrity, Chapter Three: Wildlife: "There is considerable concern about the impacts of timber harvest and forest management on overall health of the ecosystem. Harvest of timber can alter the structure, function, and composition of forest ecosystems. This can harm biological diversity, not only in plant but also in animal species which suffer from the change in their habitat. Sensitive, threatened, and endangered species are especially vulnerable to changes in their environment."

Within each of the effects analyses, the number of such "special concern" species are listed separately. As well, Appendix WLD includes a list of all such species, allowing the reader to track projected effects on each species of special concern through the remainder of the tables in the Appendix.

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1 Please note that since the printing of the DEIS, the USFWS has eliminated C2 species from their listing. C2 species were candidate species being considered for protection by the USFWS. Despite the elimination of this category, we have retained the information on C2 species in this EIS because we feel it provides useful information in assessing the impacts of management activities on sensitive and threatened species.

2 Species designated as sensitive by the USFS are listed in Forest Service Manual 2670.22.

COMMENT: 1) The wildlife analysis for Epsilon & Delta underestimated the negative impacts to wildlife, while Beta underestimated the positive impacts to wildlife. While I recognize the difficulty of attempting to model impacts on such a wide diversity of wildlife species as are found across Montana, some biologically crucial details were lost in the number crunching. 2) Assigning all species a "1" gives equal weight to robins and pileated woodpeckers. These two species differ greatly in their sensitivity to human alteration of landscapes...but are given equal weight because neither has special legal or economic status. (026)

RESPONSE: 1) The "number crunching" was presented as a way to project likely effects (admittedly quite crudely) on all native terrestrial vertebrates. We agree that many important details are lost in this portion of the analysis. We stated in the DEIS that, "An advantage of the...approach [used] is that it allows expression of the particularities of each species. A weakness is that it requires ecosystem-appropriate data on habitat affinities for each species. If available at all, such data are likely to be based on few studies and small sample sizes, and be categorical or qualitative in nature. Therefore, in addition to presentations of species richness generated by the species/habitat matrix approach, we also stepped back from our model to make general observations about the expected consequences that changes to the landscape from each Alternative will likely produce on wildlife communities." (DEIS, page IV-101).

2) The intention of treating each species individually was to allow the reader to follow the likely impacts on any species of interest, by Descriptor, by alternative. Thus, if the reader believes one species is more important or sensitive than another, they can focus on that species by careful observation of the Appendixes. We state in the DEIS that the "Effects of each descriptor have been presented primarily in terms of species richness. Such an approach recognizes that all species have value and function within the forest ecosystem, and is in accord with the current emphasis on biodiversity. Appropriate as such a focus on biodiversity may be, it can easily be misinterpreted: even under the most "natural" of conditions, we would not expect all species to be present on any given site. Rather, a mosaic of forest conditions over the landscape is necessary, as is enough connectivity among patches of various conditions that none become ecological isolates. Further, sole reliance on species richness can obscure dynamics of real interest: There may be a greater number of species associated with disturbed habitats or small habitat patches than with old-growth or large, uninterrupted patches, but these former will often be species well adapted to our changing landscape, and thus faring well. Concern over the effects of forest management is appropriately channeled toward those species that have evolved to exploit forest conditions increasing in rarity as human influence expands." (DEIS, page IV-140).

COMMENT: We would suggest that some of the analyses (specifically of plant species of special concern, noxious weeds, and wildlife) be included as indicators of forest health rather than as indicators of protection of the physical and biological environment. (140)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: There is no analysis of cumulative impacts of the proposed actions on wildlife habitat. (138a)

RESPONSE: See the end of the Wildlife section of Chapter IV for a discussion of cumulative effects common to all alternatives, as well as specific to each alternative.

COMMENT: The cumulative effects summary acknowledges that "a comprehensive evaluation of effects on wildlife must also consider projects for state lands in the context of other ownerships" (DEIS, page IV-141), yet no such discussion is included. (145)

RESPONSE: The EIS is programmatic, not site-specific. It was not the intent of this document to examine particular land-uses or allocations; on a statewide basis, few sweeping generalizations can be supported about the uses and future status of adjoining lands, save that they will vary, and be important.

COMMENT: The wildlife analysis in the DEIS implies that wildlife species associated with older forest habitats will benefit from proposed logging of old-growth. (138a)

RESPONSE: We do not agree with this comment. The effects assessment treats each descriptor (many of which deal with characteristics of timber harvests) and each alternative. Some of the characteristics for some of the alternatives are projected to have beneficial impacts on some species of wildlife. Other characteristics for some of the alternatives are projected to have detrimental impacts on some species of wildlife.

COMMENT: The existing habitat problems that have been created by past management activities such as road construction and logging are never disclosed or addressed. (138a)

RESPONSE: We disagree with this comment. For example, see DEIS, page III-26, "Old-growth conditions are now rare where they were once abundant...and relatively abundant where they were once rare." Also, on page IV-108 of the DEIS, "Regardless of the acreage involved, the current condition of these habitats does not seem to provide what species dependent on these communities need. Livestock grazing and fire suppression have reduced regeneration and structural diversity, resulted in soil loss and compaction, and reduced habitat value of woodlands (Finch and Ruggiero 1993) and presumably more open savannahs. These habitats are considered some of the most threatened habitats in North America (Terborgh 1989). Grasslands and shrublands have also been affected, as evidenced by widespread declines in songbird populations associated with these habitats (Paige 1990)."

On Page IV-114 of the DEIS, it states that, "Each forest type supports wildlife species which are rare or absent in other types. Ponderosa pine and western larch forests support the largest number of species, but have experienced the greatest decline due to past management efforts as described in the Vegetation section of this analysis. Conversely, spruce and subalpine fir forests, the second most species-rich forest type, have increased substantially."

"Forest management practices, reviewed in the Vegetation section on pages 55-60, suggest that small diameter snags have increased but larger diameter snags have decreased relative to historical conditions" (DEIS, page IV-122). And, "Examples of turn-of-the-century logging can be seen in extensive second-growth forests and old railroad grades in the lower Clark Fork and Blackfoot valleys west and east of Missoula. Old cruise information in DNRC files indicates that less than 1,000 board feet per acre were left after logging in some old-growth ponderosa pine forests in the lower Blackfoot" (DEIS, page VEG-16). Also, "The shifts in species composition toward dominance of late-successional species have been exacerbated by the selective logging of valuable early-successional species" (DEIS, page VEG-17).

COMMENT: The analysis procedure indicating a decline in snag size represents a benefit to many wildlife species is seriously misleading. A decline in snag size due to timber management is clearly not a wildlife benefit. (138a)

RESPONSE: The analysis procedure does not project trends in snag size; rather, it projects trends in the abundance of snags within two coarsely defined size categories, ≤ 15" DBH and > 15" DBH. Under various alternatives, the abundance of snags in either of these categories is projected in the Vegetation analysis (Table IV-V23, Chapter IV: Forest Vegetation). We agree that, in general, large-sized snags are more limiting currently, and, in general more valuable to a wide-range of wildlife species. The DEIS states on page IV-122, "All types of snags are used by wildlife, but many snag-dependent species rely on the largest trees to meet their habitat needs." Also, in the table on Snag Abundance, Chapter IV: Wildlife, under the Effects of Alpha and Delta it states that, "We project an increase in small snags (15 inches in diameter or smaller) and a decrease in larger snags (> 15 inches). This would benefit the 52 species of wildlife that utilize smaller snags, including most woodpeckers, smaller owls, and bats. However, large snags, already likely reduced due to past forest practices, are projected to be further reduced, adversely affecting large snag-dependent species such as flammulated owl, three-toed woodpecker, and wood duck." Also in the discussion on snag abundance (Chapter IV: Wildlife) it states, "Large snags are probably the greatest concern, both because they have decreased historically, and because they are often associated with tree species that are valued both live and dead for timber and firewood (e.g., western larch, ponderosa pine). Maintaining these snags requires both adherence to silvicultural prescriptions and road management (because "leave trees" are often taken later by firewood gatherers)."

COMMENT: The DEIS (page IV-130) makes the assumption that all wildlife in the west of the state will benefit from the Plan, while all on the east will be harmed. Yet, it also says that DNRC doesn't know the precise relationship between individual species and habitat needs, so how can DNRC infer benefit or harm? (145)

RESPONSE: Species treated in Table IV-W14 (Riparian and Wetland Conditions, Chapter IV: Wildlife) are only those affected by changes in riparian management standards, and the effects are only relevant to that particular Descriptor. "Species associated with riparian and/or wetland areas are projected to benefit from improved management of riparian areas; they are projected to be adversely affected by continuation of the status quo" (DEIS, page IV-128). Please refer also to Methodology, Chapter IV: Wildlife, which states that, "These nine Descriptors characterize important elements of wildlife habitat for the 420 terrestrial wildlife species which can be expected to occupy habitats on state lands. Each descriptor represents only one of many elements that comprise suitable and useable wildlife habitat. However, looking at each of these nine elements separately allows us to identify interactions between competing needs of different wildlife species, and to identify trade-offs between beneficial and adverse impacts on individual species...Wild animals respond to the entirety of habitat elements presented to them ("niche gestalt", sensu James 1971), not to each element separately. We treat Descriptors separately as a convenience. Because of the categorical nature of the analysis, we have no way to systematically combine effects of different Descriptors, but we do attempt to summarize the effects of each alternative in narrative form, following discussion of the Descriptors."

Issue - Alternatives Regarding Wildlife

COMMENT: Beta does give some consideration for wildlife and recreation, but does not mention how valuable wildlife is to the State and hundreds of communities in the State. (074)

RESPONSE: Discussion of the importance of wildlife is included in the Affected Environment chapter, but is not specific to alternative Beta. The EIS states that, "Wildlife on state lands also makes important contributions to the state's local and regional economy. Table III-W3 (Chapter III: Wildlife) lists 67 Montana wildlife species that warrant special attention because they are hunted or trapped. Recreation opportunities associated with hunting and trapping these game and furbearer species represent a substantial annual economic contributions [sic]. Hunters spent $163.3 million in the state during 1992, and supported 4,100 full-time jobs and $9.7 million in state tax revenues (Brooks 1994).

Montana's diverse and abundant wildlife populations also attract large numbers of resident and nonresident visitors to wildlife-related activities. The Montana Department of Fish, Wildlife and Parks estimates that $53.8 million were spent by people involved in viewing wildlife in Montana during 1992 (Brooks 1994). Viewing wildlife is projected to be the fastest growing wildlife-related activity in the United States, growing an average of 1.43% per year over the next 45 years (Walsh et al. 1989)" (Economic Contributions, Chapter III: Wildlife).

COMMENT: The DEIS never considered a bear management alternative with selection cuts, smaller cuts, and road closures/obliteration. (138) A rationale for development of a range of alternatives with respect to wildlife management is clearly lacking in the document. Implementation of a number of the proposed alternatives will result in the elimination of vulnerable wildlife species from State lands. Examples include a failure to maintain habitat for threatened and endangered species, and the almost complete elimination of old-growth habitat. Such proposed courses of action are in conflict with both state and federal direction and thus does not represent reasonable management direction. (138a)

RESPONSE: We agree with the first comment. A "bear management" alternative was not considered. All alternatives were designed to be programmatic in nature, i.e., comprehensive in their treatment of all the pertinent concerns. Thus, alternatives were not developed specifically with reference to wildlife management. However, the underlying philosophies of each alternative clearly differ with respect to wildlife. To summarize, Alpha's philosophy focuses on timber production, emphasizing mitigation for big game, and threatened and endangered species. Beta's philosophy focuses on diversity, putting less emphasis on standards for specific species, and more on maintenance of a broad range of habitats. Gamma's philosophy focuses on non-intrusive management, and thus likely benefits those species most requiring freedom from human disturbance. Delta's philosophy focuses on following market trends in revenue generation, thus wildlife species capable of generating revenue would likely receive most consideration, while those with less obvious economic value would have receive the least. Epsilon's philosophy focuses on timber production, thus wildlife concerns would be addressed to the degree they did not detract from silvicultural objectives. Zeta's philosophy focuses on recreation, of which many wildlife species are an integral part.

COMMENT: The proposed alternatives in the DEIS fail to require coordination with adjacent landowners for management of wildlife habitat. (138a)

RESPONSE: The commenter is correct in stating that no alternative "requires" such coordination. However, under Beta, it states that, "DNRC would make reasonable attempts to develop cooperative ecosystem management planning with major adjoining landowners. The objectives of cooperative planning would be to: (a) maintain appropriate amounts and distribution of stand structures and species mixtures to promote biodiversity at a landscape level; and (b) equitably maintain or promote trust revenue opportunities over the long term." Similar language exists in Gamma RMS. Similar language in Delta, Epsilon and Zeta is prefaced by the clause, "In situations where cumulative impacts to biodiversity limit DNRC's potential income-producing opportunities (timber harvests)..." (Appendix RMS: Biodiversity).

Issue - Threatened and Endangered Species - General Concerns

COMMENT: The environmental consequences section in the DEIS fails to evaluate the effects of roads and logging on grizzly bears, big game, bald eagles, other threatened and endangered species and sensitive species. (138)

RESPONSE: The environmental consequences section provides a qualitative estimate of the effects each alternative would have, by eight forest attributes (including road density), on each species. This includes grizzly bears. For example, changes in the abundance of large, down woody debris are expected to be beneficial for grizzly bears under Alternatives Beta, Gamma, and Zeta, adverse for grizzly bears under alternative Epsilon, and uncertain under alternatives Alpha and Delta (Table IV-W13, Chapter IV: Wildlife). Project changes in road density and road management are estimated to be beneficial for grizzly bears under alternatives Beta and Gamma, adverse under alternatives Alpha, Delta, and Epsilon, and uncertain under alternative Zeta (Table IV-W18, Chapter IV: Wildlife). The appendices provide such information for all eight descriptors.

Issue - Threatened and Endangered Species - Grizzly Bears

COMMENT: Statements to the effect that DNRC will avoid a "taking" of grizzly bear or, as appropriate, use standards and guidelines from various federal Forest Plans are wholly inadequate. (071)

RESPONSE: We understand that specifically articulated standards and guidelines in this Plan are desired by some members of the public, and would serve to provide clear accountability of our actions. However, in this programmatic and philosophical plan, treating as it does, lands distributed across the entire state, such specificity would be inappropriate. Instead, we have chosen to adopt a coherent management policy with the assistance of public input, while allowing for flexibility in the standards and guidelines to respond to new and best available information over time. Particularly with grizzly bears, this information changes more rapidly than could be accommodated in a statewide planning effort.

COMMENT: We urge DNRC to adopt the total and open road density standards required by USFWS (in its biological opinion on the USFS Lost Silver Timber Sale) as necessary to avoid an illegal "incidental take" of grizzly bears. (071) Where roads near the limit, some added, new "taking" of grizzlies is illegal under the ESA. (138)

RESPONSE: "Incidental take", as defined both in the USFWS Lost Silver biological opinion, and the USFWS opinion on the more-recent Flathead National Forest Amendment 19, refers to the USFWS requirement to consult with other Federal agencies on actions that may affect listed species (Section 7). It is not necessarily the standard that would apply to a "taking" of endangered species under Section 9, which is the section applicable to DNRC. The latter has yet to be clearly defined.

Additionally, please note the language in the USFWS Biological Opinion for the Flathead National Forest's Amendment 19, written as part of their obligations under Section 7 of the ESA: "Sections 4(d) and 9 of the Act, as amended, prohibit taking...of listed species...without a special exemption...Section 7 consultation includes responsibility for direct and indirect effects together with the effects of other activities that are interrelated or interdependent with that action. These effects are added to the existing environmental baseline to determine the impact on the species. Section 9 liability for taking has not been defined by the Service to include or exclude legal responsibility for this range of the effects of the action...In other words, the scope of the [incidental take] statement [issued under Section 7] is not intended to define legal responsibilities or takings under section 9". (Biological Opinion on Amendment 19 to the Flathead National Forest Plan, USFWS, January 6, 1995, p. 29).

COMMENT: As a member of the NCDE (Northern Continental Divide Ecosystem) Managers' Subcommittee of the IGBC (Inter-Agency Grizzly Bear Committee), DNRC voted to adopt the draft "Interim Motorized Access Management Direction NCDE Recovery Zone." The standards set forth in that draft mirror those adopted by the Flathead in Amendment 19. Why does DNRC now take the position that it may develop and implement standards other than those developed by federal agencies or working groups? (071)

RESPONSE: Alternatives appearing in the DEIS were essentially completed prior to March 7, 1995. The standards in the "Interim Motorized Access" report do "mirror" those adopted by the Flathead for federal lands; however they do not for non-federal lands. The exact wording of the Report for lands that will be managed under this DEIS is: "In subunits containing State trust lands...cooperatively develop a strategy by which access parameters will be managed" (Interim Motorized Access Management Direction Northern Continental Divide Recovery Zone, 3/8/95, p. 4). On October 6, 1995, DNRC released Interim Guidance for Grizzly Bear Mitigation and Analysis which states, "While sharing some characteristics with federal policy, this guidance is not identical to federal standards. The latter are intended to assist grizzly bear recovery, whereas our guidance is intended to prevent 'take' of grizzly bears resulting from management activities. While we have referenced the inter-agency Motorized Access report and the Recovery Plan, neither requires DNRC to adopt federal standards. For example, the Motorized Access report specifically places non-federal lands in a different category of obligation than federal lands. This is clear on Page 5, where it states that: 'This direction [interim recommendations] is to be implemented throughout the NCDE recovery zone on Federal lands" and in fact that it segregates obligations for 'state trust and/or corporate land' into a separate item number. Similarly, the Grizzly Bear Recovery Plan calls for guidelines 'similar' to those adopted on federal lands, not identical to them." (DNRC Interim Guidance, pages 1-2)

COMMENT: The draft Swan Valley Grizzly Bear Conservation Agreement (between DNRC, USFWS, USFS, Plum Creek Timber Company, L.P.) does not accomplish the goal of coordinating road management in areas of mixed ownership in a manner which avoids "incidental take" and instead sinks to management by the least common denominator. (071)

RESPONSE: The decision about issuing an incidental take statement for agreements such as the Swan Valley Conservation Agreement is the responsibility of the USFWS, not DNRC. We understand that the commenter does not agree with the rationale elucidated by the USFWS in their Opinion, and have taken note of this viewpoint.

COMMENT: The DEIS shows that road densities in the NWLO and SWLO will in most cases far exceed the 2 miles per square mile and 1 mile per square mile maximums recommended for total and open road density, respectively, by the South Fork Grizzly Bear study conducted by Mace and Manley. (071)

RESPONSE: According to our best ability to project road densities in the future, total road densities would exceed an average of 2 mi/mi^2 in both NWLO and SWLO under all alternatives. Open road densities would exceed an average of 1 mi/mi^2 in NWLO under most alternatives, although not in SWLO. The import of this comment is largely correct.

However, for clarity, it should be kept in mind that average road densities, as depicted in Table RD-1 (Executive Summary, Chapter II and Appendix SCN) do not measure the same thing as the road "densities" that appear, for example, as standards in the Flathead National Forest Plan Amendment 19. The former are true densities, obtained by dividing the total distance of roads within a specified analysis unit by the area of that unit. The latter are proportions of analysis units that exceed specified quantities, which themselves are road densities, as defined by a "moving windows" GIS procedure. The practical effect of the difference is that the former depicts an average condition, without regard to the variability and spatial pattern of roads. In contrast, the latter depicts the spatial arrangement of areas with and without roads, allowing for delineation of the landscape into "relatively roaded" and "relatively unroaded" regions. The latter analysis, because it requires digitized data, can currently be conducted only on the Swan and Stillwater State Forests, and a few other limited areas. The former values can be approximated on all forested lands, and that is the reason they were used.

COMMENT: We are at a loss to even find specifics in the DEIS to comment on regarding road management standards for grizzly bears. (071)

RESPONSE: We understand that specifically articulated standards and guidelines in this EIS are desired by some members of the public, and would serve to provide clear accountability of our actions. However, in this programmatic and philosophical plan, treating as it does, lands distributed across the entire state, such specificity would be inappropriate. Instead, we have chosen to adopt a coherent management policy with the assistance of public input, while allowing for flexibility in the standards and guidelines to respond to new and best available information over time (DNRC released Interim Guidance for Grizzly Bear Mitigation and Analysis in October 1995). Particularly with grizzly bears, this information changes more rapidly than could be accommodated in a statewide planning effort.

COMMENT: We would like to see provisions that reduce road densities...other roads should be reclaimed to protect water quality by eliminating mass wasting at road crossings and provide secure areas required by species like the grizzly bear. (140)

RESPONSE: Reclamation of roads is included as part of the Roads RMS; it is given greatest emphasis in Gamma, some in Beta, and less in the other alternatives.

COMMENT: The three largest forests - Stillwater, Swan River and Coal Creek - provide excellent grizzly bear habitat. I strong favor Beta's intention of complying with federal bear management guidelines. (103)

RESPONSE: The RMS for Beta states: "...implement Federal..standards and guidelines for grizzly bear management in each recovery area or develop our own standards for application on state lands. Our own standards would be developed through consultation with the U.S. Fish and Wildlife Service. They might differ from Federal management guidelines, but would be equivalent in their conservation effect" (Appendix RMS: Threatened and Endangered Species). We note further that we have substituted the word "conferring" for "consultation" in the above RMS, because "consultation" has a specific meaning in the context of the Endangered Species Act, and such "consultation" is not available to non-federal entities.

