AUGUST 1996

WILDLIFE MITIGATION PROGRAM

DRAFT ENVIRONMENTAL IMPACT STATEMENT

DOE/EA-0246

BONNEVILLE POWER ADMINISTRATION

Bonneville Power Administration Wildlife Mitigation Program Draft Environmental Impact Statement (DOE/EIS-0246)

Responsible Agency: Bonneville Power Administration (BPA), U.S. Department of Energy

Title of Proposed Action: Wildlife Mitigation Program Standards and Guidelines

States Involved: Idaho, Montana, Nevada, Oregon, Washington, and Wyoming

Abstract: BPA is responsible for mitigating the loss of wildlife habitat caused by the development of the Federal Columbia River Power System. BPA accomplishes this mitigation by funding projects consistent with those recommended by the Northwest Power Planning Council (Council). The projects are submitted to the Council from Indian Tribes, state agencies, property owners, private conservation groups, and other Federal agencies. Future wildlife mitigation actions with potential environmental impacts are expected to include land acquisition and management, water rights acquisition and management, habitat restoration and enhancement, installation of watering devices, riparian fencing, and similar wildlife conservation actions. BPA needs to ensure that individual wildlife mitigation projects are planned and managed with appropriate consistency across projects, jurisdictions, and ecosystems, as well as across time. BPA proposes to standardize the planning and implementation of individual wildlife mitigation projects funded by BPA. Alternative 1 is the No Action alternative, *i.e.*, not to establish program-wide standards. Five standardizing (action) alternatives are identified to represent the range of possible strategies, goals, and procedural requirements reasonably applicable to BPA-funded projects under a standardized approach to project planning and implementation. All action alternatives are based on a single project planning process designed to resolve site-specific issues in an ecosystem context and to adapt to changing conditions and information. Alternative 2 would prescribe only existing legal requirements (which would also form the "base" for Alternatives 3 - 6). Alternative 3 would additionally prescribe goals, strategies, and requirements emphasizing strict pursuit of project biological objectives. Alternative 4 would emphasize cost and administrative efficiency in achieving wildlife mitigation objectives. Alternative 5 (environmentally preferred) would emphasize general environmental protection in addition to wildlife mitigation objectives. Alternative 6 (BPA-preferred) seeks to balance wildlife mitigation objectives, cost and administrative efficiency, and general environmental protection. Decisions to be made are which strategies, goals, and procedural requirements, if any, should regularly apply to BPA-funded wildlife mitigation projects.

Date by which comments must be received: October 1, 1996

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BONNEVILLE POWER ADMINISTRATION

WILDLIFE MITIGATION PROGRAM DRAFT ENVIRONMENTAL IMPACT STATEMENT

Summary

Purpose of and Need for Action

BPA is responsible for mitigating wildlife habitat loss caused by development of the Federal Columbia River Power System. BPA meets this responsibility by funding projects submitted to and recommended by the Northwest Power Planning Council (Council). Project submissions come from Indian Tribes, state agencies, property owners, private conservation groups, and other Federal agencies. Future wildlife mitigation actions with potential environmental impacts are expected to include land acquisition and management, water rights acquisition and management, habitat restoration and improvement, installation of watering devices, riparian fencing, and similar wildlife conservation actions. BPA needs to ensure that these BPA-funded individual projects are planned and managed with appropriate consistency across projects, jurisdictions, and ecosystems, as well as across time.

BPA intends to base its choices among alternatives on the following objectives:

- Achievement of the biological objectives of wildlife mitigation projects to be implemented by BPA;
- Achievement of cost and administrative efficiency;
- Compliance with all applicable laws and regulations; and
- Environmental protection.

Proposed Action and Alternatives

BPA's proposed action is to establish a comprehensive program that addresses the common issues and environmental impacts associated with mitigation projects. With such a program in place, BPA implementation of individual wildlife mitigation projects would change in two fundamental ways.

- First, BPA's on-the-ground involvement would be greatly reduced as project proponents take the lead in preparing Project Management Plans according to the program requirements.
- Second, because this EIS explores, identifies, and discloses many of the environmental impacts expected from mitigation projects, individual projects may not require further National Environmental Policy Act (NEPA) review, so long as project managers follow the program requirements. Subsequent environmental analysis (including NEPA) would be required if anticipated impacts or project components were to differ substantially from those evaluated in this EIS.

Alternative 1, No Action, is to continue the current case-by-case approach to project implementation. Environmental review and decisionmaking would be conducted at the individual project level through separate categorical exclusions, environmental assessments, or environmental impact statements. BPA would continue to maintain a high level of involvement in making on-the-ground decisions.

Five action alternatives are evaluated and compared to accomplish the proposed action. The action alternatives identify different approaches to standardize the planning and implementation of individual wildlife mitigation projects funded by BPA. All action alternatives are based on a standard, interactive 8-step planning process[1] (described below under Alternative 2). Each alternative contains prescriptions (goals, strategies, and procedural requirements) that would be applied to BPA-funded wildlife mitigation projects under a standardized program.

Alternative 2, Base Response, would standardize the planning and implementation process, but would consist only of those prescriptions (i.e., goals, strategies, and processes) required by regulation or law. (Alternatives 3 through 6 would include all prescriptions listed under Alternative 2 as part of their actions.) These required prescriptions are described below, under the appropriate process step.

1. **Define the Area of Concern/Interest.** In the first step, project managers delineate the project boundaries and project issues.

   Under all action alternatives, project managers would:

   - Coordinate with water resource agencies to verify viability of new water sources and uses and to design and implement features necessary to protect aquatic systems and other water users.
   - Make preliminary identification of the presence or absence of listed and proposed threatened and endangered species and their habitat within the area that may be affected by the project.
   - Identify any minority and/or low-income populations that may be adversely affected by the mitigation project being considered.
   - *[For project involving property acquisition]* Make preliminary identification of the presence of historic and archeological resources.
   - *[For project involving property acquisition]* Make preliminary identification of the presence of hazardous and toxic wastes.

2. **Involve Stakeholders.** In the second step, managers gather input from affected agencies, land owners, Tribes, individuals, and organizations. This step is similar to the project scoping and public involvement that occurs in a NEPA analysis. Interested parties may include individuals; interest groups; Tribes; and county, state, regional, or Federal agencies.

[1] This process is adapted from *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies*, a report of the Interagency Ecosystem Management Task Force, June 1995.

Under all action alternatives, project managers would:

- Consult with affected Tribes, state fish and wildlife agencies, local governments, and adjacent landowners.

3. **Develop a Statement of the Desired Future Condition.** Under BPA's standard planning process, project managers develop a statement that expresses a clear conceptual picture of the ideal long-term state towards which efforts are directed.
   - *No standard prescriptions required.*

4. **Characterize the Historical and Present Site Conditions and Trends.** Project managers identify current and past condition of the project area in terms of composition, structure, function, stresses, and other variables.

   Under all action alternatives, project managers would:

   - Contact the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to determine whether threatened or endangered species are known to occur or potentially occur in the vicinity of the project area.
   - Consult with the State Historic Preservation Office (SHPO) and affected Tribes to identify potential occurrences of cultural resources.
   - Survey for threatened or endangered plant or animal species before disturbing land or conducting other activities that may affect such species if the USFWS and/or NMFS identify these species as potentially occurring in the vicinity of the project area.

5. **Establish Project Goals**. In step 5, project managers identify the specific targets (in terms of conditions, outputs, features, or functions) against which progress and success will be measured.
   - *No standard prescriptions required.*

6. **Develop and Implement an Action Plan for Achieving the Goals.** Project managers create a Project Management Plan that details the actions to be taken to achieve project goals, including the specific techniques, standards, and guidelines to be implemented and protocols for coordination with others.

   Under all action alternatives, project managers would:

   - Take no action inconsistent with Tribal legal rights, or with other legally mandated protections such as those under the Endangered Species Act.
   - Ensure that the project does not result in disproportionately high and adverse human health or environmental effects on minority or low-income populations, in accordance with Executive Order 12898 (Environmental Justice).
   - Follow State and Federal regulations for all activities in or near wetlands, whether for maintenance or improvement, including (1) the Clean Water Act, Section 404;

(2) Protection of Wetlands, Executive Order 11990; and (3) Floodplain Management, Executive Order 11988.

- Construct wildlife developments in consultation with water agencies and state and Tribal fish and wildlife agencies. Obtain required permits.
- Avoid activities that might adversely affect threatened and endangered species or their habitat. Document compliance with Section 7 of the Endangered Species Act.
- Use only Environmental Protection Agency (EPA)-approved pesticides, and use only in the manner specified by EPA.
- *[For projects involving use of herbicides]* Prevent use of herbicides in or near surface water, unless the herbicide has been EPA-approved for such use.
- Screen structures from sensitive viewing locations or develop designs that blend into the landscape in areas managed as National Scenic Areas.
- *[For projects involving prescribed burns]* Obtain required permits and use state-defined smoke management direction to determine allowable smoke quantities.
- If consultation with the SHPO and Tribes indicates a potential for cultural resources, conduct cultural resource surveys to document any resources that are present.
- *[For projects involving property acquisition (including leases), and where properties on or potentially eligible for the National Register of Historic Places are known to exist on the property]* Incorporate a cultural resource management plan or other SHPO-approved actions.
- Ensure that barriers are not created that unduly restrict access for physically disabled persons where public access is allowed.
- Specify that any new public-use facilities are free of barriers to persons with physical disabilities.

7. **Monitor Conditions and Evaluate Results**. Once a Project Management Plan is being implemented, project managers start a program to (1) monitor implementation of relevant standards and guidelines; (2) verify achievement of desired results; and (3) determine soundness of underlying assumptions.

   No standard prescriptions required.

8. **Adapt Management According to New Information.** In this step, project managers respond to new information and technology by adjusting management actions, directions, and goals: Management planning, action, monitoring, and feedback are established as a continuous cycle.

   No standard prescriptions required.

Note: Each of the prescriptions under Alternative 2 applies to each of the action alternatives described below.

Alternative 3, Biological Objectives Emphasis, would focus on technical results. In addition to the prescriptions under Alternative 2, BPA would support only those actions intended specifically to achieve biological objectives; however, project managers would retain a great deal of flexibility to adapt application of specific techniques and other actions to best meet the biological objectives of the project. Only minimal attention would be paid to cost or environmental consequences. Social, economic, and other resource conditions would be considered only as they relate to supporting biological objectives.

For example, BPA would expect project managers to select management techniques that best achieve project biological objectives, as determined on a case-by-case basis; to include (but not be limited to) reintroduction of wildlife species, major habitat restoration projects, use of prescribed fire, predator control, pesticide use (including herbicides), restriction of public access, purchase of private lands, water diversions, fencing, livestock removal, or other techniques. Management techniques intended to provide other resource benefits would be considered only as they relate to achieving the biological objective.

Alternative 4, Cost and Administrative Efficiency Emphasis, would support only the least costly approach to achieving project biological objectives, in addition to those prescriptions listed under Alternative 2. Project managers would emphasize minimizing administration costs and maximizing on-the-ground application of mitigation funds. Biological objectives would be limited to the Council's habitats and species priorities. Achievement of more comprehensive wildlife mitigation objectives, such as protection or improvement of natural ecosystems and general species diversity over the long term, would occur only incidentally to achievement of the priority objectives.

As with Alternative 3 (Biological Objectives), BPA would support only those actions directly aimed at achieving wildlife mitigation. However, under Alternative 4, project managers would also be restricted in the specific techniques and other actions available to them (i.e., only the least costly techniques would be available). Social, economic, and other resource conditions would be considered only as they relate to lowering costs of achieving and/or supporting biological objectives.

BPA would expect more passive, less aggressive strategies for achieving wildlife mitigation. For example, reliance primarily on natural regeneration rather than active restoration to achieve biological objectives. Also, management plans would typically not include the more costly techniques such as irrigation systems, purchase of water rights, purchase of private lands (including prime farmland or timber lands), fertilization, major habitat creation or water development, or provision of developed recreational opportunities, unless use of such methods clearly results in the least costly approach to achieving biological objectives.

Alternative 5, General Environmental Protection (environmentally preferred), in addition to those prescriptions listed under Alternative 2, would support actions providing collateral benefits for fish, recreation, local economic productivity, or other resources. Project managers would apply program-wide measures, as appropriate, to protect the environment, including soils, fish and water resources, vegetation, non-target wildlife, land use, local economies related to the

environment, recreation, and air quality. Management techniques likely to have adverse environmental impacts would be minimized.

BPA would support broad-scale project planning that takes into account many different resources, including more stakeholder and public involvement than under the other alternatives. For example, definition of the area of concern might include a comprehensive and rigorous analysis of economic, social, cultural, and ecological conditions that might influence area boundaries.

BPA would encourage project managers to include social, economic, cultural, and natural resource protection and improvement goals that complement the primary goal of wildlife mitigation. Activities might include identification of opportunities to foster public appreciation of the relationship between natural resources and Tribal culture, opportunities to foster public appreciation of wildlife and wildlife mitigation activities, or recreational opportunities suitable for physically disabled persons.

Alternative 6, Balanced Action (BPA's preferred alternative) seeks to achieve balance among the purposes emphasized in Alternatives 3, 4, and 5: (1) meeting the biological objectives of wildlife mitigation projects, (2) achievement of cost and administrative efficiency, and (3) protection and improvement of other environmental resources when such actions would support wildlife mitigation.

Under Alternative 6, BPA would support a wide range of actions to achieve wildlife mitigation consistent with Council's goals and priorities. BPA would place a strong emphasis on achieving the biological objectives in the least costly manner. Also, project managers would apply program-wide measures, as appropriate, to protect the environment, including soils, fish and water resources, vegetation, non-target wildlife, land use, local economies related to the environment, recreation, and air quality.

Unlike other alternatives, this alternative would develop new mitigation projects similar to past wildlife mitigation projects. The primary difference between the preferred alternative and the existing situation (No Action) is that, under Alternative 6, (1) BPA would establish a standard planning process and (2) project managers would apply program-wide mitigation measures, as appropriate, to protect the environment. These two differences would allow BPA to implement wildlife mitigation programs more efficiently and with greater consistency than under the current case-by-case approach.

Areas of Controversy

Local economic impacts. Many county officials in the Columbia River Basin are especially concerned about the potential impacts of converting land from economic uses to wildlife conservation use. The issue involves both a change in economic activity and a potentially reduced tax base, sometimes in counties already including substantial proportions of public land. Although the Council's Fish and Wildlife Mitigation Program specifies use of publicly owned land for wildlife mitigation (or management agreements on private land) in preference to acquisition of private land, the Council does approve projects involving property acquisition. BPA is prevented by law from making payments in lieu of taxes.

Public access. Some hold that wildlife mitigation lands should be managed strictly for wildlife benefit, and that public use harmful or disturbing to wildlife should not be allowed. For instance, some object to hunting on mitigation lands; others hold that hunting is a valid wildlife management technique. BPA recognizes that wildlife management is generally under state or Tribal jurisdiction. Others hold that persons with disabilities should be allowed special vehicular access where motorized vehicles are otherwise disallowed because of conflict with wildlife mitigation objectives.

Land maintenance. Publicly owned land can become a community nuisance if improperly managed. Public access can facilitate illegal dumping, and noxious weed infestations can affect neighboring land. County officials have stressed that, when land is to be acquired for wildlife mitigation, funding should be adequate to ensure proper maintenance. BPA is concerned about the mounting costs of project operations and maintenance, and looks for ways to minimize these expenses.

Project planning process. Project managers want to act quickly and efficiently. Affected interests, especially Tribes and county officials, want to participate in project management planning.

Major Conclusions

- Wildlife mitigation activities may have short-term adverse impacts on soils, with increasingly beneficial impacts in the long-term.
- Indirect impacts on fish and water resources may follow impacts on soils. Some wildlife mitigation activities are specifically intended to develop water resources for wildlife use.
- Target wildlife species and species with similar habitat needs would benefit most from wildlife mitigation activities.
- Vegetation associated with target wildlife habitat would increase most from wildlife mitigation activities, especially native plant communities.
- Where land was converted from private to public ownership, it could conflict with local land uses; however, conflict can often be avoided through early planning and local consultation.
- Where land was converted from private to public ownership or commodity production on public lands was lost, local tax bases would diminish. However, wildlife migitation land also provide opportunities for local economic benefit. Wildlife mitigation projects would not be sufficient in scale to cause broader impacts within regional economies.
- Wildlife mitigation sites are generally compatible with cultural resources. Ground-disturbing activities can adversely affect historic and cultural resources, but impacts can usually be avoided.
- Wildlife mitigation activities can benefit Tribal cultural values.
- Public use of wildlife mitigation lands can be compatible with wildlife mitigation objectives, but seasonal, area, and motor vehicle restrictions are often necessary.

- With observance of State and local burning regulations, wildlife mitigation activities would not significantly affect air quality.

Issues to Be Resolved

Bonneville Power Administration must decide:

- whether to adopt a set of management principles to guide all wildlife mitigation projects as selected by the Council, and
- if so, which set.

In the course of making these decisions, BPA will also be resolving the following issues:

1. Whether and to what extent BPA should prescribe conditions for funding types of wildlife mitigation actions.
2. Whether BPA should categorically eliminate any wildlife mitigation techniques from future funding consideration.
3. What role(s) might be most appropriate for public, Tribal, and agency participation in planning proposed wildlife mitigation projects.

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Chapter 1: Purpose of and Need for Action

Bonneville Power Administration (BPA) must mitigate for wildlife habitat that was lost during development of the Federal Columbia River Power System; it does so by funding individual projects recommended by the Northwest Power Planning Council. At present, Bonneville addresses all project issues and impacts project by project. This approach is inefficient: BPA must readdress many common issues that arise repeatedly with each successive project. This approach does not foster consistency across projects, jurisdictions, and regions, or across time. BPA needs to find a way to ensure that consistency.

1.1 UNDERLYING NEED FOR ACTION

The network of rivers that feeds into the Pacific Northwest's Columbia River Basin has been altered by dams built to generate power, as well as to control flooding and to provide navigation, irrigation, and recreation services. Twenty-nine Federal hydroelectric dams and numerous other dams now regulate the flows of many of these rivers.

Development of this hydropower system has had far-reaching effects on wildlife and wildlife habitat. Many floodplains and riparian habitats important to wildlife were inundated when reservoirs filled behind dams. Streams have been channelized and roads and electrical facilities built. All these developments have acted to change or eliminate wildlife habitat. The Bonneville Power Administration (BPA) is responsible for mitigating the loss of wildlife habitat caused by development of the Federal Columbia River Power System. (See Pacific Northwest Electric Power Planning and Conservation Act [Northwest Power Act], 16 U.S.C. 839 *et seq.*; Section 4.[h][10][A].)

Specific mitigation actions that BPA may support to satisfy this responsibility are generally developed in a public process managed by the Northwest Power Planning Council (Council). BPA is asked to implement projects included in the Council's annual Columbia River Basin Fish and Wildlife Program (Fish and Wildlife Program). Implementation covers a wide range of activities and a variety of potential implementors, each with different points of view and mandates. For instance, present and future BPA wildlife mitigation actions with potential environmental effects are expected to include the following:

- fee-title land acquisition and management;
- property lease and management;
- conservation easement acquisition and management;
- water rights acquisition and management;
- habitat restoration and improvement;
- installation of watering devices;

- riparian fencing; and
- similar wildlife conservation actions.

Potential project implementors and managers include Indian Tribes, state agencies, property owners, private conservation groups, and other Federal agencies. The range of actions and actors means that ensuring consistency from project to project is difficult. BPA needs to ensure that individual wildlife mitigation projects are planned and managed with appropriate consistency across projects, jurisdictions, and ecosystems, as well as across time.

1.2 PURPOSES

BPA intends to base its choices among alternatives on the following objectives:

- Achievement of the Fish and Wildlife Program's biological objectives for wildlife mitigation projects to be implemented by BPA;
- Achievement of cost and administrative efficiency;
- Compliance with all laws and regulations; and
- Environmental protection.

1.3 BACKGROUND

The Northwest Power Act recognized that development and operation of the Federal hydroelectric dams of the Columbia River and its tributaries have affected fish and wildlife resources. The Act created the Council, in part, to develop a program to protect, mitigate, and enhance fish and wildlife, including related habitat, within the Columbia River Basin (section 4[h][1][A]).

With considerable public participation, the Council prepared the its Fish and Wildlife Program[1], an outline of steps to achieve this mandate. The first Program was prepared in 1982; it has been amended from time to time with additional public participation. Related events include:

- State-prepared mitigation status reports for each Federal hydroelectric project;
- Wildlife loss assessments prepared by States and Tribes, using U. S. Fish and Wildlife Service (USFWS) Habitat Evaluation Procedures (HEP);
- An independent scientific audit of the loss assessments (Council, 1993); and

[1] While BPA does not embrace every provision in the Council's Program, BPA does use the Program to guide BPA's implementation of wildlife measures that mitigate for the power share of impacts on wildlife and wildlife habitat caused by the Federal Columbia River Power System.

- Development of a wildlife mitigation project prioritization process managed by the Columbia Basin Fish and Wildlife Authority,[2] with the participation of the Yakama Indian Nation. This process includes independent scientific review and public comment opportunities.

According to the Council's current Program, "The goal of this [P]rogram's wildlife strategy is to achieve and sustain levels of habitat and species productivity as a means of fully mitigating wildlife losses caused by construction and operation of the [F]ederal and non-[F]ederal hydroelectric system." Also, "For purposes of this [P]rogram, mitigation is defined as achieving and sustaining the levels of habitat and species productivity for the habitat units lost as a result of the construction and operation of the [F]ederal and non-[F]ederal hydropower system." (Council, 1995: 11-3) The Program directs development of wildlife mitigation plans and projects consistent with the following principles:

- To select the least costly way to achieve the biological objective;
- To have measurable objectives, such as the restoration of a given number of habitat units;
- To protect high-quality native or other habitat or species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species;
- To provide riparian or other habitat that can benefit both fish and wildlife;
- Where practical, to mitigate losses in-place, in-kind;
- To help protect or enhance natural ecosystems and species diversity over the long term;
- To complement the activities of the region's state and Federal wildlife agencies and Indian Tribes;
- To encourage the formation of those partnerships with other persons or entities that would reduce project costs, increase benefits, and/or eliminate duplicate activities;
- To address special wildlife losses in areas of historic salmon and steelhead runs that were eliminated by hydroelectric projects;
- To address concerns over additions to public land ownership and impacts on local communities, such as reduction or loss of local government tax or economic base, or consistency with local governments' comprehensive plans; and

[2] The Columbia Basin Fish and Wildlife Authority is a regional association of Columbia River Basin fish and wildlife managers, including the Burns Paiute Tribe; Coeur d'Alene Tribe; Colville Confederated Tribes; Confederated Salish and Kootenai Tribes; Confederated Tribes of the Umatilla Indian Reservation; Confederated Tribes of the Warm Springs Indian Reservation; Kootenai Tribe of Idaho; Kalispel Tribe; Nez Perce Tribe; Shoshone-Bannock Tribes; Shoshone-Paiute Tribes of the Duck Valley Reservation; Spokane Tribe of Indians; Idaho Department of Fish and Game; Montana Fish, Wildlife and Parks; Oregon Fish and Wildlife; Washington Department of Fisheries and Wildlife; the National Marine Fisheries Service; and the U. S. Fish and Wildlife Service.

- To use publicly owned land for mitigation or management agreements on private land (in preference to acquiring private land), while providing permanent protection or enhancement of wildlife habitat in the most cost-effective manner. (Council, 1995: p. 11-3 &4)

The current Program also identifies habitat type and target species mitigation priorities for the three Columbia River Basin subbasins, as shown in Table 1-1.

Table 1-1:
Columbia River Basin Wildlife Mitigation Habitat Type and Target Species Priorities

Subbasin	High Priority	Medium Priority	Low Priority
Lower Columbia	• Riparian/Riverine *Great blue heron* • Old Growth Forest *Northern Spotted Owl* Wetlands *Great blue heron* *Band-tailed pigeon* *Western pond turtle*	• Coniferous Forest *Ruffed grouse* *Elk* *American black bear* *Cougar*	
Upper Columbia	• Riparian/Riverine *Bald eagle (breeding)* *Black-capped chickadee* *Peregrine falcon* • Shrub-Steppe *Sharp-tailed grouse* *Pygmy rabbit* *Sage grouse* *Mule deer* Wetlands *Mallard* *Redhead*	• Islands *White pelican*	• Agricultural lands *Swainson's hawk* *Ring-necked pheasant*
Snake River	• Riparian/Riverine *Bald eagle (breeding)* *Bald eagle (wintering)* *River otter* *Black-capped chickadee* *Peregrine falcon* *Ruffed grouse* • Wetlands *Mallard*	• Native Grass and Shrubland *Mule deer* *Elk* *White-tailed deer* *Sharp-tailed grouse* • Coniferous Forest *Elk* Old Growth Forest *Pileated woodpecker*	• Lowland Forest *White-tailed deer*

Source: Council, 1995: p. 11-5, 6 & 7.

The Program and its amendments have included wildlife mitigation projects proposed by States, Tribes, Federal agencies, and others. Future Program amendments are expected to include additional projects for implementation. Where a mitigation project relates to power production, inclusion in the Council's Program represents a recommendation that BPA

implement the project in accordance with the Northwest Power Act (section 4[h][10][A]). Wildlife mitigation projects proposed for BPA implementation in the past have varied considerably in scale and in detail. Typically, several project management issues have needed resolution prior to BPA implementation; this has been especially true of larger, more complex projects.

1.4 RELATIONSHIP TO OTHER DOCUMENTS

1.4.1 Other BPA Wildlife Mitigation Program Environmental Analyses

Planning for several wildlife mitigation projects, and associated environmental review, has proceeded during preparation of this environmental impact statement (EIS). These projects are:

- Albeni Falls Wildlife Project (DOE/EA-1099) in northern Idaho;
- Washington Wildlife Mitigation Projects (DOE/EA-1096), covering several projects in Washington;
- Anderson Ranch/Camas Prairie Wildlife Project (DOE/EA-1129) in southern Idaho; and
- Northeast Oregon Wildlife Mitigation Project (DOE/EA-1160) in northeast Oregon and southeast Washington.

BPA decisions regarding these projects are independent of this EIS and will not in any way dictate its outcome.

1.4.2 Vancouver Lowlands Wildlife Project EIS

In March 1996, BPA published a Notice of Intent to Prepare an EIS on the Vancouver Lowlands Wildlife Project. The project involves the purchase and management of wildlife mitigation lands in Clark County, Washington. Scoping for the project EIS identified concern that time taken to prepare the EIS might limit the opportunity to purchase available lands. BPA has agreed to discontinue preparation of the Vancouver Lowlands Wildlife Project EIS and fund purchase of the property under two conditions:

1. That the project manager, Washington Department of Fish and Wildlife (WDFW), will keep the property in its status quo, not changing use of the property or undertaking large-scale management activities until completion of the Wildlife Mitigation Program EIS and Record of Decision; and
2. That WDFW prepare a project management plan consistent with the requirements of the alternative that BPA selects from this EIS.

Many issues raised in scoping the Vancouver Lowlands Wildlife Project EIS are addressed in the Wildlife Mitigation Program EIS; site-specific issues will be addressed in the Vancouver Lowlands Project Management Plan to be prepared by WDFW.

1.4.3 Columbia River System Operation Review (SOR) EIS

In December 1995, BPA, the U.S. Bureau of Reclamation (BOR), and the U.S. Army Corps of Engineers (Corps), as joint lead agencies, published the SOR final EIS (DOE/EIS-0170). That EIS examined the impacts of various system operating strategies, including impacts on wildlife resources. Appendix N of the EIS focuses on wildlife and recommended mitigation measures that may be included in future Council Fish and Wildlife Program amendments.

1.4.4 BPA Watershed Management Program

In March 1996, BPA published a Notice of Intent to Prepare an EIS on the Watershed Management Program. As with the Wildlife Mitigation Program, BPA proposes to establish standards and guidelines for planning and implementing watershed conservation and rehabilitation projects throughout the Columbia River Basin. Although the underlying need of the Watershed Management Program is mitigation for the loss of fish habitat caused by the construction and operation of Federal hydroelectric projects in the Basin, many of the program's techniques are similar to those for wildlife mitigation. Therefore, much of the environmental impact analysis and potential standards and guidelines addressed in the Wildlife Mitigation Program EIS will also be included in the Watershed Management Program EIS. That EIS is scheduled for completion in mid-1997.

1.4.5 Interior Columbia Basin Ecosystem Management Project EISs

The U.S. Bureau of Land Management (BLM) and U.S. Forest Service (USFS) are jointly proposing to develop and implement an ecosystem-based management strategy for lands they administer in the upper Columbia River Basin (UCRB). The agencies are preparing two EISs on land management strategies: the UCRB EIS addresses USFS- and BLM-administered lands in parts of Idaho, Montana, Wyoming, Nevada, and Utah; the Eastside EIS addresses agency lands in eastern Oregon and Washington. Because the geographic scope and many of the management issues are similar, BPA's Wildlife Mitigation Program EIS references several relevant studies prepared for these EISs.

1.5 DECISIONS TO BE MADE

Preparation of this document is intended to fulfill the requirements of the National Environmental Policy Act (NEPA) for BPA. Two decisions will be made from this document.

Bonneville Power Administration must decide:

- whether to adopt a set of management principles to guide all wildlife mitigation projects as selected by the Council, and
- if so, which set.

In the course of making these decisions, BPA will also be resolving the following issues:

1. Whether and to what extent BPA should prescribe conditions for funding types of wildlife mitigation actions.
2. Whether BPA should categorically eliminate any wildlife mitigation techniques from future funding consideration.
3. What role(s) might be most appropriate for public, Tribal, and agency participation in planning proposed wildlife mitigation projects.

If BPA were to adopt a set of governing principles, individual projects could be undertaken (once approved for funding) with the development and implementation of a Project Management Plan and without further NEPA analysis (unless the anticipated impacts or project components were to differ substantially from those evaluated in this EIS). If BPA were to decide *not* to adopt a set of principles (the No Action alternative), each individual project would be required to evaluate environmental impacts under NEPA.

1.6 SCOPING

A Notice of Intent (NOI) to prepare an EIS for the Wildlife Mitigation EIS was issued on June 12, 1995. Scoping meetings were held throughout BPA's service area with interested parties, including representatives of Native American Tribes and of local and county governments. Meeting sites included Flathead, Montana; Boise and Fort Hall, Idaho; Burns, Mission, Portland, Salem, and Warm Springs, Oregon; Owyhee, Nevada; and Olympia, Spokane, Toppenish, Moses Lake, and Grand Coulee, Washington. Over 50 people attended these meetings, and 6 letters were received on issues of concern for the project.

The following issues were identified during the scoping process:

- the EIS process itself, including the extent to which public involvement and local consultation and review would play a part
- socioeconomic issues centering on land acquisition and multiple use opportunities and conflicts, as well as on potential local effects on the economy
- cultural values and resource protection
- Tribal rights
- public access
- project management (who, and by what means)
- resources management: water, vegetation, wetlands, wildlife; weeds/chemicals; fire management
- issues related to public versus private land ownership
- government "taking" of private property.

In addition, many of these issues were identified in written and spoken comments present at an April 9, 1996, open house for the proposed Vancouver Lowlands Wildlife Mitigation Project. Most of these issues are addressed in this Wildlife Mitigation Program EIS; more site-specific issues will be addressed in the Vancouver Lowlands Project Management Plan to be prepared by the WDFW.

Chapter 2: Alternatives Including the Proposed Action

Chapter 2 describes and compares five action alternatives to accomplish the proposed action, as well as the No Action alternative. The action alternatives identify different approaches to standardize the planning and implementation of individual wildlife mitigation projects funded by BPA. All action alternatives are based on the same planning process. Each one contains prescriptions (goals, strategies, and procedural requirements) that would be applied to BPA-funded wildlife mitigation projects under a standardized program.

As described in Chapter 1, BPA needs to mitigate for wildlife habitat that was lost during development of the Federal Columbia River Power System. BPA accomplishes this mitigation by funding projects recommended by the Council.

Many of the projects recommended by the Council are submitted as proposals from various sources ("project proponents"), including Indian Tribes, state agencies, property owners, private conservation groups, or other Federal agencies. Project proponents develop proposals (to various degrees of detail) and submit them to the Council for consideration. Council then selects projects to recommend for BPA funding.

At present, BPA addresses each project and its accompanying NEPA analysis on a case-by-case basis. BPA works closely with project proponents to develop a Project Management Plan. BPA then funds the project, and the project proponents (now called "project managers") implement the project according to the Project Management Plan and an accompanying Memorandum of Agreement.

BPA's proposed action is to establish a comprehensive program that addresses the common issues and environmental impacts associated with mitigation projects. With such a program in place, BPA implementation of individual wildlife mitigation projects would change in two fundamental ways.

- First, BPA's on-the-ground involvement would be greatly reduced as project proponents take the lead in preparing Project Management Plans according to the program requirements.
- Second, because this EIS explores, identifies, and discloses many of the environmental impacts expected from mitigation projects, individual projects may not require further NEPA review, so long as project managers follow the program requirements. Subsequent environmental analysis (including NEPA) would be required if anticipated impacts or project components were to differ substantially from those evaluated in this EIS.

2.1 THE ALTERNATIVES

Six alternatives are evaluated in this EIS (five action alternatives plus the No Action alternative). While each of the five action alternatives identifies a different approach to standardizing the planning and implementation of individual wildlife mitigation projects funded by BPA, they are all based on a single planning process (see Section 2.1.1).

Sections 2.1.2 through 2.1.7 describe each of the alternatives, including No Action. The alternatives present a range of possible strategies, goals, and procedural requirements (referred to collectively as management prescriptions) to be applied to BPA-funded projects. Following these descriptions, Section 2.1.8 outlines the actual on-the-ground techniques that might be used under any of the alternatives to support and achieve wildlife mitigation.

2.1.1 The Process for Project Implementation Common to All Alternatives

Each action alternative is developed from an ecosystem-based project planning process[3]. The process seeks to solve problems within the context of landscapes (as defined by the human and natural environment) rather than the context of land parcels (ownership and jurisdictional lines). The goal of this process is to encourage Federal actions that support both a sustainable environment and a sustainable economy.

BPA would require that BPA-funded projects follow the eight basic steps of the standard planning process. For each project, managers would develop a Project Management Plan that addresses each step, commensurate with project scale and complexity. This process is **interactive,** rather than linear, and can involve many feedback loops between steps. For example, the results of one step may require that managers re-evaluate earlier steps.

The steps are as follows:

1. **Define the Area of Concern/Interest.** In this step, project managers delineate the project boundaries and project issues.

2. **Involve Stakeholders.** In the second step, managers gather input from affected agencies, land owners, Tribes, individuals, and organizations. This step is similar to the project scoping and public involvement that occurs in a NEPA analysis. Interested parties may include individuals; interest groups; Tribes; and county, state, regional, or Federal agencies.

3. **Develop a Statement of the Desired Future Condition.** Under BPA's standard planning process, project managers develop a statement that expresses a clear conceptual picture of the ideal long-term state towards which efforts are directed.

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[3] This process is adapted from *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies*, a report of the Interagency Ecosystem Management Task Force, June 1995.

4. **Characterize the Historical and Present Site Conditions and Trends.** Project managers identify current and past condition of the project area in terms of composition, structure, function, stresses, and other variables.

5. **Establish Project Goals**. In step 5, project managers identify the specific targets (in terms of conditions, outputs, features, or functions) against which progress and success will be measured.

6. **Develop and Implement an Action Plan for Achieving the Goals.** Project managers create a Project Management Plan that details the actions to be taken to achieve project goals, including the specific techniques, standards, and guidelines to be implemented and protocols for coordination with others.

7. **Monitor Conditions and Evaluate Results**. Once a Project Management Plan is being implemented, project managers start a program to (1) monitor implementation of relevant standards and guidelines; (2) verify achievement of desired results; and (3) determine soundness of underlying assumptions.

8. **Adapt Management According to New Information.** In this step, project managers respond to new information and technology by adjusting management actions, directions, and goals: management planning, action, monitoring, and feedback are established as a continuous cycle.

2.1.2 No Action

Alternative 1, No Action, is to continue the current case-by-case approach to project implementation. The eight-step process would not be formally adopted to implement wildlife projects. Environmental review and decisionmaking would be conducted at the individual project level through separate categorical exclusions, environmental assessments, or environmental impact statements. BPA would continue to maintain a high level of involvement in making on-the-ground decisions.