COMMENT: Most road closures in Northwestern Montana are based on the South Fork Grizzly Bear Study that indicates bears use roaded areas less than expected. The same study also states that linkage zones between the Mission and Swan ranges are not needed because grizzlies are traveling freely between the two ranges. The Swan Valley is one of the more heavily roaded areas yet the bears have no trouble crossing the valley. Come on folks, we can't have it both ways. (148)

RESPONSE: Our understanding of the main results of MDFWP's South Fork Grizzly Bear Study differs from that of the commenter. Although it is true that some crossing of the Swan Valley were documented through radio telemetry, the only animals that were known to cross the valley were males. Females, particularly those with young, tended to remain in relatively small home ranges, and these home ranges were preferentially situated in locations with fewer roads than the study area as a whole. This information, plus the lack of documented females with cubs within the Swan

Valley during the past few years of compilations by the U.S. Fish and Wildlife Service, suggests that female home ranges in the Mission and Swan ranges may be geographically isolated.

We note that we have made explicit reference in the Plan to DNRC's recent signing of a cooperative agreement in the Swan Valley, including Plum Creek Timber Co., the Flathead National Forest, and the U.S. Fish and Wildlife Service, that coordinates road management for grizzly bear security, while allowing for continued timber harvest activity.

Issue - Threatened and Endangered Species - Legal Concerns

COMMENT: When impacts caused by actions of the state government contribute to the demise of indigenous species, those impacts must be considered significant. The preferred alternatives Delta and Epsilon would not "routinely implement Federal and working group guidelines to promote recovery of threatened and endangered species" are in direct violation of Montana's Nongame and Endangered Species Conservation Act. (138)

RESPONSE: The issue of "significance" in the MEPA context is a complex one. In general, "significance" must be assessed by the decision maker. The Montana "Nongame and Endangered Species Conservation Act" (§ 87-5-101, MCA) provides a list of those species meriting its protection. It is not intended to apply to all species other than those classified as "Game". Unlike the U.S. Endangered Species Act, it does not explicitly include protection of habitat under its rubric. Thus, while it forms an important policy statement, it does not mandate any particular management alternative upon land management agencies. Alternatives Delta and Epsilon were among three that were preferred at the time the DEIS was published. The quote from RMS associated with those two alternatives is correct. However, there exists no wording or intent within the Montana Nongame and Endangered Species Conservation Act that requires state agencies to implement Federal and working group guidelines with respect to Endangered Species.

COMMENT: We find the direction under alternatives Delta and Epsilon to manage habitat to 'avoid violations of the Endangered Species Act' to be a far cry from the commitment necessary for the state to effectively recover such species. We suggest the state must adopt an alternative which supports and improves its ability to recover species. Beta and Gamma are the only alternatives that the DEIS suggests could promote recovery. (122)

RESPONSE: We tried to provide a reasonable range of alternatives for the management of state forested trust lands in this programmatic plan. Some of the alternatives, such as Beta and Gamma, emphasize the protection and/or recovery of species more than others.

Issue - Wildlife and Timber Management

COMMENT: Harvesting timber in wildlife-sensitive areas doesn't make sense, especially when the 1972 Montana Constitution mandates that state lands shall be managed for all of their uses. All wildlife in the state is managed by FWP, and all wildlife belongs to the people of the state. Some trust consideration should be given for these values because there is all kinds of wildlife on public state lands. (074)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: It can be expected that habitat fragmentation will continue with the proposed harvest, and as a result, that habitat for forest interior species will continue to decline. (138a)

RESPONSE: These patterns of harvest vary depending on alternative. The "expectations" of the commenter are probably reasonable for Epsilon, given its associated RMS, but are not necessarily correct under the philosophy embodied in either Beta or Gamma.

COMMENT: Using timber harvests to create diverse ecosystems (as outlined in Beta) for wildlife habitat and fisheries has been shown again and again to be impossible. Beta also assumes that DNRC knows more about habitat needs and natural processes than Mother Nature does, which is highly arrogant considering the mandate to provide for Montana's schools. (139)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: Large and small snags should be retained within safety guidelines as they are important to cavity nesters. Systematic, even-aged harvest spread over a reasonable rotation is best for wildlife, big game, non-game and birds. (100)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative. We note as well that we are bound by guidelines promulgated by OSHA on snag retention.

COMMENT: The impact of logging on large woody debris needs to be clarified in the DEIS. The implications that large woody debris will increase with the proposed actions needs to be corrected. (138a)

RESPONSE: For our analysis, we assumed that the abundance of large, woody debris would parallel that of snags. Because abundance of snags was projected to increase under some alternatives and to decrease under others, projections for abundance of woody debris showed a similar variety. It should be pointed out that nowhere is the claim made that on any particular harvest unit timber cutting increases the amount of large, down woody material (relative to its pre-harvest state). Rather, these projections are for the totality of forested Trust lands; thus, while large, down woody material generally decreases in harvested areas, it accumulates in other areas.

Thus, net increases or decreases are both possible in a managed forest. For those alternatives in which we project a net increase or decrease in the abundance of large, down woody material, see Large Woody Debris on the Forest Floor, Chapter IV: Wildlife.

COMMENT: The Beta alternative seems to best satisfy the identified selection criteria...We do not agree with the fundamental assumption in the analysis of Beta that "intensive" forest management promotes healthy ecosystems. Reduction in old-growth forests will not "promote biodiversity." You are likely to lose species with this management regime. Also increased levels of administrative activity necessary for active management is likely to adversely affect many of the sensitive species. (122, 139, 145)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Wildlife and Clearcutting

COMMENT: Clearcutting has had a significant effect on wildlife habitat fragmentation, yet not much is said about its impacts in the DEIS. (138)

RESPONSE: It is true that clearcutting is rarely singled out for extensive discussion, either in terms of past effects or projected future effects. As pointed out in Table III-V2 (Timber Harvest Methods, Chapter III: Forest Vegetation), clearcutting has been the type of timber harvest on approximately 9% of all harvested acres during Fiscal Years 1990-1994, and is projected to be applied to from 0 to 10% of harvested acres under the alternatives considered. However, considerable discussion on fragmentation, in particular the contribution to fragmentation produced by even-aged harvest methods (of which clearcutting is one), can be found in Patch Sizes and Shapes, Chapter IV: Forest Vegetation. Examples include: "Patch size and shape influence habitat suitability for many animal species. Small, closely-spaced patches of similar habitat favor dispersal for some species, while other species are associated with large contiguous patches. Some species benefit from a mosaic of different habitat conditions. Many species are associated either with edges or with interior conditions" (DEIS, page IV-68). "Even-aged harvests (clearcut, seed tree and shelterwood) have generally been done in dispersed patches, commonly 10 to 80 acres in size, on both state and federal lands...This has resulted in the reduction in width of the intervening matrix of closed-canopy forest in these moister environments" (DEIS, page IV-68).

"The homogenizing of patch sizes and increases in the amount of abrupt edge may have major effects on wildlife habitat. In effect, natural mosaics both of large uniform areas of even-aged forest and of naturally patchy and clumpy forest have been fragmented...More of the forest area is influenced by distinct edges than would be the case in a natural environment, which probably reduces habitat suitability for species associated with 'forest interior' conditions" (DEIS, page IV-69).

Issue - Wildlife Resource Management Standards

COMMENT: Beta de-emphasizes standards in wildlife habitats for individual species. How can you properly manage wildlife if their habitats are destroyed? (074)

RESPONSE: The philosophy underpinning Beta's RMS is that a maintenance of a diverse set of forested conditions, in amounts more closely emulating those pertaining prior to the arrival of Europeans, is the best way to provide habitat for all native species. This is often abbreviated as the "coarse-filter" approach (as contrasted with a "fine-filter" approach, which would attempt to consider habitat needs of each species individually). The DEIS states that, "When considering projects, we would manage wildlife habitats by promoting a diversity of stand structures and patterns. We would rely on this to provide good habitat for native wildlife populations. Big game habitat would be de-emphasized". Also, "Non-game species would be protected by promoting a diversity of forest conditions" (DEIS, page II-32).

It is not the intent of Beta that wildlife habitats be destroyed, merely that the coarse-filter be generally relied upon, with attention to specific species' needs a site-specific decision. "Big game habitat needs would be a secondary consideration in management decisions. However, measures to mitigate potential impacts would be implemented if they were consistent with overall management objectives, and with the Biodiversity Resource Management Standards" (Appendix RMS: Big Game). "DNRC would manage so as to support and where appropriate enhance populations of sensitive species on state land" (Appendix RMS: Sensitive Species). "DNRC would promote recovery of threatened and endangered species" (Appendix RMS: Threatened and Endangered Species). Also, "DNRC would promote biodiversity by favoring a variety of stand structures and patterns on state lands, thus maintaining representation of habitats for native plant and animal species" (Appendix RMS: Biodiversity).

COMMENT: The Resource Management Standards are different for each alternative. This is especially problematic for wildlife; standards should be based on scientific criteria not resource outputs. Alpha, Delta, Epsilon and Zeta don't protect sensitive species unless it meets other management goals. RMS for Threatened and Endangered Species under Delta and Epsilon conflicts with Governor Racicot's letter to Secretary of the Interior Babbitt suggesting that State-Federal conservation agreements designed to recover declining species. (138)

RESPONSE: The RMS usually vary by alternative, although not in all cases. The RMS were designed to treat resources in which we felt that, under law, we had some discretion as to how to develop a philosophical approach to their management. The varying RMS are an attempt to embody those differences in philosophy. We agree that standards based on scientific criteria would ensure that actions over which we have control would not jeopardize species' survival. The letter from Governor Racicot refers specifically to bull trout, and makes only vague reference to possible future agreements. It is true, however, that various alternatives would provide varying levels of concordance with the sentiments in the Governor's letter.

COMMENT: All wildlife RMS should be scientifically-based and include: open/total road density, thermal cover, old-growth definition/retention; Threatened and Endangered Species RMS should include a scientifically-based standard for the Peregrine Falcon and Water Howellia. (138, 162)

RESPONSE: We understand that specifically articulated standards and guidelines in this Plan are desired by some members of the public, and would serve to provide clear accountability of our actions. However, in this programmatic and philosophical plan, treating as it does, lands distributed across the entire state, such specificity would be inappropriate. Instead, we have chosen to adopt a coherent management policy with the assistance of public input, while allowing for flexibility in the standards and guidelines to respond to new and best available information over time. Threatened and Endangered Species RMS apply to all federally listed species. These two species are not named in the RMS (the others are) because the naming occurs in connection with participation in inter-agency working groups. There exist inter-agency working groups, for example, for grizzly bears, wolves, and bald eagles. There are currently no such groups working on Peregrine Falcons or Water Howellia.

COMMENT: Preservation of viable populations of wildlife on State lands will require the implementation of habitat standards to ensure suitable levels of snags, old-growth, burned and forest interior habitat remain over time. With the exception of old-growth, no such standards have been provided for any of the proposed alternatives. (138a, 139)

RESPONSE: We understand that specifically articulated standards and guidelines in this Plan are desired by some members of the public, and would serve to provide clear accountability of our actions. However, in this programmatic and philosophical plan, treating as it does, lands distributed across the entire state, such specificity would be inappropriate. Instead, we have chosen to adopt a coherent management policy with the assistance of public input, while allowing for flexibility in the standards and guidelines to respond to new and best available information over time.

While specific standards are not part of this programmatic plan, one of the three preferred alternatives, Beta, is explicit in calling for management that provides for a wide array of habitat elements. Thus, for example, it would be inappropriate management under Beta to eliminate or reduce dramatically the representation of such elements as snags, old-growth, burned areas, or interior forest habitat. As well, Beta requires maintenance of "site characteristics generally recognized as important" for sensitive species (Appendix RMS: Sensitive Species). Such site characteristics will often include habitat elements such as snags, old-growth, etc.

FISHERIES

Issue - Fisheries Protection

COMMENT: Epsilon fails to protect fisheries. (059)

RESPONSE: Epsilon meets laws and regulations regarding watersheds and fisheries, but we agree that it does provide the lowest level of protection of all of the proposed alternatives.

COMMENT: DNRC's management of native fish-bearing streams should emphasize no adverse impacts to native fish and should actively seek to reconnect populations to provide for metapopulation viability. No beneficial uses of any state water should be partially or fully impaired. (103)

RESPONSE: Fisheries RMS are designed to preclude or limit impacts to fisheries. Watershed RMS provide for protection of designated beneficial water uses, which include fisheries and mitigation of water quality impacts resulting from past activities. Implementing Fisheries and Watershed RMS may promote population connectivity. However, due to our scattered land base, it would be misleading to suggest that we could have a substantial effect on reconnecting populations, regardless of the final alternative selected.

COMMENT: We recommend the following criteria for fisheries (others listed under watershed section):

1) ***maintain healthy salmonid propagation and satisfy life-history demands of local populations;***
2) ***ensure that populations of state-listed Species of Special Concern (especially bull and cutthroat) are not adversely affected either locally or at the metapopulation; and***
3) ***provide watershed protection that helps recovery of dwindling species. (060)***

The Stillwater, Coal Creek, Swan and Sula state forests contain viable populations of westslope and bull trout and should be managed based on above criteria. We recommend coordinating with Bull Trout Restoration Program. (060, 068)

RESPONSE: 1) All alternatives meet minimum legal requirements, including water quality standards. Water quality must be suitable for propagation of salmonid fish and associated aquatic life. Gamma, Zeta & Beta provide the highest level of protection.

2) Bull trout will be managed within the recommendations of the Governor's Bull Trout Restoration Team under all alternatives. Cutthroat trout, as a sensitive species, would be managed to be supported or enhanced under Gamma & Beta. Under all other alternatives, sensitive species would be protected to the degree that measures can be reconciled with other management goals (Appendix RMS: Sensitive Species).

3) Watershed restoration projects are currently undertaken in conjunction with timber sales and other projects. Work may include removing stream crossing structures, replacing stream crossing structures to enhance fish passage and reduce erosion, closing roads, obliterating roads, adding road drainage, etc. All alternatives, except Alpha, will place an increased emphasis on inventory and analysis of watershed improvement needs to mitigate impacts caused by past activities.

Under all alternatives, interim measures recommended by the Governor's Bull Trout Restoration Team will be implemented as stated in the Fisheries RMS (Appendix RMS: Fisheries). According to the Department of Fish, Wildlife and Parks (Memo from Chris Clancy, MDFWP, 11/17/93), there is no bull trout currently on the Sula State Forest; however, the forest is listed as historic habitat. Westslope are present.

Issue - Fisheries and Roads

COMMENT: According to the USFS, generally, 80 to 90% of sediments from streams are due to road construction, yet the DEIS states that timber harvest and road building combined account for "60% of the direct, indirect, and cumulative impacts generally seen at the watershed level." The DEIS does not include any biological evaluation of the effects of roads on fisheries and fails to make the connection between road and sediment fines in critical spawning streams when assessing environmental consequences. (138)

RESPONSE: The 60% figure quoted relates to the relative amount of watershed effects by land use for timber management when considered in conjunction with other land uses, e.g., grazing and recreation. This is not saying that 60% of the sediment comes from roads associated with timber harvest. It is widely accepted that 80-90% of the sediment generated by timber harvest is derived from roads. The effects on fisheries were evaluated using sediment, nutrients, large organic debris, and water temperatures. Road density was a primary factor in determining effects on sediment and nutrients. Open roads were a primary factor for determining effects on large organic debris and water temperature. These factors all relate directly to the impacts to the aquatic ecosystem. Fisheries RMS will be implemented for all streams, including critical spawning streams. The Descriptor Relationship sections in Chapter IV: Fisheries describes the typical sediment threshold for spawning habitat requirements for salmonid fish. Upper limits for fine sediment levels are recognized as an important spawning requirement.

COMMENT: The DEIS never considered a broad range of road alternatives. Increasing road densities in all three preferred alternatives leads to increasing the threats to bull trout and westslope cutthroat trout. (138)

RESPONSE: The DEIS did consider a range of road management philosophies (See Summary of Alternatives Table, Executive Summary). The three preferred alternatives range from Beta, which emphasizes the evaluation and use of "alternative transportation systems that do not require roads whenever possible," as well as a standard to "plan road density to minimize open roads on state lands to Epsilon, which would "plan road density to meet timber harvesting schedules" (Appendix RMS: Road Management).

The Scenario appendix contains the estimated road densities as plausible output scenarios. These output scenarios were developed for the purpose of providing some tangible basis for our resource and economics effect assessments. They were not intended as accomplishment targets, but simply as estimates of probable ranges of activity, given the management philosophy developed under each alternative. Each alternative includes a standard for road closures to minimize impacts to watersheds and fisheries.

Issue - Fisheries Analysis in DEIS

COMMENT: Instead of taking a realistic hard look at the likely consequences of the proposed high-end logging scenarios, the DEIS states that management activities will increase the sediment and nutrient additions to streams and lakes (see DEIS, page IV-145). (141)

RESPONSE: The statement from DEIS page IV-145 discusses the rationale for the methodology used in the fisheries effects assessment. The results of the fisheries effects assessment can be found in Chapter IV: Fisheries and Appendix FSH. This effects assessment takes into account the varying levels of timber harvest outlined in Appendix SCN.

COMMENT: The fisheries analysis doesn't conform to local data, nor to the published literature, some of which is listed in the DEIS bibliography. (138)

RESPONSE: The fisheries analysis conforms to the basic tenets of fish biology. A good faith effort was made to consider pertinent literature in our impact assessment. For instance, there are many studies which assert that forest roads are sources of sediment which can adversely affect the reproductive success of salmonids. Our analysis takes this into account by increasing the impact rating for alternatives that are expected to result in relatively high road densities. The rating is simply a tool to compare alternatives. We are not attempting, in this analysis, to quantify the effects of roads, harvest, grazing, or any other activity, on fisheries. By necessity, this analysis is coarse and does not address site-specific (local) impacts. Site-specific analyses will be conducted as projects are proposed.

COMMENT: A worst case analysis is necessary for fisheries. (138)

RESPONSE: We analyzed the alternatives based on a range of management activities presented under each alternative. Given that the information is already provided in the EIS, we don't think it would be necessarily useful to label the greater impacts as "worst case."

COMMENT: The DEIS ignores the symbiotic relationships of State actions when combined with potential watershed and fisheries impacts from all other ownerships in the cumulative effects analysis. (141)

RESPONSE: As described in the Resource Management Standards, cumulative effects will be analyzed, watershed and fisheries protection measures will be implemented on all projects, as applicable. When DNRC is a minor owner in a watershed, implementing these standards on our lands will not ensure the basin-wide condition of the fishery. Activities or events on other ownerships may overshadow impacts or benefits provided on state land.

COMMENT: 1) The DEIS contains no alternative with protection of critical trout streams. 2) Critical trout streams were not identified or evaluated. (138)

RESPONSE: 1) All alternatives include implementation of Fisheries and Watershed RMS, as well as the recommendations of the Governor's Bull Trout Restoration Team (see Appendix RMS: Fisheries). All alternatives include implementation of the recommendations of the "Flathead Basin

Forest Practices and Fisheries Co-op Program Final Report" for protecting bull trout and westslope cutthroat habitat. In addition, under Gamma, Beta, and Zeta, land management activities outside of the Flathead Basin would be managed to sustain and enhance sensitive fish species (see Appendix RMS: Fisheries).

2) Fisheries standards apply to all streams, however the identification and evaluation of individual streams is beyond the scope of this programmatic plan. This level of evaluation will be done at the project level.

COMMENT: Landtypes with erosion problems (particularly Landtype 73) are not identified or mapped in the DEIS. Landtype 73 occurs in the Flathead watershed in many key bulltrout and westslope cutthroat streams. (138)

RESPONSE: The identification and mapping of individual landtypes is beyond the scope of this programmatic plan. This level of evaluation will be done at the project level. Watershed and road standards require implementation of BMPs. BMPs for forestry in Montana include numerous practices concerning avoiding high hazard and unstable geology in the Planning, Design, and Location Section and the Timber Harvest Section.

Issue - Fisheries Species of Special Concern

COMMENT: The analysis of coldwater fisheries in Eastern Montana should focus on Yellowstone cutthroat trout as a Species of Special Concern. (145)

RESPONSE: Yellowstone cutthroat trout were included in the assessment of statewide distribution of cutthroat trout. The habitat preferences of Yellowstone cutthroat trout are similar to westslope cutthroat trout, and therefore only westslope cutthroat was referenced for habitat consideration (see Fisheries Project file). As stated on page III-43 DEIS, "we chose bull trout and westslope cutthroat trout to represent the habitat needs of cold water species because these fish are very susceptible to human-induced environmental changes such as decreases in streamflow; increases in temperature, pollution or siltation; and competition with introduced exotic species." Also, in the Resource Management Standards for Beta, Zeta and Gamma we state that "land management activities in areas outside the Flathead Basin would be managed to sustain and enhance bull trout, westslope and Yellowstone cutthroat trout, and all other designated 'sensitive' species and Species of Special Concern, where applicable" (Appendix RMS: Fisheries).