2.1.3 Alternative 2: Base Response

This alternative proposes to standardize the planning and implementation of individual wildlife mitigation projects funded by BPA, but only with respect to those prescriptions (i.e., goals, strategies, and processes) required by regulation or law. (Alternatives 3 through 6 will include all prescriptions listed under Alternative 2 as part of their actions.) These required prescriptions are described below, under the appropriate process step.

1. **Define the Area of Concern/Interest**

   Under all action alternatives, project managers would:

   - Coordinate with water resource agencies to verify viability of new water sources and uses and to design and implement features necessary to protect aquatic systems and other water users.
   - Make preliminary identification of the presence or absence of listed and proposed threatened and endangered species and their habitat within the area that may be affected by the project.
   - Identify any minority and/or low-income populations that may be adversely affected by the mitigation project being considered (Environmental Justice).
   - *[For project involving property acquisition]* Make preliminary identification of the presence of historic and archeological resources.
   - *[For project involving property acquisition]* Make preliminary identification of the presence of hazardous and toxic wastes.

2. **Involve Stakeholders**

   Under all action alternatives, project managers would:

   - Consult with affected Tribes, state fish and wildlife agencies, local governments, and adjacent landowners.

3. **Develop a Statement of the Desired Future Condition**

   No standard prescriptions required.

4. **Characterize the Site Conditions and Trends**

   Under all action alternatives, project managers would:

   - Contact the USFWS and NMFS to determine whether threatened or endangered species are known to occur or potentially occur in the vicinity of the project area.
   - Consult with the State Historic Preservation Office (SHPO) and affected Tribes to identify potential occurrences of cultural resources.
   - Survey for threatened or endangered plant or animal species before disturbing land or conducting other activities that may affect such species if the USFWS and/or NMFS identify these species as potentially occurring in the vicinity of the project area.

5. **Establish Project Goals**

   No standard prescriptions required.

6. Develop and Implement an Action Plan for Achieving the Goals

Under all action alternatives, project managers would:

- Take no action inconsistent with Tribal legal rights, or with other legally mandated protections such as the Endangered Species Act.[4]
- Ensure that the project does not result in disproportionately high and adverse human health or environmental effects on minority or low-income populations, in accordance with Executive Order 12898 (Environmental Justice).
- Follow State and Federal regulations for all activities in or near wetlands, whether for maintenance or enhancement, including (1) the Clean Water Act, Section 404; (2) Protection of Wetlands, Executive Order 11990; and (3) Floodplain Management, Executive Order 11988.
- Construct wildlife developments in consultation with water agencies and state and Tribal fish and wildlife agencies. Obtain required permits.
- Avoid activities that may adversely affect threatened and endangered species or their habitat. Document compliance with Section 7 of the Endangered Species Act.
- Use only Environmental Protection Agency (EPA)-approved pesticides, and use only in the manner specified by EPA.
- *[For projects involving use of herbicides]* Prevent use of herbicides in or near surface water, unless the herbicide has been EPA-approved for such use.
- Screen structures from sensitive viewing locations or develop designs that blend into the landscape in areas managed as National Scenic Areas.
- *[For projects involving prescribed burns]* Obtain required permits and use state-defined smoke management direction to determine allowable smoke quantities.
- If consultation with the SHPO and Tribes indicates a potential for cultural resources, conduct cultural resource surveys to document any resources that are present.
- *[For projects involving property acquisition (including leases), and where properties on or potentially eligible for the National Register of Historic Places are known to exist on the property]* Incorporate a cultural resource management plan or other SHPO-approved actions.
- Ensure that barriers are not created that unduly restrict access for physically disabled persons where public access is allowed.
- Specify that any new public-use facilities are free of barriers to persons with physical disabilities.

[4] See the **Consultation, Review, and Permits** discussion in Chapter 5.

7. **Monitor Conditions and Evaluate Results**

   No standard prescriptions required.

8. **Adapt Management According to New Information.**

   No standard prescriptions required.

Note: Each of the prescriptions under Alternative 2 applies to each of the other four action alternatives described below.

2.1.4 Alternative 3: Biological Objectives Emphasis

Under this alternative, in addition to those prescriptions under Alternative 2, BPA would standardize the planning and implementation process by supporting only those actions intended specifically to achieve biological objectives; however, project managers would retain a great deal of flexibility to adapt application of specific techniques and other actions to best meet the biological objectives of the project. Specific management techniques are listed in Appendix A.

Biological objectives would focus on the Council's habitats and species priorities, but would also include more comprehensive wildlife mitigation objectives, such as protection or improvement of natural ecosystems and general species diversity over the long term.

1. **Define the Area of Concern/Interest (Alternative 3)**

   In addition to the prescriptions required under Alternative 2, project managers would undertake the following:

   - Select boundaries defined by habitat type and species identified as Council priorities, as listed in Table 1-1 (Council 1995).

2. **Involve Stakeholders (Alternative 3)**

   Under Alternative 3, no requirements for stakeholder involvement are proposed, other than those prescribed under Alternative 2.

3. **Develop a Statement of the Desired Future Condition (Alternative 3)**

   Under Alternative 3, BPA would support desired future conditions that focus exclusively on achieving wildlife mitigation. Social, economic, and other resource conditions would be considered only as they relate to supporting biological objectives.

   Project managers would undertake the following:

   - Identify a desired future condition that responds specifically and exclusively to achievement of biological objectives.

4. **Characterize the Site Conditions and Trends (Alternative 3)**

With the focus on achieving wildlife objectives, BPA would support characterization of environmental elements that project managers need to understand in order to achieve wildlife mitigation effectively.

In addition to the required prescriptions, project managers would undertake the following:

- Identify and map soil conditions, topography, hydrology, vegetation, and other physical and biological systems within areas proposed for habitat improvements.
- Establish baseline information for habitat and species against which change can be measured (related to the "measurable biological objective" standard included in step 5).

5. **Establish Project Goals (Alternative 3)**

Project managers would undertake the following:

- Establish measurable biological objectives (e.g. number of habitat units, acres and/or habitat types, list of indicator species).
- Include, as a project goal:
  * protection of high-quality native or other habitat or species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species;
  * development of riparian or other habitat that can benefit both fish and wildlife;
  * mitigation of habitat losses in-place, in kind, wherever possible;
  * protection or improvement of natural ecosystems and species diversity over the long term; and
  * development of habitat that complements the activities of the region's Tribes and state and Federal wildlife agencies.

6. **Develop and Implement an Action Plan for Achieving the Goals (Alternative 3)**

Under Alternative 3, BPA would support a wide range of management techniques and other actions, with the condition that they be the best to achieve wildlife mitigation. Only minimal attention would be paid to cost of environmental consequences. Management techniques intended to provide other resource benefits would be considered only as they relate to achieving the biological objective.

In addition to the required prescriptions, project managers would undertake the following:

- Consider the full range of management techniques available, and use the method that best achieves the biological objective, as determined on a case-by-case basis; to include (but not be limited to) reintroduction of wildlife species, major habitat restoration projects, use of prescribed fire, predator control, pesticide use (including herbicides), restriction of public access, purchase of private lands, water diversions, fencing, livestock removal, or other techniques as described in Appendix A.
- Control nuisance animals or unwanted or competing plant species where they are hindering establishment of vegetation.

7. **Monitor Conditions and Evaluate Results (Alternative 3)**

Under Alternative 3, BPA would encourage and support more rigorous and comprehensive monitoring of mitigation objectives than under the other alternatives.

Project managers would undertake the following:

- Monitor specific performance standards for status and trend of progress toward biological objectives (established under Steps 4 and 5).

8. **Adapt Management According to New Information (Alternative 3)**

Under Alternative 3, BPA would encourage and support adaptive management actions that respond to problems or opportunities identified through monitoring. Project managers would also be encouraged to apply new knowledge, insights, or technologies that might contribute to meeting biological objectives.

Project managers would undertake the following:

- Use monitoring information to guide annual management priorities and activity planning.

2.1.5 Alternative 4 - Cost and Administrative Efficiency Emphasis

Under this alternative, in addition to the prescriptions under Alternative 2, BPA would standardize the planning and implementation process by supporting only the least costly approach(es) to achieving the project's biological objectives. Project managers would emphasize minimizing administration costs and maximizing on-the-ground application of mitigation funds.

Biological objectives would be limited to the Council's habitats and species priorities. Achievement of more comprehensive wildlife mitigation objectives, such as protection or improvement of natural ecosystems and general species diversity over the long term, would occur only incidentally to achievement of the priority objectives.

As with Alternative 3 (Biological Objectives), BPA would support only those actions directly aimed at achieving wildlife mitigation. However, under Alternative 4, project managers would also be restricted in the specific techniques and other actions available to them (i.e., only the least costly techniques would be available). A list of management techniques is found in Appendix A.

1. **Define the Area of Concern/Interest (Alternative 4)**

   Under Alternative 4, BPA would consider support of focused planning that seeks out opportunities to minimize costs associated with land acquisition and subsequent actions required to achieve wildlife mitigation.

   In addition to the required prescriptions, project managers would undertake the following:

   - When identifying potential mitigation sites, examine public lands first to determine opportunities for adjustments, land exchanges, and reciprocal management agreements that eliminate management inefficiencies and inconsistencies.
   - Select lands requiring a minimum financial output, with emphasis on existing Federal or state lands.
   - Consider long-term lease or easement acquisition where public lands are not available.
   - If possible, obtain financial or land management partnerships for achieving project objectives, including agreements with non-electric power development mitigation programs, to ensure coordinated and expeditions program implementation.

2. **Involve Stakeholders (Alternative 4)**

   Under Alternative 4, stakeholder involvement would be streamlined, with fewer non-partner stakeholders identified and with a lower level of public involvement (e.g., fewer meetings and publications).

   A major emphasis would be placed on identifying stakeholders that can enter cooperative planning and share administrative and implementation costs. BPA staff would undertake a much lower level of project involvement than under the other alternatives, deferring almost completely to project proponents to develop and administer project-specific plans according to the requirements of this alternative.

   In addition to the required prescriptions, project managers would undertake the following:

   - Develop a simple and efficient public involvement program that includes solicitation of public input (by posting in the local paper of record and in BPA's monthly newsletter).

- Wherever possible, form partnerships with government agencies or other entities so as to reduce project costs, increase benefits, and/or eliminate duplicate activities.

- Tie Project Management Plans into existing Federal or state management plans whenever possible (e.g., use or adapt fire management plans already developed for USFS, BLM, or State lands near the mitigation area).

- Limit non-partner stakeholders to those with immediate interests in the project, such as adjacent landowners, representatives from local government, and jurisdictional tribal authorities.

3. **Develop a Statement of the Desired Future Condition (Alternative 4)**

   Under Alternative 4, BPA would support concepts that focus exclusively on wildlife mitigation with the lowest possible cost. Social, economic, and other resource conditions would be considered only as they relate to lowering costs of achieving and/or supporting biological objectives.

   Project managers would undertake the following:

   - Facilitate the development of a statement of the desired future condition, in cooperation with local, state, Federal, and Tribal governments; and non-governmental stakeholders (rather than having BPA facilitate).

   - Identify a desired future condition that is self-sustaining (low maintenance).

   - Consider concepts that include sustainable revenue generation (e.g. crop production, timber harvest) to reduce initial or long-term Federal costs, consistent with biological objectives.

4. **Characterize the Site Conditions and Trends (Alternative 4)**

   BPA would support only those efforts to characterize the ecosystem listed under the standard project management prescriptions common to all action alternatives (Alternative 2).

5. **Establish Project Goals (Alternative 4)**

   The overall goal under Alternative 4 would be to reduce program and administrative costs. BPA would encourage goals to include self-sustaining or low-maintenance mitigation areas, and would emphasize developing low-maintenance plans requiring lower budgets (or lower amounts of initial trust funds established by BPA to fund the project). Consideration would be given to economic use of mitigation lands to augment annual funding. Social, economic, and other resource conditions would be considered only as they relate to supporting the least costly approach to achieving biological objectives.

Project managers would undertake the following:

- Include, as a project goal, sustainable ecological systems substantially independent of active management needs.

- For forest lands, adapt the recommended goals outlined in the Federal Wildland Fire Management Policy and Program Review (USDI and USDA, 1995). (The report recommends that agencies develop a plan-by-plan strategy to introduce landscape-scale prescribed burns across agency boundaries. The report also directs agencies to seek opportunities to enter into partnerships with Tribal, state, and private land managers to achieve this objective.)

- Include, as a project goal, sustainable revenue generation (e.g., crop production, timber harvest) to reduce initial or long-term Federal costs, consistent with biological objectives.

6. Develop and Implement an Action Plan for Achieving the Goals (Alternative 4)

Under Alternative 4, BPA would support a more passive, less aggressive strategy for achieving wildlife mitigation. Project managers would have to select techniques that could achieve biological objectives with the lowest project costs.

In addition to the required prescriptions, project managers would undertake the following:

- Rely primarily on natural regeneration rather than active restoration to achieve biological objectives.

- Develop management plans that do not require the more costly techniques such as irrigation systems, purchase of water rights, purchase of private lands (including farmland or timber lands), fertilization, major habitat creation or water development, or provision of developed recreational opportunities, unless use of such methods clearly results in the least costly approach to achieving biological objectives.

- Allow passive recreation, providing it requires only minimal funding and does not interfere with achieving wildlife mitigation.

- Consider charging for permits to access mitigation lands, and apply revenue to achieve the project's biological objectives.

- For forest lands, enter a collective management agreement with Federal and state landowners to implement actions outlined in the Federal Wildland Fire Management Policy and Program Review (USDI and USDA, 1995).

- Dedicate to the project any revenue gained from commerce that results from use of the property.

7. **Monitor Conditions and Evaluate Results (Alternative 4)**

   Because emphasis would be placed on passive management and natural regeneration, no specific monitoring requirements would be established under the cost and administrative efficiency alternative.

8. **Adapt Management According to New Information (Alternative 4)**

   There would be no specific requirements. Managers would, however, seek and apply new information or approaches to improve administrative or cost efficiency.

2.1.6 Alternative 5 - General Environmental Protection [Environmentally Preferred]

Under this alternative, in addition to the prescriptions under Alternative 2, BPA would standardize the planning and implementation process by providing collateral benefits for fish, recreation, local economic productivity (related to the natural or physical environment, and including, for instance, agricultural or forestry uses), or other resources. Project managers would also apply program-wide measures as appropriate to protect the environment, including soils, fish and water resources, vegetation, non-target wildlife, land use, local economies related to the environment, recreation, and air quality (see Chapter 4). This is the environmentally preferred alternative. Management techniques likely to have adverse environmental impacts would be minimized. A list of management techniques is found in Appendix A.

1. **Define the Area of Concern/Interest (Alternative 5)**

   Under Alternative 5, BPA would consider support of broad-scale planning that takes into account many different resources. Definition of the area of concern might include a comprehensive and rigorous analysis of economic, social, cultural, and ecological conditions that might influence area boundaries.

   In addition to the required prescriptions, project managers would undertake the following:

   - Identify those areas outside of the property that may be affected by or that may benefit mitigation actions, including adjacent landowners and uses, local economic bases (to the county level), Tribal and other traditional uses, and wildlife or fish travel corridors.

   - Identify locally limited or diminished social, economic, and environmental conditions, and seek opportunities to provide benefits to these conditions along with wildlife mitigation objectives.

   - Address concerns over additions to public land ownership and impacts on local communities, such as reduction or loss of local government tax or economic base, or consistency with local governments' comprehensive plans.

2. Involve Stakeholders (Alternative 5)

Under this alternative, BPA would support more stakeholder and public involvement than under the other alternatives. Stakeholder involvement would focus on identifying relevant environmental issues, concerns, and opportunities. Involvement might include more project information being presented to the public, including public meetings, advertisements, and/or fact sheets.

In addition to the required prescriptions, project managers would undertake the following:

- *[For projects involving property acquisition, including leases and easements]* Invite affected interests to participate in an advisory project management planning group; those invited should include management agencies, adjacent landowners, county commissioners, and Indian Tribes where the project affects a Tribal "usual and accustomed area," as identified in Figure 3-5 (Chapter 3).

- Elicit public input by a variety of means, including mailings, public notices, and public meetings and workshops early in the planning process; consider alternative means of eliciting public input, such as postings on the Internet and radio advertisements.

- Make special efforts to translate technical information into a format easily readable by laypersons.

- Prepare non-English-language publications where such publications are necessary to communicate issues to stakeholders.

- Involve local and downstream water users and local water agencies to ensure that project water users do not significantly affect productivity or production costs of water-dependent agriculture.

- Provide non-binding mediation to agencies or Tribes disputing project management planning, including selection of a mutually acceptable mediator within 30 days of written request, all parties commitment of best efforts to resolve the dispute in mediation, and suspension of related legal action for at least 60 days from the start of mediation and completion of two mediation sessions.

3. Develop a Statement of the Desired Future Condition (Alternative 5)

Under Alternative 5, BPA would support concepts that seek improvement of a wide range of social, economic, and natural resource conditions in a manner that would complement or increase efficiency of wildlife mitigation projects.

Project managers would undertake the following:

- Identify a desired future condition that responds to existing social and economic conditions.

- Identify a desired future condition that includes those principal benefits the mitigation area is intended to provide to stakeholders, consistent with the primary goal of achieving wildlife mitigation.

4. Characterize Site Conditions and Trends (Alternative 5)

Because a wide range of social, economic, cultural, and natural resource issues would be considered under Alternative 5, BPA would encourage characterization of the full spectrum of environmental elements to ensure that wildlife mitigation projects protect and improve general environmental resources in addition to achieving wildlife mitigation.

In addition to the required prescriptions, project managers would undertake the following:

- Identify all relevant ecological, social, and economic systems that might be affected by the project (long-term and short-term).

- Establish, for both wildlife and general environmental resources, environmental baseline conditions against which change can be measured (related to performance standards described in step 5).

5. Establish Project Goals (Alternative 5)

Under Alternative 5, BPA would encourage project managers to include social, economic, cultural, and natural resource protection and improvement goals that complement the primary goal of wildlife mitigation.

Project managers would undertake the following:

- Identify, as a project goal, protection and improvement of environmental resources other than wildlife.

- Establish specific performance standards (goals) for relevant economic, social, cultural, and other environmental resources systems and features (e.g. fish, soils, water quality).

- Identify, as a project goal, improvement of forest, rangeland, and aquatic health, in cooperation with the BLM and USFS under their implementation of the Eastside and Interior Columbia River Basin EISs (BLM and USFS 1996a, 1996b).

- *[For projects involving wetlands]* Consider the objectives of the North American Waterfowl Management Plan.

- Include, as a project goal:
  * protection of high-quality native or other habitat or species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species;
  * development of riparian or other habitat that can benefit both fish and wildlife;
  * mitigation of habitat losses in-place, in kind, wherever possible;
  * protection or improvement of natural ecosystems and species diversity over the long term; and
  * development of habitat that complements the activities of the region's Tribes and state and Federal wildlife agencies.

6. Develop and Implement an Action Plan for Achieving the Goals (Alternative 5)

Under Alternative 5, BPA would support certain actions providing collateral benefits for fish, recreation, local economic productivity, or other resources. Management techniques likely to have adverse environmental impacts would be minimized. Additional program-wide standards, guidelines, and mitigation measures would be established to ensure protection of environmental resources.

In addition to the required prescriptions, project managers would undertake the following:

- Favor wildlife management activities with collateral benefits for fish (e.g., riparian habitat restoration).
- Apply the potential program-wide mitigation measures in Chapter 4, as appropriate to protect the environment.
- Follow the BLM and USFS standards and guidelines developed to protect general environmental resources within the planning area (Eastside and Interior Columbia River Basin EISs; BLM and USFS 1996a, 1996b).
- Encourage economic uses consistent with biological objectives (including crop, livestock, and timber production).
- Use available local supplies and labor to accomplish project goals and objectives.
- Identify opportunities for work skill training in conjunction with wildlife mitigation activities. For example, encourage construction contractors to use the local employment security office to hire staff for positions that involve on-the-job training.
- Acquire lands not currently under commercial agricultural use.

- *[In counties already containing a large amount of Federal lands]* Favor selection of public lands for acquisition (rather than private lands).
- Encourage public use consistent with wildlife objectives; identify safe public recreational opportunities that do not jeopardize project biological objectives or significantly alter local social settings.
- Maintain existing primary access roads open for public vehicular travel as practicable.
- Use conservation tillage practices for crop production on mitigation lands.
- Identify scientific educational opportunities.
- *[For projects involving vegetation control]* Develop specific protocols for use of herbicides, mechanical, and biological methods, in cooperation with local weed control boards. Protocols could be adapted from the USFS Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).
- *[For projects involving vegetation control]* Conduct weed control programs using joint multi-agency planning.
- *[For projects involving property acquisition (including leases and easements)]* Require special use permits for resource harvest; deny permits where the use might interfere with protection of general environmental resources.
- Use fertilizers with the lowest environmental cost that can still achieve acceptable results.
- Identify opportunities to foster public appreciation of the relationship between natural resources and Tribal culture.
- Identify recreational opportunities suitable for physically disabled persons.
- Identify opportunities to foster public appreciation of wildlife and wildlife mitigation activities.

7. Monitor Conditions and Evaluate Results (Alternative 5)

Under Alternative 5, BPA would encourage and support more rigorous and comprehensive monitoring of general environmental resources than under the other alternatives.

Project managers would undertake the following actions:

- Monitor performance standards (established under Step 5) for local economic productivity and tax base, social conditions, cultural resource protection, and natural resources (e.g., fish, soils, water quality).

8. Adapt Management According to New Information (Alternative 5)

Under Alternative 5, BPA would encourage and support adaptive management actions that respond to environmental problems or opportunities identified through monitoring. Project managers would also be encouraged to apply new knowledge, insights, or technologies that might contribute to environmental protection and improvement, consistent with the objectives of wildlife mitigation.

Project managers would undertake the following:

- Use monitoring information to guide annual management priorities and activity planning for protection and/or improvements of social, economic, and environmental conditions.

2.1.7 Alternative 6 - Balanced Action [BPA's Preferred Alternative]

BPA's preferred alternative seeks to standardize the planning and implementation process by undertaking the prescriptions of Alternative 2 and by achieving balance among the purposes individually emphasized in the other action alternatives(#s 3-5): (1) meeting the biological objectives of wildlife mitigation projects, (2) achievement of cost and administrative efficiency, and (3) protection and improvement of other environmental resources when it would support wildlife mitigation.

Under Alternative 6, BPA would support a wide range of actions to achieve wildlife mitigation consistent with Council's goals and priorities. BPA would place a strong emphasis on achieving the biological objectives in the least costly manner. Also, project managers would apply program-wide measures as appropriate to protect the environment, including soils, fish and water resources, vegetation, non-target wildlife, land use, local economies related to the environment, recreation, and air quality (see Chapter 4).

Unlike other alternatives, this alternative would develop new mitigation projects similar to those previously developed. The primary difference between the preferred alternative and the existing situation (No Action) is that, under Alternative 6, (1) BPA would establish a standard planning process and (2) project managers would apply program-wide mitigation measures, as appropriate, to protect the environment.. These two differences would allow BPA to implement wildlife mitigation programs more efficiently and with greater consistency than under the current case-by-case approach.

1. Define the Area of Concern/Interest (Alternative 6)

Under Alternative 6, project managers would focus primarily on the Council's priority habitat types and species.

Public lands would be favored as mitigation sites so as to minimize potential economic effects. Project managers would also seek to establish projects that can take advantage of existing land management systems or that could eliminate existing management inefficiencies.

- Select boundaries, focusing on habitat type and species priorities and accompanying elements that the Council has identified in its Wildlife Program. (See Table 1-1; Council 1995.)
- When identifying potential mitigation sites, examine public lands first to determine opportunities for adjustments, land exchanges, and reciprocal management agreements that eliminate management inefficiencies and inconsistencies.
- Consider long-term lease or easement acquisition where public lands are not available.
- If possible, establish partnerships for achieving project objectives, including agreements with non-electric power development mitigation programs, to ensure coordinated and expeditions program implementation.
- Address concerns over additions to public land ownership and impacts on local communities, such as reduction or loss of local government tax or economic base, or consistency with local governments comprehensive plans.

2. Involve Stakeholders (Alternative 6)

Under Alternative 6, project managers would actively seek public input and would plan cooperatively with government agencies or other entities to maximize planning and management efficiencies.

In addition to the required prescriptions, project managers would undertake the following:

- Identify a desired future condition that responds specifically to achievement of biological objectives.
- Develop an effective public involvement program that includes a variety of ways to solicit public input, including mailings, public notices and public meetings and workshops both early in and throughout the planning process; by posting notice in the local paper of record and in BPA's monthly newsletter; consider alternative means of eliciting public input, such as postings on the Internet and radio advertisements).
- Wherever possible, form partnerships with government agencies or other entities so as to reduce costs, increase benefits, and/or eliminate duplicate activities.

3. **Develop a Statement of the Desired Future Condition (Alternative 6)**

Under Alternative 6, BPA would support concepts that keep long-term management costs low, while ensuring coordination with watershed-level planning efforts.

Project managers would undertake the following:

- Facilitate the development of a statement of desired future condition, in cooperation with watershed activities.
- Identify a desired future condition that is self-sustaining (low maintenance).

4. **Characterize the Site Conditions and Trends (Alternative 6)**

With the primary focus on achievement of biological objectives, BPA would support the collection of the information necessary to achieve wildlife mitigation and to monitor results.

In addition to the required prescriptions, project managers would undertake the following:

- Identify basic physical and biological information needed to make sound decisions.
- Establish baseline information for habitat and species against which change can be measured (related to the "measurable biological objective" standard included in step 5).

5. **Establish Project Goals (Alternative 6)**

Under Alternative 6, project managers would establish mitigation goals for each project, including those goals established by the Council.

Project managers would undertake the following:

- Establish measurable biological objectives (e.g. number of habitat units, acres and/or habitat types, list of indicator species).
- Include, as a project goal:
  * protection of high-quality native or other habitat or species of special concern (whether at the project site or not), including endangered, threatened, or sensitive species;
  * development of riparian or other habitat that can benefit both fish and wildlife;
  * mitigation of habitat losses in-place, in kind, wherever possible;
  * protection or improvement of natural ecosystems and species diversity over the long term; and

  * development of habitat that complements the activities of the region's Tribes and state and Federal wildlife agencies;
  * a future condition that is self-sustaining after initial improvements have been completed.

- For forest lands, consider the recommended goals outlined in the Federal Wildland Fire Management Policy and Program Review (USDI and USDA, 1995). (The report recommends that agencies develop a plan-by-plan strategy to introduce landscape-scale prescribed burns across agency boundaries. The report also directs agencies to seek opportunities to enter into partnerships with Tribal, state, and private land managers to achieve this objective.)

- Allow, as a project goal, sustainable revenue generation (e.g., user fees, crop production, timber harvest) to reduce initial or long-term Federal costs *only* if consistent with biological objectives.

6. Develop and Implement an Action Plan for Achieving the Goals (Alternative 6)

Under Alternative 6, BPA would consider support of a wide range of management techniques and other actions to achieve wildlife mitigation.

In addition to the required prescriptions, project managers would undertake the following:

- Consider the full range of management techniques available, and use the method that best achieves the biological objective in a cost-effective manner, as determined on a case-by-case basis. See Appendix A for a complete list of techniques.

- Apply program-wide the potential program-wide mitigation measures in Chapter 4, as appropriate to protect the environment..

- Rely primarily on natural regeneration rather than active restoration to achieve biological objectives.

- Consider passive or active recreation, providing it and does not interfere with achieving wildlife mitigation.

- For forest lands, enter a collective management agreement with Federal and state landowners to implement actions outlined in the Federal Wildland Fire Management Policy and Program Review (USDI and USDA, 1995).

- Dedicate to the project any revenue gained from commerce that results from use of the property.

- Favor wildlife management activities having collateral benefits for fish, e.g., riparian habitat restoration.

- Use available local supplies and labor to accomplish project goals and objectives.

- Identify opportunities for work skill training in conjunction with wildlife mitigation activities. For example, encourage construction contractors to use the local employment security office to hire staff for positions that involve on-the-job training.

- *[For projects involving vegetation control]* Develop specific protocols for use of herbicides, mechanical, and biological methods, in cooperation with local weed control boards. Protocols could be adapted from the USFS Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).

- *[For projects involving vegetation control]* Conduct weed control programs using joint multi-agency planning.

- Control nuisance animals or unwanted or competing plant species where they are hindering establishment of vegetation.

- Consider recreational opportunities suitable for physically disabled persons where existing access allows.

7. Monitor Conditions and Evaluate Results (Alternative 6)

Under Alternative 6, BPA would encourage and support decision-oriented monitoring that can be used to evaluate the success of mitigation efforts and to make necessary adjustments to better achieve objectives.

Project managers would undertake the following:

- Monitor specific performance standards for status and trend of progress toward biological objectives (established under Steps 4 and 5).

8. Adapt Management According to New Information (Alternative 6)

Under Alternative 5, BPA would encourage and support adaptive management actions that respond to problems or opportunities identified through monitoring. Project managers would also be encouraged to apply new knowledge, insights or technologies that may contribute to meeting biological objectives.

Project managers would undertake the following:

- Use monitoring information to guide annual management priorities and activity planning.

2.1.8 Available Management Techniques

While the alternatives present a range of possible strategies, goals, and procedural requirements for wildlife mitigation projects, Project Management Plans will need to include actual on-the-ground techniques to support and achieve wildlife mitigation. The standardized requirements would influence the implementation of these techniques. Table 2-1 lists techniques that may be employed under some or all of the alternatives. The techniques are organized by function; in most cases, more than one specific technique can be employed at the same time. Appendix A provides a full description of each technique.

Table 2-1. Relative Use of Techniques Among Alternatives[5]

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Biological Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
RESOURCE ACQUISITION						
Fee-Title Acquisition and Transfer	★	★	★	-	★	-
Easement Acquisition	★	★	★	★	★	★
Long-term Lease	★	★	★	★	★	★
Cooperative Management	★	★	★	+	★	+
PLANT PROPAGATION						
Transplanting	★	★	+	-	★	★
Seeding	★	★	+	-	★	★
Irrigation	-	-	+	-	★	-
Fertilization	★	-	+	-	-	★
HABITAT CREATION AND CONVERSION						
Creating or Expanding Wetlands	★	★	+	-	-	★
Artificial Islands	-	-	+	-	-	-
Artificial Nest Structures	+	+	+	-	-	+

Table continued on next page

[5] + = frequent use ★ = moderate use - = infrequent use x = not used

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Biological Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
WATER DEVELOPMENT TECHNIQUES						
Wells	-	-	★	-	-	-
Diversions	-	-	+	-	-	-
Springs	+	+	+	-	-	+
Check Dams/Impoundments	-	-	+	-	-	-
Guzzlers	+	+	+	-	-	+
Water Rights Acquisition	-	-	+	-	-	-
WATER DISTRIBUTION TECHNIQUES						
Pipelines	-	-	★	-	-	-
Culverts	+	+	+	-	-	+
Drainage Ditches	-	-	★	-	-	-
FIRE MANAGEMENT TECHNIQUES						
Active Management	+	+	+	-	★	+
Let Burn	X	X	X	X	X	X
VEGETATION MANAGEMENT: IMPROVEMENT AND CONTROL						
Herbicides	★	★	+	★	-	★
Mechanical Removal	★	★	+	-	+	★
Biological Control	-	-	+	-	-	-
Hand Pulling	★	★	★	-	+	★
Prescribed Burn	★	★	+	-	★	★
Water Level Manipulation	★	★	+	★	★	★
SPECIES MANAGEMENT TECHNIQUES						
Introduction	-	-	+	-	-	-
Predator/ Nuisance Animal Control	★	★	+	-	★	★

Table continued on next page

Technique	Alt 1: No Action (assuming case-by-case decisions)	Alt 2: Base Response	Alt 3: Biological Objectives	Alt 4: Cost and Admin. Efficiency	Alt 5: General Environ-mental Protection	Alt 6: Balanced Approach
MULTIPLE USE TECHNIQUES						
Crop Production	★	★	-	+	+	-
Timber Production	★	★	-	+	+	-
Grazing	★	★	-	+	+	-
Education and Recreation	★	★	-	-	+	★
Facility Development	-	-	-	-	★	-
TRANSPORTATION / ACCESS TECHNIQUES						
Land Use Restrictions	★	★	+	+	-	★
Road Construction	★	★	-	-	-	-
Road Maintenance	★	★	-	-	+	★
Road Decommissioning	★	★	+	-	+	+

2.2 COMPARISON OF ALTERNATIVES AND SUMMARY OF IMPACTS

Each of the five action alternatives identifies a different approach to standardizing the planning and implementation of individual wildlife mitigation projects funded by BPA.

Under **Alternative 1, No Action,** BPA would continue to implement each wildlife mitigation project on a case-by-case basis.

Alternative 2, Base Response, contains only those prescriptions required by law, and represents the minimum restrictions and guidance that BPA must place on project managers developing BPA-funded wildlife mitigation projects. Alternatives 3-6 also contain these minimum requirements.

Under **Alternative 3, Biological Objectives Emphasis**, BPA would support only those actions intended specifically to achieve biological objectives; however, project managers would retain a great deal of flexibility to adapt application of specific techniques and other actions to best meet the biological objectives of the project. Other resources and issues would be considered only to the minimum extent required by law, as outlined in Alternative 2, Base Response.

Under **Alternative 4, Costs and Administrative Efficiency Emphasis**, BPA would support only the least costly approach to achieving the project's biological objectives. Project managers would be very limited in the techniques and resources available to them the implement their proposed projects.

Under **Alternative 5, General Environmental Protection**, the environmentally preferred alternative, BPA would support actions providing collateral benefits for fish, recreation, local economic productivity (related to the natural or physical environment), or other resources. Project managers would also apply potential program-wide mitigation measures as appropriate to protect the environment. Project managers could consider a wide range of project objectives under this alternative, although a wide range of objectives might reduce the resources available for meeting the project's biological objectives.

Alternative 6, Balanced Response, BPA's preferred alternative, seeks to achieve balance among the purposes individually emphasized in the other action alternatives (#s 3-5): (1) meeting the biological objectives of wildlife mitigation projects, (2) achievement of cost and administrative efficiency, and (3) protection and improvement of other environmental resources when it would support wildlife mitigation. Alternative 6 would result in new mitigation projects similar to those previously developed. The primary difference between the preferred alternative and the existing situation (No Action) is that, under Alternative 6, (1) BPA would establish a standard planning process and (2) project managers would apply potential program-wide mitigation measures as appropriate to protect the environment. These two differences would allow BPA to implement wildlife mitigation programs more efficiently and with greater consistency than under the current case-by-case approach.

Table 2-2 provides a summary and comparison of the environmental consequences of each alternative.

Table 2-3 provides a comparison of the alternatives against the decision factors (achievement of biological objectives, cost and administrative efficiency, and compliance with laws and regulations, and protection and improvement of environmental resources).

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Table 2-2. Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Alternative 1: No Action	Alternative 2: Base Response (Impa Common to All Action Alternatives)
Soils	Diverse across the Columbia Basin. Sources include glacial till, basalt erosion, windborne loess deposits, and volcanism. Soils are vulnerable to erosion, which can lead to poor soil productivity and water quality.	Based on recently completed projects, only minor soil disturbances would occur during implementation of projects.	In general, soil conditions would i at new wildlife mitigation sites as protected from ground disturbance soils would be disturbed during in project implementation.
Fish/Water Resources and Quality	The Basin's water resources provide Tribal values and use, irrigation, recreation, fish and wildlife habitat, transportation corridors, drainage, flood control, drinking water, and power. Soil erosion is one of the most common sources of water-quality and fish-habitat reductions.	Individual projects would continue without program-wide requirements, so impacts could vary widely. Overall, fish and water quality would benefit as vegetation near water is restored and/or protected.	Ground-disturbing activities to inc habitat values would potentially re water quality and fish habitat in th term. S tate water regulations wou followed under all alternatives, so significant adverse impacts are exp
Wildlife	Many sensitive wildlife species in the Basin associated with native shrub-steppe and old growth forests. Wetlands, riparian, cliffs, talus, and caves are other important habitat types.	Target wildlife habitats and species would increase. Some wildlife disturbance would occur when projects first begin.	All alternatives benefit target wild species and habitats as well as a va other species. Habitat changes an disturbances could adversely affec non-target wildlife species.
Vegetation	Basin contains three general vegetation zones: coniferous forest, sagebrush, and perennial grassland. Crop production, grazing, logging, and hydroelectric projects have greatly altered basin vegetation types, and native plant communities are relatively rare.	Overall, native plant communities would continue to benefit (after some initial impacts) from the activities associated with wildlife mitigation.	All alternatives would require som disturbance of vegetation as projec implemented. Over time, vegetati munities associated with target wil habitat would increase, including forest, wetlands, and shrub-steppe.
Land and Shoreline Use	Land ownership includes large areas of private crop- and forest land; private residential, recreational, and industrial properties; and state, Tribal, and Federal ownership.	Without program-wide standards, impacts on land and shoreline use could vary widely depending on the circumstances surrounding each project.	Land and shoreline uses would ch new wildlife mitigation sites, inclu some localized losses of grazing, t production, and farming.
Cultural and Historic Resources	Most identified cultural resources in the Basin are archeological sites such as campsites, rock art, burial grounds, and rock shelters. There are 13 Federally recognized Native American Tribes with interests and/or reservations in the Columbia River Basin within the United States.	BPA would continue to lead cultural resource protection efforts on a project-by-project basis.	Potential impacts on cultural reso would be directly related to the an ground disturbance that would oc alternative presents the minimum protection required by law.
Economics	Major sources of employment in the Basin include agriculture, forestry, real estate, retail, services, and government. Much of the affected environment is rural and sparsely populated.	No program-wide standards to protect natural resource-based economies, although BPA typically would consider such protection on a case-by-case basis. Commercial use of mitigation lands and associated taxes would decrease.	Loss of revenues and local taxes f resource lands is unavoidable wh uses have historically occurred. T impacts would add to the cumulat of ongoing reductions in available and grazing lands that have occur region.
Recreation and Visual	The Basin provides a variety of outdoor recreational opportunities. Many people from the more populated western Oregon and Washington visit rural Basin areas for recreation.	Access restrictions would be necessary and unavoidable at some new mitigation sites to protect sensitive wildlife habitats.	Access restrictions would be nece unavoidable at some new mitigat to protect sensitive wildlife habit
Air Quality	Most of the Basin is rural and generally has fewer air quality problems that do the population centers. Smoke from field burning and wind-borne dust sometimes create air quality problems in the Basin.	Burning amounts would be developed on a case-by-case basis.	Smoke from prescribed burning v cause local reductions in air qual visibility. State and local regulat would be followed.

Alternative 3: Biological Objectives Emphasis	Alternative 4: Cost and Administrative Efficiency Emphasis	Alternative 5: General Environmental Protection Emphasis	Alternative 6: Balanced Action (Preferred Alternative)
Relatively high amounts of short-term erosion might occur during the initial project phases; however, over the long term, soil conditions would greatly improve over existing conditions.	Only minor soil disturbances are expected as project managers would rely mostly on natural regeneration to achieve objectives.	Soils would be protected, although continued commercial uses of some mitigation lands might result in some ongoing erosion.	Generally beneficial to soils. A moderate level of short-term soil erosion would occur at some new sites as projects are implemented, followed by increasing soil stability.
Short-term impacts followed by long-term benefits would be expected as a wide range of projects is implemented.	Relatively few actions affecting fish or water would occur.	Project managers would include collateral benefits to fish in project management plans, so fish and water resources would be expected to improve.	Some initial sediment contribution to streams or other water features might be unavoidable during project implementation, but the long-term trend would be improved protection.
Provides the highest potential among alternatives for short-term disturbance of wildlife, but also the highest potential for long-term gains in target and incidental species and habitats.	Provides the lowest potential among alternatives for short-term disturbance of wildlife, but also the lowest potential for long-term gains in target and incidental species and habitats.	No significant adverse impacts expected on wildlife as program-wide mitigation measures would be applied, as appropriate. Continued economic use of some mitigation lands may reduce local habitat values.	No significant adverse impacts expected on wildlife. As with Alternative 5, program-wide measures would be applied to protect wildlife, as appropriate.
Use of active techniques would accelerate development of desired plant communities, although a narrow focus on biological objectives could reduce those plant communities that do not support target species.	Lowest amount of disturbance among alternatives because of the heavy reliance on natural revegetation.	Relatively low amount of initial vegetation disturbance because the more intensive habitat improvement techniques would be used infrequently. Program-wide measures would be applied, as appropriate, to protect rare plants and sensitive plant communities	As with Alternative 5, there would be relatively low initial vegetation disturbance. Program-wide measures would be applied, as appropriate, to protect rare plants and sensitive plant communities.
Changes in land and/or shoreline use might be greater at some new mitigation sites under this alternative, as project managers maintain a narrow focus on achieving biological objectives.	Lowest potential among alternatives for significant changes in land use. High-value commercial properties would be avoided because of the higher costs associated with obtaining such properties.	Potential conflicts in land and/or shoreline use would be avoided during the extensive early planning process included in this alternative.	As under Alternative 5, early planning and application, as appropriate, of program-wide measures would serve to avoid most significant conflicts in land and/or shoreline use.
Highest potential for ground-disturbing activities related to habitat improvement and correspondingly high potential for disturbing unknown cultural resources.	Relatively low amount of ground disturbance expected due to reliance on natural regeneration of vegetation (rather than more intensive techniques).	Extra efforts to protect cultural resources would reduce the potential for impacts, although some disturbances might result from commercial and/or recreational use on some new mitigation sites.	A moderate amount of ground would be disturbed as new projects are implemented. Surveys would be conducted where needed to avoid impacts on cultural or historic resources.
Greatest potential for short-term local employment and revenues, although economic benefits over the long-term would be minimal.	Very little effect on local or regional economies.	Providing collateral benefits to local economies would be a project goal, so some projects developed under this alternative would benefit local economies.	As with the other alternatives, relatively minor changes in local economies and/or tax bases is expected.
Recreational use of mitigation lands would be minimized so that funds could be focused on achieving biological objectives.	As with Alternative 3, recreational use would be minimized so that funds could be focused on achieving biological objectives.	Potential net increase in recreational opportunities at lands selected for new mitigation sites.	Recreational use would be allowed, but some net loss in opportunities may occur as emphasis shifts to achieving biological objectives.
Greatest potential for prescribed burns and associated smoke generation.	Least potential for prescribed burns and associated smoke generation.	Relatively low use of fire, fertilizers, and herbicides; relatively low associated impacts on air quality.	Relatively minor impacts associated with drifting smoke.

Table 2-3. Predicted Performance Summary

Decision Factor	Alternative 1: No Action	Alternative 2: Base Response Emphasis	Alternative 3: Biological Objectives Emphasis	Alternative 4: Cost and Administrative Efficiency Emphasis	Alternative 5: General Environmental Protection	Alternative 6: Balanced Action (Preferred Alternative)
Achievement of Biological Objectives	Meets objectives, but without benefit of consistent management direction.	Meets only minimum objectives with minimal consistent management direction.	Greatest predicted achievement of biological objectives among alternatives.	Meets only the minimum objectives.	Potentially reduced achievement of objectives as some funds are directed towards protection or improvement of non-wildlife resources.	Meets objectives.
Cost and Administrative Efficiency	Inefficient because BPA would need repeatedly to address common issues for every project.	Provides efficient process for implementation, but requires that many issues be addressed on a case-by-case basis.	Highest predicted costs because of the focus on best achieving biological objectives with minimal regard to costs.	Lowest predicted costs.	Potentially high costs because funds would be directed to general environmental protection. Provides opportunity for shared efforts among agencies and other land managers that could increase efficiency of interrelated projects and/or programs.	Provides efficient process for implementation, but requires some additional costs for general environmental protection.
Compliance with Laws and Regulations	In compliance.	In compliance.	In compliance.	In compliance.	In compliance, with additional assurances for documentation of compliance. May be inconsistent with agency statutory authorities.	In compliance.
General Environmental Protection	Protects the environment through requirements set forth in individual EISs or EAs prepared for each project.	Ensures only the minimum level of environmental protection required by law.	Ensures only the minimum level of environmental protection required by law.	Ensures only the minimum level of environmental protection required by law.	Provides maximum protection and improvement of environmental resources, consistent with achievement of biological objectives.	Provides general environmental protection, consistent with achievement of cost efficiency, biological objectives, and legal compliance.

Chapter 3: Affected Environment

This chapter describes the existing environment of the area potentially affected by BPA's Wildlife Mitigation Program. The discussion focuses on those features needed to understand the anticipated effects of the proposed action and alternatives (Chapter 4). Because this programmatic EIS addresses the Wildlife Mitigation Program as a whole, and not as specific sites or actions, the affected environment is discussed in general terms.

3.1 SETTING

The area being considered for wildlife mitigation projects is the United States portion of the Columbia River Basin. The area includes lands in Washington, Oregon, Idaho, Montana, Nevada, Utah, and Wyoming (see Figure 3-1).

The broad Columbia River Basin is defined to the west by the Pacific Ocean, the Willamette and southern Puget Sound valleys, and the north/south-oriented Cascade range; to the east by the north/south-oriented Rocky Mountain range; to the south by the Great Basin; and to the north by the Canadian border. The mountainous areas of the Cascades and Rockies are considered part of the affected environment, because the Council's Fish and Wildlife Program includes the tributaries to the Columbia River. The affected environment contains lands within 14 ecoregions defined by similar topography, climate, and vegetation (see Figure 3-2).

Climate consists of cold winters and warm, dry summers. Most precipitation falls in winter or spring, although occasional thunderstorms bring heavy rains during summer and fall. Total precipitation varies greatly, with average annual amounts ranging from 254 cm (100 in.) per year at the Cascade crest to less than 20 cm (8 in.) per year in the low-elevation basins and plains. Precipitation is greatest in the mountain ranges of the Columbia River Basin, which include the Coast Range, Cascades, Blue Mountains, and the Rocky Mountains. Precipitation is lowest in low-elevation valleys and plains, including the central Columbia Basin just east of the Cascades and the Snake River Basin/high desert of eastern Oregon and southern Idaho (Figure 3-2).

3.2 SOILS

Soil plays a critical role in nutrient, water, and atmospheric cycles. Soil is essential for most forms of plant life and associated animal communities, and is likewise essential for crop, forage, and timber production. Many of these cycles and essential roles take place in the upper few feet of the soil.

Major sources for basin soils include glacial till left from the last ice age, basalt erosion, wind-borne loess deposits, and volcanism (e.g. the pumice and ash deposited from the eruption of Mount Mazama 7,000 years ago and from the more recent 1980 eruption of Mt. St. Helens). These sources develop in place, are deposited by wind and rivers, and/or settle in lakes.

Soils are vulnerable to erosion, which can lead to poor soil productivity and water quality and can fill fish spawning gravels with silt. Some soils are more vulnerable than others. Soil surveys prepared by the Natural Resource Conservation Service (NRCS; formerly known as the Soil Conservation Service) identify local soil conditions and vulnerability to erosion. Soil development often takes hundreds or even thousands of years, so the effects of erosion are often long-term.

3.3 FISH

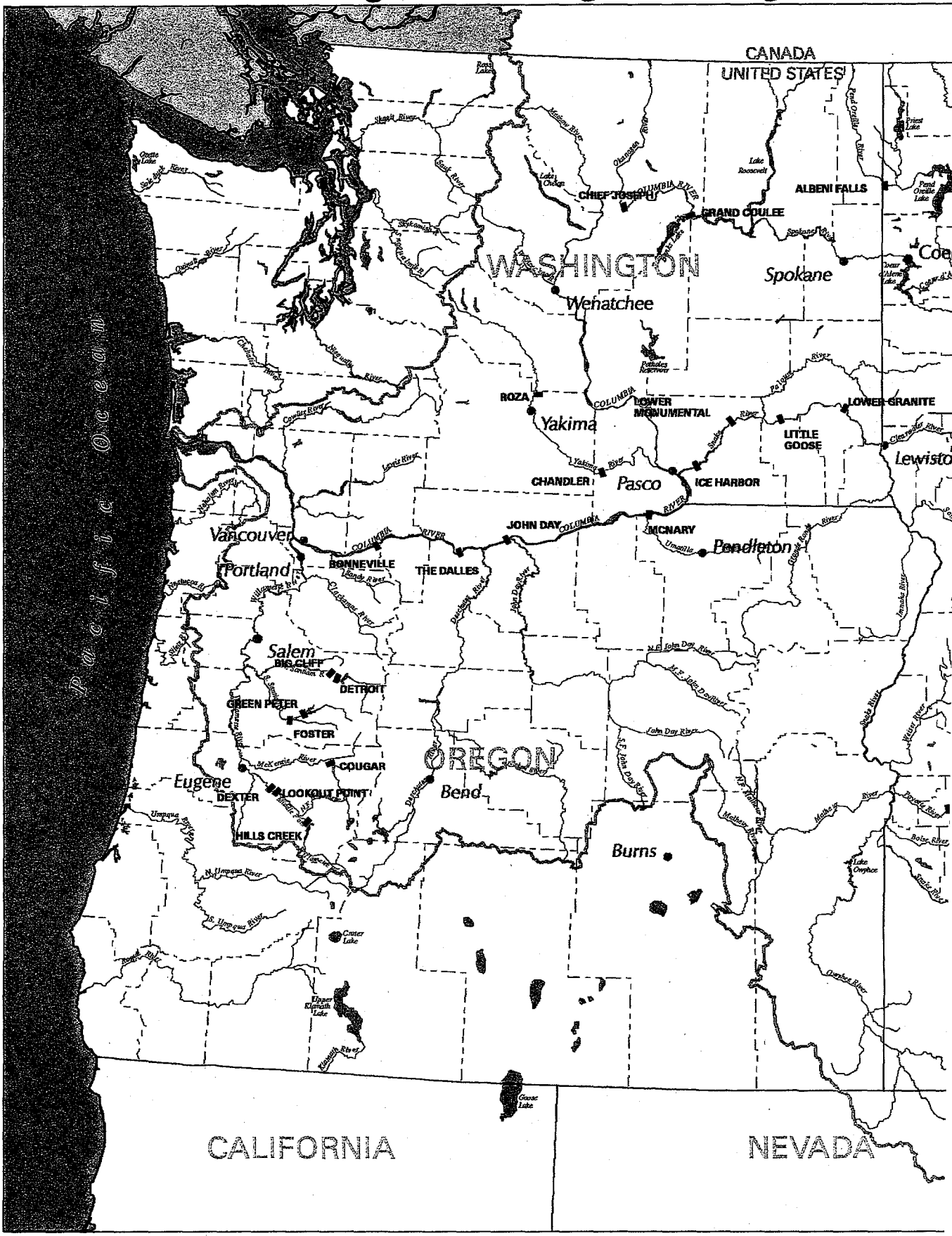
The basin includes a wide variety of relatively common and widely distributed native fish. These include both anadromous fish (sturgeon, several species of salmon, and trout), and resident fish (native trout, squawfish, mountain whitefish, largescale sucker and numerous small fish such as speckled dace, red-side shiner, stickleback, and torrent sculpin). Many other resident fish species have been introduced to provide recreational fishing, including eastern brook trout, hatchery-bred rainbow trout, largemouth bass, yellow perch, catfish, and walleye (Wydoski and Whitney 1979).

Many species of fish in the basin have declined due to habitat degradations, introduction of exotic species, over-fishing, and loss of migratory forms (USDA Forest Service, 1995). Fish habitat and migration patterns have been altered by flooding, obstruction, and direct mortality associated with dams, irrigation diversion, wetland draining, stream channel alteration, and loss of riparian habitat. Species of concern identified by the USFS (U.S. Forest Service, 1995) include the resident bull trout, redband trout, and westslope cutthroat trout, as well as the anadromous steelhead, sockeye, silver, and chinook salmon.

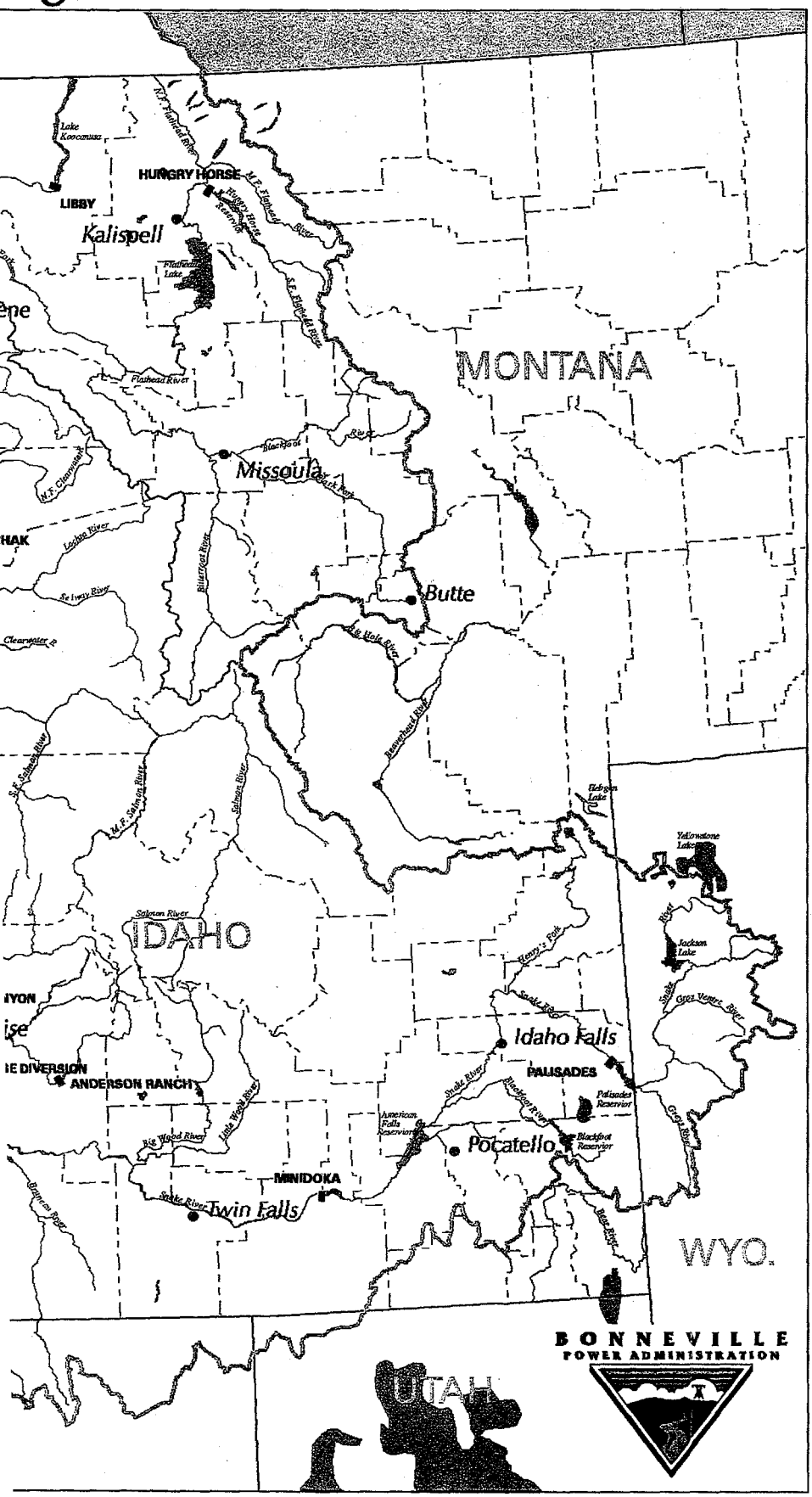
In response to these declines, reservoir drawdowns, flow augmentation, and other actions are being considered as ways to improve anadromous fish runs (BPA 1995), and the USFS and BLM have developed guidelines for management activities that may affect fish on Federal lands. These guidelines are identified in the Decision Notice/Decision Record for Interim Strategies for Managing Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon and Washington, Idaho and Portions of California (PACFISH), and the Decision Notice for the Inland Native Fish Strategy (USDA 1995). In general, these guidelines identify riparian management objectives, standards and guidelines, and monitoring requirements for USFS and BLM activities. These guidelines may apply to mitigation actions taking place on Federal lands.

Fish are very susceptible to declines in water quality. Timber harvest, road construction, grazing, and intensive agriculture have been identified as factors leading to water quality degradation and associated declines in fish habitat. Major forms of habitat declines include siltation, increased temperatures, and eutrophication (a process that can occur when unnatural amounts of nutrients enter waters, causing algae blooms, aquatic plant growth, reduced oxygen levels in the bottom layers, and the development of organic sludge).

BPA Wildlife Mitigation Program - Figure 3-1:



rogram Area"



Legend

- Federal Hydroelectric Dam
- County Boundary

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S

SCALE 1:4015000

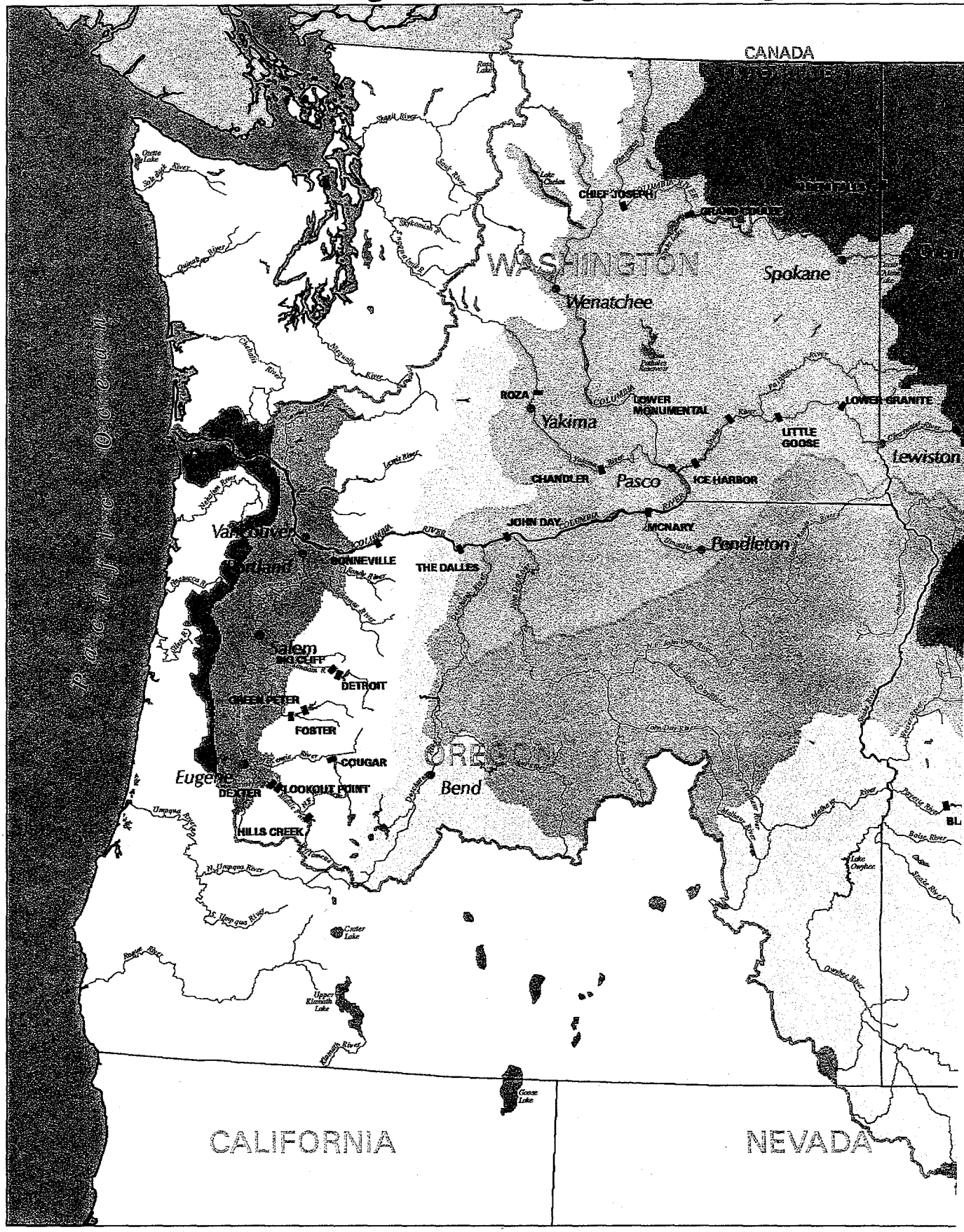
KILOMETERS

0 20 40 60 80 100

MILES

0 20 40 60 80 100

BPA Wildlife Mitigation Program - Figure 3-2:



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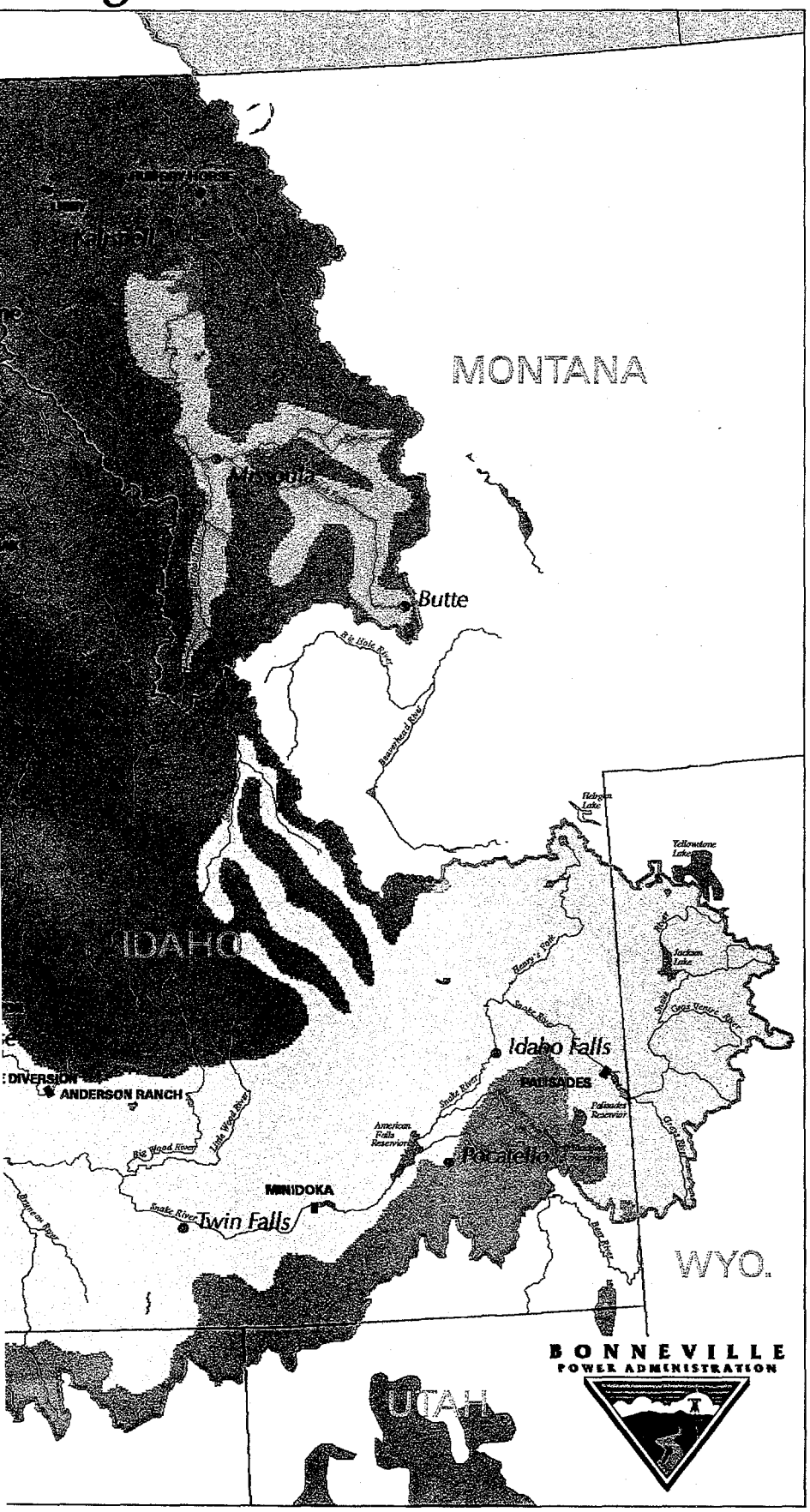

Legend

- Federal Hydroelectric Dam
- Coast Range
- Puget Lowland
- Willamette Valley
- Cascades
- Sierra Nevada
- Eastern Cascades Slopes and Foothills
- Columbia Basin
- Blue Mountains
- Snake River Basin/ High Desert
- Northern Basin and Range
- Northern Rockies
- Montana Valley and Foothill Prairies
- Middle Rockies
- Wyoming Basin

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W E
S

SCALE 1:4015000

KILOMETERS
0 20 40 60 80 100

MILES
0 20 40 60 80 100

3.4 WATER RESOURCES AND QUALITY

The Columbia River flows 1,930 km (1,200 mi.) from southeastern British Columbia, through northeastern and east-central Washington, and then west as the border between Washington and Oregon, to the Pacific Ocean. The Snake River originates in northwestern Wyoming, travels westward through southern Idaho, then northward as the border between Idaho and Oregon, before turning westward and traveling throughout southeastern Washington, to enter the Columbia River in south-central Washington.

Other tributaries feeding into the Columbia River include the Kootenay, Pend Oreille, Spokane, Okanogan, Wenatchee, Yakima, Walla, John Day, Deschutes, Hood, and Willamette rivers. This river system serves as the drainage for 670,800 km^2 (259,000 mi^2) for seven states, also including northern Utah, northern Nevada, and western Montana (McGinnis and Christensen 1994). Most of the tributaries originate in the headwaters associated with the Cascades, Blue Mountains, central Idaho Mountains, and the Northern Rocky Mountains, primarily located on USFS lands.

The Basin's water resources provide tribal values and use, irrigation, recreation, fish and wildlife habitat, transportation corridors, drainage, flood control, drinking water, and power. The Columbia River Project provides irrigation to large portions of Washington state, and is one of the largest irrigation projects in the Western states. Maintaining the quality and flows of the basin waters is critical to maintaining these functional values.

Soil erosion is one of the most common sources of water quality reductions. Other sources include agricultural chemicals, industrial wastes, human and livestock waste, and petroleum associated with urban runoff and car, truck, and boat traffic.

Water rights are held both privately and by public utilities and resource management agencies. Many ranchers and crop producers depend on their water rights to maintain their operations.

3.5 WILDLIFE

Basin wildlife can be generally discussed in association with the three general vegetation zones: coniferous forest, sagebrush, and grassland.

In coniferous forest, logging has greatly reduced late-successional forest structures. Populations of associated wildlife species have correspondingly declined; these include special-status species such as accipiter hawks, American marten, pygmy nuthatches, and many species of forest owls, bats, and woodpeckers. Both late-successional and younger forests provide habitat for large animals such as mule deer, cougar, bear and elk. Because Basin forests occur where precipitation is highest, they tend to support a higher diversity of amphibian species than do sagebrush and perennial grasslands.

Sagebrush and grassland contain similar wildlife communities and are discussed collectively in this EIS. In the sagebrush and grassland areas (also referred to as shrub-steppe), crop production and livestock grazing has directly removed native habitats or significantly altered them through invasion of exotic species. Populations of associated species have also declined, including loggerhead shrike,

pygmy rabbit, white-tailed antelope squirrel, sage grouse, Columbian sharp-tailed grouse, California bighorn sheep, and Washington and Idaho ground squirrels.

Sagebrush and perennial grassland generally support many types of mammals and relatively few types of birds (ODFW 1993), although hawks and owls are often prominent in these areas and some species of birds (e.g., sage grouse, loggerhead shrike) depend on this habitat type. The high desert area of eastern Oregon contains more bird diversity than other sagebrush/perennial grassland areas (ODFW 1993). Small mammal communities can be quite diverse, and include several sensitive species (e.g., pygmy rabbit, Merriam's shrew, and Washington ground squirrel). Large mammals of the sagebrush and perennial grassland areas include mule deer and pronghorn. Bighorn sheep were historically abundant in the desert ranges of the Basin, especially in the southeastern portion, and have been successfully reintroduced in some portions of their former range. Sagebrush and grassland areas include the more arid portions of the basin, which contain relatively few species of amphibians but several species of reptiles. Consequently, any water is a major attraction to wildlife, and water and associated riparian or wetland habitat is often critical to many of the species that occur within the sagebrush and perennial grassland regions. Other special habitat types present in the basin include cliffs, caves, and talus areas (Washington Department of Fish and Wildlife 1995, Oregon Department of Fish and Wildlife 1993).

3.6 VEGETATION

The Columbia River Basin contains diverse vegetation types as a result of different combinations of precipitation, altitude, latitude, slope, aspect, soils, and climate.

The Basin can be divided into three general vegetation zones based on native vegetation: coniferous forest, sagebrush, and perennial grassland. The sagebrush and perennial grassland vegetation types are often described collectively as shrub-steppe (Franklin and Dyrness 1973, Daubenmeyer 1970), and include habitats described as dry shrub, cool shrub, and desert salt shrub.

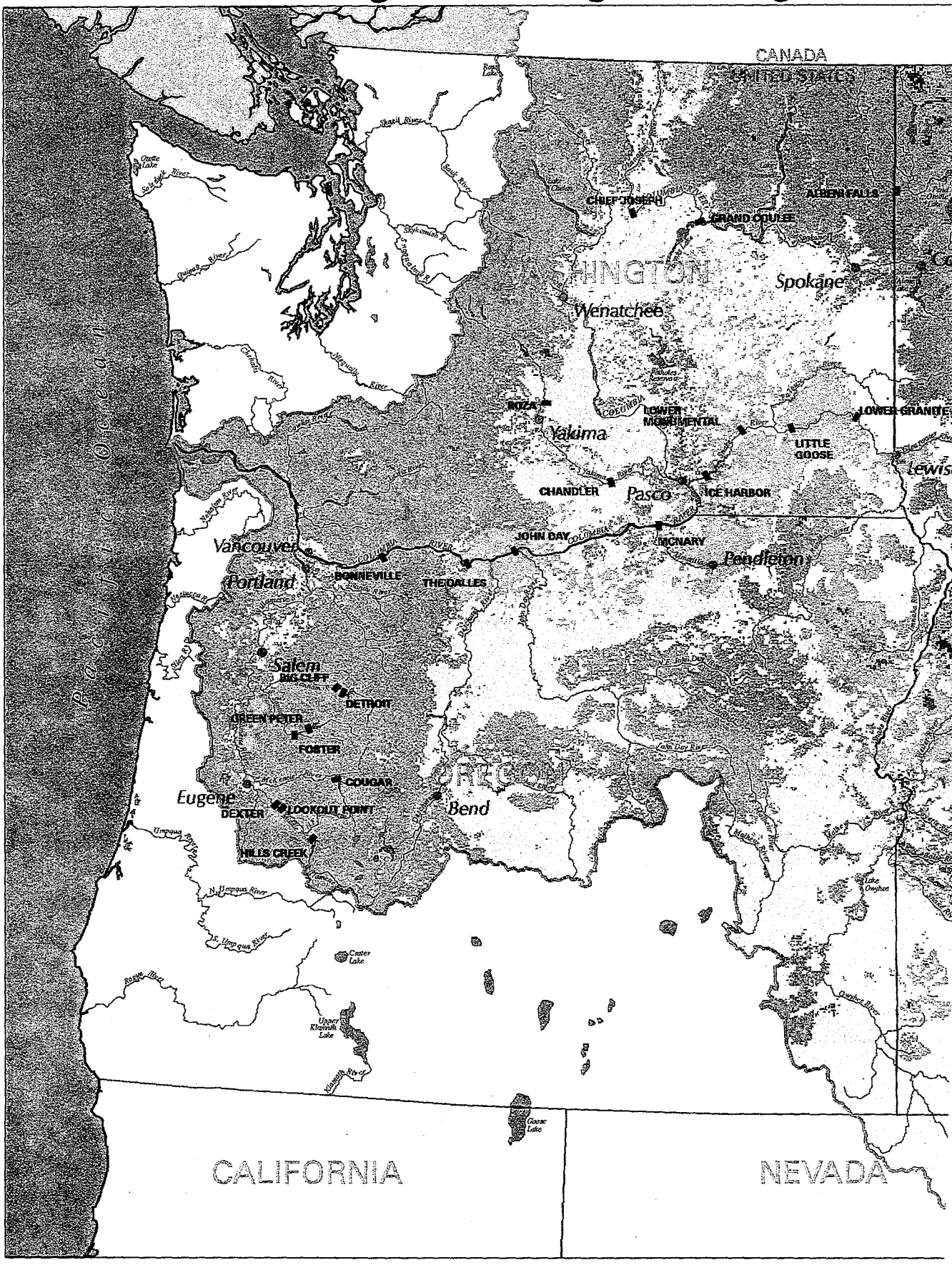
Coniferous forest occurs primarily where precipitation is highest: in the Coast Range, within the Willamette and southern Puget Sounds valleys, along the Cascade mountains, in the Blue Mountains of northeastern Oregon, and in the Rocky Mountains of northern Idaho and western Montana (see Figure 3-2 for the locations of ecoregions referenced in the text).