COMMENT: A number of warmwater Species of Special Concern (other than the goldeye and largemouth bass) may have very limited distribution and require special consideration. (145)

RESPONSE: Species of Special Concern, including warm water fish species, will be managed as in accordance with the Fisheries Resource Management Standards (See Appendix RMS, Fisheries). The standards state, for all alternatives except Alpha, that "Fisheries designated as 'sensitive' or Species of Special Concern would be managed so as to comply with any additional, and possibly more restrictive, direction specified in the Sensitive Species Resource Management Standards." The Sensitive Species RMS for all alternatives require efforts to identify sensitive species which may be affected by proposed actions. Beta, Gamma and Zeta require support and enhancement of sensitive species and Species of Special Concern (Appendix RMS: Fisheries). The remaining alternatives protect sensitive species if measures can be reconciled with other management goals.

Issue - Threatened and Endangered Species - Cutthroat Trout and Bull Trout

COMMENT: The fisheries policy presented in Delta and Epsilon is unacceptable. Cutthroat and bull trout would only be protected in the Flathead, not statewide. DNRC would not cooperate to prevent illegal stocking, over-fishing or poaching. (020)

RESPONSE: Bull trout would be protected throughout its range. Resource Management Standard #6 for Fisheries under Delta and Epsilon states that DNRC "would implement the Immediate Actions described in the DNRC Forest Management Bureau Chief's memo of 12/5/94 to NWLO and SWLO area managers as interim measures to protect bull trout habitat, as recommended by the Governor's Bull Trout Restoration Team" (Appendix RMS: Fisheries)

Cutthroat trout would be protected through protection of water quality and SMZs under all alternatives. The observation that sensitive species may get less protection under Delta & Epsilon is correct.

Delta and Epsilon do not emphasize cooperation with other agencies to prevent illegal stocking, overfishing, or poaching - but do not preclude such cooperation.

COMMENT: We recommend clarifying and strengthening the language in Beta for the protection of watersheds and fisheries, especially given the state's commitment on Bull Trout. (056, 147)

RESPONSE: Beta provides a high level of protection for water quality and fisheries (see Appendix RMS: Fisheries and Watershed). Regarding the commenters' recommendation for clarification and strengthening of Beta's language, we find it difficult to respond without specific information on what aspects of the standards are of concern. The Fisheries Resource Management Standards for Beta provide additional protection and include specific reference to implementing the Governor's Bull Trout Restoration Team's recommendations. (See Appendix RMS: Fisheries).

COMMENT: Watershed standards in Alpha and Beta go against Flowers' (Chief, Forest Management Bureau, DNRC) directive to follow the Governor's Bull Trout Team recommendations by allowing for tree removal in SMZs in salvage situations. (138)

RESPONSE: We concur that this inconsistency needs to be reconciled. The intent is that the Fisheries RMS for each alternative referencing implementation of Governor's Bull Trout Restoration Team would be the overriding standard. We have revised Watershed RMS for Alpha #10, Beta, Gamma, Epsilon, Delta and Zeta #11 to include the following: "For streams containing bull trout, Fisheries RMS #4 (Alpha), #8 (Gamma), #6 (Delta & Epsilon), #8 (Beta and Zeta) will provide the standard for timber harvest in the SMZ" (Appendix RMS: Fisheries)

COMMENT: The SMZ standard must also consider the needs of westslope cutthroat trout which occur in drainages where there are no bull trout. (138)

RESPONSE: The needs of westslope cutthroat trout are addressed as follows: westslope cutthroat trout is a species of special concern and are managed under standards, and will "be managed so as to comply with any additional and possibly more restrictive, direction specified in the Sensitive Species RMS, for all alternatives except Alpha." Under the Sensitive Species standards for Beta and Gamma, sensitive species will be supported and enhanced. Under the remaining alternatives, protection would be implemented if reconciled with other management goals. Westslope cutthroat trout will be managed under the recommendations of the Flathead Basin Co-op project in the Flathead Basin under all alternatives. For Gamma, Beta and Zeta, standard #2 also states that "land management activities in areas outside of the Flathead Basin would be managed to sustain and enhance bull trout, westslope and Yellowstone cutthroat trout, and all other designated "sensitive" species and Species of Special Concern, where applicable" (Appendix RMS: Fisheries).

Issue - Fisheries and Clearcutting

COMMENT: There is not much said in the DEIS about impact of clearcutting on fisheries. (138)

RESPONSE: The percentage of timber harvest consisting of clearcut or seed tree was one of the primary factors considered in the watershed and fisheries effects assessment (see Methodology, Chapter. IV: Watershed and Appendix FSH)

Issue - Fisheries and Timber Management

COMMENT: Watershed and fishery values must be protected during timber harvesting. (036, 175)

RESPONSE: All alternatives meet legal requirements for protection of water quality and aquatic resources. Some alternatives, notably Gamma, Zeta & Beta, provide the most protection.

COMMENT: DNRC's attempt to maintain or increase the volume of timber sold apparently fails to seriously consider that the current conditions of the watersheds and fisheries alone clearly indicates that a significant reduction in logging and roading impacts is required if the downward spiral towards extinction is not inevitable. (141, 145)

RESPONSE: Current conditions for these resources is discussed in Chapter III: Watershed and Chapter III: Fisheries. As noted, past activities have resulted in impacts to water quality and fisheries. Under all alternatives, we propose to implement watershed and fisheries standards that will meet water quality standards, protect beneficial uses, and restore degraded watersheds.

COMMENT: Watershed systems that function within the natural variability of those systems is essential to defining a balance between the long-term needs of native fish and demands for recreational use of Montana's fisheries. Although we may not be able to quantify the basin-wide effects to our fishery resources, it is evident that previous timber harvest has created problems for fishery resources. (145)

RESPONSE: We concur. In Water Quality Impairment Status, Chapter III: Watershed, the discussion details the current statewide water quality status. Included are the number of streams (miles) and lakes (acres) that have been affected by land use, including silviculture. The fisheries effects assessment focuses on factors important to functional watershed systems, namely sediment and nutrient loading, large organic debris, and water temperature.

Issue - Fisheries Resource Management Standards

COMMENT: To reduce degradation, DNRC should use Gamma RMS for grazing for whatever alternative is selected when there are high value cold water fisheries. Grazing RMS for Beta and Zeta offer the minimum protection for fisheries; while Delta and Epsilon would result in increased degradation of fisheries. (109)

RESPONSE: All alternatives except Alpha include grazing standards for bank trampling and shrub utilization. Gamma standards are the most rigid. Delta and Epsilon would promote better riparian conditions than present and likely not escalate degradation over Alpha.

COMMENT: DNRC should use Gamma RMS for fisheries for whatever alternative is chosen. (109)

RESPONSE: The Gamma alternative requires substantially more monitoring, which will be very costly. Otherwise Gamma is very similar to Beta and Zeta, but substantially different from Delta and Epsilon.

COMMENT: The RMS for fisheries should include a standard for temperature. (138)

RESPONSE: A temperature standard is provided by several aspects of the Watershed and Fisheries RMS. Watershed RMS #1 for all alternatives requires that activities meet water quality standards (Appendix RMS: Watershed). Water quality standards include standards for stream temperature increases. For example, for A-closed classification, no increase in water temperature is allowed (ARM 16.20.616(3)(c)). For A-1 classification, a 0-2°F increase is allowable, depending on starting temperature (ARM 16.20.617(3)(c)). For B-1 classification, an increase of 0-2°F increase is allowable, with qualifications (ARM 16.20.618(2)(c)).

Retention trees, submerchantable trees and brush which are maintained will provide shade and temperatures within standard (see Streamside and Riparian Management Standards, Appendix RMS: Watershed).

COMMENT: The RMS are inconsistent regarding sensitive species. The RMS in Delta, Epsilon, Beta and Zeta say that additional, possibly more restrictive, management could be used, but then only Beta actually lists more restrictive standards. (138)

RESPONSE: Under the sensitive species standards for Alpha, Delta, Epsilon, and Zeta, a site specific evaluation will be used to determine the appropriate protection level that is also consistent with management goals. It may be more restrictive than the standards found in the Fisheries RMS for these alternatives. Our proposed management philosophy varies by alternatives, therefore, it is appropriate for standards to vary also, as long as all are within legal constraints.

Cultural and Aesthetic Environment

HISTORICAL AND ARCHAEOLOGICAL SITES

We did not receive any public comments on Historical and/or Archaeological Sites.

VISUAL CONCERNS

Issue - Aesthetics and Visual Quality

COMMENT: Aesthetics as a value is not considered in Delta or Epsilon. (068) Clearcutting causes an ugly scar which will decrease the tourism appeal of Whitefish Lake. (129) DNRC should not dismiss the visual issue; it is important with timber and mining activities. (131)

RESPONSE: During our initial scoping, most people who raised concerns about aesthetics did so in the context of recreation quality; therefore, we assumed that monetary benefits of aesthetic management would be reflected mainly in demand for recreation use. In the responses to economics comments later in this section, we point out some strong legal constraints that require DNRC to manage trust lands so as to generate full market value in dollars, for the benefit of specific school trust beneficiaries. It would not be legal for DNRC to manage strictly to enhance scenic beauty unless it could be shown that doing so resulted in earning full market value, directly payable in money, for trust beneficiaries.

However, if we are able to earn full market value (over the long-run), while at the same time maintaining or enhancing visual quality, we would do so under any alternative. This is consistent with our current policy which has resulted in such efforts to maintain visual quality as DNRC's voluntary cooperation with other landowners in maintaining visual management standards along the Swan Valley Highway.

We would expect variations between alternatives, with the most favorable visual quality effects likely to occur under Beta. This is mainly because vegetation management practices under these alternatives would tend more toward replication of the kind of landscape diversity that we believe has historically occurred. Examples of expected vegetation patterns may be found in the discussions of old-growth, snag abundance, and patch size (Chapter IV: Forest Vegetation) Chapter IV: Visual Concerns also directs the reader to several other areas where visual quality would be affected by vegetation management.

Financial and Administrative Environment

ADMINISTRATIVE ORGANIZATION

Issue - State Personnel Needs

COMMENT: We recommend that DNRC pool existing state personnel rather than trying to add more FTE. (061)

RESPONSE: The discussion in the EIS of impacts to DNRC's Administrative Organization does not represent a request or proposal for additional FTE. The estimates of personnel needs to fully implement the alternatives described in the EIS were developed to assist with economic analysis of the alternatives. Additional FTE for the department can only occur after a proposal is submitted, justified, and authorized by the Legislature (Methodology, Chapter IV: Administrative Organization). At this time there is no such proposal or intention to develop additional FTE requests. While sharing of expertise among the different departments within state government is encouraged and efficient on a case-by-case basis, it is not appropriate for personnel to be held responsible for work assignments they are not funded to do. FTE within DNRC, funded for Trust Land Management activities are directed towards securing both short and long term income to trust beneficiaries.

Issue - Agency Funding and Timber Harvesting

COMMENT: Timber harvest should not exceed what the agency is financed to administer and monitor. (126)

RESPONSE: We concur. The EIS recognizes the connection between staff size, funding and implementation of programmatic goals in Methodology, Chapter IV: Administrative Organization. Programmatic goals can be established but may be achieved only if fully funded. If funding is less than what is necessary, DNRC can only work towards fulfilling the goals and may only partially achieve those goals.

Issue - Logger Education Program

COMMENT: We suggest a Logger Education Program to get logger cooperation; this type of program has been used in Idaho. (126)

RESPONSE: The Department, through the Service Forestry Bureau, currently participates in a Logger Education Program for Best Management Practices in conjunction with the Montana Logging Association. Continuation, expansion or development of a program similar to Idaho's could be conducted under any of the proposed alternatives.

ECONOMICS

Issue - Trust Mandate

COMMENT: Certain constituents and users of school trust lands have seized on the trust mandate (and current political circumstances) to advocate for the economic maximization of state trust lands. However, the Montana Constitution calls for attaining fair market value for the lands, not the maximization of revenue. The two concepts are distinguishable. (036, 068, 083, 138, 139)

Like any endowment, the principal of the trust must not be diminished. While it may be true that Gamma and Zeta don't maximize short-term monetary return, it is also true that Delta and Epsilon would squander the principal of the endowment and fail to maintain the long-term health of the forest resource (103)

RESPONSE: Montana case law has established that some short-term revenue can be foregone in the interest of preserving and enhancing the value of the trust corpus. However, the Department also cannot violate other state or federal laws in its attempt to earn trust revenue.

In fact, none of the alternatives would maximize short-term revenue. For example, the concept of sustainable annual cut is based on the idea that short term harvest will not exceed the amount of volume that the residual forest could continue to replace, year after year. It's a bit like spending the interest each year without dipping into the principal that generated the annual interest. The methodology discussion in Chapter IV: Forest Vegetation identifies some of the assumptions underlying calculation of sustainable annual harvest.

Table IV-V1 shows the effects of longer rotation periods and exclusion of deferred areas on sustainable annual harvest (Chapter IV: Forest Vegetation). By managing more intensively so that the entire forest were cut once every 80 years, instead of the 120 years upon which our economic calculations are based, we could harvest an additional 10 MMBF each year. If the Department were to harvest aggressively on deferred lands, without regard for the adverse effects of operating on steep slopes or in wet areas, a further annual volume increase of up to 35 MMBF might be realized.
At 55 MMBF per year, the highest harvest level under any alternative falls far short of this "revenue maximizing" scenario. In fact, we could probably expect further constraints on short term harvest caused by the need to allow periods of inactivity between harvest entries, or to limit total harvest in an area until younger stands have grown enough to reduce watershed impacts. We believe these are examples of how we would sacrifice short term revenue opportunities in the interest of complying with our legal responsibilities for environmental protection and providing for the long term quality and productivity of our forest land asset.

COMMENT: Delta and Epsilon call for significantly increased logging to the detriment of other uses in order to maximize income. These alternatives elevate the state's trust duty to maximize revenue for schools so high that it ignores long term economic realities and competing values such as aesthetics and recreation. (068, 103)

RESPONSE: Unlike the U.S. Forest Service and other agencies charged with maximizing "net public benefit," we have a narrower and more specific mission. We must maximize <u>monetary</u> benefit, and we must collect it on behalf of specifically named beneficiaries. This means that when considering aesthetics or recreation as competing values, we must think in terms of collectible revenue which can then be compared with collectible revenue from grazing, timber harvest and other potential uses of the same land.

We have discussed the difficult process of projecting and valuing future recreation use under each alternative (see Recreation, Chapter IV: Economics and Appendix ECN). This part of our analysis is necessarily less precise than our analysis of timber harvest. In the case of recreation, the majority of use is dispersed over a wide area, there are many different types of use and each has a different and weakly defined market value, and even if market values were well established, collecting the right dollar amount for each type of use presents an extraordinarily difficult challenge.

In light of the many, highly speculative variables involved in recreation analysis, our most prudent course of action seemed to be to make assumptions about which we could be reasonably sure. This allows the decision maker to observe the results, and to observe how results of the analysis would be affected if our assumptions were wrong.

For example, holding all other values the same, and doubling or tripling the net present value of recreation revenue would not change the rank order of alternatives, as determined by total net present value. We believe the economic reality is that recreation revenue can add to total net present value under any of the alternatives. However, using what we consider reasonable assumptions about recreation prices and our ability to collect user fees, recreation is not likely, in the foreseeable future, to out-compete timber harvest as a revenue source.

COMMENT: If the Stillwater State Forest is managed with the primary goal of protecting the watershed at the same time as providing timber, I believe the trust mandate of managing trust lands for the benefit of the schools will be met. High water quality equates to high property values in the Whitefish Lake area, which in turn translates into tax support for schools. If water quality declines, so will property values and school revenues. (153)

RESPONSE: We certainly agree that management of the Stillwater Forest, as well as all other forested trust lands, should strive to both protect water quality, and all other resource values, while also generating monetary return for school trust beneficiaries. The Summary of Environmental Consequences table (Executive Summary) gives Beta the third most favorable rating on watershed protection, and the fourth most favorable rating on net present value. Clearly, our decision maker must weigh the tradeoff of higher monetary return against the risk of lower water quality and when doing so, he must abide by the legal precedents regarding the trust mandate. However, for reasons discussed elsewhere in these responses, we do not think it is appropriate to invest government funds in analysis of the indirect property tax effects of state forest land management, when evaluating this tradeoff, because we believe those effects are highly speculative and intractable.

Issue - Trust Beneficiaries

COMMENT: As a further means of complying with the spirit of HB 263, we encourage DNRC to add a section to the FEIS which details the specific trust beneficiaries along with the acreages assigned to them. An analysis of the various alternatives should estimate the relative long-term revenue streams to each beneficiary's permanent or distributable trust account. (037)

RESPONSE: A list of Trust beneficiaries and their respective acreages may be found on page 12 of the Montana Department of State Lands Annual Report for fiscal year ending June 30, 1995. For the reader's convenience, trust grantees and corresponding acreages are listed here. These figures do not tell us the share of acreage that is Classified Forest and therefore, under jurisdiction of the proposed Plan. Geographic details of grant lands distribution are available through the DNRC Trust Land Management Division.

Trust Beneficiaries and Associated Acreages

Trust Grant	Acreages
Common School	4,621,158
University of Montana	18,556
Montana State University - Morrill Grant	63,780
Montana State University - Second Grant	31,058
Montana College of Mineral Science and Technology	59,507
State Normal School	63,455
School for Deaf and Blind	36,614
State Reform School	68,837
Public Buildings	186,350
TOTAL	5,149,315

Even at the project level of analysis, identification of individual beneficiary income streams can be difficult. In some cases, adjoining lands affected by the same project are held in trust for different beneficiaries. DNRC may not know until after the timber sale, grazing, or other management activity has taken place, exactly how much revenue was generated on which beneficiary's lands.

Even if it were feasible, we believe that estimation of long-term income stream to each beneficiary is outside the scope of this programmatic level analysis. Doing such an estimate would require identifying very exact locations (by legal land description) of all future revenue-generating activities over the next 25 years. It is neither feasible nor appropriate to do this at the programmatic level of analysis when no site-specific proposals are being made. When site-specific proposals are made, they will be subject to MEPA assessment at which time project analysts could attempt to estimate returns to specific beneficiaries if the agency believed that issue was relevant to the decision being made.

Issue - Fiduciary Responsibility

COMMENT: I suggest that you tell your audiences about the financial contributions that the timber sales program current make to public schools. (017)

RESPONSE: Please refer to Table III-E1, Forested Lands Share of DSL (now DNRC) Contributions to School Trust Funds (Chapter III: Economics) and the narrative for this table for this information.

COMMENT: The percentage of revenue contributed by trust lands is totally irrelevant to the fiduciary accountability to beneficiaries. Regardless of proportionate funding sources, the State's obligation as a fiduciary is in no way diminished. (037)

RESPONSE: It is not our intention to diminish the State's fiduciary accountability by drawing attention to the percentage of total school funding that derives from management of forested trust lands. We absolutely agree that our legal mandate remains the same regardless of how large or how small our contributed share of total school funding may be.

We disagree that this statistic is irrelevant. We believe that our decision maker (and members of the public) should understand the larger social context in which his decision is being made. The whole point of presenting alternative management plans is that there are widely differing opinions as to how our legal mandate should be interpreted. In some cases, it is relatively easy to determine the "legality" of a proposed strategy even though that determination may be unpopular among some constituents. However in other cases, our decision maker may consider each of several management strategies to meet our legal obligation, but in different ways. In those cases, we believe the relative share of total school funding that derives from forested trust lands may be a relevant factor in making a choice.

Issue - Economic Analysis in the DEIS

COMMENT: The DEIS is deficient in its analysis of revenue streams, focusing too much on traditional resource extraction benefits. Each alternative should incorporate an analysis that includes the following potential costs (counted against direct revenue) of timber management:

(a) the increased cost of restoration, replacement and mitigation of damaged resources;
(b) the increased cost of recovering species that dwindle on state lands;
(c) the loss of value to nontimber amenities and their effects on local economies and property tax values;
(d) the potential costs of reduced school-bond revenue because of property value reductions caused by timber management on nearby state lands; and
(e) the potential for reduced school bond revenue resulting from taxpayer backlash for having to pay for increased management and timber-related restoration costs on state lands. (060, 068, 141)

RESPONSE: Some people, including members of the public and natural resource professionals, would disagree that these relationships exist or that their direction of causality is correct. Some would argue that responsible timber management can be used to help species recovery with little or no unrestored resource damage. Some might argue that property values and local economies benefit from good stewardship associated with timber management, improved access, and a stronger economic base for maintaining high property values.

We neither advocate for, nor refute these views, but we are not sufficiently confident of the existence, causality, or magnitude of these alleged effects to incorporate them into our analysis beyond the degree to which they have already been estimated by our professional staff.