Shrub-steppe occurs in the Columbia Basin, Snake River Basin/High Desert, Northern Basin and Range, and portions of the Blue Mountains and eastern Cascade slopes and foothills. This vegetation zone is highly variable and includes sagebrush, grassland, sand dunes, basalt cliffs and outcrops, juniper woodlands, and riparian areas.

Riparian vegetation (vegetation associated with water, such as rivers, streams and wetlands) covers a relatively small portion of the Basin, but provides many functional values, including fish and wildlife habitat, erosion protection, and water temperature moderation.

Crop production, livestock grazing, logging, and hydroelectric projects have greatly altered basin vegetation types from their natural conditions. (Figure 3-3 shows the extent of cropland.) Because

BPA Wildlife Mitigation Program - Figure 3-3:



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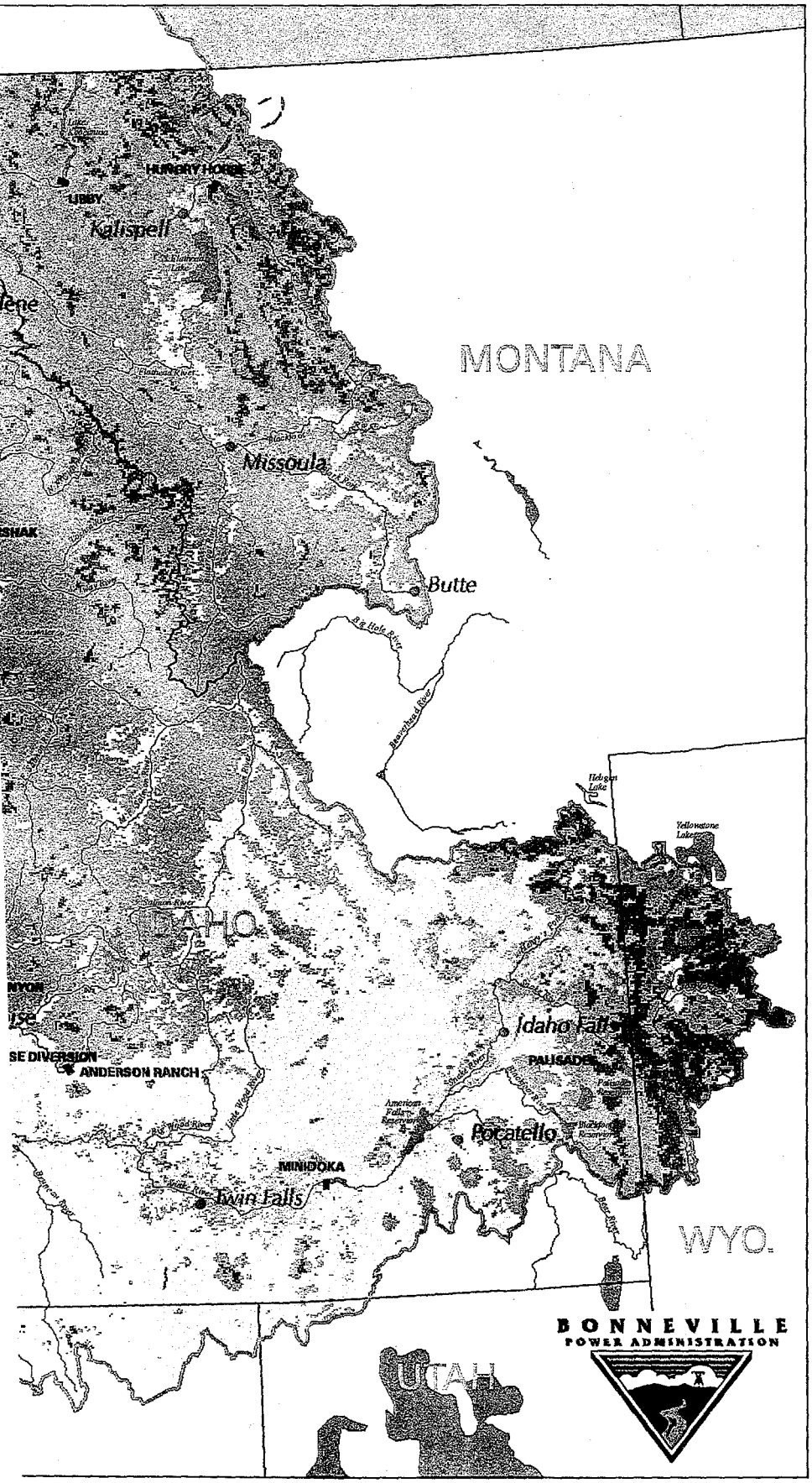

Legend

- Federal Hydroelectric Dam
- Cropland
- Mixed Cropland/Grassland and Trees
- Irrigated Agriculture
- Grassland
- Mixed Pasture/Trees and Cropland
- Mixed Pine/Fir Forest
- Pine Forest
- Mixed Deciduous
- Barren or Sparsely Vegetated

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of these disturbances, native, late-successional plant communities (e.g., old-growth forest and native shrub-steppe) generally are rare in the Columbia Basin. In general, the higher elevation forests have been less altered.

Crop production has removed native shrub-steppe vegetation. A variety of crops is produced, including wheat, potatoes, mint, peas, and apples. Hay for winter feeding of cattle is produced in many of the valleys and basins.

On less arable lands, livestock grazing has greatly reduced native perennials and encouraged the invasion of aggressive exotic annuals (e.g., cheatgrass, mustards, and Russian thistle) that now take the place of native species in most heavily grazed areas (Tisdale and Hironaka 1981). Cheatgrass, the most pervasive annual exotic, has increased fire frequency in some shrub-steppe stands, further altering the native vegetation communities. Some exotic species are legally designated as noxious weeds: species that are expanding their range and pose an increasing threat to native plant communities and range and crop production. Examples include bull thistle, Canada thistle, dalmation toadflax, and diffuse knapweed (Sheley 1995).

Some low-productivity lands have been placed within the Federally run Conservation Reserve Program (CRP), which compensates landowners for protecting crop lands vulnerable to erosion. CRP lands are taken out of crop production and planted with perennial species, most commonly the exotic crested wheatgrass and cultivars of the native western wheatgrass.

Extensive logging and silvicultural treatments have altered forests by greatly increasing the amount of young stands and by selectively removing large trees of desirable species. For example, mature ponderosa pine has been selectively removed from much of the forested areas of the basin, leaving fire-, insect-, and disease-susceptible Douglas-fir, grand fir, and white fir (Johnson et al. 1994).

Fire management has also created forest stands different in composition and structure than would have occurred naturally. Forest fire suppression has increased the intervals between fires, so that fire-sensitive species have survives and forest stands grown dense. Once ignited, these forests undergo more intense and damaging fires than would have occurred under a more natural regime. Hydroelectric projects have altered native vegetation through flooding, which submerged shoreline and floodplain vegetation.

3.7 LAND AND SHORELINE USE

The Columbia River Basin is dominated by commercial land uses, including range, crop, and timber production.

Land ownership includes large areas of private crop- and forest land; private residential, recreational, and industrial properties; state ownership; Tribal ownership; and Federal ownership. Private ownership is composed mostly of large family farms and forest lands, as well as even larger industry farm and forestry lands. Major federal land managers in the basin include the USFS, BLM, and BOR.

Local governments provide the driving force shaping land use management and regulation outside public lands. Local residents are often more able and willing to participate in government and public decisions through local governments. Because most of the Basin is rural, counties provide most of the primary regulatory and management authority over land use.

3.8 CULTURAL AND HISTORIC RESOURCES

Cultural and historic resources can be generally categorized into three groups: historic sites, including historic architecture, engineering, and archeological sites; Native American archeological sites; and traditional cultural properties. Most identified cultural resources in the Columbia River Basin are archeological sites such as campsites, housepit villages, rockshelters, rock art (petroglyphs and pictographs), lithic (stone) quarries and workshops, burial grounds and cemeteries, and isolated rock cairns, pits, and alignments. Archeological sites are valued for the information they contribute to understanding past events and cultures, for public recreational and educational interest, and as the heritage of contemporary Native American cultures. Sites of historic significance relate to early Euro-American exploration, the fur trade, military history, mining, navigation, agriculture, and early settlement.

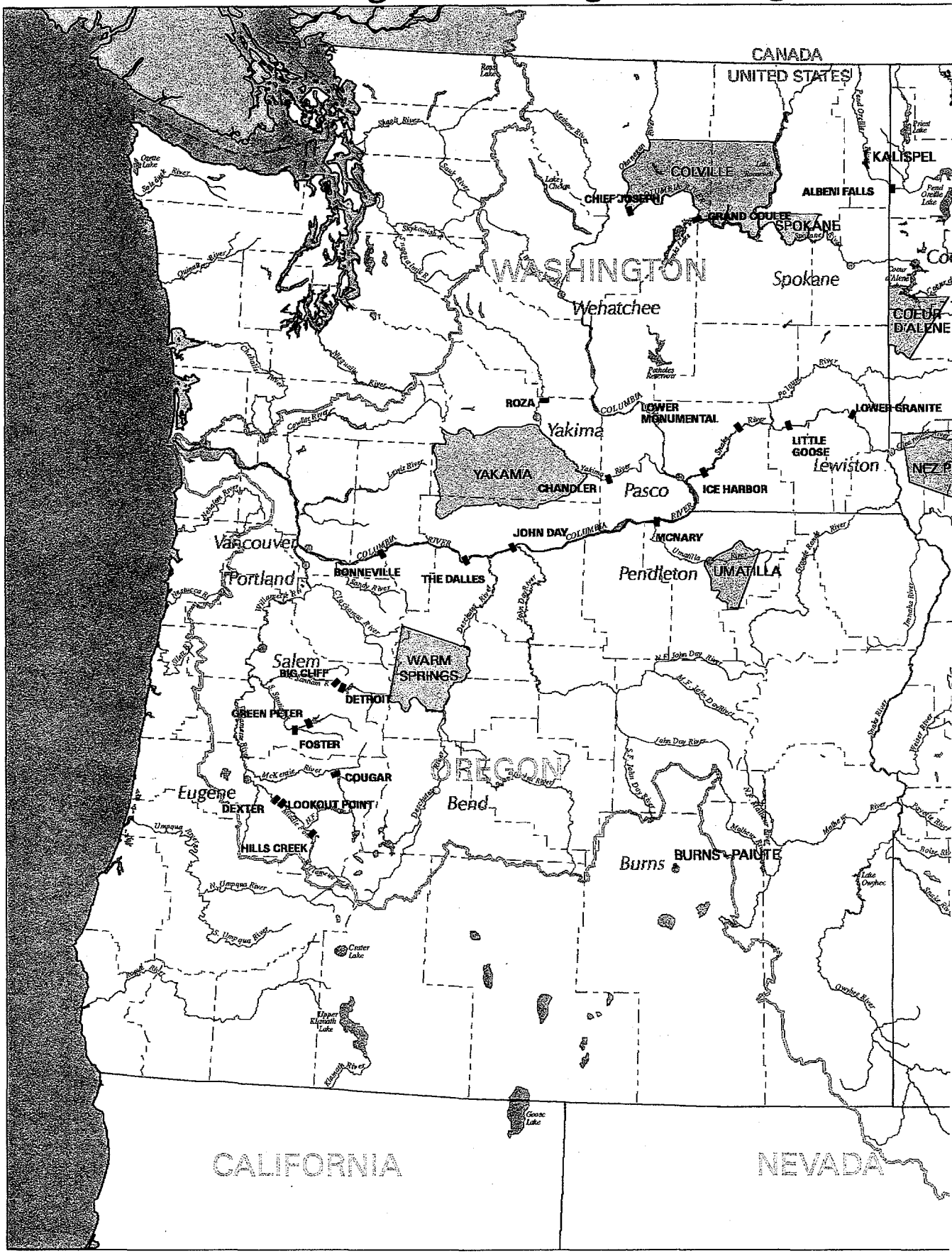
Native American traditional cultural properties include a broad range of features from the natural environment and the sacred world, such as distinctive shapes in the landscape, traditional use plants and animals, ceremonial sites, and places of spiritual renewal and guidance. Today, there are 13 Federally recognized Native American tribes with interests and/or Reservations in the Columbia River Basin within the United States. In several cases, the Tribal organizations function as confederations of multiple tribes. The 13 Tribal organizations are:

Kootenai Tribe
Shoshone-Bannock Tribes
Coeur d'Alene Tribe
Kalispel Tribe of Idaho
Burns Paiute Tribe
Nez Perce Tribe
Colville Confederated Tribes
Confederated Salish and Kootenai Tribes of the Flathead Reservation
Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation
Shoshone-Paiute Tribes of the Duck Valley Indian Reservation
Confederated Tribes and Bands of the Yakama Indian Nation
Spokane Tribe

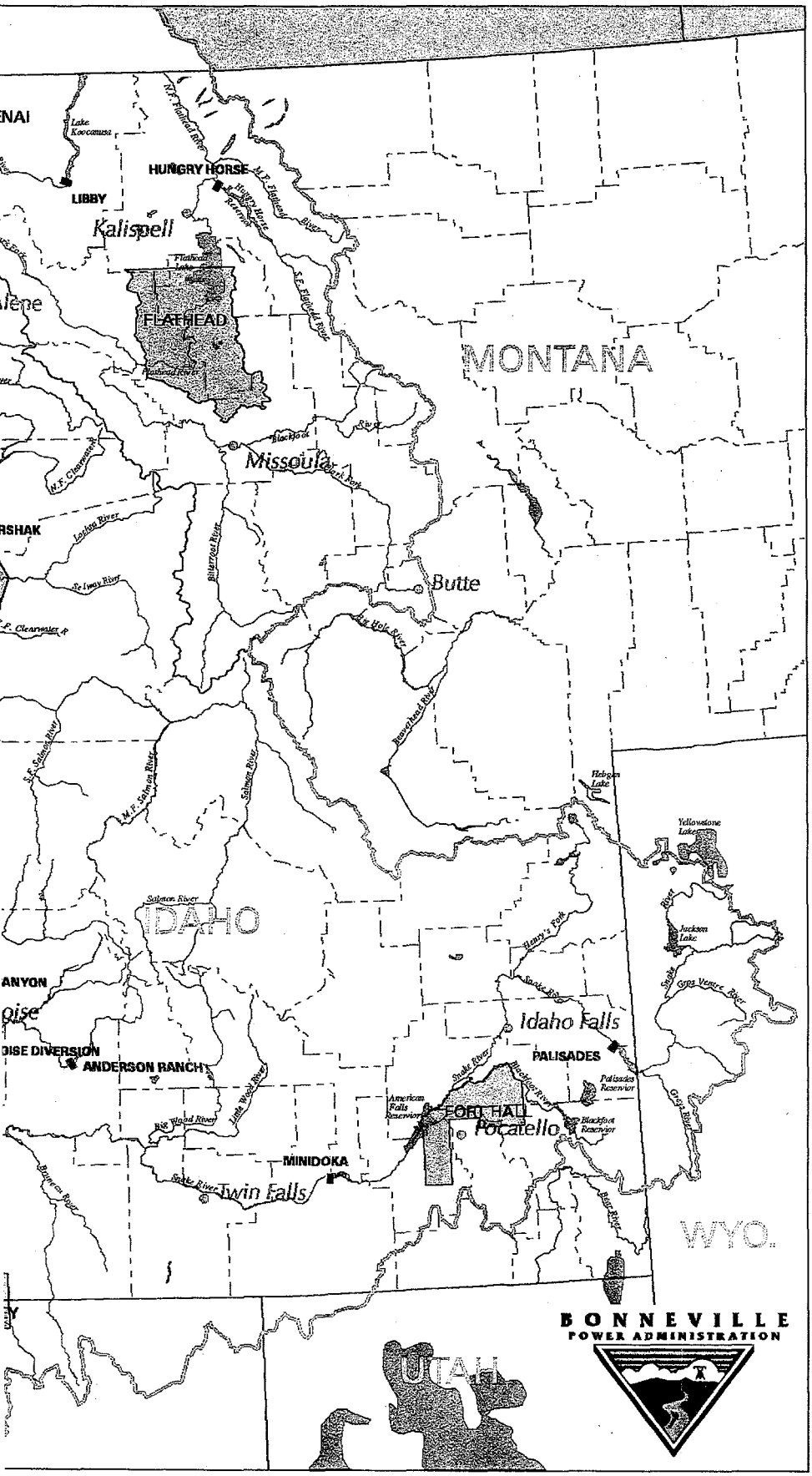
Figure 3-4 shows where the Reservations are located. However, tribal interests extend beyond the Reservations: Figure 3-5 shows tribal areas of interest, by hydrologic unit (watersheds), throughout the Columbia River Basin. Native American Tribes hold and exercise legal rights to activities and resources both within and beyond Reservation boundaries. These rights notably include fishing, hunting, gathering wild plant materials, and religious practices.

See SOR EIS (Section 2.2 and Appendix D) for more detailed information on cultural resources in the Columbia River Basin.

BPA Wildlife Mitigation Program - Figure 3-4:



Reservations"



Legend

- Federal Hydroelectric Dam
- County Boundary
- Native American Reservation

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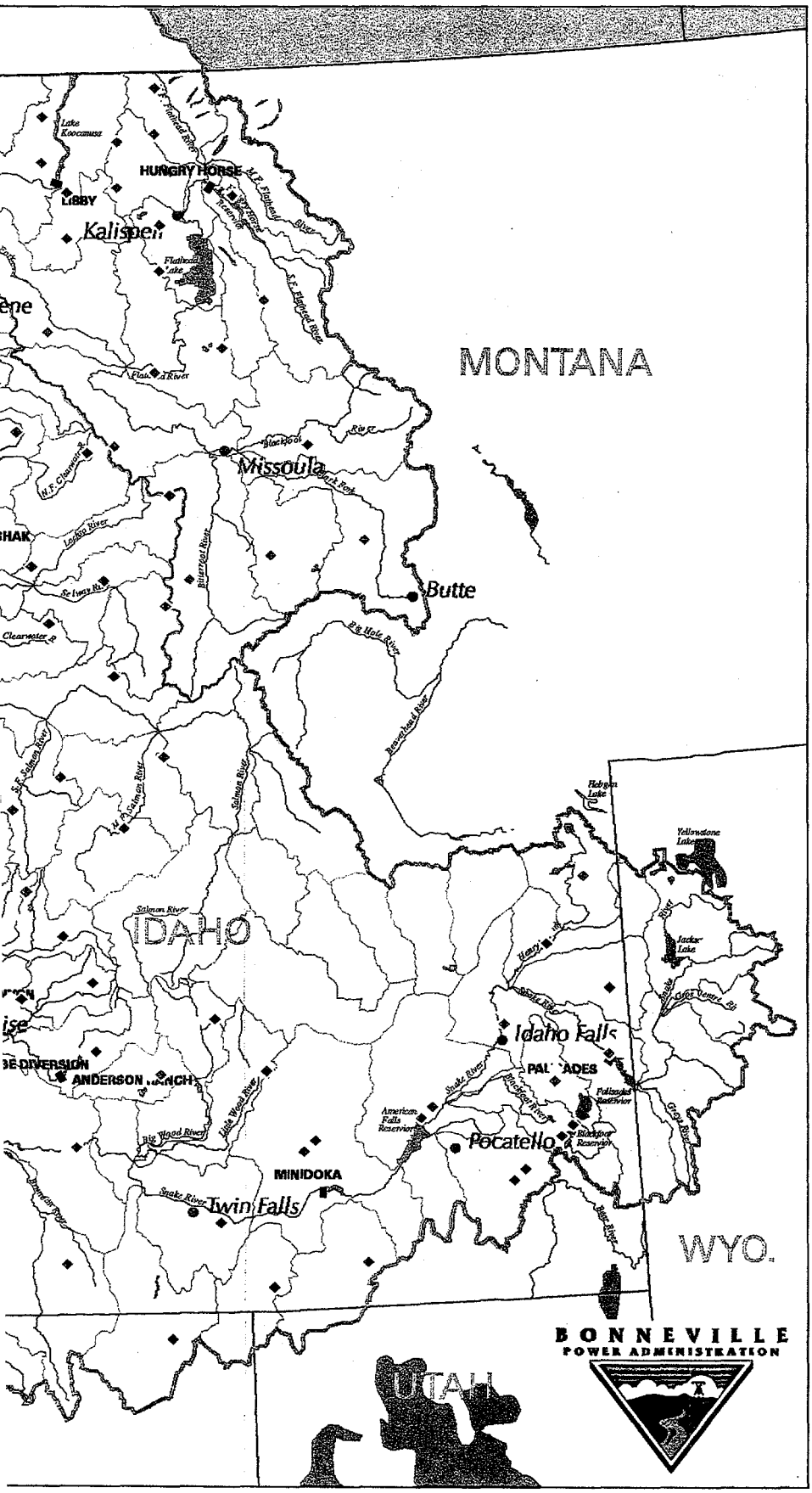
BPA Wildlife Mitigation Program - Figure 3-5:

ribal Areas of Interest"



Legend

- Federal Hydroelectric Dam
- Hydrologic Unit

TRIBAL INTERESTS

- Burns - Paiute
- Piaute - Shoshone
- Nez Perce
- Shoshone - Bannock
- Shoshone - Paiute
- Shoshone
- Yakama
- Colville
- Klamath
- Warm Springs
- Salish - Kootenai
- Umatilla
- Coeur d'Alene
- Spokane
- Kootenai
- Kalispel

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3.9 ECONOMICS

Major sources of employment include agriculture, forestry, real estate, retail, services, and government. The agricultural, forestry, and fishing industries provided 9% of the employment in the Interior Columbia River Basin in 1990 (McGinnis and Christensen 1994, citing U.S. Bureau of Economic Analysis 1993).

Most of the study area is rural and sparsely populated. Population centers range from small rural communities, to small towns (Longview/Kelso and Astoria), and major metropolitan areas (e.g., Portland, Boise, and Vancouver). Eastern Washington and Oregon are typified by expansive agricultural lands (range and crop) and widely dispersed population centers such as The Dalles, the Tri-Cities (Kennewick, Pasco, and Richland), Wenatchee, Spokane, and Clarkston/Lewiston. Primary industries of Idaho are agriculture and forestry. Major population centers in Idaho include Boise, Twin Falls, Pocatello, and Idaho Falls (U.S. Army Corps of Engineers 1992). This area is strongly oriented towards the river as a source of irrigation water for crops, a transportation route for agricultural and forestry products, and recreation.

McGinnis and Christensen (1994, citing U.S. Bureau of Census 1990 data, 1991) report that counties in the Interior Columbia River Basin had a 1990 population of 2.9 million. As a comparison, 6.3 million people reside in western Oregon and Washington. Washington counties comprise 38% of the population; southern Idaho counties 27%; Oregon counties 12%; Montana counties 11%; and northern Idaho counties 7%. Counties in the Interior Columbia River Basin in Wyoming, Utah, and Nevada comprise the remaining 5% of the study area population. The most populated county in 1990 was Spokane, Washington (361,364); the least was Camas, Idaho (727) (McGinnis and Christensen 1994).

The overall population density in the Interior Columbia River Basin in 1990 was about 4 people per km^2 (11 people per mi^2). Eastern Washington, the Snake River Plain of southern Idaho, and western Montana had the most densely populated counties; those in eastern Oregon, central Idaho, northern Nevada, and northwest Wyoming were very sparsely populated. Population densities ranged from 0.15 people per km^2 (0.4 per mi^2) in Clark County, Idaho, to 79 people per km^2 (205 per mi^2) in Spokane County, Washington (McGinnis and Christensen 1994).

The local populations and economies support a large part of county government operations. County governments rely on taxes collected from private lands, as well as on funds shared from the sale of timber on federal lands.

3.10 RECREATION/VISUAL

The basin provides a variety of outdoor recreational opportunities, including snow and water skiing, river rafting and kayaking, resort and ranch visitation, camping, hiking, horseback riding, hunting, and fishing. Photography and birdwatching are associated with camping and hiking. Much of this activity takes place on public land.

Many people from the more populated and urbanized western Oregon and Washington travel to the relatively less populated Columbia River Basin for outdoor-oriented outings. The presence of natural and scenic settings is important to many recreationists that use the area.

3.11 AIR QUALITY

Most of the Columbia River Basin is rural, and such areas generally have fewer air quality problems than do industrialized areas around large cities. Most air quality problems in the region are associated with agricultural activities such as tilling and burning.

Air quality in the basin is sometimes diminished during temperature inversions that trap pollutants near the ground. Surrounding mountain ranges prevent air masses from moving through the region and can result in an isolated, sometimes stagnant, basin atmosphere, especially during the winter months.

Chapter 4: Environmental Consequences

This chapter describes the impacts of the various alternatives on the environment. Because the primary intent of the Wildlife Mitigation Program is to increase long-term wildlife habitat values within the Columbia River Basin, any of the alternatives would provide a net benefit to wildlife, and should generally provide a net benefit to the associated resources of soils, water quality, vegetation, and fish. Other resources, such as land and shoreline use, cultural and historic resources, economics, recreation, and air quality, might benefit, be adversely affected, or remain essentially unchanged, depending on the particular circumstances surrounding each mitigation action.

The following sections outline possible environmental consequences associated with the alternatives and the impacts of the various management techniques that may be employed under some or all of the alternatives. Impacts are discussed in this chapter by resource topic (e.g., **Soils** or **Recreation**.) Four major headings are discussed under each resource topic:

- *Context:* Identifies applicable laws, standards, and policies to provide the legal and political framework for managing the specific resource; it also lists potential impacts to be avoided as project managers work to establish a desired future condition.
- *Impacts of Alternatives:* Discloses and compares the anticipated impacts of each alternative on the specific resources.
- *Impacts of Techniques:* Discloses the anticipated impact of the on-the-ground management techniques that may be used under any of the alternatives (see Chapter 2).
- *Potential Program-Wide Mitigation Measures:* Identifies ways to avoid, reduce, or rectify the potential environmental impacts of wildlife mitigation techniques.

4.1 SOILS

4.1.1 Context

- **Legal.** Most states and counties have regulations to protect soils. Soil regulations may be tied to water resource protection (see **section 4.2, Water Resources and Quality**). Under state regulations, mitigation plans may be needed to develop specific erosion and sediment control plans that specify best management practices to reduce soil loss.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: disturbing soils on unstable slopes; disturbing the upper soil horizons or accelerating erosion well beyond that occurring under natural processes; compacting of soil such that plant growth is prevented or severely restricted; or allowing sufficient deposition of salts or other materials into soils that vegetation growth is inhibited.

4.1.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Soils

Under No Action, wildlife mitigation projects would continue to be developed on a case-by-case basis. Experience with recently completed projects indicates that minor soil disturbances would occur during project implementation, followed by increased soil stability over time.

Alternative 2: Base Response - Potential Effects on Soils (Common to All Alternatives)

In general, soil conditions would improve at wildlife mitigation sites because large areas are protected from ground disturbance. Soil would be temporarily eroded, compacted, or displaced whenever ground-disturbing activities take place as part of active habitat improvement activities.

Alternative 3: Biological Objectives - Potential Effects on Soils

Under Alternative 3, relatively high amounts of short-term soil erosion and compaction would be expected during the initial phases of each new project, as a wide range of management techniques were implemented. Over the long term, soil conditions on mitigation sites would greatly improve as vegetation became established, roads were decommissioned or closed, and timber harvest, crop production, and grazing were reduced or stopped.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Soils

Short-term impacts on soils would be minor under Alternative 4 because it relies primarily on natural regeneration (rather than active restoration) to achieve biological objectives. No significant long-term adverse impacts on soils would be expected, although ongoing commercial use of mitigation lands (crop, timber, and forage production) would increase the likelihood of localized soil erosion or compaction. Soil conditions would be slow to improve over the long term.

Alternative 5: General Environmental Protection - Potential Effects on Soils

Because Alternative 5 would include an emphasis on providing collateral benefits to fish, soil protection measures would be a high priority. Impacts on soils, therefore, would be minor. Application of program-wide mitigation measures, as appropriate, would further minimize impacts on soils (see **Section 4.1.4**, below).

In general, Project Management Plans would include little use of chemical fertilizers and/or herbicides. Major soil-disturbing activities would also be minimized under this alternative, with infrequent use of wetland creation or water development and/or distribution techniques (e.g., diversions, drainage ditches).

As with Alternative 4, Alternative 5 would encourage commercial and recreational use of mitigation lands where economic and/or recreational benefits could be obtained simultaneously with biological objectives. Therefore, soil erosion associated with these activities might occur (see **Section 4.1.3, Effects of Techniques**).

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Soils

Under BPA's preferred alternative, a moderate level of short-term soil erosion would occur as new projects were begun. Program-wide measures would be applied, as appropriate, to minimize erosion.

Because project managers would rely primarily on natural regeneration to achieve biological objectives, little soil would be disturbed at new mitigation sites. In addition, project managers would favor wildlife management activities with collateral benefits for fish, including activities that protect soils. Therefore, Alternative 6 would generally benefit soil productivity and stability.

4.1.3 Impacts of Techniques: Potential Effects on Soil

Land Acquisition Techniques

Land acquisition has little direct effects on soils. Should lands be taken out of crop production and designated as wildlife habitat, erosion problems that might have occurred under farming might be reduced.

Plant Propagation Techniques

Erosion potential can be eventually reduced by any of the plant propagation techniques, because all can be used to stabilize banks and other areas vulnerable to erosion.

Initially, planting disturbs the soil. Hand-transplanting of vegetation affects relatively small areas. Mechanical transplanting and seeding and seedbed preparation (e.g., tilling) can temporarily destabilize soils and increase susceptibility to erosion (Chutter 1969).

Irrigation can lead to sheet, rill, and gully erosion, although soil condition (including vegetative cover, slope, and drainage pattern) is usually the underlying cause of erosion associated with irrigation (Brady 1984). Irrigation can concentrate salts by leaching them from the top layers of soils or by depositing those salts contained in the irrigation water itself. Excess salts are often removed through flushing, which involves temporary heavy irrigation to wash away salts.

The addition of nitrogen fertilizers can change the natural nitrogen cycle, reducing free ammonia (a necessary component of the cycle) and increasing soil acidity. Consequently, heavy nitrate fertilization can even increase losses of nitrogen from the soil (Brady 1984). Fertilizers also build up as salt layers in soil.

Habitat Creation and Conversion

Creating wetlands can have both beneficial and adverse effects on soils. Such wetlands can reduce storm water runoff and associated erosion problems. Manipulations of wetlands can stabilize stream banks and elevate existing erosion problems. Adverse effects include potential temporary erosion during construction or during diversion of water flows to increase wetland depth or size. Created wetlands can also create anaerobic and saturated soil conditions, with potential permanent changes in soil structure.

Creating habitat islands within wetlands or lakes can cause temporary erosion, either in acquiring source material or in placing the material in water.

Artificial nest structures generally have little effect on soils, other than the small amount of soil disturbed during establishment of some nest types with foundation.

Water Development and Management Techniques

Developing wells, diversions, springs, impoundments, and guzzlers can lead to soil erosion. Direct erosion can occur as these features are developed, given the typical combination and close proximity of moving water and disturbed soils. Spillways constructed as part of check dams can concentrate downstream flows during flooding, potentially adding to bank and gully erosion.

Indirect erosion may occur as water obtained from wells, diversions, springs, and impoundments is delivered to other areas, as described below, under **Water Distribution Techniques**. Because water may be acquired for irrigation, see also the discussion, above, under **Plant Propagation Techniques**. Guzzlers, springs, ponds, and other water developments might draw wildlife that trample and compact vegetation and soils.

Water Distribution Techniques

Pipelines, culverts, and drainage ditches/conveyance channels also pose a risk to soil erosion during installation because disturbed soil may be exposed to moving water. Drainage ditches/conveyance channels can similarly be long-term sources of erosion.

Development of culverts with elevated outfalls (greater than 1 m or 3 ft.) can cause erosion downstream.

Fire Management Techniques

Natural fire management would increase the risk of high-intensity wildfires, with extreme combustion temperatures that tend to damage soils severely. Severe fire intensity can change the water-holding properties of soils, so that they repel water rather than hold it. Such changes can increase erosion potential, increase water runoff, and decrease productivity during reclamation.

Prescribed burns carry the same risks as high-intensity wildfires, but generally have much lower intensity and associated effects. They also augment soils with ash and associated nutrients and protect soils from the potentially adverse effects of unmanaged wildfire.

Vegetation Management: Enhancement and Control

Herbicides generally decompose in the soil (USEPA 1980). Mechanical removal of vegetation can disturb soils and make them vulnerable to erosion. Biological control (e.g., using insects) and hand-pulling has little direct effect on soils. Prescribed burns conducted for vegetation control carry the same risks and benefits as those conducted for fuel reduction (see previous

section). Prescribed fire can be used instead of grazing as a vegetative management strategy (e.g., controlling shrubs), avoiding some of the more serious adverse erosion problems associated with grazing (e.g., erosion along riparian areas and nutrient loading from animal waste).

Water level manipulation to control vegetation can add to soil erosion and transport. During drawdowns, exposed fine sediments can be vulnerable to wind or water erosion. During flooding, rising waters may destabilize banks, causing erosion, and deposit loosely consolidated soils that may be further eroded.

Species Management Techniques

While the introduction of peregrine falcons or similar small species generally has little effect on soils, the introduction of large, herding animals, such as elk, can cause soil compaction and erosion.

Introduction of non-native or non-endemic species can have serious effects on vegetation and soils. For instance, mountain goats have caused serious erosion and other problems for the alpine environment at Olympic National Park (Robinson and Bolen 1989).

Control of nuisance animals can protect vegetation or vegetation enhancement projects, which in turn can protect soils. For example, voles and mice can often kill significant amounts of planted vegetation by eating through the bark, and Canada geese can remove planted tubers and bulbs.

Multiple Use Techniques

Crop production practices related to harvest and planting can cause significant levels of soil erosion. For example, crop tilling can destabilize soil, making it susceptible to erosion.

Provision of educational and recreational opportunities on mitigation lands can add to soil erosion and compaction problems. However, most public uses consistent with wildlife mitigation are generally low-intensity activities such as group tours, photography, and hiking, with little impact on soils.

Recreational vehicles can add to soil problems. In the absence of managed trails, regular use of off-road vehicles poses the greatest level of risk because large networks of braided trails are typically established (Jones & Stokes Associates 1995).

High levels of grazing can cause direct soil erosion and compaction through physical disturbance (the direct action of breaking and compacting soils through repeated walking, trampling, laying, and wallowing), and indirect erosion through removal of vegetation by feeding or trampling, especially in riparian areas.

Transportation/Access Techniques

Restricting access by fences and gates can prevent potential erosion caused by recreational activities an other public uses. Constructing of fences and gates can disturb soils: fence post holes are dug, vegetation is trampled, and soils are compacted by vehicles and equipment and at material staging areas.

Road construction can increase soil erosion. Unimproved roads (i.e., dirt and gravel roads) may themselves erode by diverting runoff along tire ruts or by rills created by moving water cutting into the road. Roadside ditches can accelerate runoff velocity and erode road beds. Drainage structures installed in conjunction with roads to allow surface water flows disturb soils and can lead to erosion if soil is allowed to be exposed to moving water.

4.1.4 Potential Program-Wide Mitigation Measures — Soils

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Monitor newly disturbed soils for evidence of erosion, and implement active controls, such as plowing and seeding of new gullies (or temporary stabilization for later seeding during dry season).
- Where soil-disturbing activities are being considered, survey soil conditions to find and map potentially fragile soil types (such as shallow "scablands") and allow only those activities that would not disturb soils in these areas.
- *For projects involving land acquisition,* develop and implement a sediment and erosion control plan where soils might be disturbed.
- Develop and implement an erosion control plan that applies best management practices for each activity that involves disturbing soils (e.g., preparation of seedbeds or creation of wetlands).
- Use conservation tillage practices for planting and maintaining vegetation (e.g., no-till methods). These methods (including reduced-tillage or no-tillage methods) are less harmful to soils.
- *For projects involving water development,* establish guzzlers, springs, ponds, and other wildlife water developments in areas where soils can tolerate increased wildlife trampling.
- *For projects involving installation of guzzlers,* design guzzlers in accordance with NRCS specifications.
- *For projects involving installation of culverts,* avoid elevated outfalls. Where such outfalls are unavoidable, install energy diverters to absorb and deflect flow.

- Plant vegetation, or place rip rap or similar material along created ditches and channels to minimize bank erosion.
- *For projects involving prescribed burns*, implement the recommended goals and actions outlined in the Federal Wildland Fire Management Policy and Program Review (USDI and USDA, 1995). (The report recommends that agencies develop a plan-by-plan strategy to introduce landscape-scale prescribed burns across agency boundaries. The report also directs agencies to seek opportunities to enter into partnerships with Tribal, state, and private land managers to achieve this objective.)
- *For projects involving prescribed burns*, conduct a pre-burn inventory to identify areas to avoid, including areas that may be vulnerable to increased erosion. Develop an approach to avoid these areas.
- *For projects involving prescribed burns*, check burned areas at regular intervals (e.g., once every 3 months during the first 2 years) to identify potential problem areas requiring additional treatments, such as transplanting, seeding, soil stabilization, or fertilization.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, develop a specific population control strategy for introduction programs involving large mammals.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, introduce large mammals only where feasibility studies indicate that soils and vegetation can tolerate increased foraging or physical damage.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, introduce only species that have been historically present, and ensure that factors resulting in previous extirpation are no longer present.
- Control nuisance animals where they are hindering establishment of vegetation.
- Use conservation tillage practices for crop production on mitigation lands.
- *For projects involving property acquisition*, inventory and map sensitive soil areas, and restrict human access to these areas.
- Manage livestock levels and timing to minimize damage to soils.
- Allow livestock grazing only as a vegetation management tool (possibly conflicts with Economic considerations).
- *Where off-road vehicle travel is planned*, develop a trail network to contain travel routes.
- *For projects involving road construction*, build roads with water bars, culverts, and other erosion control features, such as placement of gravel or pavement where soil, slope, and other site conditions may encourage erosion.
- Allow road construction only where necessary for maintenance and operation of mitigation lands. Decommission unnecessary roads.

- *On large tracts of wildlife mitigation land,* provide good, general vehicle access with relatively few roads by maintaining one or more through roads.
- *For projects involving road construction,* build roads at least 15 m (50 ft.) from perennial streams; construct within 46 m (150 ft.) only when necessary.

4.2 FISH AND WATER RESOURCES

4.2.1 Context

- **Legal: Water.** The U.S. Department of Energy requires an assessment of impacts on floodplains and wetlands (10 CFR 1022.12). The NRCS regulates wetlands on agricultural lands. The Corps regulates discharge of dredge and fill material in waters of the United States, including wetlands under Section 404 of the Clean Water Act. In addition, state and county regulations may be more restrictive and may preempt certain activities that would otherwise be authorized under a Federal permit.

  Several state agencies also have regulatory authority over protection, use, and management of water resources. Projects would need to comply with state-specific regulations, as well as with any county, district, or other local regulations. The state agencies that may be involved in regulating water use and management on mitigation lands include:

  1. **Washington State Department of Ecology:** regulates pollutant discharge to waters of the United States, which include lakes, rivers, streams, wetlands, natural ponds, and tributaries.
  2. **Oregon Water Resources Department:** responsible for overseeing state regulations to protect water resources, permit and license procedures for water rights, well construction, and stream channel alterations.
  3. **Oregon Department of Environmental Quality:** regulates all pollution control programs in the state. Has jurisdiction over water quality.
  4. **Oregon Department of Agriculture:** State administrative agency for non-point source water quality programs dealing with agricultural lands. Also manages the state's field-burning weather monitoring program, and the native plant species conservation program.
  5. **Idaho Department of Water Resources:** responsible for permit and license procedures for water rights, well construction, and stream channel alterations.
  6. **Montana Department of Natural Resources and Conservation:** plans, regulates, and coordinates the development use of other water, land, and energy resources; water-right adjudication; floodplain management.
  7. **Nevada Department of Conservation and Natural Resources, Division of Water Resources:** responsible for permit and license procedures for water rights, well construction, and stream channel alterations.
  8. **Utah State Department of Natural Resources, Division of Water Rights and Division of Water Resources**: responsible for permit and license procedures for water rights, well construction, and stream channel alterations.

9. **Wyoming Environmental Quality Department**: regulates water quality and use.

- **Legal: Fish.** As described under **Section 4.4.1**, Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of any threatened or endangered species. Officially designated critical habitat for listed species cannot be adversely modified.

  The USFS and BLM have developed guidelines for management activities that may affect fish on Federal lands. These guidelines are identified in the Decision Notice/Decision Record for Interim Strategies for Managing Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon and Washington, Idaho and Portions of California (PACFISH), and the Decision Notice for the Inland Native Fish Strategy (USDA 1995). In general, these guidelines identify riparian management objectives, standards and guidelines, and monitoring requirements for USFS and BLM activities. These guidelines may apply to mitigation actions taking place on Federal lands.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following water resources impacts: violating water quality standards; placing dredge or fill materials into wetlands under the jurisdiction of the Corps and not covered under a nationwide permit, as defined under Section 404 of the Clear Water Act; reducing instream flows to the extent that riparian vegetation is likely to be permanently reduced or eliminated; or infringing upon existing, priority water rights. They will further seek to establish that condition without the following impacts on fish: adversely affecting a fish species listed or proposed for ESA listing; adversely modifying designated critical habitat for listed fish species; adversely affecting fish species listed by state fish and wildlife or Tribal agencies as species of special concern (such as endangered, threatened, sensitive, etc.); removing habitat that has been identified by state or Tribal agencies as unique, rare, or important to fish distribution; directly killing fish or fish eggs; permanently removing or degrading spawning habitat; temporarily reducing habitat that in turn may result in increased fish mortality or lowered reproductive success; or avoidance by fish of biologically important habitat for substantial periods (e.g., blockages of upstream passage), possibly resulting in increased mortality or lower reproductive success.

4.2.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Fish and Water Resources

Under No Action, individual projects would continue without a standardized program; impacts on fish and water resources could vary widely. Overall, fish and water resources/quality would benefit (after some initial impacts) from riparian and other habitat improvements that would continue with or without a standardized program to implement projects.

Alternative 2: Base Response - Potential Effects on Fish and Water Resources (Common to All Alternatives)

Ground-disturbing activities, such as riparian habitat restoration or creation of wetlands, would potentially disturb water quality and fish habitat in the short term. However, state water regulations would be followed under all alternatives, so no significant impacts are expected.

All alternatives would follow state and Federal regulations for all activities in or near wetlands and floodplains, whether for maintenance or enhancement. Many wildlife projects might involve activities within floodplains because the floodplains and their related surface waters have high wildlife values. Any development (such as fencing) within these floodplains would be to protect or enhance wildlife values, and would be designed to minimize or avoid any restriction in floodwater flow.

Over the long term, wildlife mitigation projects would benefit fish and water quality as vegetation cover increases (either by active restoration or by natural revegetation). Control of non-native species (especially carp) would improve water quality (carp muddy water by foraging along the bottom).

Alternative 3: Biological Objectives - Potential Effects on Fish and Water Resources

In the short term, water quality and associated fish habitat would potentially decrease at each site as a wide range of management techniques were implemented. Over the long term, water quality and fish habitat would generally improve as riparian habitat and other vegetation communities became established, as roads were closed, and as crop, timber, and grazing activities were reduced or stopped. Fertilizers and herbicides would be used to better meet biological objectives, thus increasing the potential for chemicals reaching surface waters and affecting fish.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Fish and Water Resources

Short-term impacts on fish and/or water resources/quality would be minor under Alternative 4 because it relies primarily on natural regeneration (rather than active restoration) to achieve biological objectives. No significant long-term adverse impacts on water resources/quality or fish habitat would be expected, although ongoing commercial use of mitigation lands (crop, timber, and forage production) would increase the likelihood of localized transfer of sediments and chemicals to streams and rivers. Long-term improvement of water resources/quality and fish habitat would occur, but at a relatively slow rate, as riparian habitat increased through natural succession.

Alternative 5: General Environmental Protection - Potential Effects on Fish and Water Resources

Alternative 5 would require Project Management Plans to provide collateral benefits to fish; therefore, fish habitat and water quality would increase across mitigation lands. Fertilizer and herbicides would be used only when necessary to meet mitigation objectives. Application of program-wide mitigation measures, as appropriate, would minimize impacts on fish and water resources/quality.

As with Alternative 4, Alternative 5 would encourage commercial and recreational use of mitigation lands where economic and/or recreational benefits could be obtained simultaneously with biological objectives. Therefore, sediment transfer associated with these activities might occur over time, reducing the improvement potential for fish habitat and water quality.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Fish and Water Resources

Under BPA's preferred alternative, project managers would have a wide range of techniques available that could potentially affect fish and/or water resources/quality. However, program-wide measures would be applied, as appropriate, to minimize or avoid such impacts. BPA would also support actions under Alternative 6 that provide collateral benefits to fish, so that fish and associated water quality would be generally protected program-wide. In addition, because Alternative 6 would emphasize natural revegetation rather than the more intensive techniques of seeding and transplantation, the short-term effects of ground disturbance would be low. Fish habitat and water quality at new mitigation sites would increase over the long term as riparian habitat were allowed to develop and as intensive timber, farming, and grazing activities were reduced.

4.2.3 Impacts of Techniques

Land Acquisition Techniques

Land acquisition has little, if any, direct effects on fish or water quality other than the potential change in land use. Should lands be taken out of crop or stock production and designated as wildlife mitigation habitat, erosion and sedimentation problems that may have occurred under farming or grazing might be reduced.

Plant Propagation Techniques

Restoration of riparian communities would increase fish habitat and stream stability and decrease sediment contributed to bank erosion. Plants along streams can reduce stream stormflow velocities and associated erosion potential. Root systems of riparian vegetation help to hold soil together, thus preventing soils from being dislodged and entering the stream system (Salo and Cundy 1987). Short-term increases in stream sediments may occur during initial phases of planting or seedbed preparation; however, the long-term effect would be positive.

Fertilizers can be transported through soil, by rain or irrigation water, to surface and ground water. Excess amounts in wetlands, ponds, and streams can cause algae blooms, reduced oxygen levels in the bottom layers, and the development of organic material that eventually builds up on the bottom (*eutrophication*).

Irrigation runoff can transport soil, agricultural chemicals, salts, and naturally occurring inorganics leeched from soils. Many of these chemicals can be toxic to aquatic organisms (Ohlendorf et al. 1988, Ingersoll et al. 1992, Dwyer et al. 1992). On areas previously used as croplands, existing soils may contain pesticides, industrial chemicals, and various persistent compounds found in irrigation drainwater (e.g., heavy metals).

Habitat Creation and Conversion

Creating wetlands can have both beneficial and adverse effects on fish and water quality. Such created wetlands can support resident and anadromous fish and can improve downstream fish habitat and water quality by providing stormwater storage, sediment catchment, and biofiltration. Wetland water levels could be raised or lowered to reduce excessive concentrations of aquatic plants, which can be detrimental to resident fish populations.

Sediment may temporarily be transported during wetland construction or expansion. Adverse effects of wetland creation include temporary sediment transport or diversion of water flows to increase wetland depth or size.

Creation of habitat islands within wetlands or lakes can cause temporary turbidity and sedimentation.

Water near the bottom of deeper impoundments can be low in oxygen, and release of this water can decrease downstream oxygen contents, which is harmful to fish, especially salmon and trout.

Water Development and Management Techniques

Water rights acquisition can affect fish and water quality. Adverse affects may include impacts associated with irrigation (see **Plant Propagation Techniques,** above).

Beneficial effects may occur where poor water practices by the existing water rights holder are curtailed through acquisition of the rights. Overall effects of acquiring water rights may be neutral because, in many cases, no significant change in water use or management practice would occur.

Development of diversions and check dams or impoundments can reduce instream flows in source waters, which in turn reduces habitat for fish and other aquatic organisms. Diversions and dams can also block upstream or downstream fish passage or can directly kill fish that pass through spillways or into diverted water flows.

Development of springs and guzzlers typically occur away from major surface waters. Little degradation in fish habitat or water quality would occur from these types of developments.

Water rights could potentially be compromised unintentionally where new wells are developed, possibly decreasing aquifer reserves in circumstances where a shallow and limited aquifer is tapped. Likewise, major water diversions, flood irrigation, or development of new well sources could cause unintentional flow changes in shallow aquifers. Both potential conditions can be predicted through hydro-geologic testing and avoided through design of particular water developments. More generally, existing water rights would be protected through consultation with state water resource agencies and notice to potentially affected water rights holders.

Water Distribution Techniques

Pipelines, culverts, and drainage ditches/conveyance channels also pose a risk to fish habitat and water quality during installation because disturbed soil might be exposed to moving water. Drainage ditches/conveyance channels can be long-term sources of water-borne sediments where bare soils are exposed to water.

Development of culverts with elevated outfalls (greater than 1 m, or 3 ft.) can add to downstream sediment loads.

Water distribution systems can also distribute undesirable elements as well. For example, livestock waste products or weed seeds can be carried to streams, rivers, wetlands, and other waters. Likewise, carp, an exotic species that disturbs aquatic vegetation and makes waters turbid (cloudy), can be introduced to areas through water distribution systems.

Fire Management Techniques

Intense fires can eliminate all vegetation, root systems, and organics; this elimination can result in increased stormflows, surface runoff, and sedimentation, with potential effects up to 3 years or more after a fire (Ursic 1970). Fires also contribute polycyclic aromatic hydrocarbons (in the form of ashes) to aquatic systems; most of these are ultimately deposited in sediments (Eisler 1987), which can adversely affect fish and other aquatic organisms by covering the bottoms of shallow lakes and wetlands.

Prescribed burns are conducted under controlled conditions and generally do not result in significant impacts on water quality. Over the long term, prescribed burns can reduce fuel loading and the risk of high-intensity wildfires and associated impacts on fish and water quality. Because of the typical high fuel loads of forests within the Columbia River Basin, reliance on natural fire management without active fuel management would increase the risk of high-intensity wildfires, which tend to damage soil, vegetation, fish habitat, and water quality severely.

Vegetation Management: Enhancement and Control

Overall, removal of undesirable species improves fish habitat and water quality over the long term. For example, control of reed canary grass in wetlands would maintain natural wetland conditions and would increase both plant diversity and structure, and associated water cleansing and storage benefits in wetlands and floodplains.

However, the methods use to remove undesirable species can have temporary adverse effects on the environment. Herbicides can pollute water and lead to decreased productivity in aquatic systems. Each of the wide variety of herbicides carries its own risks, benefits, and drawbacks. Standard buffer requirements of 6 m (20 ft.) from surface waters provide some protection, but cannot ensure complete protection. An analysis of each type is beyond the scope of this assessment. Refer to the U.S. Forest Service Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).

Mechanical removal of vegetation can lead to soil erosion and increased stream sediments. Biological control and hand-pulling has little direct effect on fish or water quality.

Water level manipulation can reduce water quality. During drawdowns, exposed fine sediments can be washed to receiving waters. During flooding, rising waters may destabilize banks and increase stream sediments. Water level manipulation may also affect water quality or quantity for adjacent landowners or downstream water users by changing surface water and

sediment transport regimes. During drawdowns, young fish can be stranded and killed, and exposed fine sediments can be washed to receiving waters. During flooding, rising waters may destabilize banks, increasing stream sediment.

Prescribed burning generally does not significantly affect fish habitat, water yield, or water quality except where severe fires damage soils or riparian habitat or where previous soil damage has cause increased vulnerability to erosion. Should soil damage occur, then so would the potential for increased sediments in surface waters. As described under **Soils**, severe fire intensity can create hydrophobic soils, which can in turn increase stormwater runoff. Following fire, nutrient levels may rise in surface waters as nutrients leach from ashes.

Prescribed fire in grasslands can be used in place of grazing and haying as a habitat management strategy, thereby avoiding some of the more serious adverse water quality impacts associated with these practices. Also, prescribed burning would reduce the threat of more ecologically destructive wildfire. On balance, increasing prescribed burning would have a slightly positive effect on water quality by eliminating these other potential effects.

Species Management Techniques

Introduction of large, herding animals, such as elk, can possibly remove vegetation, compact soil, and cause erosion, all of which can adversely affect fish habitat and water quality. However, introduction of small mammals or birds generally has little effect on water quality.

Control of nuisance animals can protect vegetation or vegetation enhancement projects, and thus protect fish habitat and water quality. For example, controlling carp by regulating water levels would increase water quality. Carp stir up muddy bottoms of wetlands when feeding and can create very turbid water conditions. Temporary control of waterfowl in newly planted wetlands can encourage the successful development of wetland vegetation and associated benefits to water quality.

Multiple Use Techniques

Intensive agriculture can affect fish habitat and/or water quality as chemicals (fertilizers and herbicides) are introduced and sedimentation increases.
Reduction of grazing as a mitigation action could improve fish habitat and water quality by reducing animal wastes and by reducing physical damage to streams caused by grazing. Livestock grazing increases the amount and rate of transport of fine sediment to streams and rivers (Meehan and Platts 1978). In addition, grazing can affect streams by indirectly increasing water temperatures as riparian habitat is lost, as concentrations of ammonia and fecal coliform increase, and as concentrations of dissolved oxygen decrease (Meehan and Platts 1978, Platts 1979). Therefore, reducing or controlling grazing can reduce existing impacts on water quality before the site is converted to a mitigation site. Conversely, increasing or maintaining current levels of grazing would have negative or neutral effects on water quality.

Transportation/Access Techniques

Fencing lands to prevent cattle from entering riparian areas would improve fish habitat and water quality by increasing stream stability and reducing stream sediments. Reducing human access and activities on some lands may reduce sedimentation caused by human disturbances (Cole and Landres 1995). Should access be increased or roads developed, then stream sedimentation near roads and alteration of stream courses might increase.

Road development can add to sediment loads of streams and rivers by exposing disturbed soils to streams and stormwater runoff. The development of culverts and roadside ditches can also add to stream sediment loads. Roads also can promote human activities, including fishing, which can potentially affect fish populations. Closing roads and restoring natural stream courses could improve water quality by alleviating these potential problems.

4.2.4 Potential Program-Wide Mitigation Measures — Fish and Water Resources

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Select, implement, and enforce Best Management Practices based on site-specific conditions, technical and economic feasibility, and the water quality standards for those waters potentially affected.
- Monitor water quality downstream from activities with potentially significant adverse affects to water quality, such as those land-disturbing activities occurring within 15 m (50 ft.) of the wetted perimeter of a stream or wetland. Implement corrective actions for conditions found to be approaching maximum allowable degradation under state regulation.
- *For projects involving creation of water conveyance features*, plant vegetation or place rip rap or similar material along created ditches and channels to minimize bank erosion.
- *For projects involving the installation of culverts*, place structures at elevated outfalls to absorb and deflect flow.
- *For projects involving placements of culverts*, use culverts designed to allow fish passage (e.g., box culverts) in streams containing native fish or non-native food or game fish; position culverts even with the natural downstream flow.
- Minimize use of fertilizer and require monitoring of downstream wetlands and streams to identify possible adverse affects.
- Stop application of fertilizer if signs of eutrophication are detected.
- Use fertilizers with the lowest environmental cost that can still achieve acceptable results.

- Before establishing an irrigation system, sample soils and groundwater on previous cropland for possible accumulation of chemicals.
- Apply fertilizer away from streams. Do not apply fertilizer using aircraft in areas containing streams.
- Minimize irrigation runoff and monitor runoff for the presence of contaminants on newly irrigated lands.
- *For projects involving wetland and/or island creation*, construct wetlands and islands during the dry season.
- *For projects involving wetland creation*, ensure adequate strategy to control nutrients excreted by large concentrations of waterfowl.
- Monitor dissolved oxygen levels in water released from deep impoundments and take actions to eliminate low-oxygen discharges if found.
- *For lands involving property acquisition*, withdraw surface waters or groundwater only where such withdrawal is necessary for the use and management of the property and when such withdrawal is demonstrated not to cause significant adverse effects on aquatic life, riparian communities, or adjacent land use.
- Coordinate with state water resource and/or rights agencies to verify viability of new water sources and to design and implement features necessary to protect aquatic systems and other water users.
- Develop water impoundments or diversions in consultation with state water agencies and state and Tribal fish and wildlife agencies. Obtain Corps permits, where needed.
- *For each controlled burn operation*, develop a specific plan that outlines objectives as well as measures to minimize risk of escape and impacts on soils, air quality, and other resources.
- *For projects involving prescribed burns*, conduct a pre-burn inventory to identify areas to avoid, including areas that may be vulnerable to increased erosion. Develop an approach to avoid these areas.
- *For projects involving prescribed burns*, monitor burned areas at 1-day, 1-month, 6-month, and 1-year intervals to identify potential problem areas requiring additional treatments, such as transplanting, seeding, soil stabilization, or fertilization.
- *For projects involving prescribed burns*, maintain standard protection buffers near riparian areas; take protective measures, such as fire lines, to ensure that riparian vegetation is maintained.
- Coordinate with adjacent landowners and management agencies to discuss and resolve potential problems.
- For projects involving use of herbicides, prevent use of herbicides within 15 m (50 ft) of water bodies, unless the herbicide has been approved by the Environmental Protection Agency (EPA) for use in or near water.

- Establish 15-m (50-ft) buffers for chemical spraying to control vegetation near perennial streams.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations*, develop a specific population control strategy for introduction programs involving large mammals (see related discussion under **Soils**).
- Prevent direct pollution by livestock under commercial grazing permits by eliminating streamside or lakeside corrals and pastures and associated watering sites on natural waters.
- *Where grazing will continue on mitigation lands*, fence riparian areas particularly susceptible to damage or areas that have already been damaged and are being restored.
- Develop roads only where necessary for efficient operation and maintenance. For recreational use, utilize existing roads.
- Prevent livestock from direct access to streams, lakes, or other natural surface waters.

4.3 WILDLIFE

4.3.1 Context

- **Legal.** Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of any threatened or endangered species. Officially designated critical habitat for listed species cannot be adversely modified. The USFWS maintains considerable responsibility and regulatory authority over waterfowl and other migratory birds, as defined under the Migratory Bird Treaty Act. States maintain control over wildlife, especially over game species. States and Tribes generally have the authority to regulate hunting and hunting seasons.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: adversely affecting a species listed or proposed for ESA listing; adversely modifying designated critical habitat for listed species; adversely affecting candidate species under the ESA, or species listed by state fish and wildlife or Tribal agencies as species of special concern (such as endangered, sensitive, monitor, etc.); or removing habitat that has been identified by state or Tribal agencies as unique, rare, or important to wildlife distribution (such as big game winter range, waterfowl nesting areas, late-successional forest, native shrub-steppe).

4.3.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Wildlife

Wildlife mitigation projects would continue to be implemented and, as with all alternatives, target wildlife habitats and species would increase. Wildlife disturbance would occur when projects first begin. BPA typically requires seasonal restrictions to avoid disturbance of sensitive wildlife habitats; however, no standardized program would be established to ensure program-wide mitigation.

Alternative 2: Base Response - Potential Effects on Wildlife (Common to All Action Alternatives)

All alternatives include, as a primary objective, protection and/or improvement of target wildlife habitats and species, and all alternatives would benefit these habitats and species as well as numerous other species. Control or eradication of non-native invasive plant species would increase the quality and quantity of native wildlife habitat and increase the biological diversity of native species.

Habitat changes resulting from management activities could adversely affect some species. For example, while increasing vegetative density in open rangeland would increase habitat for a wide variety of birds, it would also reduce habitat for those species adapted to more open conditions (e.g., the red-tailed hawk).

Activities on mitigation lands could disturb existing wildlife as habitat improvements are implemented, although, as a general rule, management activities (e.g., burning of reed canary grass, mechanical removal of blackberries) would be timed and placed so as to minimize disturbance to native fish and wildlife, especially during such critical periods as the breeding season for waterfowl.

Alternative 3: Biological Objectives - Potential Effects on Wildlife

This alternative provides the highest potential for short-term disturbance, displacement, and habitat loss for wildlife, but also the highest potential for long-term gains in target species and habitats. Because Alternative 3 would work aggressively to achieve wildlife objectives, local wildlife communities might be temporarily disturbed through use of the more intensive habitat improvement techniques, including water developments, large-scale vegetation planting, creation of wetlands, and prescribed burn. These techniques would involve clearing and use of heavy equipment.

Eventually, however, increased habitat values would outweigh the initial temporary disturbance. For example, prescribed fire temporarily destroys habitat, but can greatly improve wildlife habitat over time.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Wildlife

Alternative 4 has a low potential for disturbance to wildlife because of its overall emphasis on passive, rather then active, management techniques. However, for the same reason, the potential for long-term wildlife habitat improvement would be lower on an acre-by-acre basis. The provision for multiple use would reduce the total area available for wildlife habitat at new mitigation sites and would increase the level of human activities and associated disturbance to wildlife.

Alternative 5: General Environmental Protection - Potential Effects on Wildlife

Under Alternative 5, only minor disturbances to wildlife at new mitigation sites would be expected because the more intensive habitat improvement techniques would be used infrequently (e.g., large-scale wetland creation or vegetation plantings). For the same reason, the potential for major changes in habitat quality would be lower than under the other alternatives. In addition, the multiple-use allowance of Alternative 5 would: (1) reduce the amount of land available for wildlife habitat improvement, (2) introduce or maintain a higher level of human activity across new mitigation lands, and (3) divert management time and

resources away form wildlife and toward management of multiple use. Application of program-wide mitigation measures, as appropriate, would minimize impacts on wildlife.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Wildlife

Under BPA's preferred alternative, projects might include a wide range of techniques that could potentially disturb wildlife habitat. Yet, with the program-wide measures applied, as appropriate to protect sensitive wildlife areas (**Section 4.3.4**, below), no significant impacts are expected. In addition, Alternative 6 emphasizes natural revegetation rather than the more intensive techniques of seeding and transplantation; the short-term effects of ground disturbance would therefore be low.

4.3.3 Impacts of Techniques

Land Acquisition Techniques

In general, land acquisition does not in itself have adverse effects on wildlife. Land use changes, however, would adversely affect some species, while benefiting others. For example, converting irrigated cropland to non-irrigated natural vegetation could reduce wetland habitat created by irrigation drainage. Species affected would include those associated with wetlands and cropland (such as red-winged blackbird, ring-neck pheasant, waterfowl, and amphibians). Some native species that have been adversely affected by the development of croplands would increase on lands taken out of crop production (such as pygmy rabbit, jackrabbits, sharp-tailed grouse, and loggerhead shrike).

Land acquisition does not necessarily involve future actions that would dramatically change wildlife habitat value. In some cases, high-quality habitats would be designated as mitigation areas without the need for significant improvements. In such cases, wildlife would benefit from the protection of habitat from possible future losses that could occur if the areas were not protected from development.

Plant Propagation Techniques

Active programs to increase desired plant communities would increase plant diversity and prevalence of native plant species and communities. This in turn would benefit most native wildlife species, including those listed as threatened or endangered and many Federal candidate or state-listed species of concern.

Planting activities conducted during spring and early summer can disturb nesting birds (including bald eagle and other species, such as Swainson's hawk, a species recognized as

sensitive in several states) that nest in agricultural areas and are sensitive to disturbance during spring and early summer.

Irrigation runoff can create wetland habitats that benefit waterfowl, amphibians, and other wetland-associated species.

Habitat Creation and Conversion

Habitat creation and conversion would increase target species diversity and abundance; however, in many cases, some wildlife species may be adversely affected.

Creating or expanding wetland areas, while increasing habitat for wetland species, would decrease habitat for upland species. In some cases, high-quality upland habitats could be removed. Artificial islands would provide good nesting habitat and increase shoreline habitat, a type that tends to be used heavily by several types of wildlife. However, islands could also concentrate nesting and provide opportunities for increased predation. Development of artificial nest structures would allow for increases of species where nesting habitat is limited, but nest structures can also attract predators, risking both lower reproduction and survival rates.

Overall, the effects on wildlife from habitat creation and/or conversion would be positive because the sole intent would be to benefit wildlife. Nevertheless, the potential adverse effects should be considered during design of mitigation projects.

Water Development and Management Techniques

Making water available where it has previously been absent can increase the distribution and abundance of many wildlife species in arid environments. Adverse effects may include the reduction of some drought-tolerant wildlife species, as less-tolerant species expand their range and compete with existing residents.

Development of wells, diversion dams, springs, check dams, impoundments, and guzzlers can all result in the direct loss of wildlife habitat through clearing and incidental disturbance from machinery and from placement of materials and equipment at work staging areas.

Guzzlers, springs, ponds, and other water developments may concentrate some wildlife species, which would make them more vulnerable to predation.

Water Distribution Techniques

Development of pipelines, culverts, drainage ditches, and conveyance channels can result in the direct loss of wildlife habitat through clearing and incidental disturbance from heavy equipment and from placement of materials and equipment at work staging areas.

Deep-sided drainage ditches and canals can attract wildlife, which may fall in and be unable to escape. Crossing structures, escape ramps, and fences have been used to reduce mortality in some hazardous canals, but proper design (e.g., low-sloped banks and presence of rip-rap or other material that can serve as escape routes) is usually the best approach to avoid possible problems.

New water distribution systems can connect previously isolated water bodies, inadvertently introducing carp to new areas. Carp can cause serious damage to aquatic vegetation, thus reducing many types of wildlife, including amphibians and marsh birds (e.g., marsh wren, sora).

Fire Management Techniques

Large, intense fires can have long-term effects on wildlife and habitat, including potential direct mortality, loss of habitat, and lowered soil productivity. Fuels management can reduce these effects by minimizing the chance of high-intensity wildfires. However, considering the typically high fuel loads of forests within the Columbia River Basin, reliance on natural fire management would increase the risk of high-intensity fires, which severely damage soil, wildlife habitat, and water quality.

Vegetation Management: Enhancement and Control

Active control of exotic annuals and other undesirable plants can provide long-term increases in the abundance and distribution of native wildlife species, including those with significant population decline in the Columbia River Basin.

The temporary loss of ground cover may reduce small mammal populations or destroy habitat for ground-nesting birds.

Herbicides can be toxic to some wildlife species.

The effects of prescribed burning on wildlife are variable and depend largely on the intensity of the fire, magnitude of the area burned, topography, type of soils, and the type of past fire management. Prescribed fire temporarily destroys habitat, but can result in better wildlife habitat over the long term. Prescribed fire could kill smaller, less mobile animals. However, most animals are sufficiently mobile to escape the characteristically "cool and slow" burns of prescribed fire, either by moving out of the area or by retreating underground.

If allowed to invade riparian areas, prescribed burning can remove streamside shade. Water temperatures consequently increase, thus harming aquatic organisms, including fish.

Prescribed burning can be used in place of grazing as a habitat management strategy, thereby avoiding grazing's adverse effects on wildlife (e.g., loss of riparian vegetation and increased competition for forage plants).

Species Management Techniques

Populations of target species would increase. Management programs for threatened or endangered species generally provide collateral benefits to other wildlife. Protection of nesting and foraging habitat for listed species such as bald eagle also benefits other species that occur in similar habitats (e.g., red-tailed hawk, kingfisher, and otter). In some cases, where hunting is used as a management tool (e.g., to protect desirable vegetation), populations of selected species would be reduced.

Reintroducing species to an area usually adversely affects resident species to varying degrees. For example, reintroduced peregrine falcon can displace prairie falcon nesting, and reintroduced pronghorn could reduce deer populations. In both cases, the reintroduced species would somewhat overlap and thus compete with resident species for food and habitat, eventually lowering carrying capacity for resident species. The degree to which the capacity is lowered depends on the amount of overlap. In addition, moving animals from one place to another can transmit wildlife diseases.

Multiple Use Techniques

Lands under intensive crop production typically provide little habitat for non-game wildlife, other than for common species associated with agricultural lands (e.g., raven, vesper sparrow, crows, meadowlarks, and swallows). However, crop production can be managed to provide seasonally important food sources for migrating or wintering waterfowl; for game birds, such as pheasant (non-native) and quail (both native and introduced); for small mammals; and for raptors. Crop lands co-managed for wildlife are most likely to employ conservation farming practices such as no-till or minimum-tillage methods and the establishment of buffer strips. These practices tend to mitigate some of the potential adverse effects that active crop production may have on wildlife.

Allowing public access for recreational or educational opportunities on mitigation lands could disturb some wildlife, so that they avoid otherwise suitable habitat. Human activity can disturb nesting birds, feeding or resting waterfowl, and wintering deer, causing increased energy expenditure and decreased survival and reproductive success.

Some types of recreation are more likely to have adverse effects on wildlife. Bird watching, hiking, and photography are generally low-impact activities, while developed camping, boat use, and off-road vehicle use (including motorcycles, ATVs, and snowmobiles) can significantly disturb wildlife and wildlife habitat. One surprising exception is that occasionally

people on foot are more disturbing to wildlife than are people in motor vehicles. For example, one study found that wintering deer allowed snowmobiles to travel closer to them than they did people on foot (Freddy et al. 1986).

Hunters may have a greater chance of disturbing wildlife than non-hunters because they add directly to wildlife mortality and they tend to venture into more remote areas. Non-hunting visitors tend to remain near trails in a forested environment. However, in more open environments, photographers, bird watchers, and hikers may travel well beyond trails.

Public access can allow vegetation to be trampled. While motorized vehicles provide the greatest potential for habitat degradation, persons afoot can also trample vegetation and compact soils. Even controlled visitor use, including group tours, can damage habitat (Purdy et al. 1987).

Public access can also indirectly affect wildlife habitat and populations, by diverting management time and resources away from wildlife and toward recreation management.

Development of facilities on mitigation lands could adversely affect wildlife directly through removal of habitat or indirectly through increased human activity and associated disturbance.

When carefully controlled, grazing can improve habitat for mule deer and pronghorn (Anderson et al. 1990). However, intensive grazing can damage habitat by removing desirable plants, by displacing native species, and by decreasing vegetative productivity by increasing soil erosion and compaction (Kennedy 1991). Riparian and other habitats can be successfully protected with proper timing and stocking of cattle, such as limiting cattle use to dry seasons, when riparian soils are less vulnerable to physical disturbance (Marlo 1987).

Transportation/Access Techniques

Restricting access could protect sensitive wildlife areas, including recently planted areas, riparian areas, nesting areas (e.g., heron colonies), and wildlife concentration areas (e.g., wintering areas for waterfowl or for deer).

Fences can restrict animal movements, such as mule deer migration routes (Wallmo 1981). Specific fence designs are available that restrict cattle but do not restrict wildlife. However, it is difficult to construct a fence that allows deer, but not people, to pass. In such cases, restrictive fences can be placed near where people are expected to encounter them, while less restrictive fences can be placed away from areas where people are expected to travel.

Road construction removes wildlife habitat directly and can indirectly remove habitat by increasing human presence. Several types of animals, such as American marten, wolverine, woodland caribou, wolf, and grizzly bear, typically avoid areas containing roads. Road maintenance generally has little effect on wildlife use other than adding human disturbance along the road corridor. Road decommissioning can improve habitat directly and can also reduce human disturbance in areas containing sensitive wildlife species.

4.3.4 Potential Program-Wide Mitigation Measures — Wildlife

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Before implementing any active management technique, identify sensitive wildlife habitats or features (e.g., eagle and other raptor nests, mule deer winter range) and establish buffers and timing restrictions in consultation with state and/or Tribal wildlife biologists.
- Restrict access, either seasonally or spatially, to protect sensitive wildlife areas, including recently planted areas, riparian areas, nesting areas (e.g., heron colonies), and wildlife concentration areas (e.g., wintering areas for waterfowl or for deer).
- Use interpretive signs and on-site custodian care to reduce adverse impacts of recreation on sensitive wildlife habitats.
- For projects involving introduction, reintroduction, or augmentation of wildlife populations, test animals for diseases before release.
- Coordinate wildlife control efforts with state wildlife agencies and with Animal Damage Control, U.S. Department of Agriculture, Animal and Plant Health Inspection Service. If threatened or endangered species are involved, coordinate with the USFWS.
- Avoid vegetation removal during the nesting season for birds. Where unavoidable, conduct nest surveys for sensitive bird species before disturbing lands.
- Conduct inventories and establish fire breaks around riparian areas before conducting prescribed burns (unless riparian areas are expected to benefit from the treatment).
- Inventory vegetation in areas proposed for land-disturbing activities and avoid high-quality native vegetation communities (as defined by state or Tribal agencies).