We have incorporated the effects of timber harvest in Chapter IV of the EIS. For example, we discuss the extent of soil disturbance typically associated with different slopes and different timber harvest methods (Chapter IV: Forest Soils); watershed sediment and nutrient loading effects of timber harvest level and extent of clearcut or seedtree harvest (Chapter IV: Watershed); and the effects on wildlife habitat caused by such timber harvest related factors as forest successional stage, stocking levels, snag abundance, woody debris on forest floor, and road densities (Chapter IV: Wildlife).

We also explain the assumptions we have made regarding staffing needs to assure that the conditions assumed by our resource analysts are met (Chapter IV: Administrative Organization). The results of these assumptions are presented in Table IV-AD1, Predicted Forestry Personnel Changes by Alternative, and translated into total program costs as summarized and explained in Figure IV-E13 in the DEIS/Table IV-E14 in the FEIS (Chapter IV: Economics).

COMMENT: One of the central flaws of the DEIS is its reliance on short-term, measurable economic indicators. Traditional economic measurements cannot account for unpredictable future economic benefits of maintaining biological diversity. Species once considered undesirable and therefore systematically eliminated may turn out to be economically and socially valuable over the next few thousand years. A far superior economic principal that cannot be immediately quantified is the concept of maintaining the overall integrity and diversity of the trust and utilizing the principal of the trust to produce long-term income for schools. (103)

RESPONSE: We agree that the future economic benefits of maintaining biological diversity are unpredictable by traditional analytic means. We are also unaware of any non-traditional techniques to account for "unpredictable future economic benefits." The best we know how to do is make carefully documented assumptions about possible future trends and possible cause-effect relationships. In the EIS, we have limited those assumptions to areas where we feel reasonably confident, avoided quantitative predictions in areas we do not feel confident, and tried to explain the limited role of economic predictions in the decision making process.

For example, we feel reasonably confident of the range of timber harvest and grazing use we could expect under each alternative, but not of the exact use levels. Consequently, we have calculated present values for both the high and low ends of the probable range as credible estimates, but by no means precise predictions. We are much less confident of future recreation use levels or prices. We do not even have precise estimates of current recreation use levels on state lands. Consequently, we have explained in considerable detail how we arrived at the recreation figures so the reader and decision maker can see, and challenge, our assumptions (Appendix ECN). We consider our economic analysis to be supportable and the results to be plausible and useful information to aid in the selection of a final alternative.

COMMENT: This management Plan should be developed within a timeframe that is not just hundreds or thousands of years but is forever. Imagine, if you will, the future scarcity in this world of prime grizzly bear spring range, such as found in the Stillwater State Forest. From this perspective, project your economic analysis into infinity and run a supply and demand model to determine the relative scarcity and thus the relative value. (103)

RESPONSE: We do not consider estimation of supply and demand curves for grizzly bear and bull trout habitat to be supportable for even the 25 year horizon of the EIS, not to speak of the infinite future. This is not to say that grizzly bear and bull trout habitat should not be considered for, of course, they should be. It is just to say that, in our opinion, they can not be part of a credible economic analysis of the kind necessary to defend the Department's well established obligation to generate monetary return to the school trust. We refer to the Montana Attorney General's opinion that states "that uses such as highways, parks, or natural areas might generally benefit the public is immaterial because they simply go beyond the narrow condition of the grant in the Enabling Act" (Opinion No. 92. Opinions of the Attorney General. Volume No. 36. July 7, 1976).

In fact, we fully expect that our decision maker *will* consider such things as future scarcity of wildlife habitat and other elements of biological diversity in their decision; however we think it would be a disservice to create the impression that we have sufficient information to include those elements in a quantitative economic analysis.

Regarding extension of the time horizon to infinity, or even 100 years, it is well understood among financial analysts that costs or benefits that accrue more than about 30 to 50 years into the future carry rapidly declining additional value when discounted to the present. The following table illustrates the point by displaying the present value of $1 million discounted from various times in the future.

Years	0	20	30	50	70	100	200	500
$ P.V.	1 mill.	456,387	308,319	140,713	64,219	19,800	392	.003

COMMENT: The Plan does not evaluate discontinuing timber harvests in NELO, SLO and ELO. The 1992 Performance Audit Report from the Office of the Legislative Auditor on the Management of Forest Trust Land indicates that these offices do not generate enough revenue to cover the cost of continuing timber sales in these land offices. (138)

RESPONSE: In general, the 1992 Performance Audit reported acceptable and appropriate performance by the Forest Management Bureau; however, it correctly noted net timber management losses in some areas of the three eastern land offices. (The Northeastern, Eastern, and Southern Land Offices (the Eastside) manage about 13% of the total forested land base, and employ slightly over 4% of the total forestry management staff.) These losses were partly due to a very low level of timber management activity in the Northeastern Land Office. In 1994, the Northeastern program was reactivated, in part by transferring one full-time timber manager into this office from another area of the state. By 1995, the Northeastern Land Office was showing positive return from its timber management program and the Eastside as a whole showed very respectable positive returns. We expect this situation to continue or improve as passage of HB 201 allowed the Department to add two additional foresters to the Eastside, one in Lewistown and one in Billings.

Based on recent past and expected future performance, discontinuing the Eastside timber program would lead to a reduction of 3.5% or more in the net present value of total timber revenues reported in Figures IV-E14 through E-16 in the DEIS/Tables IV-E16 through E-18 in the FEIS (Chapter IV: Economics). This conclusion is based on the following figures:

EASTSIDE	*FY94*			*FY95*		
	Revenue	Cost	Net	Revenue	Cost	Net
East Total	158,351	165,494	-7143	411,706	156,484	255,222
% of State	2.23%	6.26%	-0.16%	7.56%	5.94%	9.09%
Avg Net						**3.42%**

In the future, if the Eastside timber program, or the timber program in any other land office should show persistent losses, the Department would evaluate that program and either discontinue it or take corrective action.

COMMENT: The DEIS has practically admitted that its economic analysis provides not really useful information for a decision maker to use to discriminate between alternatives. One of the reasons for this might be that the present and future value of timber assets does not have a corresponding present and future value of ecologically related assets that can be as strongly relied on. Until the DEIS can be more conclusive, we feel that an economically conservative alternative like Gamma would be most appropriate to manage the school trust responsibly. (139)

RESPONSE: We do not agree that the economic analysis in the EIS provides no "really useful information." We have stated that there are limitations to the quantitative economic analysis; however this does not mean the analysis is not useful. To the contrary, we believe that clear statement of limitations makes the analysis even more useful to the decision maker in better understanding exactly how much weight to give the economic analysis when balancing its conclusions with the many other factors that contribute to a good decision.

With regard to the absence of precise quantitative analysis of "ecologically related assets," we would like to stress that quantitative results, economic or otherwise, are only part of the data used in making an informed decision. The decision maker must also consider social, political, and technical factors that go beyond the bounds of environmental analysis.

COMMENT: The watershed and fisheries section of the DEIS apparently does not attempt to delineate any economic contributions to the state's economy, as was done with hunting and trapping in the wildlife section. (141)

RESPONSE: The Department has a legal obligation to generate direct monetary return to designated school trust beneficiaries and not to any other entity, no matter how worthy that entity may be. As such, we believe it would be an inappropriate expenditure of state funds to engage in an analysis of all possible economic benefits that might accrue to Montana because of management of forested state trust lands.

COMMENT: We do not agree with the interpretation of the data presented in the analyses that led to the selection of Beta, Delta and Epsilon as the preferred alternatives. Delta and Epsilon are projected to produce the greatest revenue over the planning period. However, we feel that a long-term view requires that the economic portion of your decision criteria focuses not on net present value (NPV) project over a 25 year period, but on the sum of the NPV and remaining asset value. This analysis would tend to favor Zeta over all other alternatives, would place Epsilon on the bottom, and would place Delta near the middle of most economic scenarios. (145)

RESPONSE: It is true that our net present value computations rank Zeta highest, and Epsilon lowest, when both periodic income stream and residual asset value are combined. However, residual asset value is very high under all alternatives, with a difference of only 2.6% between alternatives Zeta and Epsilon. By contrast, when we rank by net present value of income stream only, the difference between the highest and lowest ranked alternatives (Epsilon, Gamma) is 93.5%. (Both percentage computations are based on the difference between highest and lowest values, divided by the highest value.) We see that there are very large economic differences between alternative income streams, but very small differences between alternative residual timber asset values.

We believe it would be difficult to defend the economic choice of a low income stream alternative (such as Zeta at $34.987 million), over a much higher income stream (such as Epsilon, Delta, or Alpha with NPV income streams between two and three times higher than Zeta). This is not to say we couldn't choose the lower income alternative; however, such a choice would have to result from a determination that the alternative with lower direct economic value offered superior forest health and environmental protection benefits that outweighed the shortfall in direct economic value. In other words, DNRC must demonstrate that the chosen alternative in some way offers full market value, payable in money, directly to the designated trust beneficiaries.

While residual timber asset value is higher for alternatives with lower harvest levels, none of the alternatives would harvest beyond a level that could be sustained indefinitely. That is, it cannot be argued that alternatives with lower residual timber asset values will not be able to sustain their higher periodic income streams. Therefore, the only way the lower income stream alternatives could be economically superior would be if residual timber value could be converted to additional monetary return within the same time frame that the income stream is being evaluated.

In Interpretation and Summary, Chapter IV: Economics, we explain why we think that market conditions and potential environmental harm would make it infeasible to convert a large residual timber asset to its theoretic monetary equivalent in anything less than seventeen to fifty years.

Issue - Interest Income

COMMENT: It wouldn't hurt to elaborate on the value of interest income under Economics. You have adequately described the current and potential value of forested land and timber, etc., but have understated the contribution of interest income kept for reinvestment. (031)

RESPONSE: We agree that the contribution of interest earned on the Trust and Legacy account is very significant. In fact, in recent years it has been the largest single component of the total annual forested lands contribution to the School Equalization Fund. Further, principle of the Trust and Legacy account grows each year through reinvestment of 5% of the previous year's interest. The remaining 95% of interest is paid to the Equalization Fund.

The reason this point is only minimally stated in the EIS is because our main emphasis is on providing a very rough estimate of the share of the total school funding that is derived from forested state lands. In the EIS, we have used the simplistic but necessary assumption that future education revenues from all other sources, beside forested state lands, would remain constant for the next 25 years in order to make comparably rough estimates of the school funding share under all alternatives (Chapter IV: Economics).

We also explain the difficulty in separating the share of Trust and Legacy interest earned from forested land activities, from interest earned on all state lands activities combined (see Chapter IV: Economics). Even if we were able to isolate the forested lands share of interest, that sum would be in direct proportion to annual earnings contributed to the Trust and Legacy account, a figure that we have calculated for each alternative. Calculation of interest would not add any information that could change the relative ranking of alternatives.

We believe that, given our intention to use the Equalization Fund contribution figures only to give perspective and not as a key decision criteria, we could not justify the complex and uncertain analysis needed to separate the forested lands contribution to aggregate Trust and Legacy interest from the shares contributed by all other uses of state lands.

Issue - Asset Values

COMMENT: DNRC's assumption that not harvesting timber today under sustained yield principles will lead to higher asset values tomorrow is based on speculation and does not adequately consider the time value of money. (037)

RESPONSE: All assumptions about the future are somewhat speculative. Good analysis is a matter of making prudent assumptions about what the future might be like, observing the consequences, and making a decision based on our degree of confidence in those assumptions.

In the case of timber, historical evidence shows that over the long term, real (inflation adjusted) stumpage values have increased. Our understanding of price theory suggests that these real stumpage values should continue to increase as the supply becomes more scarce relative to the demands of a growing population. Recognizing that there is uncertainty as to how much stumpage rates will increase, we have calculated the net present value of all alternatives using two different stumpage rate assumptions, each made by a different credible authority (Table IV-E9, Chapter IV: Economics).

In the case of land values, evidence discovered in the Department's recent study regarding the wisdom of selling cabinsites to leaseholders suggests that land values in Montana continue to rise steadily and at rates that strongly favor not selling the land.

We believe that the EIS' assumptions as to growth in stumpage prices, and the Department's assumption regarding rising land values, do prudently and appropriately address speculative future values.

The time value of money is a related but different concept. Once we have settled on an estimate of the future yield of our resource management program, we must assess our willingness to wait for that yield to be realized. The so-called "time value of money" is a measure of our willingness to wait, or the degree to which we "discount" future values because they are not available for use right now. Based on the discussion in the Net Present Value Computations & Support for Choice of 4% Discount Rate, Appendix ECN, we believe that we have adequately considered the time value of money by discounting all future costs and revenues at an annual rate of 4%.

COMMENT: If harvesting timber or developing facilities on trust lands is politically unpopular today, it is only logical to assume those activities will be even less politically appealing in the future. At some point, the appreciated asset value must be "realized" through timber harvest, intensive development, or outright sale. (037)

RESPONSE: We agree that the Department has an obligation to "realize" a return on its forest asset by converting earning potential into monetary benefit for trust beneficiaries. Presumably, as our asset value appreciates, the expected annual return from management will also increase. An important question, and one we have tried to address by offering a range of management alternatives, is the proper balance between short term and long term monetary return. How much potential should be "realized" now, and how much should be maintained for "realization" at some time in the uncertain future?

The presumption that timber harvest on trust lands will continue to become more politically unpopular in the future is debatable. Recent past experience suggests this could be true. However, industry efforts to more effectively accommodate public concerns could offset the recent trend; a clearly stated and well implemented Forest Land Management Plan could diminish opposition to timber management; or an adverse public reaction to rapid population growth could cause a backlash against growing recreation and amenity uses and in favor of intermittent timber harvests spaced by long periods of inactivity. Our obligation is to select the best long-range management plan, as we see things now, and to adapt that plan according to the guidelines we have developed in the EIS (see Appendix MNG), as necessary to meet changing future conditions.

Issue - Discount Rate

COMMENT: DNRC must explain more clearly whether or not the four percent discount rate, which is possibly adequate for timber sales, is adequate for recreation benefits. The DEIS indicates that recreation could be much more valuable if fair market value were insisted upon. (139)

RESPONSE: Please refer to Supplement to Economic Appendix, Appendix ECN for a discussion on how we arrived at a discount rate of four percent. We undertook a thorough study of different ways a government agency might arrive at an appropriate discount rate, and a provided well documented explanation as to why we chose four percent.

Using different discount rates for different components of the same economic analysis, such as discounting recreation and timber values at different rates, is equivalent to using different scales of measure. It would be equivalent to using a thirty-six inch yardstick to measure one component and a forty-two inch yardstick for measuring another. While each measurement might be useful by itself, it would be unfair and relatively meaningless to make a direct comparison between the two, or to sum the two results. Based on the material cited above, we are very confident that a four-percent discount rate is appropriate for the entire analysis.

Issue - Amenity Values

COMMENT: The DEIS pictures the school trust lands as warehouses for timber and other resource industries. It ignores the amenity values associated with neighboring properties and the contributions these properties make to the local tax base. (008, 060, 068, 109)

RESPONSE: If we could show a clear, substantial, and technically supportable connection between the level and kind of management activity on forested state lands and consequent changes in public school funding due to changes in property value of adjoining private lands, then we would do so. The many complexities and uncertainties surrounding this issue cause us to conclude that the depth and breadth of analysis necessary to definitively answer this question are neither feasible nor a wise expenditure of taxpayer funds.

Here are some examples of assumptions and questions we would have to resolve:

- We would either have to assume that all other factors affecting property tax receipts would remain static, or greatly expand our analysis to accommodate them.
- The same actions can often be argued to have either positive or negative effects. For example:
  - Timber harvest causes park-like settings which result in higher adjoining land values and consequent property tax payments to public schools, <u>or</u>
  - Timber harvest causes lands to be less attractive thereby lowering adjoining property values and consequent property tax payments to public schools, <u>but</u>
  - Timber harvest may also cause higher average wages resulting in higher disposable income which increases the likelihood of tax increases and bond issues being supported with consequent positive effect on public school revenues.

  Which of the above effects is correct?

- To what extent do DNRC forested lands activities affect property values on adjoining lands?
- What is the direction (positive or negative) and magnitude of those effects?
- To what extent are changes in property values converted into actual changes in public school funding?
- What specific private lands would be affected?
- When will the activities happen, and what will they be? (The last two items go well beyond the scope of programmatic level analysis).

While we believe it is neither feasible nor appropriate to conduct this analysis, we have tested the assumption that amenity value tax effects are a serious omission in the DEIS by conducting a very rough analysis for one representative county.

<u>Amenity Effects on Property Tax Receipts</u>
This is a <u>very rough</u> estimation of changes in property tax receipts that might be caused through the <u>amenity effects</u> of managing State lands so as to increase market value of adjoining private lands. We have chosen Flathead County for the analysis because we believe it offers an ownership pattern that, if anything, favors the argument that amenity-tax effects are a significant omission from the EIS.

Flathead County contains 38,915 acres of taxable private lands in the 1 to 160 acre size class. Taxation of holdings larger than 160 acres is based on the value of their productivity rather than on their market value and we assume that activities on DNRC lands would not substantially affect productivity of adjoining lands. Some of these 38,915 acres are close enough to State lands to have their value affected by DNRC management, while others are sufficiently removed that their would be no effects. For this rough analysis, we assume that one-half, or 19,458 acres of private land, would be affected. Assuming that each affected acre would experience a $100 increase in market value because of the assurance that no timber harvesting would take place on adjoining DNRC lands, and applying the average Flathead County rate of 400 mils per $1000 of taxable value, we arrive at a $30,043 total annual increase in property tax revenue.

19,458 ac X $100/ac X .0386 (% taxable value) X 400/1000 = $30,043

The equivalent present value of this amount accrued over the 25 year planning period and using the same 4% discount rate used in the EIS calculations, would be $469,334.

We assume that the maximum favorable effect on adjoining property values would occur if there were no timber harvest on the "interface" DNRC lands, but that grazing and recreation use could continue as specified in the EIS. That is, the only adverse effect on the school trust would be the loss of timber harvest revenue from "interface" lands (i.e., these DNRC lands on which timber harvest would affect property values on nearby private lands.)

There are 129,984 acres of State land in Flathead County. Subtracting State lands surrounded by National Forest or by private holdings larger than 160 acres, leaves 58,684 acres whereon activities could affect taxable value of adjoining private holdings. We further assume that discontinuation of timber harvest on only half of these <u>eligible</u> acres would be sufficient to create a positive property tax effect on the 19,458 acres of private land that would be effected. That is, in Flathead County 29,342 acres would be removed from timber production. This represents a 4.5% reduction in total acres available for timber harvest (29,342/655,709=.0447) and therefore, a 4.5% reduction in expected timber harvest revenues. That is, under each alternative, the Department would experience a 4.5% reduction in timber harvest revenue in order to support a gain of $469,334 in Flathead County property tax revenue. The net effect of this action would be as follows.

Net Effect of Reducing Timber Harvest to Support Increased Property Tax Values

	ALPHA	BETA	GAMMA	DELTA	EPSILON	ZETA
PV Timber Revenue	142,766,000	126,812,000	47,040,000	158,721,000	190,630,000	78,949,000
4.5% Reduction	6,424,470	5,706,540	2,116,800	7,142,445	8,578,350	3,552,705
Tax Benefit	469,334	469,334	469,334	469,334	469,334	469,334
Net Change in Revenue	-5,955,136	-5,237,206	-1,647,466	-6,673,111	-8,109,016	-3,083,371
Net Change ($1000)	-$5,955	-$5,237	-$1,647	-$6,673	-$8,109	-$3,083

Even if the tax effect were undisputedly positive (a premise with which we disagree), it appears that property value increases would have to range from 3.5 to 17 times greater than our assumed $100 per acre in order to offset losses in timber harvest revenue.

These rough figures tend to support our conclusion that an analysis of sufficient depth and breadth to yield the precise effect on public school funding of changes in property values due to management of adjoining State lands would not be a useful or appropriate expenditure of taxpayer dollars.

In addition to the analysis, there is some legal precedent to consider. Preservation of the associated amenity values of trust land does not present any economic value to the trust beneficiaries except where the public is willing to pay the trust for preserving those values. In Ervien v. U.S., 251 U.S. 41 (1919), the Commissioner of State Lands of New Mexico also advocated that school trust assets could be utilized for the general public to ultimately increase the value of school trust assets. He diverted 3% of school trust revenue to advertise the benefits of living in New Mexico in an attempt to increase the State's population. He reasoned that an increase in population would increase the value of real estate and the State's school trust lands would become more valuable. The Supreme Court struck down this scheme as a breach of the State's fiduciary duty to its beneficiaries. Similarly, the State could not constitutionally refuse to make economic use of trust lands (whether it be by charging for recreational use; harvesting of timber products; mining; or grazing) in an attempt to drive up the value of adjacent private lands which pay property taxes to support public education. See also, Lassen v. Arizona, 385 U.S. 458 (1967)

Issue - Joint Management Approach

COMMENT: The DEIS should include an alternative with a joint management approach - environmental services that support off-site economic viability (e.g., taxable property and income) with on-site revenue from sales of marketable goods and services. (109, 138, 138b, 140, 141)

The DEIS arbitrary limits how trust lands can provide "support of common schools." The DEIS designed the alternatives that it analyzed solely in terms of the direct flow of income from commercial activity on the trust lands to the trust accounts. Other types of management that supported schools financially in different ways was completely ignored. (138b)

RESPONSE: It is well established that federal courts do have authority in these matters as the Enabling Act is a federal law. According to the U.S. Supreme Court decision in Lassen v. Arizona 87 S. Ct. 584 (1967):

> S467: The Act thus specifically forbids the use of 'money or thing of value directly or indirectly derived' from trust lands for any purposes other than those for which that parcel of land was granted. It requires the creation of separate trust accounts for each of the designated beneficiaries, prohibits the transfer of funds among the accounts, and directs with great precision their administration. 'Words more clearly designed to create definite and specific trusts and to make them in all respects separate and independent of each other

could hardly have been chosen'. [United States v. Ervien, 10 Cir. 246 F. 277, 279]. All these restrictions in combination indicate Congress' concern both that the grants provide the most substantial support possible to the beneficiaries and that only those beneficiaries profit from the trust.