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4.4 VEGETATION

4.4.1 Context

- **Legal.** As described under the **Wildlife** and **Fish** sections, Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of any threatened or endangered plant or animal species. Officially designated critical habitat for listed species cannot be adversely modified. Counties typically have jurisdiction over weed control. County Noxious Weed Control Boards may cooperate with project planning to ensure that wildlife mitigation activities do not promote or spread noxious weeds.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: adversely affecting a plant species listed or proposed for ESA listing; adversely modifying designated critical habitat for a listed plant species; adversely affecting plant species that are listed by state or Tribal agencies as species of special concern (such as endangered, sensitive, monitor, etc.); removing or disturbing plant communities that have been identified by state or Tribal agencies as unique or rare (such as late-successional forest or native shrub-steppe); or promoting or spreading noxious weeds.

4.4.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Vegetation

Under No Action, new wildlife mitigation projects would continue to be developed without a standardized program to protect vegetation. Overall, however, native plant communities would continue to benefit (after some initial impacts) from the activities associated with wildlife mitigation, which include protection of relatively large areas of habitat.

Alternative 2: Base Response - Potential Effects on Vegetation (Common to All Action Alternatives)

Activities at new mitigation sites implemented under any of the alternatives would initially disturb vegetation as habitat improvements are implemented. Over time, vegetation communities associated with target species and habitats would increase, including riparian/riverine, old growth forest, wetlands, and shrub-steppe communities.

Alternative 3: Biological Objectives - Potential Effects on Vegetation

While use of active management techniques (seeding, fertilizing, irrigating) under Alternative 3 would accelerate the development of desired plant communities, a narrow focus on biological objectives could potentially reduce those plant communities that do not support the target wildlife species or habitats. For example, native upland habitat could be flooded to create wetland or riparian habitat.

Because intensive management techniques would be used frequently under this alternative (e.g., large-scale tilling operations), a greater proportion of land at new mitigation sites would be disturbed under Alternative 3 than under the other alternatives. This increased level of disturbance would increase the potential for (1) invasions of noxious weeds and other undesirable plants, and (2) direct loss of native plant communities and rare, threatened, or endangered plant species.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Vegetation

Compared to the other alternatives, Alternative 4 would disturb the least amount of vegetation at new mitigation sites because of the heavy reliance on natural revegetation (rather than the use of more intensive methods). Over the long term, because native vegetation communities would not always regenerate by themselves, some damaged communities could remain in a disturbed condition indefinitely, if active efforts to restore them were not taken because of cost constraints. In most cases, native vegetative conditions would improve naturally; however, results would generally take much longer to achieve than under the other alternatives.

Alternative 5: General Environmental Protection - Potential Effects on Vegetation

Alternative 5 would include a relatively low amount of initial disturbance to vegetation because the more intensive habitat improvement techniques would be used infrequently (e.g., large-scale wetland creation or vegetation plantings). Application of program-wide mitigation measures, as appropriate, would further serve to minimize impacts on vegetation. The multiple-use allowance of Alternative 5 would reduce the amount of native plant communities protected at new mitigation sites; it would also introduce or maintain a relatively high level of human activity across new mitigation lands, thereby increasing the amount of vegetation trampling and potential introductions of unwanted vegetation that can occur with multiple use.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Vegetation

BPA's preferred alternative would include program-wide measures, as appropriate, to control the spread of weeds and to protect high-quality native plant communities and rare, threatened,

and endangered plants. Projects might include a wide range of techniques that could disturb vegetation (e.g., prescribed burn, clearing/seeding), although the amount of ground disturbed would be minimized because this alternative emphasizes natural revegetation rather than the more intensive techniques of seeding and transplantation.

4.4.3 Impacts of Techniques

Land Acquisition Techniques

Land acquisition does not necessarily involve activities that would dramatically change vegetation. In some cases, high-quality habitats would be designated as mitigation areas without the need for significant improvements. In such cases, native vegetation communities would benefit from the protection from possible future losses that could occur if the areas were developed or intensively grazed.

Conversion of cropland without active management would encourage weed invasions that could spread to adjacent croplands.

Plant Propagation Techniques

The propagation of plants changes vegetation patterns over time. In general, biological diversity would increase as multiple native species replace single-species crops or lands dominated by a few species of weeds.

Active propagation techniques (seeding, fertilizing, irrigation) accelerate development of desired plant communities over what would occur if no active efforts were taken. In places where the land has been severely disturbed, native vegetation may not naturally regenerate, and habitats may remain disturbed if active efforts are not taken.

Propagation of native species may not work on soils that have been severely disturbed. Likewise, native plants from non-local stock may not adapt to site-specific conditions and may not survive. In addition, introduction of non-endemic stock (plants from different regions) may dilute the genetic composition of existing vegetation over time through cross-pollination.

Planting activities have the potential to remove threatened or endangered plant species directly.

Transplanting vegetation can have a high success rate relative to other techniques, especially where seeding has failed. Therefore, use of this technique in problem areas would accelerate restoration or enhancement of native vegetation.

Tilling (to prepare seedbeds) disturbs soils and can allow establishment of noxious and other weeds.

Irrigation and fertilization generally benefit vegetation. Irrigation can reduce some native species adapted to dry conditions (e.g., sagebrush).

Habitat Creation and Conversion

Creating or expanding wetlands reduces upland vegetation, which may include high-quality native habitats or habitat for rare, threatened, or endangered plant species.

Water Development and Management Techniques

Water diversions from natural streams can reduce riparian vegetation.

Development of wells, diversion dams, springs, check dams, impoundments, and guzzlers can all result in the direct loss of vegetation through clearing and incidental disturbance from machinery and from placement of materials and equipment at work staging areas.

Guzzlers, springs, ponds, and other water developments may concentrate some wildlife species that (in the case of larger animals such as deer) may trample and compact vegetation and soils.

Water Distribution Techniques

Development of pipelines, culverts, drainage ditches, and conveyance channels can directly remove vegetation through clearing and incidental disturbance from heavy equipment and from placement of materials and equipment at work staging areas.

Fire Management Techniques

Natural fire management in areas of previous fire suppression presents a greater risk of high-intensity fires because much fuel has often built up. Such fires can severely damage soil, water quality, and vegetation. In these areas, fuel management programs, including prescribed burns at intervals to reduce fuels, presents less risk of high-intensity fires, and, over time, can reduce the numbers of fire-intolerant species and increase numbers of fire-tolerant species.

However, prescribed fire in areas where suppression has allowed fuels to build up must be approached with caution, because vegetation can be significantly damaged. For example, overstory trees might be killed as fires burn hotter and longer in a given place.

Vegetation Management: Enhancement and Control

Control of non-native plants would increase native plant communities. Non-native invasive plant species, such as reed canarygrass and Himalayan blackberry, would decrease on mitigation lands where vegetation control programs are implemented. Prescribed burning can be used in place of grazing as a habitat management strategy, thereby avoiding grazing's adverse effects on vegetation, such as the loss of riparian vegetation and highly palatable native plants.

However, each of the techniques available to control vegetation carries some risks of adversely affecting vegetation. Herbicides can incidentally harm desirable plant species. Mechanical removal of vegetation is typically nonselective and is likely to remove desirable plants, which may include threatened, endangered, or sensitive plant species. Biological control of vegetation can potentially disrupt natural systems. Prescribed fire can reduce desirable species, increase invasive weeds, and reduce soil productivity. Water manipulation and mechanical control can slow natural vegetative succession. Hand-pulling carries the least risk of causing adverse affects.

Species Management Techniques

Control of nuisance animals can protect vegetation or vegetation enhancement projects. For example, voles and mice can often kill significant amounts of planted vegetation by eating through the bark, and Canada geese can remove planted tubers and bulbs. Temporary control of these species may be necessary to meet certain habitat enhancement objectives effectively.

Multiple Use Techniques

Crop production on mitigation lands would continue the ongoing effects of agriculture, which include maintenance of non-native annual crops, application of herbicides and pesticides, and ongoing soil disturbance.

Provision of educational and recreational opportunities can lead to soil compaction and trampling of vegetation (Cole and Landres 1995). Wakes from speeding motor boats in lakes can disturb shoreline soils and shoreline vegetation. Increasing vehicle access can disturb soil and transport seeds of noxious and other weeds. Seeds of many species of weeds, including some that are classified as noxious weeds, can be spread by livestock, people, wildlife, vehicles, and machinery.

Facility development might require the direct removal of vegetation. Increased human activities can then disturb and remove vegetation adjacent to facilities.

Grazing decreases the population of highly palatable plants (in many cases, native plants) and increases that of unpalatable plants. High levels of grazing can also break and compact

vegetation and soils through repeated walking, trampling, and lying down. Riparian areas are especially vulnerable to physical damage because the wet soils are soft and less stable.

Grazing can benefit vegetation as well. Grazing can reduce shrub density, release trees from competition, reduce fire fuels, and create habitat diversity between grazed and ungrazed areas.

Transportation/Access Techniques

Restricting access with fences and gates can prevent the potential vegetation loss that can be caused by recreational activities and other public uses. Restricting uses could also protect sensitive plant communities, including recently planted areas, riparian areas, and high-quality wetlands. The development of fences and gates requires that minor amounts of vegetation be removed, through digging for fence posts. Vegetation is trampled and soils compacted by vehicles and equipment and at material staging areas. Road construction directly removes vegetation and results in long-term soil compaction.

4.4.4 Potential Program-Wide Mitigation Measures — Vegetation

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- For projects involving land acquisition (including leases), incorporate a weed control plan in consultation with local weed control officials.
- For projects involving plantings on disturbed soils, favor use of native vegetation but allow non-native or native cultivars to be planted where such plantings would better contribute to the long-term goals of habitat improvement.
- Use conservation tillage practices for planting and maintaining vegetation, including reduced-tillage or no-tillage where possible.
- Survey for listed or other plant species of concern before disturbing lands for planting if the USFWS identifies such species as potentially occurring in the vicinity of the project area.
- Acquire seeds and plants from stock derived under similar environmental conditions. Local stock is preferred; on-site stock is the ideal.
- For projects involving wetland creation or expansion, survey for and avoid sensitive features during early planning.
- Avoid developing new water sources that would reduce surface flows; where reduction is unavoidable, establish, in cooperation with state water resource staff, maximum allowable reduction in flows.

- Place guzzlers, springs, ponds, and other water developments in areas where vegetation can tolerate increased trampling from wildlife.
- Incorporate integrated vegetation management, within minimal use of herbicides.
- When a herbicide is needed, use species-selective herbicides and selective application techniques.
- For projects involving vegetation control, develop specific protocols for use of herbicides, mechanical, and biological methods, in cooperation with local weed control boards. Protocols could be adapted from the USFS Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).
- For projects involving vegetation control, conduct weed control programs more efficiently and with a greater regional effect by using joint multi-agency planning.

4.5 LAND AND SHORELINE USE

4.5.1 Context

- **Legal.** Land use regulation is most commonly carried out at the county level, although some state land use restrictions may also apply, especially in sensitive areas such as shorelines. County regulations may include plans, policies, and ordinances that define zones where certain land uses are allowed and others are prohibited. Examples of typical county zoning and/or comprehensive plan designations include the following: multi-family residential, single-family residential, commercial, industrial, agricultural, forestry, mining resource lands, and open space. Additional zones may also identify special emphasis on environmental protection, such as view protection districts, scenic design areas, floodplain zones, and natural areas.

  Counties typically review projects occurring within their jurisdiction for consistency with their plans, policies and ordinances, and may require conditional use permits for projects affecting private lands, as well as formal mitigation agreements as part of permit approval.

  Section 1539 of the Farmland Protection Act, Public Law 97-98 (December 22, 1981), was established to minimize Federal actions that result in the unnecessary and irreversible conversion of farmland to non-agricultural purposes. Under the Act, Federal agencies must examine their actions for potential adverse effects on farmlands, as determined by applying the criteria established in Federal rules (7 CFR 658.4).

  Shorelines are protected under the Clean Water Act, as well as by state acts and regulations.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: converting to nonagricultural purposes farmland rating 160 or greater according to the USDA rating system (7 CFR 658.4); establishing uses not compatible with adjacent land uses and ownerships; conflicting with adopted environmental plans and goals of the community where the project is located; or disrupting or dividing the physical arrangement of an established community.

4.5.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Land and Shoreline Use

Without a standardized program, impacts on land and shoreline use could vary widely, depending on the circumstances surrounding each project. As a general rule, however, BPA project managers would continue to work with project proponents, local authorities, and the public to address land and shoreline use issues, thereby minimizing potential conflicts.

Alternative 2: Base Response - Potential Effects on Land and Shoreline Use (Common to All Action Alternatives)

Any of the alternatives would change land and shoreline use at future wildlife mitigation sites. Conversion of properties to designated wildlife mitigation lands could infringe on existing land uses on the property and/or adjacent lands, and could eliminate some uses altogether. On balance, although grazing, timber production, and farming would be reduced on mitigation lands, the amount of land removed from these uses would be minor in relation to the remaining lands available in the vicinity of new mitigation sites.

Alternative 3: Biological Objectives - Potential Effects on Land and Shoreline Use

Under Alternative 3, Project Management Plans would focus narrowly on obtaining the biological objectives. Land and shoreline use issues would be considered mostly as they relate to achievement of biological objectives, rather than to compatibility with local land uses. Therefore, changes to land and shoreline use at new mitigation sites might be greater than under the other alternatives.

In addition, Alternative 3 has the greatest potential for notable changes in land use and management practices, such as access restrictions, increased prescribed burning, and/or elimination of existing land uses, such as dispersed recreation and commercial forestry or agriculture.

On the other hand, the amount of land that would be converted to wildlife mitigation might be lower under this alternative because project managers could employ intensive management techniques that can achieve biological objectives on less land than would be required with use of more passive techniques.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Land and Shoreline Use

Alternative 4 has a low potential for significant changes in land or shoreline use. High-quality farmland or commercial forests would most likely be avoided because of their high purchase costs and, in the case of farmland, the costs associated with habitat improvements. Existing farming and/or forestry within portions of proposed mitigation sites might continue under this alternative, in order to provide revenues for the mitigation site.

Alternative 5: General Environmental Protection - Potential Effects on Land and Shoreline Use

Under Alternative 5, potential conflicts in land or shoreline use would be avoided or minimized during early project planning, which would involve a high degree of stakeholder involvement. In addition, application of program-wide mitigation measures, as appropriate, would minimize impacts on land and shoreline use. Project Management Plans would include measures to protect sensitive land uses and to minimize or eliminate conflicts with local land use laws.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Land and Shoreline Use

With the proposed standard planning process in place, and with BPA's preferred requirements under Alternative 6, conflicts with land and shoreline use would be avoided or minimized. Project managers would apply potential program-wide measures, as appropriate, to avoid inconsistencies with local land use regulations and to avoid disruption of land use on lands adjacent to mitigation areas (see **Section 4.5.4**, below).

4.5.3 Impacts of Techniques

Land Acquisition Techniques

Wildlife mitigation actions can modify existing land use by reducing the amount of grazing, timber production, and crop production. These changes in land use may conflict with local and multi-jurisdictional land use plans and policies. If a project is inconsistent with local comprehensive land use plans, a variance amendment or special use permit may be required, along with public review. Implementation of large-scale mitigation programs in conjunction with other ecosystem management efforts taking place on Federal lands may eventually reduce regulatory pressure on private lands. For example, regional enhancement efforts may help the recovery of threatened or endangered species as well as help prevent the listing of some species under the ESA.

Plant Propagation Techniques

Major shifts (reductions) in irrigation practices may affect adjacent landowners by potentially reducing available water or by raising the water table. Water available to adjacent landowners could be reduced if, for example, senior water right holders were to sell some or all of their water rights for use on the wildlife project. Then, in dry years, the state water management authority might suspend junior water rights so that the senior right, now for wildlife, would be maintained. This would be a change in kind and place of use, at most, but not a change in duty or quantity of water.

Habitat Creation and Conversion

Careful coordination with state water resource agencies would serve to prevent inadvertent creation of wetlands or wetland buffer areas on lands adjacent to created wetland mitigation projects, potentially causing unintended land use restrictions. Placement of artificial nesting structures within natural settings can detract from people's visual experience. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response.**)

Water Development and Management Techniques

As mentioned above (**Plant Propagation Techniques**), major water developments and shifts in irrigation practices may affect adjacent landowners by possibly reducing available water or by increasing the water table.

Placement of guzzlers within natural settings can detract from people's visual experience. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response.**)

Water Distribution Techniques

The establishment of pipelines, culverts, and drainage ditches/conveyance channels generally do not directly conflict with land or shoreline use. These developments could potentially interfere with utility rights-of-way or traditional or emergency access routes.

Fire Management Techniques

Reliance on natural fire management would increase the risk of high-intensity fires, which can cause substantial risk of property damage, loss of human life, or injury.

Prescribed burning can temporarily interfere with adjacent land use in some cases, such as would occur if smoke drifted to recreation areas or to areas where people are working. Over the long term, fuel reduction programs decrease the risk of high-intensity wildfires and the

associated land use impacts. Prescribed burning to control fuels carries the risk of possible spread to adjacent lands.

Vegetation Management: Enhancement and Control

Prescribed fire can affect adjacent landowners if fire escapes, burning adjacent lands, or if smoke drifts. Under certain conditions, smoke can drift onto roadways and cause serious traffic accidents. Careful consideration of weather, fuel, and other conditions can significantly reduce the potential for smoke drifting onto roadways. Water level manipulation may unintentionally affect adjacent landowners by increasing the water table and restricting land use.

Species Management Techniques

Introduction, reintroduction, and augmentation of wildlife populations may affect adjacent landowners because many species of wildlife are highly mobile. Reintroduction of threatened or endangered species could increase regulatory protection on nearby lands, should these species disperse there from release sites. At the same time, large-scale reintroduction programs may eventually reduce the regulatory pressure on private lands by helping the recovery of threatened or endangered species as well as helping to prevent the listing of some species under the ESA.

Introduction of large mammals carries with it potential concerns for nearby sheep and cattle operations. Wildlife can carry diseases that may be harmful to sheep and cattle(and vice versa). Bison at Yellowstone National Park have been suspected as responsible for the spread of brucellosis to domestic animals (Robinson and Bolen 1989). Wildlife also compete with sheep and cattle for forage. Predators, such as wolves, can pose a threat to livestock if introduced in or near areas being grazed.

Multiple Use Techniques

Allowing crop and grazing on mitigation lands can provide for continuation of historic land use while providing benefits for wildlife. Provision of educational and recreational opportunities can attract visitors to rural areas that are not accustomed to heavy recreational use. Such increases in visitors can change the character of local communities.

However, development of wildlife mitigation areas is not likely to result in noticeable changes in tourist/recreation uses or activity because (1) the primary management emphasis would be on wildlife mitigation and not recreation, and (2) other areas managed primarily for recreation would most likely continue to attract the majority of recreational users.

Transportation/Access Techniques

Access and use restrictions could violate Tribal rights by restricting access to treaty or traditional use lands. Harvest agreements developed between the implementing agency and affected Tribe could serve to prevent potential violations of Tribal rights.

4.5.4 Potential Program-Wide Mitigation Measures — Land and Shoreline Use

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Meet with county officials during early planning of mitigation areas, to try to develop the project in a manner consistent with county zoning and planning efforts.
- For projects involving land use changes, meet with county commissioners and land use officials, who can provide local wisdom and help ensure coordinated, efficient, and effective use of multi-jurisdictional resources.
- Elicit public input, which allows for application of local knowledge and for development of plans consistent with the local land use values.
- Survey proposed alignments of water distribution systems to ensure that no rights-of-way or access routes are blocked.
- For projects involving prescribed burns, identify acceptable weather conditions and air quality concerns, and develop contingency plans in the event of fire escaping to adjacent lands.

4.6 CULTURAL AND HISTORIC RESOURCES

4.6.1 Context

- **Legal.** The National Historic Preservation Act requires that Federal agencies take into account the potential effects of their undertakings on properties on or eligible for the National Register of Historic Places (National Register). The Native American Graves Repatriation Act (NAGPRA) requires that Federal agencies consult with Native American Tribes when activities and operations encounter cultural items or when cultural items are inadvertently discovered. The Archeological Resources Protection Act prohibits the purposeful excavation and removal of archeological resources on Federal land without a permit from the Federal land manager. The American Indian Religious Freedom Act requires that Federal agencies protect the integrity of Native American religious places and opportunities for the exercise of Native American religions on lands under Federal jurisdiction.

- **Desired condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: adverse effects on properties on or eligible for the National Register, or disturbance of Native American cultural items or religious places, or adverse effects on the exercise of Native American religion, pending consultation with the appropriate Tribe(s).

4.6.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Cultural and Historic Resources

Under No Action, BPA would continue to lead cultural resource protection efforts on a project-by-project basis.

Alternative 2: Base Response - Potential Effects on Cultural and Historic Resources (Common to All Action Alternatives)

Wildlife mitigation sites are generally compatible with cultural resource protection. Establishing new mitigation sites can reduce existing or future land uses with a high potential to disturb archaeological, cultural, and historic resources (e.g., road construction and other ground-disturbing activities associated with timber harvest, cattle grazing, and development).

Potential impacts from ground-disturbing activities would occur to varying degrees under any of the alternatives. Program-wide mitigation measures would be applied, as appropriate, to protect cultural resources.

Alternative 3: Biological Objectives - Potential Effects on Cultural and Historic Resources

Because Alternative 3 has the highest potential among the alternatives for ground-disturbing activities related to habitat development, it therefore has the highest potential to disturb cultural resources. Relatively high amounts of ground-disturbing activities would be expected during the initial phases of each new project, as a wide range of management techniques is implemented.

Over the long term, potential impacts would decrease as roads are decommissioned or closed, and timber harvest, crop production, and grazing are reduced or stopped.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Cultural and Historic Resources

Potential impacts on cultural resources would be relatively minor under Alternative 4 because it relies primarily on natural regeneration rather than on active restoration to achieve biological objectives. Ongoing commercial use of mitigation lands (crop, timber, and forage production) would increase the potential for disturbing cultural resource sites.

Alternative 5: General Environmental Protection - Potential Effects on Cultural and Historic Resources

As with Alternative 4, Alternative 5 would encourage commercial and recreational use of mitigation lands where economic and/or recreational benefits could be obtained simultaneously with biological objectives. Therefore, the disturbance of cultural resources associated with these activities might occur over time.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Cultural and Historic Resources

Under BPA's preferred alternative, a moderate amount of ground would be disturbed at new mitigation sites as improvements are begun.

4.6.3 Impacts of Techniques

Land Acquisition Techniques

Cultural and historic resources on lands acquired for wildlife mitigation would probably benefit from increased protection. That is, project managers would have an affirmative responsibility to protect significant cultural and historic resources, whereas private landowners do not. Also, converting from private to public or Tribal land ownership would benefit Tribal cultural interests by providing Tribal access for traditional uses.

Plant Propagation Techniques

Plant propagation techniques that disturb soil may also disturb archeological resources. Planting techniques, including hand transplanting and use of machinery, can disturb surface and subsurface sites. In the long-term, plant propagation would reduce erosion and therefore the potential for site disturbance from erosion.

Propagation of native plant species would benefit Tribal traditional values because many native species are also traditional use species.

Habitat Creation and Conversion

Creating wetlands can affect archeological resources by disturbing sites where there is construction activity, or by inundating sites.

Water Development and Management Techniques

Techniques that can cause soil erosion (such as development of wells, diversions, springs, impoundments, and guzzlers) can disturb archeological sites. Impoundments can also affect sites by inundation. Water features that draw wildlife can also lead to trampling of surface sites, and compaction of subsurface sites.

Water Distribution Techniques

Installation of pipelines, culverts, and drainage ditches/conveyance channels may disturb archeological sites, either by construction or by erosion.

Fire Management Techniques

Fire can affect archeological sites by exposing them to discovery, or by disturbance caused by potentially increased erosion. As discussed in **Potential Effects on Soil (Section 4.1.3)**, natural burn management would have greater potential for causing erosion than would prescribed burn management.

Fire can also damage or destroy historic buildings. Because prescribed burns would be conducted under controlled conditions, there would be less likelihood of adversely affecting historic buildings than with natural burn management.

Vegetation Management: Enhancement and Control

Mechanical removal of vegetation can directly disturb archeological sites. Grazing can compact archeological sites, and can also cause exposure by erosion. Water level manipulation can also cause site exposure by erosion.

Prescribed burns for vegetation management would have the effects described above (**Fire Management Techniques**).

Managing vegetation with preference for native plant species would benefit Tribal traditional values because many native species are also are traditional-use species. Use of herbicides during plant harvest times can conflict with Tribal traditional uses, and/or create health concerns.

Species Management Techniques

Introducing large herding animals, such as elk, can compact soils and archeological sites within them.

Improving conditions for or reintroducing traditional use animals, such as bear, elk, deer, antelope, and bighorn sheep, would benefit Tribal traditional values.

Multiple Use Techniques

Activities that can compact soils, such as grazing and recreational vehicle operation, can also compact archeological sites. Activities that can disturb soils, such as crop tilling and facility development, can also disturb archeological sites.

Facility development can destroy or alter historic property qualities: for example, refurbishing a historic building in a manner inconsistent with the building's historic character, or introducing a manufactured structure into a historic landscape. However, careful planning and

implementation can protect historic qualities while making a building or landscape suitable for contemporary uses.

Recreational use can also expose cultural and historic resources to vandalism. Recreational harvest of Tribal traditional use plants can conflict with Tribal interests.

Transportation/Access Techniques

Fencing can disturb archeological sites, or lead to compaction caused by cattle trailing along the fence line.

Road development can also disturb archeological sites, and also encourage public access which can lead to vandalism of sites. Conversely, closing and decommissioning roads can reduce public access and associated site vandalism.

4.6.4 Potential Program-Wide Mitigation Measures — Cultural and Historic Resources

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Consult with the SHPO and affected Tribes to identify potential occurrences of cultural resources.
- Where there is potential for adversely affecting cultural resources, conduct cultural resource surveys to document any resources present.
- Where properties on or eligible for the National Register are under management control, incorporate a cultural resource management plan.
- Identify opportunities to foster public appreciation of the relationship between natural resources and Tribal culture.

4.7 ECONOMICS

4.7.1 Context

- **Legal.** Executive Order 12898 of February 11, 1994, directs all Federal agencies to ensure that their actions do not result in disproportionately adverse environmental of human health effects on minority and/or low-income populations. In addition, Federal agencies must analyze the environmental effects, including human health, economic and social effects, of their actions, including effects on minority communities and low-income communities.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: involuntary displacement of property owners or restriction of commercial uses, disruption of traffic or business activities during construction or ongoing operation, reducing local tax revenues, either directly or indirectly, to the extent that greater than 1% of total annual revenues are lost.

4.7.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Economics

Under No Action, no standardized program would be applied to provide collateral benefits to local economies. However, experience with previous projects indicates that most lands selected for mitigation would already be under Tribal, state, or Federal jurisdiction, and that the loss of tax base and related concerns would be minimal. Lost landowner revenues from cessation of timber, grazing, and development would be generally offset by BPA's funding to acquire the land or to purchase easements. Some commodity production (e.g., timber) would continue to take place on mitigation lands as part of wildlife mitigation activities (e.g., created openings to provide sharp-tailed grouse habitat). However, as a whole, commercial use of mitigation lands would decrease. Implementation of management activities would continue to provide some temporary employment, service, and supply revenues to the local economies.

Alternative 2: Base Response - Potential Effects on Economics (Common to All Action Alternatives)

Implementation of mitigation projects can provide some temporary and/or seasonal local employment, services and supplies revenues. However, few, if any, full-time employees would be required for most mitigation projects.

Use of water for mitigation projects could potentially reduce water available to other water users who currently have no water rights or whose rights are junior to those of the mitigation project(s). These reductions could correspondingly reduce agricultural productivity or other water-dependent revenues. Conversion of private lands to public or loss of commodity production on public lands could diminish local tax bases. Wildlife mitigation projects would not be sufficient in scale to cause broader impacts within regional economies.

Alternative 3: Biological Objectives - Potential Effects on Economics

Alternative 3 provides the greatest potential for short-term economic benefits derived from local employment and use of services, supplies, and equipment. Over the long term, however, economic benefits would be minimal because (1) project activities would likely taper off after initial implementation and (2) little or no commercial use of mitigation lands would occur. In some instances, local services and supplies might be used indefinitely (e.g., for projects that require long-term maintenance).

Management techniques would be implemented under Alternative 3 to best achieve biological objectives. Impacts on the local economy, including loss of tax base or reduced water supplies, would not be a major design criterion used by project managers to develop projects. Commodity production on mitigation lands and associated revenues would be reduced or eliminated.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Economics

Alternative 4 would likely have little effect on local or regional economies. To reduce costs, Alternative 4 would require that public lands be used for mitigation sites whenever available, so loss of property tax would be minimal. Loss of county timber or grazing revenues would also be minimal because the commercial use of mitigation lands would be encouraged to help offset costs to the government. Should private lands be required to meet the biological objectives, high-quality commercial forest or agricultural lands would be avoided because these properties would be expensive.

Alternative 5: General Environmental Protection - Potential Effects on Economics

Alternative 5 would include actions with collateral benefits to local economies. In addition, application of program-wide mitigation measures, where appropriate, would minimize impacts on local economies.

Commercial uses that are consistent with biological objectives would be encouraged, including crop, livestock, and timber production. Project managers would also monitor local economic

indicators and adapt management to better benefit the human environment, including local economic conditions.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Economics

BPA's preferred alternative would include application of program-wide mitigation measures, as appropriate, to minimize impacts on local economies. This alternative would provide only minor increases in local revenues from employment, services, and supplies, because natural revegetation would be emphasized rather than the more labor- and supply-intensive techniques of seeding and transplantation.

4.7.3 Impacts of Techniques

Land Acquisition Techniques

Changes in grazing, crop production, and timber harvest methods and extent can reduce the economic return of resource lands. In general, commercial use of lands acquired for mitigation actions would occur only as they are consistent with the overriding wildlife management goals and objectives. Because commodity production is secondary (or, in some cases, irrelevant), local economic activity can be reduced if farming and associated economic activities are lost (i.e. equipment sales, local services). In most cases, the amount of land removed from commercial purposes would be very minor in relation to lands remaining available for these uses in the general area of mitigation sites.

For fee-title acquisition of private property, the property is converted from taxable private ownership to nontaxable governmental ownership. Property and other taxes would be lost to the county and state in which the property is located and possibly to established special districts that receive funds from tax assessments. Severity of the impact would depend on the size, value, and tax revenue generation of the property relative to the overall county tax base. Counties with a large proportion of public land could be especially hurt by conversion of private land to the public domain because the tax base of these counties is already limited.

If the property acquired for mitigation land is currently used for crop, forage, or timber production or other forms of income, the associated local benefits (e.g., employment and local product consumption) and taxes (e.g., sales taxes, business and occupation taxes, and income taxes) would also be lost. If Federal land is currently producing timber, and timber production is reduced or eliminated as part of the mitigation area plan, then the county share of timber revenues produced from the land would be lost. Tax losses may be somewhat offset by an increase in economic activity associated with increased recreational visitation and land management activities (as described below).

For easement acquisition, some tax revenues could also be lost if the restriction resulting from the easement were to decrease property value and/or commodity production.

When Tribes would manage mitigation lands, local governments may have lower public service costs if the Tribes were to assume responsibility for police, fire, and road maintenance services.

Plant Propagation Techniques

Employment and income generated by vegetation transplanting and reseeding could temporarily benefit local economies. Transplanting would provide more long-term employment than would reseeding, which is less labor-intensive but which can provide more funds for equipment rental. The employment generated by these activities is likely to be only temporary, or at best seasonal.

In addition, because positions would likely be low-skill, income generated by these two vegetation programs would not likely be a significant benefit local retail businesses or governmental tax revenues.

Habitat Creation and Conversion

The creation of wetlands, artificial islands, and artificial nests would also provide some temporary employment, as well as funds for equipment rental (e.g., excavators, backhoes, and graders) during construction. The creation of artificial nests would likely be the least expensive, because relatively minimal labor and equipment would be required.

Water Development and Management Techniques

Construction and long-term maintenance of wells, diversions, spring development, check dams/impoundments, and guzzlers would generate some income through local labor, equipment, services, and supplies. The amount generated depends strongly on the size of the structures, their design, the materials used, and other factors. Dams/impoundments have the greatest potential for costs and associated income.

Employment and income generated by these activities would vary from very short periods to 1 or 2 years. Construction would thus provide employment opportunities ranging from temporary to year-long full-time jobs. Types of employment would range from low-skill laborer positions to management positions, with associated variation in income.

Depending on the size of the construction project, these structures could require substantial purchases of rock, concrete, pipe, and other materials, as well as water rights. These activities also would provide funds for equipment rental (e.g., excavators, backhoes, and graders) during the construction activities. These purchases and the additional employment would benefit local retail businesses and would increase governmental tax revenues.

Much of the economy of the Pacific Northwest (i.e., agriculture, navigation, power, industry, domestic supplies, and recreation) is closely tied to or dependent upon the availability of water. Conflicts over these rights and access, as evidenced during recent debates about hydropower generation versus fisheries mitigation, are common during periods of reduced annual precipitation. Thus, additional use of water caused by water development projects at mitigation areas could raise concerns regarding economic impacts on other users (such as ranchers or producers of irrigated crops).

Water Distribution Techniques

Construction of pipelines, culverts, and drainage ditches/conveyance culverts to convey water from various sources to the irrigation system are short-term activities. Associated revenues would also be short-term, and would not generate significant long-term income, local retail business, or governmental tax revenues.

Fire Management Techniques

Reliance on natural fire management would increase the risk of high-intensity fires, with a much greater chance of burning adjacent lands and adversely affecting economic values, including loss of cash crops and potential long-term loss of productivity.

The use of prescribed fire generally has little effect on regional or local economies. Potential concerns could stem from the risk of escaped fires damaging crops, livestock, timber, or property. Prescribed burning would have minimal positive impacts on employment.

Vegetation Management: Enhancement and Control

Aerial spraying of herbicides would benefit crop-dusting businesses, while vehicle-mounted herbicide application and mechanical removal would benefit commercial applicators or farmers and others already possessing tractors and trucks with the appropriate equipment.

Hand-pulling of weeds and backpack herbicide application are the most labor-intensive of the vegetation management techniques. However, as with transplanting, seeding, and habitat creation, they would involve the short-term, low-paying laborer positions, and would not result in noticeable positive economic impacts to the area.

Fencing of riparian areas may reduce range value by eliminating stock access to water. Solar-powered springs, hydro rams, or guzzlers can be used to replace water for stock. Large-scale reduction of available grazing land could increase the economic value of remaining grazing land nearby.

Species Management Techniques

Increasing the numbers of browsing/grazing wildlife species may increase wildlife crop damage offsite. Predator/nuisance control can be contracted out to local residents, or the state wildlife agency may open a special season to allow shooting or trapping of the target species. These activities would not likely result in noticeable employment opportunities because they would be short-term.

Multiple Use Techniques

Multiple-use management options include integration of habitat and crop production, provision of educational and recreational opportunities, restricted access for recreation, facility development, and agricultural grazing. In general, allowing multiple-use management would provide greater opportunities for economic benefits at the local level.

Many of these techniques represent no or little minor change to existing uses of the properties. Crop production, restricted access for recreation, and grazing might not vary much from existing practices. Habitat and crop production merely alters timing of harvest and the planting of uncultivated areas to improve habitat, a slight change in land use or management practices. Because most lands purchased would likely be privately owned or otherwise involve some form of restricted access, restricting access for recreational purposes would likely have a negligible impact on local economics.

Providing educational and recreational opportunities would expand tourism and recreational opportunities and associated positive economic impacts. This increase in opportunities for sight-seeing, camping, picnicking, swimming, boating/canoeing, and walking/hiking would likely represent additional options for participating in activities (i.e., at one local site versus another), but would not likely result in noticeable changes in overall recreation uses or activity.

Facility development would have the greatest impact on the implementing agency and the local economy of all of the multiple-use management options. Constructing interpretive centers, observation stations, office space, parking, housing, garages, and storage sheds would have minimal to major costs to agencies to purchase building materials. These purchases would benefit local lumber yards, hardware stores, electrical and plumbing stores, and other related retail businesses. Additional temporary employment would also be provided to construction company employees, but would likely represent only part of their existing business activities, and would not require adding staff.

Transportation/Access Techniques

Transportation and access management options include land-use restrictions through fences and gates, road construction, road maintenance, road decommissioning. These activities can

be fairly labor-intensive. The employment generated by these activities would likely be only temporary.

4.7.4 Potential Program-Wide Mitigation Measures — Economics

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Use available local supplies and labor to accomplish project goals and objectives.
- *For projects involving land acquisition (including leases)*, acquire lands not currently under commercial agricultural use.
- *For projects involving land acquisition, in counties already containing a large amount of Federal lands*, favor selecting existing Federal lands.
- *For projects involving land acquisition (including leases)*, allow revenue generating activities consistent with biological objectives.
- *For projects involving prescribed burns*, develop a specific plan that outlines measures to minimize risk of escape and impact on adjacent land uses and other resources.
- Train and maintain a qualified and adequate work force to plan and implement prescribed burn projects safely and effectively.
- Establish inter-local agreements with fire districts, the USFS, and other appropriate agencies to assist in controlled burn activities.
- Involve local and downstream water users and local water agencies to ensure that project water users do not significantly affect productivity or production costs of water-dependent agriculture.
- *For projects involving prescribed burns*, develop a specific plan that outlines measures to minimize risk of escape and impact on adjacent land uses and other resources.
- Where traditional stock watering areas are fenced to protect riparian habitat, provide alternate sources of water, including solar-powered springs, hydro dams, or guzzlers.
- *For projects involving introduction, reintroduction, or augmentation of wildlife populations,* involve local landowners early in the planning process to develop consensus regarding specific management parameters of wildlife introductions.

4.8 RECREATION/VISUAL

4.8.1 Context

- **Legal.** Hunting is generally regulated by Federal and state fish and wildlife agencies, or by Tribes. Off-road vehicle use is regulated by local and state law enforcement and may also be regulated by local, state, Tribal, or Federal land management agencies.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: creating hazards that might pose a risk to the public; disrupting recreational activities on lands adjacent to lands acquired for mitigation, or recreational activities that conflict with biological objectives, or recreational activities that conflict with Tribal rights.

4.8.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Recreation/Visual

Without a standardized program, recreational opportunities would be developed on a case-by-case basis. In most cases, existing recreational use would continue (based on past mitigation projects). Some wildlife-oriented developed opportunities may be provided, such as wildlife viewing stations and trails. Recreational access would continue to be restricted near sensitive wildlife habitat (e.g., bald eagle nesting areas).

Alternative 2: Base Response - Potential Effects on Recreation/Visual (Common to All Action Alternatives)

While changes in recreational uses would depend greatly on the various approaches outlined in the alternatives, some general consequences would be expected for all of the alternatives. Access would be restricted to some degree under any alternative, including restrictions near bald eagle nests (a threatened species), sensitive cultural resources, or areas undergoing active management (e.g., seeding). On the positive side, reduction of timber or crop production would often increase recreational opportunities or improve recreational experiences at new mitigation sites (e.g., less crowding, noise, dust, or commercial traffic).

Development of structures such as water catchments (guzzlers), signs, and public facilities could alter the visual setting at some new wildlife mitigation sites.

Alternative 3: Biological Objectives - Potential Effects on Recreation/Visual

Under Alternative 3, recreational use at mitigation sites would be minimized because the cost to develop and manage public use would subtract from funds that could otherwise be used to better achieve biological objectives. Therefore, conversion of properties with a high level of previous recreational use would result in a net decrease in recreational opportunities under this alternative. In addition, the likelihood of intensive management over the first several years of new project implementation has the potential to interfere with recreational uses on nearby lands and might detract from the visual setting (e.g., smoke from prescribed burning, traffic and dust from on-site activities).

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Recreation/Visual

As with Alternative 3, the costs associated with recreation management would limit the amount of available resources to maintain or increase recreation on lands obtained for mitigation. Therefore, recreational opportunities would likely be minimal at new mitigation sites developed under Alternative 4.

Alternative 5: General Environmental Protection - Potential Effects on Recreation/Visual

Recreational use of mitigation lands would be encouraged under Alternative 5. This alternative would therefore potentially provide a net increase in recreational opportunities on lands selected for new mitigation projects. In addition, application of program-wide mitigation measures, as appropriate, would minimize impacts on recreation. Alternative 5 does allow access fees to be charged to visitors, and these charges could discourage recreational use in some cases. Placement of recreation-related structures (e.g., restrooms, garbage containers, traffic signs) could detract from the visual setting at some areas.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Recreation/Visual

Under BPA's preferred alternative, recreational uses would be allowed, providing they do not interfere with achieving wildlife mitigation. In many cases, access would be restricted to protect sensitive habitats, cultural resource areas, or other environmentally sensitive areas. Alternative 5 does allow access fees to be charged to visitors, and these charges could discourage recreational use in some cases. Some roads might be permanently closed at new mitigation sites. Program-wide mitigation measures would be applied, as appropriate, to protect recreation and visual resources.

4.8.3 Impacts of Techniques

Land Acquisition Techniques

In some cases, resource acquisition through fee-title acquisition, easement acquisition, or long-term lease could result in the shift of habitat mitigation areas from private to public management. Once the land is under public management, mitigation decisions can increase, maintain, or decrease recreational opportunities. By itself, the acquisition of land does not directly affect recreation; however, the individual techniques employed following acquisition can do so, as described under the other techniques in this section.

Overall, each of the techniques would result in the long-term improvement or maintenance of wildlife and habitat and would likewise result in the long-term increase and enhancement of recreational opportunities for hunting, wildlife viewing, hiking, and other wildlife-related recreation.

Plant Propagation Techniques

Recreational opportunities may be temporarily or permanently lost in areas undergoing active habitat enhancement through plant propagation. Areas may need to be protected to avoid incidental damage to recently planted areas, which typically are vulnerable to disturbance.

In the long-term, improvement of vegetation on communities and associated wildlife populations may increase wildlife-related recreational opportunities, as well as improve the natural character of mitigation lands.

Habitat Creation and Conversion

Recreational opportunities may be temporarily or permanently lost in areas undergoing active habitat creation or conversion. Opportunities may increase as habitat develops into more natural ecosystems and provides improved wildlife habitat.

Placing artificial nesting structures within natural settings can detract from people's visual experience. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response.**)

Water Development and Management Techniques

Placing guzzlers within natural settings can detract from the visual experience of people. (Under any alternative, screening would be required for such structures in National Scenic Areas; see **Chapter 2, Base Response.**)

Habitat improvements from water development and management could increase wildlife-associated recreation and enhance recreational experiences where access is allowed.

Water Distribution Techniques

The establishment of pipelines, culverts, and drainage ditches/conveyance channels generally does not directly conflict with recreational use. These developments could potentially interfere with recreational access, and could detract from the natural setting and associated recreational experiences. Deep ditches with swift flows could pose a potential hazard to recreationists.

Fire Management Techniques

Prescribed burning to reduce fuels can temporarily conflict with recreational use on or near mitigation lands. Recreation opportunities may be temporarily lost while sites are closed for prescribed fire operations and during the immediately following recovery period. Drifting smoke could disturb downwind recreational use. Over the long run, fuel reduction programs reduce the risk of high-intensity fires, which have a much greater chance of creating a long-term loss of recreational opportunity as well as short-term losses of scenic resources.

Vegetation Management: Enhancement and Control

Flooding of areas to control reed canarygrass or otherwise to manage vegetation can restrict recreational access, but can also increase some opportunities associated with water, such as bird watching or hunting. Prescribed burning to control fuels carries the risk that fire might spread to adjacent lands, with associated potential loss of recreational opportunities. (See also **Fire Management**, above.)

Species Management Techniques

Introduction, reintroduction, and augmentation of wildlife populations on mitigation lands could affect both on- and off-site recreation opportunities. Reintroduction of threatened or endangered species could require that some areas be closed to public use. Such reintroductions can also provide opportunities for the public to see rare species. Introduction of large mammals can increase hunting opportunities on mitigation areas and adjacent lands. In addition, the use of hunting as a management tool would provide increased hunting opportunities.

Multiple Use Techniques

Allowing multiple use on mitigation lands would generally increase or maintain recreational opportunities. Developing public facilities, interpretive trails and signs, wildlife viewing stations, and interpretive centers can enhance recreational opportunities and visitor experience, including opportunities for disabled individuals who would not otherwise be able to access these areas.

Transportation/Access Techniques

Transportation and access management options include land-use restrictions through fences and gates, road construction, road maintenance, and road decommissioning. Fences, gates, and road decommissioning can limit (and potentially reduce) the amount and types of recreational activities. Where unrestricted access has been allowed, newly imposed restrictions may diminish recreational opportunities. Road construction and maintenance can also enhance recreation access. Because most private lands involve some form of restricted access, such restriction under the mitigation program on lands acquired from private ownership would have a negligible impact on recreation in most instances.

Providing educational and recreational opportunities and developing facilities might expand tourism and recreational opportunities for sightseeing, camping, picnicking, swimming, boating/canoeing, and walking/hiking. However, noticeable changes in tourist/recreation uses or activity would be unlikely, because (1) the primary management emphasis would be on wildlife mitigation and not recreation and (2) other areas managed primarily for recreation would most likely continue to attract the majority of recreational users.

4.8.4 Potential Program-Wide Mitigation Measures — Recreation/Visual

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- *For projects involving property acquisition (including leases)*, identify safe public recreational opportunities that do not jeopardize project biological objectives.
- *For projects involving property acquisition (including leases)*, identify recreational opportunities suitable for physically disabled persons.
- *For projects involving artificial nesting structures*, screen structures from sensitive viewing locations or develop designs that blend into the landscape in areas managed as National Scenic Areas.
- *For projects involving installation of guzzlers*, screen guzzlers from sensitive viewing locations or develop designs that blend into the landscape in areas managed as National Scenic Areas.

- *For projects involving the development of water conveyance channels*, ensure that these areas are safe for public access or else restrict public access.
- *For projects involving prescribed burns*, identify recreational use areas within the affected environment and develop burn plans that avoid significant smoke drift into these areas during high-use periods.
- *For projects involving the reintroduction of threatened or endangered species*, establish reintroduction sites away from important recreational areas (e.g. boat launches, campgrounds).

4.9. AIR QUALITY

4.9.1 Context

- **Legal.** Several air quality programs under the Clean Air Act regulate prescribed burning and other activities. The National Ambient Air Quality Standards (NAAQS) are established to protect human health and welfare. Pollutant concentrations that exceed the NAAQS are considered injurious to public heath. Air pollutants for which NAAQS have been established are called "criteria" pollutants and include particulates (PM_{10}), carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb).

  The Clean Air Act requires each state to develop, adopt, and implement a State Implementation Plan (SIP) to ensure that the NAAQS are attained and maintained for each criteria pollutant. These plans must contain schedules for developing and implementing air quality programs and regulations. SIPs also contain additional regulations for areas that have violated one or more of on the NAAQS (nonattainment areas). In general, nonattainment areas are located near large, urban centers with large traffic volumes and heavy industrial sources, although some rural areas are non-attainment for PM_{10} as a result of blowing dust.

  The Clean Air Act established the Prevention of Significant Deterioration (PSD) program: it prevents areas that currently have clean air from being degraded. Class I areas are subject to the most limiting restrictions on how much additional pollution can be added to the air while still protecting air quality. All National Parks and Wilderness areas are designated as Class I areas. Other jurisdictions that wish to limit degradation and that implement a plan approved by EPA can also qualify as Class I areas. Other areas not in Class I are considered Class II areas.

  State and local governments have the authority to adopt their own air quality rules and regulations. These rules can be incorporated into the SIP if they are equal to, or more protective than, the corresponding Federal requirements. For example, many states have incorporated smoke management provisions for prescribed burning into their SIPs.

- **Desired Condition.** Project managers will seek to establish a desired future condition without incurring the following impacts: violating Federal, state, or local ambient air quality standards; causing or contributing to a new violation of the NAAQS; increasing the frequency or severity of an existing violation; delaying the timely attainment of a standard; emitting more than the threshold amount of a criteria pollutant in a nonattainment area; contributing to an existing or projected air quality violation;

exposing sensitive receptors (e.g., campgrounds, businesses, or residences) to irritating or harmful pollutant concentrations.

4.9.2 Impacts of Alternatives

Alternative 1: No Action - Potential Effects on Air Quality

Under No Action, burning levels would be prescribed on a case-by-case basis. No standardized program would be established to prevent impacts on air quality, although existing state and local regulations would be followed.

Alternative 2: Base Response - Potential Effects on Air Quality (Common to All Action Alternatives)

Prescribed burning, which would be used to varying degrees under all alternatives, can adversely affect air quality. Under some conditions, burning can reduce visibility, sometimes to a point of posing a safety hazard on public highways. Under all alternatives, project managers would be required to coordinate with state officials to ensure that impacts on air quality would be minimal and within state-defined limits. In addition, because burning already occurs on some land types expected to be selected for wildlife mitigation (e.g., crop-, range- and forest lands), burning levels might remain similar to current conditions. Each alternative involves some risk to air quality associated with aerial application of fertilizers and herbicides, as described below.

Alternative 3: Biological Objectives - Potential Effects on Air Quality

Alternative 3 has the greatest potential use of prescribed burns among the alternatives because fire is often one of the best methods obtain the vegetation change necessary to meet biological objectives. Therefore, this alternative could generate some of the highest levels of smoke at new project sites, especially during the first few years of each new project's implementation, when prescribed fires may be used with greater frequency. Likewise, the potential for dust and emissions from heavy equipment and ground disturbance would be greatest under this alternative.

Fertilizers and herbicides would be used as needed to promote vegetation development. Techniques employed might include aerial application over relatively large areas (greater than 16 ha or 40 ac.). Agricultural use of chemicals would be low because crop production on mitigation lands would not be encouraged.

Alternative 4: Cost and Administrative Efficiency - Potential Effects on Air Quality

Relatively few impacts on air quality would be expected under this alternative because cost constraints would reduce the amount of acres burned or treated with fertilizer or herbicides.

Alternative 5: General Environmental Protection - Potential Effects on Air Quality

Alternative 5 would include a relatively low level of use for fire, fertilizers, and herbicides because protecting the environment would be a high priority. In addition, application of program-wide mitigation measures, as appropriate, would minimize impacts on air quality.

Alternative 6: Balanced Approach (BPA-Preferred) - Potential Effects on Air Quality

Relatively minor impacts associated with drifting smoke would be expected under this alternative. Program-wide mitigation measures would be applied, as appropriate, to minimize potential air quality impacts.

4.9.3 Impacts of Techniques

Land Acquisition Techniques

Conversion of cropland to wildlife habitat could, over the long-term, reduce aerial application of pesticides and herbicides intended to benefit crop production, and their associated impacts on air quality.

Plant Propagation Techniques

Aerial application of herbicides can locally deteriorate air quality.

Habitat Creation and Conversion

Creating wetlands, artificial islands, and artificial nest structures does not significantly affect air quality. Dust and vehicle emissions during construction could temporarily reduce local air quality.

Water Development and Management Techniques

Development and management of water resources does not affect air quality. Dust and vehicle emissions during construction of water improvements could temporarily reduce local air quality.

Water Distribution Techniques

Water distribution techniques generally do not affect air quality, although dust and vehicle emissions during construction could temporarily reduce local air quality.

Fire Management Techniques

Fire can significantly degrade air quality. Smoke effects are typically local, although the cumulative effects of burning on lands acquired for wildlife mitigation, considered with agricultural and silvicultural burning or wind-blown erosion, could cause regional effects, especially in Class I areas with pristine views.

Over the long term, prescribed burning decreases the risk of high-intensity wildfires and the associated air quality impacts. High-intensity fires generally create more smoke than prescribed burns because more fuel is burned per unit of area and greater areas of fuels are burnt.

Vegetation Management: Enhancement and Control

Aerial application of herbicides can locally deteriorate air quality. Prescribed fire can reduce air quality in the short term, as described under **Fire Management Techniques,** above.

Species Management Techniques

Species management techniques do not significantly affect air quality.

Multiple Use Techniques

Allowing crop production on mitigation lands could reduce local air quality associated with farming, including aerial application of herbicides and emissions of dust through wind erosion.

Providing educational and recreational opportunities can attract visitors and increase very local levels of automotive emissions, which would disperse quickly.

Transportation/Access Techniques

Transportation and access techniques do not significantly affect air quality.

4.9.4 Potential Program-Wide Mitigation Measures — Air Quality

Under Alternatives 5 (General Environmental Protection) and 6 (Balanced Action), Project Managers would apply the following program-wide mitigation measures as appropriate to protect the environment.

- Restrict prescribed fire to specific conditions, such as when (1) weather conditions and forecasts are favorable to a controlled burn, (2) air quality is sufficiently high to allow local smoke emissions, and (3) smoke dispersion conditions are favorable.
- Use state-defined smoke management direction to determine allowable smoke quantities.
- *For projects involving the aerial application of herbicides*, develop specific protocols for use of herbicides, including protocols to protect air quality. Protocols could be adapted from the U.S. Forest Service Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).
- Do not conduct prescribed burns unless (1) weather conditions and forecasts are favorable for a controlled burn and (2) predicted emissions will not violate local air quality standards.

4.10 CUMULATIVE IMPACTS

Cumulative impacts can result from "individually minor but collectively significant actions taking place over a period of time"(40 CFR 1508.7). This section examines two levels of cumulative effects that may result from implementing BPA's proposed wildlife mitigation program: (1) impacts of all future BPA wildlife mitigation projects considered together, and (2) impacts of all future wildlife mitigation projects considered collectively with other past, present and future activities within the Columbia River Basin.

4.10.1 Cumulative Impacts of All Future Wildlife Mitigation Projects

The five action alternatives analyzed in this EIS would establish a standard planning process under which BPA could carry out a large number of projects. BPA could implement 50 or more individual wildlife mitigation projects within the Columbia River Basin over the next decade.

Individual projects would range in size from tens of hectares to several hundred hectares (a few hundred acres to several thousand acres). Relatively minor impacts that may occur at individual projects could occur over many hundreds of hectares/acres when all individual projects are considered together.

However, when examined within the broad geographic extent of the project area, adverse impacts of each project would be localized and relatively minor. Overall, wildlife mitigation throughout the Columbia River Basin would provide a net benefit to wildlife habitat and other natural resources, such as soils, water quality, vegetation, and fish. Other impacts, as described in this chapter (e.g., reduction of available land for grazing), would affect only a small portion of lands available for such uses within the Columbia River Basin.

4.10.2 Cumulative Impacts of All Future Wildlife Mitigation Projects Considered Together with Past, Present, and Future Human Actions in the Columbia River Basin

Impacts from developing new mitigation sites across the Columbia River Basin would add to past, present, and future impacts occurring from other human activities in the region. For example, reduction in timber production at new wildlife mitigation sites, although minor in relation to the total amount of land available for these uses, would nonetheless aggravate existing and reasonably foreseeable reductions in available timber. Timber harvest on Federal forest lands, and, to a somewhat lessor degree, on private forest lands, has steadily declined in recent years because of poor forest health and because of increasing environmental and regulatory constraints (e.g. riparian habitat protection for water quality and anadromous fish runs).

Available grazing lands might also decline in the future as some rangelands are developed, as Federal fee structures are reexamined, and as best management practices (BMPs)are implemented to ensure compliance with the Clean Water Act (Bureau of Land Management, 1994). Reduction of available range resulting from wildlife mitigation projects would add to these declines.

Prescribed burning at mitigation lands might add to existing or future regional air quality problems. Under certain climatic conditions, air pollution from field burning in the central Columbia Basin, wildfires or prescribed burning on forest lands, dust blown from exposed soils on agricultural lands, and urban air pollution from human population centers might combine to reduce visibility and general air quality over large areas.

The extent to which wildlife mitigation projects would create or aggravate negative cumulative effects on any given resource would be mitigated by establishing the eight-step ecosystem planning process with the associated prescriptions of the alternatives, which include coordinated planning with other Federal and State agencies, Tribes, and private landowners as part of watershed activities. Negative cumulative impacts may be further minimized or avoided by applying, as appropriate, potential program-wide mitigation measures to protect the environment.

Cumulative beneficial effects on wildlife should include a significant increase in wildlife populations, diversity, and habitat within the Columbia River Basin.

4.11 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires that EISs consider the effects of short-term uses on long-term productivity. *Short-term uses* of the environment are those that occur as discrete events or that can occur on a year-to-year basis. Examples include cattle grazing, timber harvest, recreation, and irrigation. New wildlife mitigation projects may include a variety of short-term uses to achieve mitigation goals: these may include irrigation, controlled grazing, and selective harvesting of trees.

Long-term productivity refers to the capability of the land to provide resources, both market and non-market, for future generations. In the vast majority of cases, development of new wildlife mitigation projects would increase the long-term productivity of the land in terms of capacity. Soils, which play a critical role in nutrient, water, and atmospheric cycles, are equally critical to the long-term productivity of the land. Because soil conditions would be maintained or improved at new mitigation sites, these sites would also support or enhance the production capacity of the land. However, market use of resources on mitigation land would be allowed only as they support the project's biological objectives; therefore, long-term production in

terms of commercial products such as timber, beef, and crops would be reduced or lost at new mitigation sites.

4.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitment of resources refers to use of non-renewable resources such as minerals and petroleum-based fuels. Wildlife mitigation projects may include the use of gravel, sand, and other non-renewable materials to construct access roads, trails, or other features. Materials may come either from on-site borrow pits or from outside sources. Projects would also require some petroleum-based fuels for vehicles and equipment, although wildlife mitigation projects generally require few non-renewable resources.

Irretrievable commitment of resources are those commitments that result in the lost production or use of renewable resources, such as timber or rangeland. Development of wildlife mitigation projects would result in such commitments because some lands currently providing renewable resources would be allocated to wildlife mitigation. For example, forests on mitigation lands would be managed to benefit wildlife rather than to produce timber. Because of this, increased volume growth that could have been achieved through silvicultural prescriptions would be foregone, an irretrievable commitment of timber resources. Other irretrievable commitments include lost land to grazing, crop production, and (in some cases) recreational use. These commitments are irretrievable rather than irreversible, because management direction could change in the future so as to allow these uses.

4.13 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Some adverse environmental impacts associated with new wildlife mitigation areas are unavoidable (i.e., cannot be fully mitigated). These impacts are disclosed in the "Alternative 2: Base Response" section of each resource impact assessment (e.g. soils, land and shoreline use, etc.) and are summarized below.

4.13.1 Soils

Soils would be disturbed during the initial phases of most new projects. Depending on the level of human use allowed at each individual project site, and on the aggressiveness of mitigation actions taken (e.g., planting programs), soils could be disturbed to various degrees over several years. On the whole, wildlife mitigation programs would serve to stabilize soils and provide long-term protection, especially at riparian areas (where soils are typically most susceptible to erosion).

4.13.2 Fish and Water Resources/Quality

Activities at some new wildlife mitigation sites would contribute sediments to adjacent surface waters during the short-term implementation period. However, with state water regulations being followed under all alternatives, and with application of the program-wide mitigation measures, as appropriate, under Alternatives 5 or 6, no significant impacts are expected. Eventually, sediment contributions would decrease as riparian and other vegetation zones become established.

4.13.3 Vegetation

Removal of some existing vegetation as part of wildlife habitat improvement activities would be unavoidable in many cases. Under all alternatives, rare, threatened, or endangered plant species or high quality native plant communities would be protected.

4.13.4 Wildlife

All alternatives would benefit target wildlife species, as well as numerous other native species. With application of program-wide mitigation measures, as appropriate, only minor disturbance of wildlife would occur under Alternatives 5 or 6.

4.13.5 Land and Shoreline Use

For most new mitigation projects, change in land use would be unavoidable. In some cases, however, lands acquired for mitigation purposes may have been previously fallow or otherwise not actively used, and conversion to mitigation lands would not significantly change land use.

4.13.6 Cultural Resources

Wildlife mitigation sites are generally compatible with cultural resource protection. However, ground-disturbing activities such as wetland construction or installation of pipelines can adversely affect archeological resources. Program-wide measures would help to protect cultural resources, but inadvertent impacts are possible.

4.13.7 Economics

Some loss in local revenues and taxes would occur wherever commercial land uses are halted, as part of new wildlife mitigation projects.

4.13.8 Recreation

Access restrictions would be necessary in some areas to protect sensitive wildlife habitats.

4.13.9 Air Quality

Smoke from prescribed burning conducted to improve wildlife habitat or to manage fuel loads would cause local reductions in visibility and air quality.

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Chapter 5: Consultation, Review, and Permit Requirements

5.1 NATIONAL ENVIRONMENTAL POLICY

This EIS was prepared pursuant to NEPA (42 U.S.C. 4321 *et seq.*) and its implementing regulations. Because this EIS explores, identifies, and discloses many of the environmental impacts expected from mitigation projects, future individual projects may not require further NEPA review, so long as project managers follow the program requirements. Subsequent environmental analysis (including NEPA) would be required if anticipated impacts or project components were to differ substantially from those evaluated and addressed in this EIS.

5.2 WILDLIFE, PLANTS, AND HABITAT

5.2.1 Endangered and Threatened Species and Critical Habitat

Under all alternatives, project managers would consult with the USFWS and with the NMFS about listed and proposed endangered and threatened species or designated critical habitat that might be within the area of potential effect. Before any major construction activities, BPA and/or the project manager (e.g., State or Tribal agency) would prepare Biological Assessments according to the interagency coordination rules set forth in 40 CFR Part 402.

5.2.2 Fish and Wildlife Conservation

The Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901 *et seq.*) encourages Federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats. All alternatives under consideration would conserve fish and wildlife. As mentioned above, the USFWS will be consulted regarding all major construction projects, including those affecting water resources, as required by the Fish and Wildlife Conservation Act.

5.3 HERITAGE CONSERVATION / NATIVE AMERICANS

5.3.1 Historic Places

The National Historic Preservation Act of 1966 (16 U.S.C. 470) requires Federal agencies to take into account the potential effects of their undertakings on properties on or eligible for the National Register of Historic Places. Projects involving property acquisition would first receive an overview to determine the potential existence of historic and cultural resources. Under all alternatives, where

a wildlife mitigation lands contain properties on or eligible for the National Register, a cultural resources management plan would be prepared in consultation with the SHPO and/or affected Tribes. This draft EIS is part of the review process, and may result in one or more Programmatic Agreements in accordance with 36 CFR Part 800.

5.3.2 Native Americans

Under all alternatives, project management plans would recognize the need to avoid disturbance of Native American cultural items or religious places, or adverse effects on the exercise of Native American religion, pending consultation with the appropriate Tribe(s).

5.4 STATE, AREAWIDE, AND LOCAL PLAN AND PROGRAM CONSISTENCY

Under all alternatives, project managers would consult with local county and city authorities to address possible conflicts with local plans or programs, including coastal zone management plans, if applicable.

5.5 ENVIRONMENTAL JUSTICE

There is no evidence to suggest that the wildlife mitigation program would have disproportionately high and adverse human health or environmental effects on minority or low-income populations. However, the Base Response alternative includes steps to ensure that such effects would not occur, in accordance with accordance with Executive Order 12898. These steps would also be undertaken on a case-by-case basis under No Action.

5.6 FLOODPLAINS AND WETLANDS

5.6.1 Floodplains

Wildlife mitigation activities are typically consistent with floodplain values, and would often benefit many of those values (i.e., water-quality maintenance, moderation of floods, and living resources). Using floodplains for wildlife conservation would ensure the conservation of natural floodplain functions, as required under Executive Order 11988.

5.6.2 Wetlands

Because wetlands provide valuable habitat for many wildlife species, wildlife mitigation projects are more likely to maintain or improve existing wetlands, or to create new wetlands;

net loss of wetlands is unlikely under any alternative, as specified under Executive Order 11990, Protection of Wetlands.

5.7 FARMLANDS

Consistent with the Farmland Protection Policy Act (7 U.S.C. 4201, *et seq.*), project managers would use the USDA rating system (7 CFR 658.4) if intending to convert farmland. A rating of 160 or greater would require project managers to consider alternatives to conversion, such as using crops to achieve wildlife mitigation objectives.

5.8 GLOBAL WARMING

Although wildlife mitigation projects might involve prescribed burning for habitat or fire management, it would not likely be greater than would occur if the land managed were managed for other purposes, and possibly less. Managing land for wildlife habitat conservation is likely to conserve biomass. However, considering the relatively small amount of land that would ultimately be affected by wildlife mitigation activities, there would be no appreciable effect on global climate.

5.9 WATER RESOURCES

5.9.1 Permits for Structures in Navigable Waters

Some wildlife mitigation activities, such as irrigation system outakes in navigable waters, might require a permit from the Corps under section 10 of the Rivers and Harbors Act of 1899. Consultation requirements of all alternatives would ensure that project managers acquire necessary permits.

5.9.2 Permits for Discharges into Waters of the United States

Some wildlife mitigation activities, such as creation of islands in waters of the United States, may require a permit from the Corps under provisions of the Clean Water Act. (Nationwide permits are typically sufficient for the types of actions conducted at wildlife mitigation areas). Consultation requirements of all alternatives would ensure that project managers acquire necessary permits.

5.10 PUBLIC LANDS

5.10.1 Permits for Rights-of-Way on Public Land

Consultation requirements of all alternatives would ensure that project managers acquire permits or agreements for rights-of-way on lands not owned by BPA.

5.10.2 Outdoor Recreation Resources

Consultation requirements of all alternatives would ensure consistency with all public recreation resources, including Wild an Scenic Rivers, National Trails, Wilderness Areas, parks, campgrounds, and scenic areas

5.11 ENERGY CONSERVATION AT FEDERAL FACILITIES

Federal facilities are not likely to be involved in or affected by wildlife mitigation activities.

5.12 POLLUTION CONTROL

5.12.1 Contract Compliance with the Clean Air and Water Acts

Neither the proposed action nor the alternatives would require BPA to enter into a procurement contract with any entity convicted of an offense under the Clean Air or Water Acts.

All alternatives would require project managers to obtain appropriate permits for prescribed burns, thus ensuring compliance with applicable air quality standards.

5.12.2 Hazardous Waste and Toxic Substances

Some properties acquired for wildlife mitigation might contain solid and/or hazardous waste. For example, land that had been used for ranching might have dilapidated structures, junked vehicles or machinery, fuel tanks, pesticide containers, oil drums, or other refuse. Prior to acquiring property, BPA or project managers would survey for such materials to determine whether they are present. If the cost of cleanup would be excessive, the property would not be acquired. Project managers would be required to dispose of any solid waste at approved landfills. For hazardous and toxic waste, project managers would consult with the EPA and with the appropriate State regulatory agency to determine proper disposal methods and procedures.

5.12.3 Drinking Water

Wildlife mitigation activities are unlikely to release contaminants into groundwater. Herbicides would be the only potential contaminant used, but the methods of herbicide use and restrictions for use near surface waters present little opportunity for herbicides to enter groundwater.

5.12.4 Noise

Wildlife mitigation activities might involve use of heavy equipment that can generate noise. However, projects are typically in remote areas where there is no potential for residential disturbance, so compliance with noise standards is not a concern.

5.12.5 Pesticides

All alternatives would require the use of only EPA-approved pesticides, and only in the manner prescribed by the EPA.

5.12.6 Asbestos/Radon

Wildlife mitigation activities are not expected to involve use, transportation, or disposal of asbestos; the release of radon gas; or the violation of regulations concerning radon gas.

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Chapter 7: List of Preparers

Name	EIS Responsibility	Qualifications
Grant Bailey Jones & Stokes Associates, Inc.	Contract Project Manager	B.S. Biology; 25 years experience in NEPA evaluation and project management.
Charles D. Craig Bonneville Power Administration	Program Review	B.S., M.S. Fishery and Aquatic Biology; 21 years as fish and wildlife biologist.
Joe L. DeHerrera Bonneville Power Administration	Program Review	B.S. Wildlife Management; 11 experience as wildlife biologist, including 6 with BPA
Steve Hall Jones & Stokes Associates, Inc.	Environmental Analysis	B.S. Wildlife Management; 6 years experience conducting environmental impact analysis; 3 years experience as a U.S. Forest Service wildlife biologist.
Phillip D. Havens Bonneville Power Administration	Program Review	B.S. Biological Sciences; 32 years experience as natural resource manager and wildlife biologist.
Philip S. Key Bonneville Power Administration	Legal Review	B.A. Religion, J.D. with certificate in environmental law; 7 years practicing law.
Thomas C. McKinney Bonneville Power Administration	EIS Manager and NEPA Compliance Officer	B.A. Geography, 17 years experience conducting and managing environmental impact analysis at BPA.
Judith H. Montgomery Judith H. Montgomery/ Communications.	Technical Writer/ Editor	Ph.D. American Literature; 16 years experience in writing and editing electric power and environmental documents.
Greg Poremba Jones & Stokes Associates, Inc.	Environmental Analysis (Economics)	Ph.D. Sociology; 15 years experience in conducting NEPA and state environmental and socioeconomic impact assessments.
Curt Overcast Jones & Stokes Associates, Inc.	Environmental Analysis	M.S. Environmental Science; M.P.A. Public Administration, B.S. Biology, 10 years experience in environmental impact analysis and regulatory compliance.
Robert L. Walker Bonneville Power Administration	Wildlife Mitigation Program Manager	B.S. Wildlife Biology; 24 years as natural resource specialist and wildlife biologist.