S468: Nothing in these restrictions is explicitly addressed to acquisitions by the State for its other public activities; the Enabling Act is, as we have noted, entirely silent on those questions. We must nevertheless conclude that the purposes of Congress require that the Act's designated beneficiaries 'derive the full benefit of the grant.

S469: We hold therefore that Arizona must actually compensate the trust in money for the full appraised value of any material sites or rights of way which it obtains over trust lands.

We take this Supreme Court language to mean that the Department has a firm legal obligation to earn full market value from state lands, and to pay that value in money directly to the specific trust beneficiary attached to the lands in question, and not to any other entity no matter how worthy that entity may be. That is, we believe that it is clear that the direct flow of income to the school trusts is the only way in which these lands are allowed to support public schools in the state.

COMMENT: Where "external" effects can have a positive impact on the support of schools, it would be irrational and a violation of trust obligations to ignore those impacts. The DEIS is seriously incomplete in lacking an alternative that seeks to manage these lands in a way that maximizes overall support for schools, both directly and indirectly through enhanced economic vitality. (138b)

RESPONSE: In view of the preceding arguments, we believe it is clear that it would be an irresponsible expenditure of taxpayer dollars for the Department to engage in extensive analysis of external, indirect effects on public schools that might arise through enhanced economic vitality. We do not dispute that such indirect beneficial effects are possible; however, we strongly disagree that the causality and direction of such effects are clearly established, and we disagree that analysis of such effects is within the proper scope of the proposed action.

COMMENT: To the extent that those setting taxes in support of schools ask 'What total revenues do the schools have to have to provide an adequate education to students?', increases in trust fund revenues will primarily displace tax funds with little increase in the revenues to the schools. This means that primary impact of the additional trust land revenues is to reduce the level of taxes imposed on individuals and businesses in the state, not to increase support for schools. If incremental dollars flowing from state school trust lands cannot be made to increase the dollars flowing to schools, the reality is that management of state schools lands primarily affects the overall economic vitality of the state, not directly the level of support for schools. (138b)

RESPONSE: Our purpose in presenting the share of total school funding derived from management of forested state lands was to give perspective for our decision maker when he selects a management plan. We are not implying anything about the dynamics or politics of overall public school funding. We do not accept as conclusive the commenter's line of reasoning on this point and we believe previous responses to comments have clearly presented our position with regard to analyzing effects on the overall economic vitality of the state.

COMMENT: DNRC should consider the following in the discussion of short term versus long term management:

1) ***The "corpus" of the trust may be diminished through inadequate management. Once mortality exceeds growth, the value of timberland can actually decline precipitously.***
2) ***Development potential on forested tracts may likely increase when heavily stocked stands are thinned to appear more "park like." Consider the open environs of the Double Arrow Lodge at Seeley Lake versus the dense understory of adjacent federal/state lands.***
3) ***The risk of fire is seldom taken into account in arguing for lower harvest levels on the basis of future values. If a timber sale is deferred on the basis of speculative appreciation only to burn up later, the trust has lost, not gained, tremendous revenue. (037)***

RESPONSE: We agree that these points are worthy of consideration and will be considered in the selection of a final alternative. However, they do not appear to justify revision of the quantitative portion of our analysis.

It is true that the value of our timber asset (but not necessarily the value of the underlying timberland) could decline if mortality exceeded growth and there were no other offsetting factors at play. However, it is also true that many people believe unmanaged wildlands will be immensely more valuable to our society as population continues to grow and the quality and availability of wildlands remains static or declines. In some ecological groups (see Ecological Group Descriptions, Chapter III: Forest Vegetation), land values could be increased by thinning to create park-like timber stands. However, in other ecological groups, park-like thinning could lead to excessive blow-down and site conversion to non-timber, brush species. Large fires could diminish asset value. Rising land prices could make it increase.

The future holds many uncertainties and we have tried hard to make it clear to the public and to our decision maker where and how uncertainties could be reasonably accommodated in our quantitative analysis, and where they could not. We believe our analysis has accommodated uncertainties to the degree necessary for making a good, informed programmatic level decision.

COMMENT: Our state lands can only provide a small, limited amount of funds to our schools. School needs grow as the population grows, but the ability of our state lands to provide funds will not grow with the population. Support for schools must come mainly from sources that will grow with the population, and the stewards of our state lands must resist pressure to squeeze more out of state lands as our population grows. (109)

RESPONSE: This observation is consistent with our discussion in Environmental Consequences, Part I: School Funding in Chapter IV: Economics. At present, roughly 2.7% of annual public school funding is derived from school trust lands. If the commenter is correct, this percentage will grow smaller as Montana's population continues to grow. However, the state does have a firmly established fiduciary obligation to return full market value from management of its lands, regardless of the relative share of total school funding. It becomes a matter of balancing monetary return with long term health of the forest and effects on the natural environment. Our attempt to strike this balance is reflected in the alternative selection criteria stated in Chapter I of the EIS.

COMMENT: By cutting timber in unsustainable, non even-flow and non-ecosystem approaches, as advocated in Delta and Epsilon, the state could be foregoing significant economic and environmental values for the future. (060)

RESPONSE: We discuss the determination of estimated sustainable annual timber harvest in The Effects Assessment, Chapter IV: Forest Vegetation and display sustainable harvest in four regions of the State in Table IV-V1. Our timber harvest scenarios were developed under the assumption that the Department would comply with all environmental protection laws. Alternative Beta would come closest to implementing true ecosystem management. Results of our economic analysis (Tables IV-E23, E24, Chapter IV: Economics) indicate that Beta would rank among the least economically valuable alternatives in terms of net present value, with or without inclusion of residual timber asset value. On the basis of net present value alone, alternatives Delta and Epsilon would offer the highest return and Delta remains second highest even when residual timber value is included in the calculation. It is not clear to us that selection of a non-ecosystem approach would mean foregoing significant economic or environmental values.

COMMENT: Alpha, Delta and Epsilon emphasized short term maximum commodity production but produced considerable risk of harming long term productivity of our state lands and narrowed our future options for producing economic values from these lands. (109)

RESPONSE: It is true that alternatives Alpha, Delta, and Epsilon would take a somewhat more intensive, traditional business management approach; whereas, Beta and Gamma would be less business oriented and Zeta would focus on the business of managing wildlife and recreation. We feel that having this variation in management philosophies, all of which represent some constituency's interpretation of our trust mandate, is consistent with our MEPA obligation to consider a reasonable range of alternatives.

Issue - Land Exchanges

COMMENT: In many cases, land exchanges would facilitate better access and more management opportunities on trust lands. We encourage you to give serious consideration to exchanging appropriate tracts of trust lands. (037)

RESPONSE: To clarify the discussion that appears in the EIS, land exchanges would continue to be an important management tool under any of the alternatives. The alternatives differ in the funding and staffing priority that land exchange proposals would receive, and in the primary objectives that would motivate exchanges. These differences are specified in the Summary of Alternatives Table under the heading Administrative Coordination (Executive Summary).

We do not expect dramatic increases in state government spending in the foreseeable future. Consequently, it will continue to be necessary to set priorities when deciding how to allocate the funding and human resources available to the Department. Continuation of our current management philosophy (Alpha) would place relatively low priority on land exchanges. While we don't foresee land exchange having top budgeting priority under any alternative, each of the other alternatives would favor exchanges that supported their corresponding philosophical emphases.

For example, Beta would emphasize flexibility to manage for a variety of revenue opportunities; Gamma would stress the restoration or maintenance of natural conditions; Delta would focus on revenue generating opportunities; Epsilon would manage for the consolidation of timber lands; and Zeta would highlight opportunities for recreational and wildlife leases.

Issue - Sale of State Lands

COMMENT: The range of alternatives in the Statewide Plan does not include an analysis of divestiture of the forested trust lands. It is within the purview of the State to liquidate these lands and invest the proceeds into appropriate permanent trust accounts. Given your minimum management alternatives (Gamma and Zeta), it is only reasonable to present a sale alternative as well. It could be easily argued that selling trust lands is more Constitutionally defensible than the Gamma or Zeta alternatives. (037) Include land sales in the philosophy of Delta. (006)

RESPONSE: In the EIS, we discussed several issues that would not be addressed by this planning effort because they were outside DNRC's decision making authority (Chapter I). If the issue of outright sale of all classified forest lands had been raised at the outset of our planning process, it too would have been placed in this category. The reason is that the sale of classified forest lands is not legal. It is true that lands can be reclassified by the department, and then sold; however, this is normally done only on an isolated, case-by-case basis, when the primary use changes.

We believe that wholesale reclassification of all classified forest lands would violate the spirit of the law, and would be inconsistent with recent past positions of the Legislature, the Land Board, and the Department. Consequently, we believe a proposal to manage lands in this manner would be outside our sphere of decision-making authority.

A recent study of Department sales of cabinsite leases indicated that land values, statewide, are increasing at an inflation-adjusted rate of over 8% per year. Based on this finding, we have concluded that a broad program of state land sales is not in the best fiduciary interest of the trust beneficiaries. (DNRC, Cabin/Home Site Sale Financial Analysis, Analysis and Protocol Approved by State Land Board, 10/94).

COMMENT: A sale alternative would facilitate a much more accurate analysis of return on investment (ROI) for other alternatives by establishing an asset value. (037) A trustee who doesn't know the underlying value of the asset he/she is managing is not meeting fiduciary responsibilities. It would be grossly negligent to select an alternative under the Statewide Plan without considering the ROI of various alternatives. (021, 037)

RESPONSE: Forestry investments are typically evaluated with some measure of discounted cash flow (e.g., internal rate of return, net present value, land expectation value, etc.). A discounted cash flow is considered the appropriate measure of financial performance for forestry investments, because of the extended period of time between forestry investments and subsequent returns. This type of analysis considers the time value of money (i.e., a dollar today is worth more than a dollar 20 years from today). Of the commonly used measures of discounted cash flow, we consider net present value (NPV) of the accumulated income streams over the next twenty-five years to be the most suitable basis for comparing one alternative with another, at the same discount rate.

As the commenters suggests, we also thought it was appropriate to describe the asset value. We chose to describe the value of the asset at the end of the planning period, because the Department's fiduciary responsibility requires consideration of short term and long term financial performance. This would allow the decision-maker to consider not only the short term returns (i.e., cash flow resulting from our forest management), but also assess the affect of our management on the residual timber asset value at the end of the planning period.

PROPOSED CATEGORICAL EXCLUSIONS

Issue - Categorical Exclusion of Certain Management Activities from MEPA Review

COMMENT: ***DNRC's exclusion of certain activities from the EA and EIS process is suspect, because even though projects can be viewed individually as not being significant, over time and collectively, they can cause adverse impacts. This comment was noted for: 1) Plans and Policies; 2) Leases and Licenses; 3) Road Maintenance and Repair; 4) Bridges and Culverts; 5) Crossing Class 3 Streams; 6) Timber Harvest; 7) Timber Stand Improvement; and 8) Herbicides and Pesticides. (083, 138, 139)***

RESPONSE: 1. Plans and Policies: We believe that Plans and Policies should be categorically excluded. Chapter V: Categorical Exclusions, defines activities included under this categorical exclusion as plans that would not pre-determine future actions. Planning does not have environmental impacts, impacts occur when the projects are implemented. Individual projects, unless specifically categorically excluded, would require the preparation of an EA or EIS.

2. Leases and Licenses: We believe lease and license administrative activities should be categorically excluded. The EIS describes lease renewal, assignment or issuance included under this categorical exclusion as those that would be issued under the same terms as the existing lease. No change in situation would occur.

New leases are issued for the same use when either the current lessee abandons such use, fails to comply with the terms of the lease or does not meet the rental rates when competitively bid by another party. In any case, the authorized use remains the same, only the lessee changes.

Lease renewals occur when the terms of the current lease expires. The renewal period allows the Department to review the lease and determine if its in the Trust's best interest to continue the lease arrangement. Renewals are issued under the same terms and to the same lessee as the existing lease.

Lease Assignments, transfer the existing lease terms from one lessee to another. No authorization for change in use is included it is simply an administrative change in lessee.

3. Road Maintenance and Repair: We believe road maintenance and repair should be a categorical exclusion. The EIS describes activities authorized under this categorical exclusion. Maintenance and repair would be conducted on roads that are open to vehicle use and in use. Maintenance is conducted as a mitigation to reduce impacts from road use such as water quality. Periodic maintenance is included as a mitigation during the analysis conducted prior to construction and is generally a condition under which new roads may be constructed. Periodic and timely maintenance is a standard adopted by the Department under Best Management Practices. There is no need to conduct additional analysis. The EIS describes extraordinary circumstances under which maintenance may need to be evaluated such as presence of critical habitat for threatened and endangered species.

4. Bridges & Culverts: We believe bridge and culvert replacement activities should be a categorical exclusion. The EIS describes activities authorized under this categorical exclusion. The existing structures are open for use. Repair and replacement would be conducted under the authorization of applicable permits and state and federal regulations that require review by regulating agencies. There is no need for DNRC to duplicate that review.

5. Crossing Class 3 Streams: We believe crossing of Class 3 Streams should be a categorical exclusion. The EIS defines Class 3 Stream segments as those defined by Administrative Rule 26.6.601 (SMZ Class 3 definition). The SMZ rules authorizes the construction of crossings by Federal, State, and private entities in Class 3 streams without review or an alternative practice. This practice is already authorized without analysis, by rule. Including it as a categorical exclusion clarifies the process and is consistent with existing rules.

6. Timber Harvest: We concur and have deleted category 13 - Timber Harvest described on page V-8 of the DEIS as a categorical exclusion. While timber permits harvesting less then 100 MBF or salvage that removes less than 200 MBF under those conditions would have very little potential to produce significant impacts, we believe that some level of analysis would need to be conducted to determine that site specific conditions for a given permit conformed to the proposed exclusion.

7. Timber Stand Improvement: We concur and have deleted category 15 - Timber Stand Improvement described on page V-9 of the DEIS as a categorical exclusion. The range of Timber Stand Improvement activities that could be conducted under the category is considered too broad to be excluded from review. Extensive acreages treated under this proposed exclusion could lead to adverse impacts if not evaluated prior to implementation.

8. Herbicides and Pesticides: Herbicide and pesticide applications would be limited to spot applications by licensed applicators in accordance with State laws (Agriculture, Water Quality etc.) and rules and regulations of governing weed district. This categorical exclusion is intended to improve the rapid response control of noxious weeds in spot infestations on areas well away from surface water. Project administrators would still be required to complete EA level analysis for weed control on areas of any environmental concern. Small experimental plot studies and physical or cultural noxious weed treatments would also be excluded. Therefore, we see no need to re-evaluate this categorical exclusion.

COMMENT: The categorical exclusion for Prescribed Fire (DEIS, page V-11) should be re-examined. We agree that fire is beneficial to the ecosystem, however, timing of burns is important especially to many plant species. Without an analysis of timing of burn on plants benefits of fire cannot always be guaranteed. DNRC should also re-examine its policy of fire suppression, it may be more prudent and cost-effective to allow fires to burn in some areas. (138)

RESPONSE: We concur and have deleted category 21 - Prescribed Fire described on page V-11 of the DEIS as a categorical exclusion. While prescribed fire, conducted under the conditions described on page V-11 would have very little potential for significant impacts, we believe some level of analysis would need to be conducted to determine that site specific conditions for a given prescribed fire conformed to the proposed exclusion. We appreciate your opinion on fire suppression and will consider your input in the selection of a final alternative.

Topics Discussed in DEIS Appendixes

LEGAL FRAMEWORK

Issue - Trust Responsibilities

COMMENT: By narrowly interpreting the Enabling Act and its interrelationship to other state statutes, and the Montana Constitution, DNRC has arbitrarily constructed perceived legal obstacles that prevent the DEIS from conducting a fair MEPA process. DNRC has an obligation, as trustee of school trust lands, to maintain the corpus of the trust. Corpus includes the trees, soils, water, wildlife and air. Meeting trust responsibilities does not override the duty to preserve healthy naturally functioning ecosystems which comprises the corpus. (138) The Board should adopt a management philosophy that provides current revenue production and preserves the corpus of the trust (wildlife and fisheries) for future generations. (032, 058, 068, 103, 110, 126, 130, 172)

RESPONSE: Our legal staff defines the corpus of the trust from the description under Art. X, Section 3 of the 1972 Montana Constitution, which states that the corpus is composed of:

- proceeds from lands granted by the United States;
- lands granted in-lieu of those lands;
- lands granted to the States by private persons or corporations;
- all grants of land or money by the United States for general educational purposes;
- estates which escheat to the State;
- unclaimed dividends and shares of corporations; and
- other grants and gifts for general educational purposes.

The Enabling Act of 1889 is a federal law which admitted the states of Montana, South Dakota, North Dakota, and Washington into the Union. Over the past century, federal and state courts have repeatedly and consistently interpreted provisions of the Enabling Act to mean that the states are legally bound to generate monetary return from trust lands, explicitly for the benefit of the named trust beneficiaries.

The law is very clear that it is the specifically named trust beneficiaries; not "the public", the "citizens of Montana", or any other broader category of beneficiaries; that must be served. In some cases, the courts have even ruled against other agencies of the same state government who wished to be exempted from paying monetary return to trust beneficiaries on grounds that the law should be interpreted in favor of the welfare of the state, in general.

So far, there is no precedent that allows the Montana Multiple Use Act, or any other state or federal law to relieve the Department of its primary obligation to generate monetary return specifically for the trust beneficiaries. The Department's management of school trust lands is subject to the Legislature's general regulatory enactments designed to protect the public health, safety and welfare. However, the control and disposition of school trust assets is constitutionally under the sole direction of the State Land Board of Commissioners under Article X, Section 4 of the 1972 Montana Constitution. The State must abide by laws that may constrain the way it generates revenue, such as water quality laws and some provisions of the Endangered Species Act, but it is legally barred from engaging in activities for the general public benefit (no matter how worthy those activities may be), unless it can be shown that those activities also generate "full market value" from management of the affected lands. We take this quote from a 1976 opinion of the Montana Attorney General:

> Given the foregoing authorities, the requirement of compensation for school trust lands used for any purpose other than "the support of common schools" is unavoidable absent the express consent of Congress. That uses such as highways, parks, or natural areas might generally benefit the public is immaterial because they simply go beyond the narrow condition of the grant in the Enabling Act.[3]

The question left open for some interpretation is the balance between maximizing revenue in the short-run, and sacrificing some short-term revenue in favor of long-run revenue maximization, in generating "full market value". Montana law has allowed that it is permissible to sacrifice some short-term revenue in order to protect and enhance the value of trust assets; however, we do not have a clear precedent for deciding exactly what the short-term vs. long-term balance should be. This is one of the areas in which our decision maker must use their best judgment.

We agree that the Department should adopt a management philosophy that provides current revenue production and preserves the corpus of the trust for future generations. We also believe that no matter what our own personal preferences may be regarding the larger public good, we are legally bound by a rather narrow intent of the law that trust lands be managed to generate full market value, in monetary terms, explicitly for deposit to the accounts of named trust beneficiaries. Through continuing dialogue with members of the public and our own professional staff, we will provide our decision maker with information to help him do the best possible job of deciding which alternative will best meet that objective.

COMMENT: The Final EIS should acknowledge the role of state trust lands in satisfying another traditional state trust, which is to protect its wildlife and waters. This public trust doctrine requires that the state maintain the diversity and stability of the resident biotic community. This broader interpretation of the trust mandate was reaffirmed most recently in Judge Hatfield's decision on the Soup Creek Timber Sale. (103)

RESPONSE: All alternatives provide for and require DNRC to comply with all applicable laws, including, but not limited to those affecting water quality. In this programmatic plan, Beta and Gamma espouse a management philosophy that states that ensuring the full diversity of flora and fauna constitutes a prudent way to manage state forested trust lands over the long-term. To our knowledge, Judge Hatfield has not ruled on a case called the Soup Creek Timber Sale. In DNRC's Mid-Soup Timber Sale, Judge McKittrick placed a temporary injunction on the sale and we agreed, by consent decree, to prepare a site-specific EIS. This case did not have any impact on the trust mandate.

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[3] Opinion No. 92. Opinions of the Attorney General. Volume No. 36. July 7, 1976.

Issue - Mitigating for other Landowners

COMMENT: It is not the responsibility of DNRC to mitigate for other ownerships. In most instances, this would be outside the legal mandates of DNRC and not in the best interests of the trust. DNRC should mitigate for their share of resources on trust lands especially for impacts caused by direct actions of DNRC. (148)

RESPONSE: Under Delta, Epsilon and Zeta we stated that "We would evaluate cumulative effects and pursue cooperative agreements to share the responsibility of mitigation among landowners. If cooperators would not agree to limit their activities, DNRC would: (1) Mitigate for the activities of others for resources that have legal protection such as threatened and endangered species or water quality; and (2) In other cases, we would conduct our proportional share of the mitigation based on land ownership in the project area" (Summary of Alternatives Table, Executive Summary). The key to this discussion is the issue of cumulative effects. We would not allow our activities, when evaluated in conjunction with the past activities of other owners in the area, to cause us to violate any state or federal laws. We are hopeful that other landowners would be willing to cooperate in any necessary mitigation.

GRAZING

Issue - Grazing Analysis in DEIS

COMMENT: The DEIS does not address the cumulative impacts of the alternatives which includes the effects of past timber cutting and grazing on the forests lands in each land office. The DEIS apparently presumes that these lands are in pristine condition and have never had any impacts (138)

RESPONSE: Past cutting and grazing are reflected in the description of existing condition of Montana's watersheds. Past cutting was an important factor in determining the timber harvest scenarios. The timber harvest scenarios were then used in the effects assessment. The watershed impacts of past grazing are discussed in Water Quality Impairment Status, Chapter III: Watershed. The current grazing program was used as a basis for analyzing the impacts of Alpha.

The anticipated levels of grazing, along with Grazing RMS, were used to analyze the proposed grazing effects. Grazing levels were a factor in the watershed and fisheries effects assessments. This analysis incorporated the collective impacts of grazing in conjunction with current watershed conditions. In addition, we give further consideration to cumulative impacts in our project level environmental assessments. The cumulative effects analysis includes the effect of cattle on riparian areas and stream channels.

COMMENT: The DEIS does not contain any maps of grazing allotments or associated impacts to upland and riparian areas. (138)

RESPONSE: The identification and mapping of individual grazing allotments is beyond the scope of this programmatic plan.

Issue - Grazing & Range Management

COMMENT: DNRC should adopt measures that control grazing, particularly those that protect riparian areas. (041, 065, 083, 109, 144)

RESPONSE: Protection of range resources and mitigation of damage from past activities are now, and would continue to be management priorities on classified forest Trust Lands. Grazing RMS for all alternatives except Alpha provide for specific standards related to riparian grazing impacts. These include standards for bank trampling and browse utilization, as well as provisions for mitigation measures.

COMMENT: I don't feel grazing should be allowed on our forested lands. Wildlife is more important than cows. (114)

RESPONSE: We believe some level of livestock grazing is compatible with the resources and uses in each of the alternatives. We recognize that resource use must be monitored. Where resource problems exist, we will implement management practices to improve range condition. (see Appendix RMS: Grazing on Classified Forest Lands).

COMMENT: More proactive grazing management is needed. You have a trust responsibility to see that any activity on State land is implemented according to permit requirements and sound environmental standards. Close monitoring of grazing methods on trust lands should be initiated and emphasized as much as timber values. Better monitoring of riparian areas should also be implemented to protect all watersheds. All permits and leases must be given adequate monitoring, including field compliance reviews. (020, 036, 062, 065, 074, 128, 140, 144, 145)

RESPONSE: We feel that grazing and healthy streamside ecosystems are compatible. We do recognize, however, that damage to riparian areas due to grazing has occurred in Montana (Water Quality Impairment Status, Chapter III: Watershed). Because of this we have prescribed monitoring of grazing leases/licenses. All Grazing Resource Management Standards have monitoring guidelines and allow for additional reviews as may be necessary. Cancellation of leases/licenses for mismanagement is provided for in the lease agreement and under statute. A riparian grazing evaluation process will be implemented under all alternatives except Alpha. This process will include monitoring of shrub utilization and bank trampling. Where resource problems exist, we will implement management practices to improve range condition (see Appendix RMS: Grazing on Classified Forest Lands). Implicit in this monitoring is the assumption that resource conditions, rest periods, season of use, soils, climate, and the vigor and physiology of the native plant species must be considered when assessing acceptable utilization levels.

COMMENT: DNRC should consider competitive bidding on some parcels where continuous range mismanagement has been prevalent. (074)

RESPONSE: Grazing leases and licenses are issued for 10 year periods. At the time of renewal, these leases and licenses are offered for competitive bid. The lessee or licensee has the right to meet the high bid if the terms and conditions of the lease or license have not been violated. If a lessee or licensee is mismanaging state property, DNRC can take action and cancel the lease or license. DNRC would then determine if the state land would be offered for competitive bid.

COMMENT: Stricter grazing requirements must be implemented statewide, not just west of the divide. (140)

RESPONSE: The rationale for limiting the Grazing Resource Management Standards to classified Forest lands was provided in Methodology, Chapter IV of the DEIS and can be found in the FEIS in Administrative Framework, Chapter I). Some classified Forest lands are located east of the divide.

Issue - Rangeland Monitoring

COMMENT: Beta, Delta and Epsilon incorrectly use riparian areas as the exclusive or primary indicator of rangeland health. Although cattle may concentrate in these areas, proper monitoring and management of upland areas should not be neglected. If livestock distribution is adequate, the riparian areas may recover much more quickly than the uplands. (120, 148)

RESPONSE: Widespread loss of riparian areas due to grazing throughout the West is well documented. We do not, however, feel that grazing and healthy streamside ecosystems are mutually exclusive. We encourage the use of innovative and flexible grazing strategies on State land and we agree that riparian recovery rates are dependent on livestock distribution. Because of this we intend to evaluate the effect of these systems on both riparian and upland range health. Under all alternatives, upland range sites will also be considered in assessing lease and license condition. Implicit in the monitoring of grazing leases and licenses is the assumption that resource conditions, rest periods, season of use, soils, climate, and the vigor and physiology of the native plant species must be considered when assessing acceptable utilization levels.

COMMENT: Reductions in AUMs are given as the only mitigation in Beta, Delta and Epsilon. Try also grazing systems, upland improvements, time/duration of use, etc. Animal distribution, not numbers, increase the potential for damage. (120, 145)

RESPONSE: We agree that reducing AUMs is not the only method of improving range condition and will work with lessees/licensees to find alternate solutions to address management problems when they may exist. The "Estimated Grazing Use Schedule" (Appendix SCN) shows high/low estimates of future AUMs based on the philosophy of each alternative and the implementation of the respective RMS. Reduction of AUMs may be considered where livestock grazing clearly inhibits the implementation of the Standards or where management problems exist which clearly require a reduction. We agree that reducing numbers itself does not alter distribution, however, it may be necessary to reduce impacts or when the forage present will not support the existing numbers.

COMMENT: Zeta contains one positive aspect not mentioned in the other alternatives: that field personnel would monitor each tract every ten years and resource concerns would be considered on a case-by-case basis. This will produce the most reliable results. (120)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: One important aspect of Alpha is that the responsibility for determining time and duration of use is up to the lessee on classified grazing lands. We recognize that DNRC does not have the budget or personnel to monitor each grazing lease annually and determine the proper turn-on or turn-off dates. As long as the lessee is sensitive to vegetation, maturity and utilization through the grazing season, the health and vigor of the vegetative community will be maintained. The currently used assessments of range condition will reveal cases of misuse. In light of this consideration, responsibility for the season of use of designated forest lands should be given to the licensee. (120)

RESPONSE: It is important to distinguish the type of permit associated with different classifications of state land. Leases are issued for forested classified Grazing lands; while licenses are issue for classified Forest Lands.

Under Alpha, lessees of forested classified Grazing lands would dictate season of use. On tracts without management problems, this period would typically be season long. Where management problems exist, the grazing period could be shortened to allow for resource recovery. Under the other alternatives, however, lessees would not determine period of uses; this would be specified by the department in their lease. For licensees of classified forest lands, DNRC would determine the period of use under all alternatives presented in the EIS (see Appendix RMS: Grazing on Classified Forest Lands).

COMMENT: The DEIS does not define what conditions will be considered "functional-at-risk" and "nonfunctional." (120)

RESPONSE: The RMS in the EIS do not call for a determination of these conditions (see Appendix RMS: Grazing on Classified Forest Lands). These terms were used in describing the existing conditions in Status of Riparian Areas and Wetlands, Chapter III: Watershed. The same terms were inadvertently used in the Plausible Output Scenarios (Appendix SCN). This has been corrected. Riparian areas will be evaluated based on browse utilization levels and streambank disturbance. Upland areas will be evaluated using standardized survey methods.

COMMENT: Several of the alternatives suggest that field assessments of riparian health will be by "ocular assessments." There is very little science that is based on a ocular assessment - especially using different observers on the same tract for year to year. (120)

RESPONSE: The commenter is correct in stating that ocular estimates of riparian condition are not purely objective. This is true, however, with most fields of study in natural resources. The judgement of an experienced resource professional is, we feel, a valid, proactive approach to monitoring grazing impacts and managing these lands.

Issue - Grazing Impacts

COMMENT: The DEIS seems to indicate that forest health problems (for which timber harvests are the cure) have resulted from fire suppression. However, there is some evidence that livestock grazing may cause similar forest health problems. (139)

RESPONSE: We believe some level of livestock grazing is compatible with other resources and land uses. Grazing in the uplands and riparian areas will be monitored under all alternatives except Alpha. Grazing will be modified to promote healthy range conditions.

COMMENT: How can you justify year-long grazing on forest grasslands and with up to 60% utilization of the vegetation? (020, 115)

RESPONSE: Utilization of 60% of the vegetation is generally considered the upper limit of use before affecting plant physiology. Under the Beta Alternative, up to 60% utilization during a season (not year long) could be allowed as long as riparian areas are maintained in a healthy, functioning state, and the range resource is not degraded. To gauge the trends in range resource condition we have prescribed monitoring of grazing leases for both riparian impacts (all alternatives except Alpha) and stocking rates (see Appendix RMS: Grazing on Classified Forest Lands). Implicit in this monitoring is the assumption that resource conditions, rest periods, season of use, soils, climate, and the vigor and physiology of the native plant species is considered when assessing acceptable utilization levels.

COMMENT: When damage to rangelands is occurring it should not be allowed. A philosophy of watershed and range management should more closely follow the descriptions under Gamma. (083)

RESPONSE: The importance of riparian areas is irrefutable. The alternatives (except Alpha) prescribe varying degrees of protection for riparian areas. Gamma standards are the most rigid, however, all alternatives except Alpha would result in improvements when compared to current condition.

Issue - Grazing Fees

COMMENT: The DEIS indicates that cattle interests take precedence over the school trust. DNRC insists on using the legislated minimum fee for grazing rather than charging current market value. We feel it would be more appropriate to charge current market value with whatever alternative is selected. (139)

RESPONSE: The grazing fee is set by the State Board of Land Commissioners and modifying fees is an issue beyond the scope of this document.

Issue - Grazing Resource Management Standards

COMMENT: A problem with the DEIS is that the hands-off grazing management guidelines are vague and probably inadequate. (020)

RESPONSE: The Grazing Resource Management Standards are designed to maintain rangelands which are in good or excellent condition. Where resource problems exist, we will implement management practices to improve range condition. (see Appendix RMS: Grazing on Classified Forest Lands).

COMMENT: The RMS for grazing should contain standards for:
a) soil compaction and loss of productivity;
b) biodiversity (impact on altering forest vegetation);
c) noxious weeds;
d) sedimentation, channel stability, bank stability; and
e) threatened, endangered and sensitive plants. (138)

RESPONSE: The monitoring guidelines under each Grazing RMS for all alternatives except Alpha evaluate range condition, species composition, streambank disturbance, and browse utilization. These characteristics reflect or influence soil compaction & productivity, stream sedimentation and channel & bank stability, and thus we feel they are a valid measurement of riparian condition.

a) Soil compaction is related to intensity and duration of grazing use which will be measured through browse utilization and bank trampling evaluations. Heavily used livestock/wildlife trails and areas of concentrated use such as salt licks, gates and watering areas can cause soil compaction, erosion and short term reduction of soil productivity. Soil compaction and effects to infiltration can be controlled by grazing utilization requirements outlined in the Grazing RMS. These areas can be revegetated and recover by implementing a combination of rest rotation and range rehabilitation.

b) We feel that the specified standards for grazing will be adequate measures of grazing impacts.

c) Noxious weed management standards included in this programmatic plan are applicable to all forest land management activities and include specific standards and monitoring for grazing leases (Appendix RMS: Weed Management).

d) We feel that bank trampling and upland browse utilization levels (as required in the Grazing RMS) are adequate measures of riparian grazing impacts. The results of the prescribed bank trampling and browse utilization evaluation (see Appendix RMS: Grazing on Classified Forest Lands) will serve as an indicator of livestock impacts on channel and bank stability and sedimentation.

e) All alternatives except Alpha would implement stricter riparian grazing standards that would reduce riparian grazing effects on soils and riparian plant communities, and should provide for some recovery of plant species associated with riparian and cottonwood habitats on classified Forest lands. Plant surveys would not be required for grazing leases and it is possible that unidentified plants may be affected by grazing animals. Protection would be provided for identified threatened and endangered plant species.

RECREATION AND NON-RECREATION SPECIAL USES

Issue - Public Access to State Lands

COMMENT: Whether recreation and wildlife are included in the four legal highest and best uses as specific categories or not they should be included under other...Public access to lands owned by the State should be free, since somewhere along the line the public pays. (001, 092, 136)

RESPONSE: Some Trust lands are currently classified as "other". This classification includes recreation and wildlife. When the highest and best use of lands changes from forested to other the land is reclassified and the lands are managed accordingly. Each alternative addresses multiple use management of the forested lands and is summarized in the Summary of Alternatives Table (Executive Summary). Property and income tax is assessed to support state, city, county and school services. The general recreational use license fee is assessed for the use of state trust lands and is not part of property and income tax. All rates and fees are set by the board of land commissioners and apply to nonforested as well as forested lands. Adjustment of those statutory fees is outside the scope of this programmatic plan (Issues Outside the Scope of the Decision, Chapter I).

COMMENT: The public shouldn't have to pay for access in order to subsidize timber harvest and other extractive uses. (092) Keep access fees affordable. (093, 094, 105, 135, 145)

RESPONSE: All rates and fees are set by the State Board of Land Commissioners and apply to nonforested as well as forested lands. Adjustment of those statutory fees is outside the scope of this programmatic plan (Issues Outside the Scope of the Decision, Chapter I).

COMMENT: Keep access to state lands open. (012, 079, 084, 091, 097, 105, 159)

RESPONSE: Per § 77-1-203(3), MCA, "State lands, including those lands that are leased primarily for other purposes, are open to general recreational use subject to legal access and to closures and restrictions pursuant to rules adopted under 77-1-804."

Section 77-1-804(3), MCA states that "Closure rules adopted pursuant to subsection (2) [procedures for closure] may categorically close state lands whose use or status is incompatible with recreational use. Categorical or blanket closures may be imposed on state lands due to: (a) cabinsite and homesite leases and licenses; (b) the seasonal presence of growing crops; and (c) active military, commercial, or mineral leases." See § 77-1-804, MCA for more information on rules for recreational use of state lands.

COMMENT: Alternatives Delta and Zeta would limit access and therefore negatively effect the most people. (121, 145)

RESPONSE: Alternative Delta and Zeta have the potential to limit access, however Alpha, Beta, Gamma and Epsilon do not include leasing exclusive hunting rights (see Summary of Alternatives Table, Executive Summary).

Issue - Leasing of State Lands

COMMENT: We are opposed to leasing land for exclusive recreational purposes. (036, 054, 097, 128, 133, 136); especially hunting. (052)

RESPONSE: The EIS was developed in accordance with the legal framework (Chapter I and Appendix LGL) that trust lands are managed to provide revenue in support of public schools. This mandate has been challenged in courts and upheld that trust lands must be managed to secure the largest legitimate return for the interest disposed of through leasing. In some cases exclusive leasing for various purposes will secure the largest return to the trusts and therefore will be considered under each alternative as described in the Summary of Alternatives table (Executive Summary). Alpha, Beta, Gamma and Epsilon do not include leasing exclusive hunting rights. As described in that same section under alternatives Delta and Zeta, we would consider leasing some state land for exclusive hunting and fishing, where other outfitters would be excluded, not the general public. However, exclusive leasing that is not compatible with general recreation use is categorically closed to the public (as defined in § 77-1-804, MCA). An example of this type of a non compatible lease would be a rifle range. An example of exclusive lease compatible with general recreational use and open to the public would be a nature trail. Under each alternative new leases proposed for exclusive use will be evaluated under MEPA including public scoping to identify issues relative to the proposed activity.

COMMENT: Don't privatize wildlife; we object to any effort to lease recreation rights, especially hunting rights to the highest bidder. (001, 036, 039, 042, 052, 159)

RESPONSE: The leasing of hunting rights is considered an alternative way to appropriately meet the objective of raising revenue for the Trust under Alternatives Delta and Zeta. We appreciate that it may be objectionable to some people, and will also consider that in making a final decision. It is not considered under the preferred alternatives.

COMMENT: Zeta is extreme in its leases for recreation. (052) Although Zeta could be environmentally friendly, it would, in the end, be management of our state lands for the rich. (020)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: DNRC should consider leasing areas to conservation groups. (103) DNRC should consider leases with private groups interested in maintaining public access to high value recreation areas. (145)

RESPONSE: All of the alternatives provide for the development of recreational uses (Summary of Alternatives Table, Executive Summary). Recreational uses were analyzed for each alternative according to activity groups (Recreation, Chapter IV: Economics). Leasing land to conservation groups as well as the development of low impact recreational uses could be considered with all the alternatives.

COMMENT: On Page Sum-17, does this data deal with recreation type leases? Is the 70 percent estimate for Zeta realistic? Does the recreation analysis tie to the SCORP? (156)

RESPONSE: Yes, the information in Table R-1 (Executive Summary) does refer to recreation leasing. Our estimate that, under Zeta, 70 percent of acres in state forests would be offered for dispersed-use leasing is based on the assumption that commercial recreation would be a major theme of this management philosophy. The Department would actively promote opportunities for high-value wildlife enjoyment and recreation use. Because this is such a major departure from the Department's past approach, it is difficult to know whether 70 percent is a realistic estimate; however, it is also difficult to know whether our estimates of future demand and future recreation prices are realistic. We believe that the 70 percent figure is an appropriate basis for making economic comparisons between the Zeta management philosophy and each of the other alternative management philosophies. (Please note that the 70 percent figure is based on state forest acreage, and not on total forested lands acreage.)

Regarding the last comment, yes, the recreation analysis does tie to the SCORP. However, the tie is a tenuous one for reasons we develop in the discussion of dispersed recreation use (Net Present Value of Expected Revenues, Appendix ECN). We were not able to find highly credible estimates of either current recreation use or future trends in recreation use on forested state lands. We used the most geographically and situationally appropriate data from other management agencies (BLM, USFS, MDFWP) to estimate current use levels on forested state lands, then asked our own Area Managers to fine tune the estimates based on their own knowledge. Greg Super, of the USFS Washington Office recreation staff, cited Cordell (1990) as the most authoritative source on future use projects (see Bibliographic References chapter for complete citation). Our recreation analysis is far from perfect; however, we have no reason to believe any superior estimating techniques (that are within the scope of this type of assessment) have been overlooked.

Issue - Cabinsite Leasing

COMMENT: I am opposed to new cabinsite leasing. (054)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: Cabinsite holders should pay higher fees because present rates are far below market values. (074)

RESPONSE: All rates and fees are set by the board of land commissioners and apply to nonforested as well as forested lands. Adjustment of those statutory fees is outside the scope of this programmatic plan (Issues Outside the Scope of the Decision, Chapter I).

Issue - Outfitting

COMMENT: We need careful regulation of outfitters. (054, 083)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: DNRC should consider exclusive state land leases to outfitters in lieu of individual recreation access permits. (152)

RESPONSE: The issue of closing state land available for general recreational use versus exclusive leases for outfitters is considered outside the scope of this programmatic plan (Issues Outside the Scope of the Decision, Chapter I).

Issue - Recreation on State Lands

COMMENT: Perhaps the goal of increasing revenue from state lands could be met by developing more recreational options, such as the proposal for a Beaver Lake State Forest mountain bike park, and by charging user fees for those who would enjoy those options; don't preclude recreation as a way to produce revenue. (008, 043, 044, 047, 048, 066, 072, 078, 088, 103, 109, 111, 112, 117, 130, 139, 158)

RESPONSE: All alternatives provide for the development of recreational uses (Summary of Alternatives Table, Executive Summary). Recreational uses were analyzed for each alternative according to activity groups (Recreation, Chapter IV: Economics). The development of low impact recreational uses such as mountain bike trails is within the range of all alternatives. Also, alternatives Zeta and Gamma support the option of managing state trust lands for recreation to provide the largest return from State trust lands now and in the future (Alternatives, Chapter II).

COMMENT: I am opposed to outside proposals to develop recreational sites. (054)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: Motorized recreation such as scenic driving, motorcycles, ATVs, huckleberry picking, access for seniors and handicapped which all produce revenues to the state, though not directly to DNRC, through motor vehicle fees, offroad vehicle licenses, and fuel taxes must be given as much value as non-motorized recreation. (108, 148)

RESPONSE: Motor vehicle fees, off road vehicle licenses and fuel taxes are assessed to support road maintenance, cities, counties, and schools. The general recreational use license fee is assessed for the use of state trust lands and is not part of motor vehicle and fuel tax. The Enabling Act of 1889 (see Appendix LGL) mandates that the management of state trust lands must provide income for its designated trust beneficiaries (e.g., common schools, agricultural schools, mining colleges, asylums, reform schools or public buildings). Since the motor vehicle and fuel taxes do not directly support state trust land beneficiaries, we could not consider these revenue sources in meeting our agency's mandate.

COMMENT: A more detailed analysis could be made to project how recreation or, specifically, what type of recreation is going to meet the goals and philosophy of the other alternatives that do incorporate recreation uses into the equation. (162)

RESPONSE: The recreation scenario was developed using historical information from the state lease data base. Due to the large timber base and personnel, past management of school trust lands has focused on timber management. Therefore, minimal data was available on recreation. Future use and development levels for recreation were predicted using statistical studies from various sources. Methodology for the recreation assessment is discussed in Chapter IV: Economics.

Issue - General Recreation Use Fee

COMMENT: As a revenue source, add a fee to the conservation license for access. (052) Increase recreation uses annual fee by $1.00. (088) Hunting and fishing uses of all state lands should be leased to MDFWP for $1 million per year. FWP could then increase the cost of licenses to cover the lease. (076)

RESPONSE: Collection of the general recreational use fee is considered outside the scope of this programmatic plan (Issues Outside the Scope of the Decision, Chapter I).

ROADS

Please note that some of the comments and responses regarding roads also appear under the Resource Categories for Fisheries, Soils, and Wildlife.

Issue - Road access

COMMENT: Keep access open. (019, 084)

RESPONSE: According to ARM 26.3.186(1)(a)(I), "except as provided in (ii - [permit to hunt from vehicle]) and (iii -[parking]), motorized vehicle use on state lands by recreationists is restricted to federal roads, state roads, dedicated county roads, other county roads that are regularly maintained by the county and those roads on state lands that are designated by the department as open for motor vehicle use."

DNRC has authority, per ARM 26.3.186, to outline restrictions on persons engaging in general recreational use of state land and impose additional site specific restrictions to protect public safety, property or the environment. These restrictions include motor vehicle use and parking. Open road designations only apply to the use to the road for general recreational use. Authorization for use of roads on state land for any other purpose requires issuance of a license or easement from DNRC.

Issue - Discussion of Roads in DEIS

COMMENT: None of the alternatives include any specific road or access density standards. (071, 109) DNRC should base road density standards on entire watershed, not just state lands. (109)

RESPONSE: We understand that specifically articulated standards and guidelines in this Plan are desired by some members of the public, and would serve to provide clear accountability of our actions. However, in this programmatic and philosophical plan, treating as it does, lands distributed across the entire state, such specificity would be inappropriate. Instead, we have chosen to adopt a coherent management policy with the assistance of public input, while allowing for flexibility in the standards and guidelines to respond to new and best available information over time.

COMMENT: Roads not defined in glossary. (138) DNRC needs to define open/closed roads. (145)

RESPONSE: There are certain terms that were not defined in the glossary, such as roads, trees, streams, etc., because of the more general nature of this programmatic plan. Each of these terms is a general description that is characterized by common language usage. Roads are specifically defined in project level MEPA documents and once the Plan is implemented, will be evaluated according to all of the RMS that have been developed for the management philosophy of the final alternative. We have amended the Road Management RMS to include more specific information on road closures and monitoring for road closures.

COMMENT: No road closure program is included in the DEIS. (138)

RESPONSE: Road closure and monitoring for road closures is included in the RMS for all of the alternatives (see Appendix RMS: Road Management).

COMMENT: The DEIS assumes that the road density numbers are correct; there are no maps provided; there is no information on how open road density was calculated. (138)

RESPONSE: We have expanded the narrative on how we calculated the road density figures provided in the Scenario section of the DEIS. The Scenario appendix contains the estimated road densities as plausible output scenarios. These output scenarios were developed for the purpose of providing some tangible basis for our resource and economics effect assessments. They were not intended as accomplishment targets, but simply as estimates of probable ranges of activity, given the management philosophy developed under each alternative. The provision of maps of roads on all state lands is beyond the scope of this programmatic plan. This level of evaluation will be done at the project level.

COMMENT: In light of the vast gaps in knowledge about wildlife which is necessary to make informed decisions (e.g., all the "?"s in Appendix WLD) the DEIS should have used total road density in its computations. (139)

RESPONSE: For an discussion of the questions marks in Appendix WLD, see response under Issue - Wildlife and Roads in the Wildlife section of this chapter. Our effects analysis used total road densities, multiplied by coefficients that were assumed to reflect different philosophies regarding roads of the alternatives. That coefficient was 1.0 for Alpha, Delta, and Epsilon (i.e., total roads were used), 0.75 for Beta and Zeta, and 0.6 for Gamma.

Issue - Road Management

COMMENT: DNRC should agree to building no more roads. (038, 039, 043, 044, 047, 049, 063, 066, 068, 069, 070, 072, 078, 090, 095, 096, 104, 108, 109, 112, 117, 119, 130, 141, 151) DNRC should reduce roads. (041, 100, 122, 128, 140, 141) The State's philosophy should be no net increase in total road densities and efforts to decrease road densities. (103)

RESPONSE: We understand that the public is sensitive to the impacts of roads on the environment. We have addressed the issue of road management and maintenance in each of the philosophies presented in the EIS. Some of the alternatives, such as Beta and Gamma are more proactive in trying to minimize the amount of new roads needed to support management activities and to close roads following use. We have not found it useful to incorporate specific road thresholds in our statement of philosophy. Although not part of this planning process, we have recently provided guidance to field units within the Northern Continental Divide Ecosystem recovery zone for grizzly bears that calls for no net increase in the proportion of bear management subunits that exceed 1.0 mi/mi^2 open, and 2.0 mi/mi^2 total road densities.

COMMENT: There are too many roads already; roads are increasing erosion. (048, 058) None of the alternatives offer a reduction in road density. (020, 103) Epsilon increases roads; it's not worth it. (137)

RESPONSE: For all alternatives, we would endeavor to build or reconstruct the least roads necessary for management due to the expense of construction, road maintenance and effects to other resources. In many areas there are already considerable roads from past use, with some segments of poor location, steep grades or difficult soils and associated problems.

COMMENT: Why does DNRC need so many roads? (115)

RESPONSE: The extent and nature of roads varies by alternative to service the area to be managed. On a site specific basis we must balance which roads to retain and improve, which roads to relocate and which to eliminate from the road system.

COMMENT: DNRC should have included a road access plan in the EIS. (091) DNRC needs a road/travel management plan with adjacent landowners to minimize weeds, litter, etc. (083, 145)

RESPONSE: DNRC is a member a Road Management Cooperative with signatories who own, manage, or otherwise have an interest in the management of roads in Montana (USFS, BLM, MDFWP and Plum Creek Timber Co., L.P.). The management plan not only benefits the signatories but also the general public through management of road use. The parties share a mutual desire to cooperatively manage roads and road uses in the most cost-effective means while minimizing road maintenance, protecting water quality, and providing wildlife habitat security. DNRC is also a participant in the Swan Valley Grizzly Bear Conservation Agreement, that calls for restrictions on open roads in the Swan valley, and coordination in road management with the Flathead National Forest and with Plum Creek Timber Company.

COMMENT: DNRC needs to include road management objectives and goals in the DEIS. (128)

RESPONSE: Each of the alternatives presented in the EIS includes a philosophy of road management and maintenance (see Summary of Alternatives Table, Executive Summary). Included in the roading philosophy are objectives for road development, closure and/or obliteration and maintenance. These philosophies are then reflected in the Road Management RMS (Appendix RMS: Road Management).

Issue - Temporary Roads

COMMENT: DNRC should build temporary roads for timber sales, then obliterate them. (048, 068, 108) New access roads should be temporary "scratch" roads. (047, 061, 069, 075, 103, 112, 116, 117, 119, 127, 130)

RESPONSE: Temporary roads are well suited to short spur type roads but may not be feasible for all soil/site conditions and seasons of use.

COMMENT: DNRC should use or retire temporary roads, but not obliterate these capital improvements. (061, 148) DNRC should take a conservation approach when obliterating roads, to reduce disturbance. Be careful not to obliterate and then reconstruct, this just increases impacts. (109)

RESPONSE: Main system roads and existing roads across difficult terrain are major capitol investments that provide long term access and would be maintained. For all alternatives, road construction will require mitigations measures to meet BMPs for drainage, revegetation and erosion control.

COMMENT: Because roads and trails are not defined in the DEIS, it is not possible to determine environmental effects of temporary roads and how they are managed. Firewood cutters use skid trails and often cut their own roads which create added environmental impacts. It is unacceptable to ignore the definition, and management of jeep trails, and other temporary roads. (138)

RESPONSE: DNRC does have definitions of primary road, secondary roads, spur roads and temporary spur roads that are included in our guidance to area staff. These definitions include such specifics as width, materials, season of use, etc. Considering that we have not included such specific road categories in our discussion of roads and the various resources affected by them, we did not feel it was necessary to include these definitions in this document. We have not ignored the definition, we just do not think it would have added much value to the analyses or the discussion.

Issue - Road Maintenance

COMMENT: Road maintenance should be paid for by annual fee. (054) Logging operations should pay for road gates. (128)

RESPONSE: Under all alternatives except Alpha, we would begin to develop an active road management program and require commercial road users to do maintenance or pay maintenance fees. In addition, the RMS for Road Management include a monitoring program under all alternatives (see Appendix RMS: Road Management). Road improvements, including gates, are generally financed through logging operations. We appreciate your opinion on funding road gates and will consider your input in the selection of a final alternative.

Other Topics Presented by the Public

PROGRAM MANAGEMENT

Issue - Agency Authority

COMMENT: If DNRC presented options outside its current authority, the agency might be able to convince the legislature to modify its existing authority/mandate. (141)

RESPONSE: We state in the EIS that "certain matters of significant concern to Montanans are outside the Trust Land Management Division's decision-making authority and will not be addressed by this planning effort" (Issues Outside the Scope of the Decision, Chapter I). We considered major changes in statute or regulation to be outside the scope of this programmatic plan.

COMMENT: We are concerned about the power of state employees at the local level. (033)

RESPONSE: There are trade-offs between localized decisions being more sensitive and well-founded versus the localized decisions losing sight of their fundamental responsibility to the trust.

COMMENT: DNRC should not let each land office set up their own annual harvest goals - the issue will become political. (074)

Harvest levels will be assigned by the Forest Management Bureau and will not be developed by each land office.

Issue - Recent Legislation HB 201 / HB 263

COMMENT: The current draft of the Plan does not consider the legal requirements of HB 201 or HB 263. I urge you to complete the annual sustainable yield study required by HB 201 and then draft a new Plan that reflects the legal requirements of these two important pieces of legislation. (002, 003, 007, 013, 016, 021, 023, 037, 045, 061, 080, 083, 087, 091, 124, 125, 143, 160)

RESPONSE: The Department considered HB 201 before releasing the DEIS, and ensured that the DEIS complied with the legal requirements of that law. HB 201 directs DNRC to commission a study to determine the annual sustainable yield on forested state lands. There are a number of variables, including watershed and wildlife protection, cumulative effects of management activities, and forest health, which are necessarily part of the sustained yield equation. These parameters (watershed/fisheries/wildlife protection, etc.) will be determined based on the management philosophy selected through this programmatic plan. DNRC must harvest the annual sustainable yield as determined by the sustainable yield contractor hired per HB 201. HB 263 clarified that "other worthy objects" refers to the Trusts, as listed in the Enabling Act. This is consistent with how DNRC interpreted "other worthy objects" in the past.

COMMENT: We are strongly supportive of concluding this EIS process before completing the mandates sustainable yield study. State lands are the source of many diverse "products" - recreation, clean water, timber, wildlife, scenic beauty, cultural resources and more. Clearly the citizens of Montana must decide what is to be "yielded" from school trust lands before maximum harvest levels for sustainable yield can be determined. (140)

RESPONSE: See response to previous comment.

COMMENT: The current political situation (which resulted in HB 201) weakens the rights of the public under the Clean Water Act, the Endangered Species Act, NEPA, and the National Forest Management Act. (141)

RESPONSE: Thank you for your comment.

COMMENT: The scientific credibility of DNRC's process or analyses is highly questionable given the intense industry and political pressures to log even greater quantities. NEPA documentation must not be used to justify decisions already made per Save the Yaak Committee v. Block, 840 F.2d at 718, quoting 40 C.F.R. sec. 1502.5. (141)

RESPONSE: We have a specific mandate to manage state trust lands to generate revenue for the support of common schools. The State Legislature, by passing HB 201, has narrowed that mandate to include the harvesting of 45-55 MMBF of timber until an annual sustainable yield study can be completed. The study will be conducted by a third-party consultant and directed by the management philosophy chosen as the final alternative in this programmatic plan. We have presented different alternatives that reflect the various management philosophies that we could pursue, keeping in mind that the final alternative had to meet the three selection criteria listed in the Executive Summary. This MEPA process has been conducted as objectively as possible.

Issue - Management Options

COMMENT: DNRC should manage for diversity and not exclusively for timber/grazing. (006, 008, 036, 040, 044, 049, 051, 058, 059, 065, 066, 074, 080, 087, 094, 103, 107, 109, 110, 111, 116, 117, 122, 126, 130, 145, 157, 159) DNRC should be more specific on implementation of non-timber uses. (162)

RESPONSE: All of the alternatives allow for different uses that address unique capabilities of the land. Rather than prescribe a specific use in all cases, the alternatives prescribe a management orientation or philosophy. Delta and Zeta directly provide opportunities for developing other uses, such as recreation.

COMMENT: DNRC should emphasize long-term management of state trust lands. (001, 008, 010, 018, 020, 025, 026, 028, 042, 046, 047, 048, 049, 051, 052, 055, 062, 065, 066, 067, 072, 077, 078, 083, 085, 086, 098, 103, 104, 108, 109, 110, 111, 112, 114, 116, 117, 121, 122, 123, 125, 127, 130, 139, 143, 145, 150, 153, 157, 158, 168, 169, 172, 173, 175)

RESPONSE: We believe that all of the alternatives presented in the EIS allow us the flexibility to conduct long-term management strategies that are in the best interest of the trust.

COMMENT: DNRC Director Bud Clinch stated that state land should be managed like industrial timberlands; this is irresponsible considering the way that Champion and Plum Creek have managed for profit and not for ecosystems. (103)

RESPONSE: Thank you for your comment.

COMMENT: DNRC should make environmental considerations a goal, not merely a constraint on the timber program. (103)

RESPONSE: We agree that the long-term productivity of state trust lands requires that we include environmental considerations in our short and long-term planning. The alternatives presented in the EIS offer different management philosophies to meet both our management and environmental goals.

COMMENT: The concept of sustained yield must be modified to include ecosystem components as proposed in Gamma. However, unlike in Gamma, environmental quality need not be emphasized over a sustainable supply of timber. Instead, these two necessities should be weighed against each other as co-equals. (140)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: The DEIS follows Region 1 USFS' unrealistic plans which propose increased timber volumes and roads while "promising" to protect Threatened and Endangered Species, wildlife, old-growth, watershed, and fisheries. (141)

RESPONSE: There are many different issues to balance in the management of state trust lands. We state in the EIS that the selection of a final alternative will be based on three factors: monetary return to the school trust, long term health of our forest resource, and effect of our management activities on the biological and physical environment (Executive Summary). Through this Plan, we are attempting to find the appropriate balance which will protect the forest resource for the long term and still allow us to meet our trust mandate.

The timber volumes included in the EIS are not targets or objectives associated with a particular alternative. Rather, they are scenarios we created to allow an assessment of potential impacts. The actual timber harvest target will be determined by the sustained yield study under HB 201.

COMMENT: Instead of turning trees into computer paper and textbooks and revenue, use them in their raw state - as a living outdoor classroom. Students will participate in hands-on practical skills learning. (073)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - Coordination and Cooperation

COMMENT: DNRC should pursue ecosystem management across land ownerships. (085, 110) DNRC needs to consider the entire area when harvesting near private timber land; and coordinate policies with other state, federal and private interests. (019, 110) DNRC should explain whether relationships with other agencies will vary between the alternatives. Do joint agency programs have an affect on DNRC land management? (156)

RESPONSE: MEPA requires, for this programmatic plan as well as our site-specific projects, that we "invite the participation of affected federal, state, and local government agencies, Indian tribes, the applicant, if any, and interested persons or groups" (ARM 26.2.647(2)(a)). Beyond the legal requirements of MEPA, our relationship with other agencies will vary somewhat based on the alternatives presented in this EIS. We will continue to participate in joint agency programs and will review our participation in future programs within the context of the management philosophy chosen as the final alternative.

In the Summary of Alternatives Table (Executive Summary), we describe our policy by alternative on coordination and cooperation among adjacent landowners, cumulative effects of activities on intermingled ownerships, and conflicting land uses with adjacent landowners.

Issue - Logging Contracts

COMMENT: DNRC should have "ethical" loggers contract directly with the state on stewardship contracts. (103) Don't rely on logging contractors to monitor and enforce rules. (147)

RESPONSE: Logging contracts are generally sold to the highest bidder. We do not rely on logging contractors to monitor and enforce DNRC rules. DNRC personnel is charged with enforcing contractor stipulations (rules) on state lands. We currently have audit procedures in place for BMPs and SMZs that monitor the activities of contractors. In addition, there are other programs which protect watershed and wildlife resources. We have developed Resource Management Standards for these and other resources that include monitoring.

THE STATE FOREST LAND MANAGEMENT PLAN

Issue - The DEIS Document - General Concerns

COMMENT: DNRC has compared this effort to similar efforts undertaken by the Forest Service under the National Forest Management Act. This EIS doesn't contain the degree of specificity found in comparable forest plans for federal lands. While those plans may not have contained adequate information, DNRC's EIS fails to adhere to any standard of forest planning set by its sister agency in the federal government. (138)

RESPONSE: DNRC and the Forest Service operate under different mandates, laws and constraints. We have attempted to develop a programmatic plan that addresses a diversity of lands and issues state-wide. In that, we may have compared our efforts to those of the Forest Service, but in no way were we intending to duplicate their process or product. This Plan is unique to DNRC and should be evaluated on its own merit.

COMMENT: We see the Management Plan that will come from your DEIS as meeting the same need as our Regional Guide did for National Forest Lands. It is an important part of the overall planning process to clearly state what the overall goal or direction is for the lands being managed. (156)

RESPONSE: This programmatic plan was designed to direct the management of 662,000 acres of state trust lands across the entire state. The management philosophy chosen as the final alternative will then be used to develop specific management projects in each land office. In this way, it may seem like a regional guide because we had to take into account the wide diversity of land and resources in the state.

COMMENT: The EIS is inadequate. In a 1991 lawsuit, DNRC agreed to do a programmatic environmental review of Forest Management Standards/Guidelines - this Plan, instead, is vague, general philosophy and policies. Plan should be scientific evaluation which forms analytical basis for evaluating environmental impacts. (138, 162)

RESPONSE: On December 5, 1989, Jeff Jahnke, then Chief of the Forest Management Bureau of the Forestry Division (now Trust Land Management Division) of the Montana Department of State Lands (now DNRC), submitted an affidavit to the Montana 11th District Court of Flathead County, in Friends of the Wild Swan v. DSL. In his affidavit, Jahnke stated that the Department would prepare a series of Forest Management Standards and Guidelines "providing direction to state forest managers on how specific forest resources should be managed, given the laws, rules and policies that govern the management of state trust lands. While some 'chapters' of these Standards and Guidelines will concern administrative aspects of forest management of little significance to natural resources, other chapters will contain minimum standards for the conservation and protection of important environmental resources... The standards and guidelines will apply to all state forest land..." (Affidavit, pages 13-14) The subject of these standards and guidelines were to be Road Management, Grizzly Bear Management, Silvicultural Treatment, White-tailed Deer Winter Range, Elk Winter Habitat and Watershed Management (Affidavit, pages 14-15). The affidavit goes on to say that Chapter One "...is intended to be a broad programmatic review of the Department's forest management program. Such review will meet the requirements of the rules (ARM 26.2.657) adopted by the Department to implement the Montana Environmental Policy Act" (Affidavit, page 15). In addition, Jahnke stated that the Department would do an old-growth study "to determine if old-growth has intrinsic value to the state school trust" (Affidavit, page 18).

As we began to complete the first final drafts of standards and guidelines (on grizzly bear management), it became clear that the appropriate MEPA documentation would be difficult. The standards and guidelines themselves didn't directly cause impacts. They had to be measured against what we were actually doing on the ground and that had not been defined at a level any broader than the specific project (except in the Swan River State Forest Management Plan, July 1978). We had made several attempts in the past to prepare a programmatic MEPA analysis on the standards and guidelines, but always ran up against the same problem.

In addition, over the past few years, we began to see a significant increase in both the amount and intensity of requests for the use of state forest land for other than traditional purposes. The Bear Canyon timber sale/scenic easement request, proposals for leasing the Tom Miner Basin for non-timber uses and the Sula Hunting Lease are all examples of these kinds of requests.

When the MEPA rules were revised in 1989, a rule was added which required the preparation of a programmatic review for any program with the potential to affect the environment. The Department determined the forest management program was, in fact, a program under MEPA and therefore would require a programmatic analysis. That conclusion became further motivation to conduct a statewide programmatic plan that included resource management standards. Also, the Department felt that a statewide plan was the most appropriate tool to provide management direction to our field managers.

Thus, the decision to do a statewide forest management plan was not a snap decision. It was a reasoned process developed through the issues discussed above. We have conformed to the commitments made by Jahnke in his 1989 affidavit. The EIS includes a programmatic plan for the management of state forests as well as Resource Management Standards for road management; grizzly gear management (expanded to include all threatened and endangered species), silvicultural treatment, White-tailed Deer Winter Range and Elk Winter Habitat (expanded to include all big game) and Watershed management (see Appendix RMS). In addition, we have also developed Resource Management Standards for Sensitive Species, Fisheries, Biodiversity, Grazing on Classified Forest Lands, and Weed Management (see Appendix RMS).

COMMENT: There is too much repetition in the document; you should state once all the factors common to all alternatives. (109)

RESPONSE: We recognize that a document of this size can be cumbersome to read and evaluate. However, we felt that some repetition of information was necessary to allow the reader to compare alternatives under each resource category. This was preferable to referring the reader back to other places in the document where certain information would be located.

COMMENT: The DEIS does not include irreversible and irretrievable commitment of resources. (138)

RESPONSE: Please refer to page IV-187 of the DEIS (IV-197 of the FEIS) for a discussion of irreversible and irretrievable commitments of resources, as required by MEPA (ARM 26.2.649(4)(d)).

COMMENT: There is no worst case analysis done (needed for grizzlies, old-growth, fisheries). (138)

RESPONSE: We presented the anticipated environmental effects of the management activities that would take place under each alternative, guided by output scenarios for grazing, recreation and non-recreational special uses, timber management activities, and roads. (Appendix SCN). These scenarios were assigned a high and low range of output (e.g., grazing schedules, timber harvest, road density) consistent with the management philosophies of each alternative. The ranges were then used in determining the impact of activities on the resource categories in the EIS. Although not labeled as such, our intent was to provide a range of impacts that would represent both the best case and worst case situation for each resource by alternative.

Issue - The DEIS - Data

COMMENT: The DEIS lacks enough specific information on wildlife, fisheries, or recreation for making an informed decision. (138, 162) The DEIS lacks a credible analysis of existing conditions (DNRC had plenty of time to gather this data) - the author of this comment cites several quotes that note a lack of data on issues of soils, riparian/wetlands, species of special concern, weeds, old-growth, snags, patch conditions / fragmentation). (141)

RESPONSE: Please note that we used two large and comprehensive databases to project the qualitative effects on all 420 native terrestrial vertebrate species, as described by 8 attributes of forest condition, for all of the alternatives considered. All projections are admittedly qualitative and thus approximate; this is because the EIS deals with a statewide, programmatic plan, and thus site-specific effects are impossible to project.

COMMENT: The DEIS uses outdated/obsolete scientific literature as the basis for environmental affects analysis. (138, 141) The data used is contrary to proper biology. The DEIS lacks footnotes to scientific references that are relied on for conclusions (also in charts/figures). (138)

RESPONSE: We agree that proper methodologies are those that are unbiased. We have used both contemporary and pertinent scientific literature in our environmental analysis and have cited these references when appropriate. The EIS includes a Bibliographic Reference. This section includes the references used directly in the preparation of this document. However, our resource professionals also have a bevy of reference and source materials that they use in the course of their duties. To include all of the reference material that encompasses the knowledge of our staff would be violating the spirit of MEPA to be analytic, not encyclopedic.

Issue - The DEIS - Cumulative Effects

COMMENT: In the well-known, controversial areas of timber harvest methods, timber harvest volume projects, grizzly bears and roads, old-growth habitat, economics and fisheries, the DEIS lacks rigorous discussion of cumulative (past, present, future) environmental effects. Most of the available scientific data on wildlife was ignored. (138, 138a) Cumulative effects need to be more thoroughly evaluated, especially on old-growth and sensitive plants. (145)

RESPONSE: Given that this programmatic plan does not address land allocations or site-specific projects, the level of cumulative effects analysis presented in the EIS is appropriate. Cumulative effects conducted as part of the MEPA analysis for all site specific projects will provide the level of detail requested by the commenters.

The DEIS states that, "Several models have been developed to assess the effects of roads on wildlife. Mace and Manley (1993) estimated that total road densities in excess of two miles per square mile preclude grizzly bears from making full, effective use of available habitat. Most of the grizzly bear habitat managed by DNRC is in the Northwestern Land Office, where total road densities exceed this level" (DEIS, page IV-135). "Also, the U.S. Fish and Wildlife Service (1993) concluded that road use during one or two periods exceeding 14 days could adversely affect grizzly bears" (DEIS, page IV-140).

Issue - The DEIS - Resource Management Standards

COMMENT: The RMS should not contain subjective, undefined language (e.g., sufficient, adequate, unacceptable). (138)

RESPONSE: We have used terminology most appropriate to the state-wide level of planning presented in this document and may provide more quantitative measures that support the RMS of the chosen alternative in our implementation guidance to our land managers and field staff.

COMMENT: Some standards in the DEIS seem like goals; DNRC should clarify. (156)

RESPONSE: Our Resource Management Standards are designed to provide our land managers with both goals and procedural requirements for the management of state trust lands. We do not consider these two elements of the RMS to be incompatible with the purpose of this Plan in providing a management philosophy.

COMMENT: The mitigation and monitoring presented in the DEIS is not committed to by DNRC with funding. DNRC should prepare annual monitoring/evaluation reports to demonstrate effectiveness of mitigation; this should be available to the public. (138)

RESPONSE: Mitigation measures will be specified at the project level and as such, funding will be committed through individual projects. In addition, the Forest Improvement Program, which conducts such things as tree plantings and road maintenance, will assume some of the costs of mitigation.

Our monitoring occurs in the form of project audits, for example the Biennial BMP Audit Program, which produces a report that is available to the public. We have specified in Appendix MNG measures that we will use to ensure compliance with the Plan.

Monitoring is also an important facet of all of the Resource Management Standards presented in this programmatic plan. For example, the Watershed RMS for all alternative, except Alpha, include the following monitoring commitments:

> Qualitative assessments, such as BMP audits, would be conducted on most projects with a substantial amount of soil disturbance. Problems noted would be remedied by DNRC. BMPs that failed to provide adequate protection would be revised for future application.
>
> Water quality monitoring would be conducted on a representative sample of streams in areas of contiguous ownership to track trends in water quality. The data collected is generally not of adequate resolution to be used for cause and effect relationships of specific land management activities. As suitable projects became available, monitoring of individual projects would be considered. If monitoring indicated watershed impacts from management activities, problems would be corrected (Appendix RMS: Watershed).

Issue - The MEPA Process

COMMENT: DNRC is being inconsistent with its own Administrative Rules by not selecting a preferred alternative. (083)

RESPONSE: Rules for Implementing the Montana Environmental Policy Act, ARM 26.2.649, states that "the agency shall prepare a draft environmental impact statement using an interdisciplinary approach and containing the following:" ... Subsection 9 "the agency's preferred alternative, if any, and its reasons for the preference." On page SUM-20 of the DEIS, we state "It was the general opinion of the planning team that two of the alternatives, Gamma and Zeta, are seriously deficient according to one or more of the [selection] criteria above. The remaining four alternatives, Alpha, Beta, Delta and Epsilon, do satisfy all of the criteria to varying degrees. Of these four, Beta, Delta and Epsilon are preferred."

Issue - Alternative Selection Criteria

COMMENT: The DEIS does not say why or how it was concluded that Gamma and Zeta are deficient in meeting the objective criteria. How was it measured? (122, 131) DNRC should give information on how each alternative is measured against the criteria, and how criteria are weighted, how an alternative satisfies criteria or is deficient. (156)

RESPONSE: Gamma and Zeta were not included in the preferred alternatives because they did not meet two of the selection criteria: monetary return to the school trust and long term health of the forest resource. The DEIS provided a summary and interpretation of the economic analysis completed for each alternative. Gamma and Zeta ranked at the bottom of the expected share of total school funding and net present value (DEIS, pages IV-184 to 186). They did fair better when net present value was added to the remaining timber asset. However, the low harvest levels of Gamma and Zeta indicate that there would be increased risk of mortality due to declines in forest health. The forest vegetation cumulative effects discussion state for Gamma that "further departures from natural conditions appear unavoidable, as stocking levels and dominance of late-successional species would continue to increase with low timber harvest levels. Natural processes of insect and pathogen activity and wildfire would operate at unnatural levels when they did occur, and reestablishment of natural patterns and stand structures after such disturbances would take a very long time (DEIS, page IV-77). For Zeta, "low harvest levels, combined with a likely emphasis on maintaining high stocking levels and late-successional trees species on big-game winter range, would probably result in continued forest health declines" (DEIS, page IV-77).

Issue - The Alternatives - General Concerns

COMMENT: None of the alternatives adequately address the issues of access, wildlife habitat, watershed management, grazing, or recreational opportunity. (034)

RESPONSE: Without more specific information on how the commenter believes our discussion of these issues is inadequate, it is difficult to respond to this comment.

COMMENT: Beta provides 2/3 of the funding that Epsilon does, yet maintains the long-term viability of the trust and the best future of forest health; also provide 2/3 of the additional environmental protection of Gamma over Epsilon. (140)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: Delta could end up looking like Gamma and Zeta if close attention is paid to markets and fees can be collected efficiently. Risking the environmental impacts of Delta is a problem since the Montana economy is shifting away from extraction to ecological beauty. Delta may look too exclusively at the market and not enough to the long term. (139)

RESPONSE: Delta would allow us to respond to changing market conditions, including recreation and wildlife values, which represents the perception of the change from extraction to ecological beauty. However, Delta does state that decisions on short and long term values and future land use would be made on an economic basis and that we may allow for greater environmental risk in exchange for long-term return to the school trust.

COMMENT: Alpha, Delta and Epsilon emphasize short-term maximum commodity production with considerable risk to long-term productivity and narrows future options for producing economic value on state lands. (109)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: In looking over the summary tables beginning on Page SUM-21, it looks like Gamma rates best on more consequences than any other alternative, and rates low only on NPV. Along the same lines, Epsilon is retained as one of the preferred, but in the tables it seems to rate lowest on quite a few of the consequences. (131)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

COMMENT: The DEIS does not rigorously explore and objectively evaluate all reasonable alternatives, and fails to present a reasonable range of alternatives. (138, 141)

RESPONSE: We applied a very systematic and comprehensive approach to developing an adequate range of alternatives based on our public scoping process. Each alternative represents a specific management philosophy. In some cases, certain aspects of the alternatives may be similar, for instance some of the RMS are similar in areas where we felt it was important to have a certain level of resource protection regardless of the other aspects of the philosophy.

COMMENT: The adverse impacts to the in-place resources from cutting and roading constitutes a significant portion of the total environmental impacts, and a broader range of "cutting level" options is required. (141)

RESPONSE: On the low end of harvest, the 5 MMBF of Gamma, represents a very low, limited salvage timber sales program. On the high end, 55 MMBF of Epsilon, we felt that this was this harvest was the maximum reasonable given our inventory. The actual timber harvest level will now be set by the annual sustainable yield study mandated by HB 201, which went into effect after the release of the DEIS.

Issue - The Alternatives - Gamma

COMMENT: Gamma demonstrates creative management by saying the DNRC can't improve on nature's ability to sustain a creative and healthy ecosystem and that a fixed land base will drive up the value of forested land. (114) Gamma is the most environmentally responsive a alternative. (141) Positive aspect of Gamma is that is could adjust to changing social values, while Zeta cannot. (139)

RESPONSE: We realize that some members of the public favored Gamma and/or Zeta, however, as we discussed on page SUM-20 of the DEIS, neither Gamma nor Zeta were chosen as preferred alternatives because we felt that, once developed, they would not meet the selection criteria (Executive Summary).

Issue - The Alternatives - Epsilon

COMMENT: HB 201 forces DNRC to choose Epsilon. (017)

RESPONSE: We disagree with this comment. HB 201 sets the annual timber harvest rate at 45-55 MMBF until an annual sustainable yield study is completed by a third-party contractor. The contractor will base the study on the management philosophy that is chosen as the final alternative in this programmatic plan. At this time, we don't know what that figure will be and have not based the development of the alternatives on an assumption of what that figure could be. It is more important for us to develop a sound, implementable management philosophy that allows us to meet our trust obligations; this decision will then in turn inform the study, which we will then be legally obligated to meet the timber harvest targeted by the study.

COMMENT: Epsilon is environmentally destructive on the short-term; blatant rejection of public lands stewardship. (130)

RESPONSE: We appreciate your opinion and will consider your input in the selection of a final alternative.

Issue - The Alternatives - Zeta

COMMENT: Zeta seems specifically designed to be unacceptable by the methodology of attaching to it a 70% exclusive leasing of State forest lands proposal. (141)

RESPONSE: We designed all of the alternatives through a careful process, strongly influenced by our public scoping efforts. We have been cognizant throughout the process that it was possible that not all of the alternatives, once developed, would be preferable given our selection criteria. However, we maintained a fair and consistent process in developing all of the alternatives and did not design any of them to be unselectable.

Issue - Blending / Modifying the Alternatives

COMMENT: Several commenters provided suggestions in the modification of alternatives and the blending of alternatives (003, 007, 016, 019, 020, 023, 025, 027, 028, 031, 032, 036, 037, 043, 044, 046, 047, 048, 051, 061, 062, 063, 068, 072, 076, 078, 083, 087, 090, 092, 095, 096, 103, 108, 109, 117, 121, 122, 125, 130, 143, 145, 147, 157, 160, 168).

RESPONSE: We thank you for taking the time to read and evaluate the alternatives presented in the DEIS for the management of state trust lands. We have considered all of the public's comments and concerns as well as those of our staff and the Land Board in the development of a hybrid alternative, Omega, which is presented in this Final EIS.

COMMENTERS (in order by comment number)

Please note that comments numbers 001 - 158, 175 were assigned to letters received and phone call transcripts. Comment numbers 159-174 were assigned to transcripts from the public hearings held in Billings, Bozeman, Missoula, and Kalispell during July 1995. If someone submitted both a written comment and spoke at the public hearing(s), only one comment number was assigned to that person. Comment numbers 165, 166 and 170 are missing from this list because they were inadvertently assigned to individuals who spoke at the hearing(s) and then it was discovered that they had also submitted a written comment. In these three cases, the commenter's input was combined and the higher number was abandoned.

Also note that in two instances, a person has two comment numbers. In these cases, the individuals signed two different letters - in one case as a representative of an organization and a private citizen (#036 and #054), and in the other case, in conjunction with other organizations (#071 and #138).

001 John V. Puckett
Missoula
002 George Bailey, Superintendent
Target Range Public Schools, Missoula
003 Anthony C. Colter
Louisiana Pacific Corporation, Deer Lodge
004 Jim Hagenbarth
Hagenbarth Livestock, Dillon
005 Barry Dexter
Stimson Lumber Company, Libby
006 Bob Storer, Forest & Lands Program Mgr., Southwestern Land Office, DNRC, Missoula
007 Ed Regan
Brand S, Livingston
008 Judy Smith
Missoula
009 John Gibson
Billings Rod & Gun Club, Billings
010 T. Millar Bryce
Plains
011 Gary Cremer, Resource Manager
Crown Pacific, Thompson Falls
012 Peter C. Gleim
Seeley Lake
013 Ronald Buentemeier
Columbia Falls
014 D. Brent Mitchell
Kalispell
015 Vern Swanson
2 Dudes Ranch, Philipsburg
016 Rem Kohrt, General Manager
F.H. Stoltze Land & Lumber Co., Columbia Falls
017 Stanley A. Nicholson
Montana Fiscal Forums, Seeley Lake
018 Don Kasten, Forester
Cascade Timber, Inc., Laurel
019 Dr. James R. Habeck, Professor
Div. of Biological Sciences, Univ. of MT, Missoula
020 Janet Ellis, Program Director
Montana Audubon Council, Helena
021 John F. Hossack, Forest Consultant
Owens & Hurst Lumber Co., Eureka
022 Robert J. Habeck, Air Quality Specialist
Air Quality Division, MDEQ, Helena
023 Jack Eppensperger, Superintendent
Darby Public Schools, Darby
024 Bill Hensley
BLM, Butte
025 Bill Roney
Billings
026 Jane Adams, Wildlife Biologist
Northwestern Land Office, DNRC, Kalispell
027 Peggy Paton
Billings
028 Bebe FitzGerald
Billings
029 Lou J. Kuennen
Kootenai National Forest, USFS, Libby

030 John A. Nesser, Regional Soil Scientist, Region 1, USFS, Missoula
031 Gareth Moon
Polson
032 Charles A. McCarty
Whitefish
033 Cecil Noble
Kalispell
034 Herbert B. Johnson
Fisheries Consultant, Kalispell
035 David & Ruth Torrence
Billings
036 Wayne Worthington, Secretary
Flathead Wildlife, Inc., Kalispell
037 Cary Hegreberg, Executive Vice President, Montana Wood Products Assn., Helena
038 Ralph G. Backes
Livingston
039 Joe Gutkoski
Bozeman
040 Sharon Bergman
Big Arm
041 Ferne L. Cohen
Whitefish
042 Elaine M. Corrigan
Polson
043 Donna Finstad
Missoula
044 Alan & Susan Moore
Whitefish
045 Ed Stoots
Lewistown
046 Sara Toubman
Helena
047 Peggy Schmidt
Missoula
048 John Mortenson
Florence
049 Thomas K. Harding
Whitefish
050 Greg Danelz, Acting Superintendent of Schools, Ravalli County, Hamilton
051 Anne K. Katsaris
Trout Creek
052 Robert C. Lucas, President
Big Sky Upland Bird Assn., Missoula
053 E. Terrill Nobles
Corvallis
054 Wayne Worthington
Kalispell
055 Ed Prach
Whitefish
056 Vern Francis, President
Medicine River Canoe Club, Great Falls
057 Joseph M. Gorsh
Missoula
058 Pat Simmons
Bozeman
059 Canyon Coalition
Hungry Horse
060 Bruce Farling, Executive Director
Montana Trout Unlimited
061 Bart Cooper, President
Montana Logging Assn., Kalispell
062 Beth & Tim Baker
Helena
063 Chris Fransden
Missoula
064 Lisa Mascho
Whitefish
065 Jack Kirkley, Professor of Biology
Western Montana College, Dillon
066 Kim Erway Birck
Missoula
067 James Armstrong
Bozeman
068 Rich Day, Director
Charles Hansberry, Intern
National Wildlife Federation, Missoula
069 Robert & Olive Robison
Corvallis
070 Phoebe R. Hunter
Missoula
071 Keith Hammer, Chairman
Swan View Coalition, Kalispell
- Arlene Montgomery, Program Director, Friends of the Wild Swan, Swan Lake
072 Anne Hedges
Helena
073 Deborah E. Boots
Noxon

074 Jack Atcheson, Sr.
Tony Schoonen
The Montana Coalition for Appropriate Management of State Land, Butte

075 Karen Feather
Polebridge

076 Steve Antonioli, President
Skyline Sportsman's Assn., Inc., Butte

077 William L. Yeats
Whitefish

078 D.L. Blank
Whitefish

079 Harold W. Hale
Columbia Falls

080 Lorris Woods
Columbia Falls

081 People for Elk
Hungry Horse

082 Margaret Beer, Data Manager
Montana Natural Heritage Program, Helena

083 Al Rollo, President
John Mumma, Associate Director
Region 2, Montana Wildlife Federation, Helena

084 Candy Richter
Choteau

085 Steven C. Bryson
Whitefish

086 Jan Metzmaker
Whitefish

087 Peggy Olson Trenk, Executive Director, Western Environmental Trade Assn. (WETA), Helena

088 Russ Ramlow
Whitefish

089 L. Youmans
Columbia Falls

090 Jane Timmerman
Kalispell

091 Michael Ware, President
Montanans for Multiple Use, Hungry Horse

092 Bruce A. Measure
Kalispell

093 Pauline & Bill Murray
Whitefish

094 Randall S. Ogle
Kalispell

095 Martha Bisharat
Whitefish

096 Joan Ryshavy
Manhattan

097 Joel A. Nelson
Libby

098 Ward B. McCartney III
Whitefish

099 Rex Boller
Kalispell

100 William R. Morgan
Kalispell

101 Rod Ash
Condon

102 Elna Darrow, Chair
Flathead Basin Commission, Kalispell

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This document printed on recycled paper.