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Chapter 8: List of Agencies, Organizations, and Persons Sent Copies of the EIS

Native American Tribes

Blackfeet Indian Agency
Burns Paiute Tribe
Coeur d'Alene Tribe of Idaho
Confederated Salish & Kootenai Tribes of the Flathead Reservation
Confederated Tribes and Bands of the Yakama Indian Nation
Confederated Tribes of the Colville Reservation
Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Jamestown Clallam Indian Tribe
Kalispel Tribe
Kootenai Tribe of Idaho
Lower Elwha Tribal Community Council
Lower Elwha Tribal Fishery
Nez Perce Tribe
Point No Point Treaty Council
Puyallup Tribe of Indians
Sauk Suiattle Tribal Council
Shoshone-Bannock Tribes of Fort Hall
Shoshone-Paiute Tribes of the Duck Valley Reservation
Spokane Tribe of Indians
Upper Columbia United Tribes
Upper Skagit Tribal Council

Individuals

Adlard, Dick
Anderson, Randy
Anderson, Ted
Barnes, George
Bennett, Kimberly
Blumberg, Tamara
Bower, Mitchell, Jr.
Bracken, Edd
Buchholz, John & Esther
Cannard, Don
Clayton, Dennis
Clayton, John
Cooke, Michele
Crouch, Brady
Davis, Jeff
Dimaria, Sal
Dreyfuss, Robert
Galbreath, Don
Geddie, John
Graedel, Bill
Guzie, Jon
Hayes, Gill
Heimerl, Kathy
Hemore, Dick
Herzog, Chris
Holland, Randy
Hurless, Harry
Jones, Sallie
Kemper, Howard
Lacey, Clark & Michele
Lanigan, Steve
McEachen, Hugh
Morgan, Rhidian
Morris, Dean & Jeanine
Moses, Todd
Rauner, John
Riley, David
Sautner, Don
Seigel, J.W.
Snyder, Larry
Stanks, Larry
Stark, Dan
Starke, Gretchen
Stengle, James
Tyler, George
Vial, Maurice
Watkins, Clint
Wille, Steve
Wittey, Suzy
Wolfe, Linda
Woolums, Bill
Wyer, William

Congressional

Senator Max Baucus
Senator Conrad Burns
Senator Larry E. Craig
Senator Slade Gorton
Senator Mark O. Hatfield
Senator Dirk Kempthorne
Senator Patty Murray
Senator Ron Wyden
U.S. House of Representatives, Office of the Honorable Earl Blumenhauer
U.S. House of Representatives, Office of the Honorable Jim Bunn
U.S. House of Representatives, Office of the Honorable Helen Chenoweth
U.S. House of Representatives, Office of the Honorable Wes Cooley
U.S. House of Representatives, Office of the Honorable Michael Crapo
U.S. House of Representatives, Office of the Honorable Peter DeFazio
U.S. House of Representatives, Office of the Honorable Norm Dicks
U.S. House of Representatives, Office of the Honorable Jennifer Dunn
U.S. House of Representatives, Office of the Honorable Elizabeth Furse
U.S. House of Representatives, Office of the Honorable Richard (Doc) Hastings
U.S. House of Representatives, Office of the Honorable Jim McDermott
U.S. House of Representatives, Office of the Honorable Jack Metcalf
U.S. House of Representatives, Office of the Honorable George Nethercutt
U.S. House of Representatives, Office of the Honorable Val Ogden
U.S. House of Representatives, Office of the Honorable Linda Smith
U.S. House of Representatives, Office of the Honorable Randy Tate
U.S. House of Representatives, Office of the Honorable Pat Williams
U.S. House of Representatives, Office of the Honorable Rick White

Interest Groups and Businesses

Bonner County Sportmen Association
Cascade Geographic Society
Central Basin Audubon Society
Central Washington University
Clouston Energy Research
Columbia Land Trust
Columbia River Fisheries Program Office
Columbian
Daily News
David Douglas and Associates
Defenders of Wildlife
Direct Service Industries
Douglas County Cattlemens Association
Douglas County PUD No. 1
Ducks Unlimited
Environmental Defense Fund
Environmental Sciences Division
Four J Ranch
Friends of the Earth
Idaho Salmon and Steelhead Unlimited
Jones & Stokes Associates, Inc.
Lake Pend Oreille Idaho Club
League of Oregon Cities
League of Women Voters of Washington
Lincoln County Cattlemens Association
Longview Fibre Company
Mid Columbia PUD
Mountain States Energy Inc.
Nature Conservancy
Northwest Power Planning Council, Department of Wildlife & Resident Fish
Northwest Power Planning Council, Department of Fish & Wildlife
Oregon Health Sciences University
Pacific Marine Technology
Port of Vancouver
Project Glacier
Sierra Club, Northwest Regional Office
Sierra Club, Oregon Chapter
Tacoma Public Utilities
Timber Products Company
Vancouver Audubon Society
Vancouver Wildlife

State Government

Office of the Governor, Idaho
State of Idaho, Department of Fish and Game
Office of the Governor, Montana
State of Montana Energy Division
State of Montana Energy Division, Department of Environmental Quality and Conservation
Office of the Governor, Oregon
State of Oregon, Department of Fish and Wildlife
State of Oregon, Department of State Lands
Office of the Governor, Washington
State of Washington, Department of Fish and Wildlife
State of Washington, Department of Transportation
State of Washington, Department of Ecology Environmental Review Section

Local Government

Association of Idaho Cities
Association of Idaho Counties
Association of Oregon Counties
Association of Washington Cities
Association of Washington Counties
City of Anacortes
City of Auburn
City of Baker
City of Boise
City of Brigham City
City of Dallas
City of Drain
City of Ephrata
City of Eugene
City of Everett
City of Hoquiam
City of Kalispell
City of Middleton
City of Monmouth
City of Pendleton
City of Pocatello
City of Richland
City of St. Helens
City of Sedro Woolley
City of Tigard
City of Washougal
County of Ada
County of Adams
County of Asotin
County of Bannock
County of Bear Lake
County of Beaverhead
County of Benewah
County of Benton
County of Bingham
County of Blaine
County of Boise
County of Bonner
County of Bonneville
County of Boundary
County of Broadwater
County of Butte
County of Camas
County of Canyon
County of Caribou
County of Cassia
County of Chelan
County of Clackamas
County of Clark
County of Clearwater
County of Columbia
County of Coos
County of Cowlitz
County of Crook
County of Custer
County of Deschutes
County of Douglas
County of Elmore
County of Ferry
County of Flathead
County of Franklin
County of Fremont
County of Garfield
County of Gem
County of Gooding
County of Grant
County of Grant Chamber of Commerce

County of Harney
County of Hood River
County of Idaho
County of Island
County of Jefferson
County of Jerome
County of Kittitas
County of Klickitat
County of Kootenai
County of Lake
County of Lane
County of Latah
County of Lemhi
County of Lewis
County of Lincoln
County of Linn
County of Madison
County of Malheur
County of Mineral
County of Minidoka
County of Missoula
County of Morrow
County of Nez Perce
County of Okanogan
County of Oneida
County of Owyhee
County of Payette
County of Pend Oreille
County of Polk
County of Power
County of Ravalli
County of Sanders
County of Sherman
County of Shoshone
County of Spokane
County of Tillamook
County of Twin Falls
County of Umatilla
County of Union
County of Valley
County of Wahkiakun
County of Walla Walla
County of Wallowa
County of Wasco
County of Washington
County of Wheeler
County of Whitman
County of Yakima
County of Yamhill
Port of Vancouver
Skamania County Board of Commissioners
Stevens County Commission

Regional Agencies

Columbia Basin Fish & Wildlife Authority
Northwest Power Planning Council
Metro (Portland Regional Government)

Libraries, Repositories, and Universities

Boise Public Library
Central Washington University
Eastern Washington University

Federal Government

Environmental Protection Agency
USA Corps of Engineers
USA Corps of Engineers, Division of Planning
USA Corps of Engineers, Environmental Resource Branch
USDA Forest Service
USDA Forest Service, Pacific Northwest Region 6
USDA Soil Conservation Service
USDOI Bureau of Indian Affairs
USDOI Bureau of Indian Affairs, Yakama Agency
USDOI Bureau of Indian Affairs, Northern Idaho Agency
USDOI Bureau of Indian Affairs, Spokane Agency
USDOI Bureau of Indian Affairs, Umatilla Agency
USDOI Bureau of Indian Affairs, Warm Springs Agency
USDOI Bureau of Land Management
USDOI Bureau of Reclamation
USDOI Bureau of Reclamation, Pacific Northwest Region
USDOI Fish and Wildlife Service

USDOI Fish and Wildlife Service, Portland Field Office
USDOI Fish and Wildlife Service, Ecological Services
USDOI Fish and Wildlife Service, Office of Columbia River Fishery Resource
USDOI National Park Service
USDOI National Park Service, Coulee Dam National Recreation Area

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APPENDIX A

Available Management Techniques

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Appendix A: Available Management Techniques

Many techniques are available to create, protect, enhance, and manage wildlife habitats under the Northwest Power Planning Council's wildlife program. This section summarizes the primary techniques that may be implemented under some or all of the alternatives being evaluated in this EIS.

The techniques have been classified into 10 major categories:

- Resource Acquisition Techniques,
- Plant Propagation Techniques,
- Habitat Creation and Conversion,
- Water Development and Management Techniques,
- Water Distribution Techniques,
- Fire Management Techniques,
- Vegetation Management: Enhancement and Control,
- Species Management Techniques,
- Multiple Use Techniques, and
- Transportation/Access Techniques.

For each major category, a series of specific techniques is listed and described in the following sections. Each specific technique description includes an overview of the technique followed by a brief listing of some general benefits and drawbacks of the technique.

1 RESOURCE ACQUISITION TECHNIQUES

This section describes several techniques that may be used to obtain lands for wildlife mitigation.

1.1 Fee-Title Acquisition and Transfer

1.1.1 Overview of Technique

Fee-title acquisition and transfer is a three-step process: (1) directly purchasing property, (2) placing restrictions or protective covenants on the title, and (3) reselling or transferring ownership of the property. For the wildlife mitigation program, properties would most likely be transferred as trust lands to Tribal or state fish and wildlife agencies. Terms and conditions of long-term funding and management would be formally stipulated in a signed agreement between BPA and the management entity.

This approach can be used to protect important habitat areas, such as mule deer winter range, a waterfowl breeding area, or a high-quality native habitat (e.g., shrub-steppe).

1.1.2 General Benefits

- allows complete control of restrictions and covenants
- restrictions are usually permanent
- enhances tribal cultural values, and provides increased opportunity to practice traditional tribal activities

1.1.3 General Drawbacks

- higher expense than other land acquisition techniques
- may diminish local property tax base or revenue generation (e.g., forest products, agriculture)

1.2 Easement Acquisition

1.2.1 Overview of Technique

Easement acquisition is the purchase of partial rights to a property. Easements may be temporary; however, typically, perpetual easements are acquired for habitat management. The purchaser, referred to as the dominant tenant, owns the rights to specific aspects of use on the subject property, such as timber, grazing, mineral, or development rights. The seller, referred to as the servient tenant, retains the right for other uses of the land. The cost of the easement is derived from the difference between the assessed value of the property with and without the easement. Easements can be a very cost-effective approach to protecting habitat.

General types of easements that could be obtained include wetland and high-quality native habitat protection easements and forest and agricultural practices easements. Agricultural practices easements could stipulate the types and acreages of crops to be cultivated, define the amount of cropland to be set aside for wildlife foraging areas, and set limitations on certain cropland management practices, such as fertilizer and pesticide use.

1.2.2 General Benefits

- usually less expensive than fee-title acquisition and transfer
- potential for lower loss of tax revenues on commodity production

1.2.3 General Drawbacks

- may provide less control over restrictions and covenants than does fee-title acquisition and transfer because a tenant is involved
- potential loss of tax and commodity revenues if lands are converted from crop or timber production
- possible loss of tax and commodity revenues if lands are converted from private to public ownership

1.3 Long-Term Lease

1.3.1 Overview of Technique

Long-term leases involve leasing a property over a long period, generally for 50 years or more. The Canadian Wildlife Service has used this method to protect waterfowl habitat on private farmland in the prairie potholes of central Canada (Gilbert and Dodds 1987).

1.3.2 General Benefits

- allows flexibility for both owner and lessee
- less costly than fee-title or easement acquisition and transfer
- minimal or no loss of tax revenues

1.3.3 General Drawbacks

- not permanent
- possible loss of tax and commodity revenues if lands are converted from crop or timber production

2 PLANT PROPAGATION TECHNIQUES

Cultivation of desirable plants for wildlife is one of the most commonly employed active methods of wildlife habitat improvement. Four general techniques are available to propagate plants: (1) transplanting, (2) seeding, (3) irrigation, and (4) fertilization.

2.1 Transplanting Vegetation

2.1.1 Overview of Technique

Transplanting vegetation involves the planting of established plants. Plants can range from seedlings to mature but typically involve 1- to 2-year-old plants. Plants may be planted by hand or by machine. Machines are best used for placing seedlings on relatively flat ground.

2.1.2 General Benefits

- can have a high success rate relative to other techniques, especially where seeding has failed
- significant results can often be seen within 5 years
- can be accomplished without major disturbance of the soil over a large area

2.1.3 General Drawbacks

- more time and labor intensive than seeding
- established plants cost more than seedlings or seed
- may not be necessary where natural regeneration occurs

2.2 Seeding

2.2.1 Overview of Technique

Seeding can be used to produce food or cover habitat for wildlife, create or simulate native plant communities, or stabilize exposed soils. The process of seeding for wildlife habitat improvement is typically similar to crop production, where first a seedbed is prepared by prescribed burning or by plowing, disking, or trenching. Where heavy brush is present, sites may be cleared by dragging a heavy chain over the planting area to break off or uproot unwanted shrubs. Disking may be used to augment soils with mulch or other materials. Seeds can be distributed either by hand, tractor (with drill, spreader, or other device attached), or fixed-winged aircraft or helicopter. Use of aircraft generally requires over 50% more seed (Payne and Copes 1986).

After planting, many types of seed need to be covered to germinate. Covering is accomplished through mechanical methods (such as dragging a large chain or cable, or by harrowing) or through placement of mulch or other organic material on top of planted beds. Grazing in seeded areas is usually postponed until seeded plants are established.

Once seeds have been distributed and covered, fertilizer and/or irrigation may be needed to support survival and development (these techniques are described separately below).

2.2.2 General Benefits

- generally involves less labor than transplanting
- distributing seeds costs less per unit area than transplanting established plants

2.2.3 General Drawbacks

- seeds are more vulnerable to desiccation than established plants and may not survive on disturbed or otherwise open sites
- may take several years to reach program objectives

2.3 Irrigation

2.3.1 Overview of Technique

Irrigation involves the application of water on plants to encourage survival and growth. There are several irrigation methods that may apply to wildlife habitat enhancement. Central pivot irrigation systems involve a mobile irrigating pipe anchored to a central pivot. The pipe slowly moves as water is delivered, eventually covering a circular area, just like the sweep of the hour hand on a clock. Water cannons and sprinklers are another method used to deliver water. These are essentially grand versions of home watering sprinklers. Flat lands can also be irrigated through water diversions using a series of conveyance channels and rills (also called furrows). Water trucks can be used to apply water to small areas.

Because irrigation is relatively expensive, it is used sparingly in wildlife habitat enhancement projects. The most typical use is to support newly transplanted or seeded areas through the initial stages of establishment. Where water is readily available, irrigation becomes a more viable technique.

2.3.2 General Benefits

- can make the difference between success and failure of planting efforts in dry climates or if conditions become unexpectedly dry
- can accelerate the establishment of vegetation

2.3.3 General Drawbacks

- can be expensive, especially if water and irrigation equipment are not readily available

2.4 Fertilization

2.4.1 Overview of Technique

Fertilization is the application of nutrients to support plant survival and growth. Typical chemicals applied include elemental nutrients such as nitrogen, phosphorus, potassium, sulfur, and zinc. Fertilizers may be organic and may include compost or other less refined materials to augment soil nutrient content. This assessment also considers the application of lime to reduce soil acidity as a type of fertilization.

Fertilizer can be applied in several ways. Broadcast application involves spraying liquid fertilizer from a helicopter or fixed-winged aircraft. Land-based application may include banding, where fertilizer is applied in bands from a tractor. Banding is more controllable and requires less fertilizer than broadcast application. Fertilizer is also sometimes applied in irrigation water.

2.4.2 General Benefits

- increases success, growth, and establishment of planted vegetation
- can be used to improve habitat in areas where poor habitat conditions are the result of chemical deficiencies in the soil

2.4.3 General Drawbacks

- can be expensive
- can impact water quality

3 HABITAT CREATION AND CONVERSION

This section discusses specific techniques other than vegetative propagation that involve creating habitat for wildlife. Techniques described include creating wetlands, artificial islands, and artificial nest structures.

3.1 Creating Wetlands

3.1.1 Overview of Technique

Wetlands can be created either by excavating to groundwater, diverting surface water flow, or impounding surface water flow. Excavation to below the water level is a common practice that is sometimes combined with surface water diversion. Flow from surface water sources can be diverted to created depressions, to natural depressions, or to diked or bermed areas. Impoundments involve the construction of some mechanism on a stream or intermittent channel to serve as a dam, with the created wetland forming behind the dam.

Common practices for wetland creation include the use of heavy equipment, including excavators, backhoes, and graders. Blasting may also be used to excavate soils. Soil may be moved out of or brought onto a site, depending on the specific characteristics of the site. Wetlands can also be created using the traditional knowledge of tribal cultures. For example, introducing beavers (which build dams that create ponds) can result in high-quality wetland systems that may more accurately reflect natural conditions. Other species, such as muskrat and otter, may also interact with wetlands to create more natural conditions.

3.1.2 General Benefits

- can provide water where water is a limiting factor in the distribution of certain desirable species

3.1.3 General Drawbacks

- displaces upland habitat
- can inadvertently affect adjacent lands, potentially causing unintended land use restrictions

3.2 Artificial Islands

3.2.1 Overview

Creating islands involves placement of a structure or material within standing water. Islands may be either permanent or temporary, depending on management objectives.

Several types of structures have been developed to create islands. Simple although temporary islands can be made from brush or hay. Floating "islands" can be made by mounting a platform on logs or styrofoam.

More permanent and substantial islands can be made from soil and rock. These are most practical to install during excavation of created wetlands, although islands can be placed in existing wetlands, especially those that can be drained. Payne and Copes (1986) recommend that earthen islands be between 10 and 50 feet wide, with 3 feet elevation, covering at least 0.05 acre, and having 6:1 or flatter slopes. Vegetation is usually planted on created earthen islands. Construction of earthen islands usually involves a bulldozer and front-end loader.

3.2.2 General Benefits

- provides nesting habitat
- reduces predation rates
- creates more shoreline

3.2.3 General Drawbacks

- can require substantial effort
- can cause temporary turbidity and sedimentation

3.3 Artificial Nest Structures

3.3.1 Overview of Technique

Artificial nest structures are often developed in areas where suitable habitat is present to support breeding animals, but where there is a lack of suitable nesting habitat. Nest structures include birdhouses, nest baskets, and nest platforms. Nesting cavities may also be created by installing snags (dead standing trees) or by blasting or otherwise opening shallow caves on cliffs. Other structures include bat roosting boxes and placement of logs for turtle basking sites.

3.3.2 General Benefits

- can allow for increased species diversity
- can simulate conditions that had occurred naturally but that have been removed through human activities or other disturbances
- can have high public profile and appeal

3.3.3 General Drawbacks

- may attract predators
- can be visually unattractive
- usually provide only temporary benefits
- often require annual maintenance

4 WATER DEVELOPMENT AND MANAGEMENT TECHNIQUES

The development and control of water is one of the most effective management tools to improve habitat values. Techniques vary widely, from creating a small water source for quail to establishing a wintering refuge for waterfowl.

This section describes some of the major techniques available to secure water and to develop water sources at wildlife areas. Please see Section 2.3 (Irrigation) and Section 5 (Water Distribution Techniques) for other water-related techniques. Techniques described in this section include creating wells, diverting water, developing springs, impounding water, installing guzzlers (self-filling structures that provide drinking water), and acquiring water rights.

4.1 Wells

4.1.1 Overview of Technique

Well systems involve drilling to and tapping into groundwater sources to provide water for habitat improvement for administrative or public use. Construction usually involves a small drilling rig which is typically mounted on a vehicle. Following access to the well, pipe is installed to transport water from the well, and a pump and distribution assembly is placed at the well head and housed in a small structure. Distribution lines are then established. The diameter of pipe and distribution lines depends on water demand but is typically less than 12 inches.

4.1.2 General Benefits

- obtaining water rights for a well can sometimes be easier than obtaining surface water rights

4.1.3 General Drawbacks

- pumping, delivery, and maintenance costs to support a preserve that does not generate revenue may be excessive
- may raise concerns regarding aquifer depletion

4.2 Diversions

4.2.1 Overview of Technique

Water diversions involve drawing water from surface sources, usually streams or rivers. Water can be drawn using siphons, pumps, or conveyance ditches. Siphons can be portable hoses or may be housed in permanent structures. Pumps require a small area for the pump assembly (generally less than 100 square feet) and associated pipelines for distribution (see "Water Distribution Techniques" section below). Conveyance ditches can be lined or unlined and involve excavation of channels ranging from a few feet up to 12 feet or more in depth and width.

4.2.2 General Benefits

- relatively simple and inexpensive technique

4.2.3 General Drawbacks

- water rights may be difficult to secure
- water source can be unpredictable and shortages may occur
- some concerns may arise regarding potential effects on the aquatic environment from runoff, leaching, and drawdown of the water source

4.3 Spring Development

4.3.1 Overview of Technique

Springs and seeps occur where groundwater escapes to the surface. In general, springs provide greater amounts of water than seeps. Both can be tapped and collected to provide water to wildlife.

Spring or seep development requires (1) a field of gravel or sand to collect water, (2) a pipe to drain the field, (3) a storage area or head box to collect and temporarily store water, and (4) a pipe connected to a trough to serve as a drinking basin for wildlife.

In most cases, development of a spring requires excavation to install the drainage field and, if necessary, an impermeable barrier to prevent flowthrough. For wildlife use, spring and seep development involves relatively minor construction because of the small area required to provide a benefit.

4.3.2 General Benefits

- provides water for wildlife
- can increase vegetation and associated habitat values

4.3.3 General Drawbacks

- source water for springs can change naturally or by disturbance caused during spring development

4.4 Check Dams/Impoundments

4.4.1 Overview of Technique

Impoundments can be one of the simplest ways to create a water feature. Several scales and designs of impoundments are available to the wildlife manager. Impoundments can range from simple earthen levees to elaborate concrete dams. Examples include simple embankments made from onsite soils; clay-core dams, which contain a hard clay center; and diaphragm dikes, which contain an outer layer of concrete, steel, or wood to hold back water.

The level of construction required depends upon the magnitude of the impoundment. Simple soil berms require relatively little construction work while an elaborate concrete dam would require larger crews. Construction of dikes and levees typically involves heavy equipment, including a front-end loader, excavator, dump truck, bulldozer, and grader. Blasting may be required to remove rock or stumps or to dig out the foundation area.

Impoundments usually require spillways to allow excess water to pass during heavy flows. Spillways may be constructed from concrete, wood, steel, or earth. On smaller impoundments, simple overflow tubes may be sufficient to release potential floodwaters.

4.4.2 General Benefits

- provides controllable water features to attract desired species or to establish desired habitat

4.4.3 General Drawbacks

- design can require extensive engineering considerations
- excavation may affect archeological resources

4.5 Guzzlers

4.5.1 Overview of Technique

Guzzlers are permanent water catchment and storage devices used to provide drinking water for wildlife. They are typically composed of a lined receiving area that is filled from rainwater collected on an impervious surface (called an apron). Several types of designs, materials, and sizes have been used to construct guzzlers.

The size and design of a guzzler is determined by the expected water source and dry season, as well as the type and number of animals it is intended to serve. Some guzzlers constructed for game birds in temperate areas (i.e., non-arid) take up less than 200 square feet, while guzzlers constructed for deer or similar large animals in arid lands can take up to 4,000 square feet or more. A compact guzzler has been designed for quail. It consists of a 6-foot by 12-foot roof positioned above a storage container. The Natural Resource Conservation Service has developed a guzzler design that would be appropriate for use on wildlife mitigation lands.

The holding container can be constructed of concrete, plastic, fiberglass, or metal. Aprons can be made from sealed pavement, asphalt, metal roofing material, plastic sheeting, or similar material. The holding container may be buried or left above ground.

Construction of guzzlers typically involves small construction equipment (such as a bobcat or backhoe) and crews of four or five people.

4.5.2 General Benefits

- can allow species use in areas where water deficits have previously excluded use
- once installed, guzzlers require little maintenance

4.5.3 General Drawbacks

- may not be appropriate in some situations because factors other than water are limiting species abundance or distribution
- can be visually unattractive
- can attract predators
- ground disturbance during construction may affect archeological resources

4.6 Water Rights Acquisition

4.6.1 Overview of Technique

Water may be required for habitat improvement projects, or for domestic use at administrative or public use facilities. Water rights acquisition typically involves purchasing existing water rights which is often accomplished as part of the land purchase. Most surface water sources in the western United States have already been fully allocated, so purchasing water rights can be the only way to acquire water where well water is not available.

4.6.2 General Benefits

- can provide water without the need to search for and develop a new water source, although in some cases the source may need to be developed (e.g., construction of a diversion dam)

4.6.3 General Drawbacks

- can be expensive
- water rights are not always available if there are conflicts with prior rights

5 WATER DISTRIBUTION TECHNIQUES

The distribution of water is a critical element in any water management program. This section describes the three major techniques used to distribute water at wildlife areas: pipelines, culverts, and drainage ditches/conveyance channels.

5.1 Pipelines

5.1.1 Overview of Technique

Pipelines associated with habitat enhancement areas usually involve pipes ranging from 4 to 12 inches in diameter. They can be placed in the ground or above. Placement in the ground typically involves minor trenching using a backhoe or similar equipment.

Pipelines are used to distribute water for irrigation to support habitat enhancement, for flooding to create and maintain wetlands, or for domestic use at administrative or public facilities.

5.1.2 General Benefits

- minimizes water losses from infiltration and evaporation

5.1.3 General Drawbacks

- requires more initial investment to install and can require more effort to maintain
- disturbs vegetation
- trenching may affect archeological resources

5.2 Culverts

5.2.1 Overview of Technique

Culverts are structures that allow water to flow through an otherwise impassible barrier. They are most commonly used to allow water passage through roadbeds to maintain water levels of wetlands, to support riparian vegetation, or to protect natural drainage corridors.

Culverts are best placed during road construction, but they may be installed in finished roads as well. Installation usually requires a backhoe or similar excavating equipment.

Culverts are typically corrugated metal but may also be constructed of concrete. Types used in habitat enhancement projects may include standard culverts or box culverts. In general, standard culverts (which are simply round, corrugated metal tubes) are most commonly used. Box culverts, which are square culverts, are typically larger than standard culverts and can be constructed to allow for a natural stream substrate. Box culverts are most commonly used when fish passage is a design consideration.

Occasionally, gabions (rock-filled wire cages), rocks, logs, concrete weirs, or low-head dams (with, for example, a 1-foot rise) are placed below culverts to facilitate fish passage or to protect riparian habitat.

5.2.2 General Benefits

- allows drainage to follow natural course
- relatively simple to install and maintain

5.2.3 General Drawbacks

- can cause erosion downstream when a significant drop occurs at the outfall
- can inhibit fish passage

5.3 Drainage Ditches/Conveyance Channels

5.3.1 Overview of Technique

Drainage ditches and conveyance channels are similar in construction and purpose. Drainage ditches are used to divert or drain water while conveyance channels are used to deliver water. Installation of both generally requires trenching or ditching. The ditches or channels may be lined or unlined. Ditches are constructed using a backhoe or excavator.

Drainage ditches and conveyance channels may be used to control the water regime of a managed wetland. They may also be used to support irrigation of habitat enhancement areas or to protect certain habitats from unwanted flooding.

5.3.2 General Benefits

- important element of controlled water regimes

5.3.3 General Drawbacks

- excavation may affect archeological resources

6 FIRE MANAGEMENT TECHNIQUES

As one of the most powerful natural agents of disturbance, fire plays a major role in shaping vegetation communities and associated wildlife habitats. Because of this, fire management can be a major element in any wildlife management program.

This section describes two different techniques for managing fire and the fuels that support fire. The first technique involves an active approach, while the second is more passive. A combination of the two techniques can be developed based on specific land characteristics and management objectives. Please see Section 7.5 (Prescribed Burn) for a description of the use of fire as a tool to control vegetation.

6.1 Prompt Fire Suppression and Fuels Management

6.1.1 Overview of Technique

This technique involves active management to replace the role that natural fire regimes play in rangeland and forest ecosystems. Methods employed include direct and aggressive attack of most unplanned fires. Prescribed burns may be used to reduce fuel loads (see the section on prescribed burning under "Vegetation Management" below). Thinning and other silvicultural methods in forested areas may also be used to reduce fuels.

6.1.2 General Benefits

- more predictable and controllable than natural fire
- can be used to protect developed areas or other areas where fire would be detrimental

6.1.3 General Drawbacks

- requires relatively high devotion of resources
- requires thorough understanding of natural systems and processes, some of which may not be fully understood

6.2 Natural Fire Management

6.2.1 Overview of Technique

Natural fire management allows naturally caused fires to burn with minimum suppression. Few if any agencies widely use this technique, although it is applicable to certain wilderness or natural areas. Fire suppression under such a management approach is aimed primarily at protection of life, property, or valuable resources. Fuel reduction and fuel breaks may be implemented near homes and other developments near areas where natural fire management is applied. Otherwise, fire is allowed to occur naturally.

6.2.2 General Benefits

- allows natural processes to occur
- if natural fires occur frequently, then the severity of each fire may be relatively low

6.2.3 General Drawbacks

- difficult to implement in areas where previous fire suppression or other events have significantly altered fuel loads and natural vegetative structure, composition, and condition
- fire behavior and occurrence can be unpredictable
- substantial risk of property damage, loss of human life, or injury

7 VEGETATION MANAGEMENT: ENHANCEMENT AND CONTROL

Noxious weeds, non-native invasive plants, and aggressive, weedy species can take over disturbed lands and degrade habitat values. Much of the Columbia River Basin has been disturbed by intensive grazing, farming, and other human activities; therefore, some mitigation areas are expected to contain relatively poor habitat dominated by undesirable plant species. The control of such unwanted vegetation can create more natural habitats and encourage native plant and animal species.

This section describes the wide variety of techniques available to control vegetation, including herbicides, mechanical removal, biological control, hand pulling, prescribed burn, and water level manipulation.

7.1 Herbicides

7.1.1 Overview of Technique

Herbicides are chemicals applied to kill plants. They are typically applied in liquid form. Three main types of equipment can be used to apply herbicides: (1) aircraft, either helicopter or fixed-wing; (2) wand or broom sprayers mounted on or towed by trucks, and (3) backpack equipment containing a pressurized container with an agitation device. Herbicides can also be hand applied by injection, daubing cut surfaces, and ground application of granular formulas.

Herbicides are typically mixed with water or oils as a carrier and may also contain a variety of additives to promote saturation and adherence, to stabilize, or to enhance chemical reactions. Dyes are also sometimes added for water quality monitoring undertaken as part of the herbicide application procedure.

Typical uses of herbicides are site preparation for planting, control of undesirable plants that are competing with desirable plants, noxious weed control, right-of-way maintenance, and recreation site and facility maintenance.

Each of the wide variety of herbicides carries its own risks, benefits, and drawbacks. An analysis of each type is beyond the scope of this assessment. Refer to the U.S. Forest Service Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation (USFS 1988).

7.1.2 General Benefits

- in certain situations, can be less expensive and more effective than other methods
- large areas can be covered in a short time
- can be targeted by taking advantage of the seasonal vulnerability of specific species
- has little direct impact on soil surface integrity

7.1.3 General Drawbacks

- can carry substantial risk to environmental and human health, including impacts on water quality
- can kill nontarget species
- can be controversial
- concern over risks may require extensive permitting or environmental review

7.2 Mechanical Removal

7.2.1 Overview of Technique

Mechanical removal of vegetation typically involves the use of tractors or other heavy machinery equipped with a blade, mower, or other device to remove vegetation. Cables and chains attached between vehicles may also be used to clear vegetation.

While the degree of disturbance depends on the type of equipment used, mechanical removal breaks the surface of the soil and can remove some or all of the parts of plants, including roots.

Mechanical removal can be carried out over large areas or can be confined to smaller areas (known as scalping). Vegetation is sometimes removed in strips, rather than clearing all areas (known as contouring or furrowing).

7.2.2 General Benefits

- low cost and high efficiency

7.2.3 General Drawbacks

- can disturb soils
- typically nonselective
- use can be restricted by steep slopes or other uneven topography
- plants may resprout if the whole plant is not removed

7.3 Biological Control

7.3.1 Overview of Technique

Biological control of vegetation involves the use of disease, insects, other parasites, and desirable plants to inhibit growth and spreading of unwanted vegetation. Insect adults or larvae can be used to attack seedheads, stems, or flowers of target plants. In many cases, host-specific species of insects can be found.

Bacteria, viruses, fungi, and other microbes can also be used to control vegetation, but these techniques are mostly experimental at this time (USFS 1988). Another experimental approach involves the use of chemicals naturally produced by plants to inhibit or repel other plants. Traditional knowledge of tribal cultures can be very useful in identifying competitive relationships among plants.

Extreme care is required to effectively apply biological control. When selecting a specific type of control agent, such as a species of insect, managers must research and consider (1) the agent's known effectiveness against the target plant species, (2) the agent's ability to survive site conditions, and (3) the specificity of damage the agent will cause.

Use of any biological agent requires close coordination and consultation with local, state, and federal agencies as well as adjacent landowners. In particular, the USDA Agricultural Research Service and local weed control boards should be consulted prior to considering the use of biological controls.

7.3.2 General Benefits

- involves fewer risks to water quality

7.3.3 General Drawbacks

- requires intensive monitoring
- may be difficult to obtain appropriate insects or other control agents
- potential risk of disrupting natural systems

7.4 Hand Pulling

7.4.1 Overview of Technique

Hand pulling of vegetation can be effective where small areas are targeted for plant control.

7.4.2 General Benefits

- can target specific species
- involves much less disturbance of soils

7.4.3 General Drawbacks

- labor intensive
- not practical for covering large areas

7.5 Prescribed Burn

7.5.1 Overview of Technique

Prescribed burning is the intentional use of fire to create desired changes, such as wildlife habitat improvement, within a specific treatment area. There are three types of prescribed burns: (1) broadcast burning, (2) pile burning, and (3) underburning.

Broadcast burning involves general ignition of essentially all flammable materials within the treatment area. Hand-held or helicopter-borne drip torches are used to quickly ignite fuels. Sites are sometimes cleared or otherwise disturbed prior to igniting a broadcast burn. An example of broadcast burning is slash burning, where woody residuals from logging are burned to prepare a recently harvested timber site for regeneration.

Pile burning involves collecting and piling fuels to be burned in place. This technique allows a more selective approach to burning but is also more labor intensive.

Underburning involves burning only the lower layer of vegetation, while avoiding burning in the overstory (such as the tree canopy). It is used to reduce fuel loads (to avoid wildfires), eliminate unwanted brush, or stimulate forage production.

Prescribed burns can be used to:

- increase forage abundance and accessibility
- reduce unwanted vegetation
- prepare an area for replanting, especially where soils, topography, or slope limit the use of other methods
- create habitat for edge or early seral species
- maintain early seral stage
- increase vegetative diversity and associated wildlife communities.
- simulate natural disturbance regimes
- reduce fuel load and risk of catastrophic fire
- alter distribution patterns of animals (such as wintering deer)

7.5.2 General Benefits

- can simulate the natural role fire plays in the development of most vegetation communities
- can cause desired changes in vegetation relatively inexpensively, compared with chemical or mechanical techniques
- can have minimal impact on surface soils, when compared with mechanical methods, thereby reducing the exposure of mineral soils and associated encouragement of invasive weeds

7.5.3 General Drawbacks

- possible air pollution and soil erosion
- risk of fire escaping
- can be difficult to control because of the complex and unpredictable factors involved
- not selective within treatment area; may harm beneficial or desirable plants and animals
- effects can be severe and long term

7.6 Water Level Manipulation

7.6.1 Overview of Technique

Controlling water levels is a common practice in managing wetlands. Intensive water level manipulation is most commonly used to create waterfowl habitat, where wetlands are seasonally flooded to provide wintering and migratory habitat.

Water level control is also used to control vegetation. For example, reed canarygrass, a non-native invader, can be controlled through flooding during the growing season. Non-native wetland plants can be controlled through draining during the growing season. Water control can also be used to control non-native fish or wildlife species, such as carp.

Water level control can involve raising, maintaining, and/or lowering water levels, depending on project objectives and season. These manipulations can be annual, seasonal, cyclic (e.g., every 5 years), or occasional with no set schedule, depending on project objectives.

Associated activities include construction of berms, dams, or dikes to contain water; placement of pumps and siphons to obtain water; placement of flap gates, weirs, and pipes to control inlet and outlet; and placement of culverts and digging of conveyance channels to distribute water.

7.6.2 General Benefits

- can be relatively inexpensive
- can be integrated with flood control management, water storage, and irrigation systems

7.6.3 General Drawbacks

- may affect water quality or quantity of adjacent landowners or downstream water users
- can create artificial conditions that require constant maintenance by restricting the development of mature, self-sustaining habitats

8 SPECIES MANAGEMENT TECHNIQUES

This section describes the techniques that focus on increasing or decreasing specific wildlife species as a means to meet wildlife mitigation objectives. These techniques include introduction, reintroduction, or augmentation of wildlife populations, and control of predators or nuisance animals.

8.1 Introduction, Reintroduction, or Augmentation of Wildlife Populations

8.1.1 Overview of Technique

Reintroduction or augmentation of wildlife populations is feasible where suitable habitat exists but the species is absent or present in less than desired numbers. In general, the overriding cause of species absence or reduction for the planning area needs to have been remedied. Most reintroductions have focused on threatened and endangered species or game animals.

Threatened or endangered species that have been reintroduced or transplanted in the Interior Columbia Basin include woodland caribou (in northeastern Washington and northern Idaho) and peregrine falcon (in the Columbia Gorge and elsewhere). Peregrine falcons have been released through a technique known as hacking. Hacking involves placing nestlings or young of one species into another species' nest for rearing. Reintroduction of threatened or endangered species is usually followed by extensive monitoring and study.

One other type of species management involving transplantation from the wild is actually a salvage operation. This involves relocating individuals that are threatened by pending occurrences, such as timber harvest, insect damage, or fire.

8.1.2 General Benefits

- can accelerate natural colonization or can alleviate problems caused by barriers to dispersion
- can restore cultural values to tribal cultures

8.1.3 General Drawbacks

- potential problems with transferring diseases
- introduced species can compete with existing desirable species
- requires a detailed understanding of the ecological system in which the species is being placed

8.2 Control of Predators and Nuisance Animals

8.2.1 Overview of Technique

Controlling predators and nuisance animals involves the removal or reduction of undesirable wildlife species. Native, predatory wildlife are generally considered a part of a functioning ecosystem. Undesirable species are typically those that extensively damage habitat, other species, or human property, or that are endangering public health or safety. Examples of such problems include:

- rodent, deer, or elk foraging damage to reforestation, crops, or habitat restoration projects
- bullfrog predation on native amphibians
- carp damage to desired wetland vegetation
- beaver activity or increasing water temperatures interfering with water regimes
- raccoon predation of waterfowl or sharp-tailed grouse nests
- rabies outbreaks in skunks

Removal or reduction of animal populations can be accomplished either directly, through killing or transplanting unwanted animals, or indirectly, through habitat modification or placement of barriers or harassment devices. Efforts that focus on habitat modification are generally more effective and long term and have less adverse effect on the environment. Hunting may also be used as a management tool to reduce or maintain population levels.

Direct methods include shooting, poisoning, and trapping. Poisoning, which has fallen into general disfavor among wildlife professionals, is used most often for predators, such as coyotes, and for small

rodents. Trapping involves the use of live or mortal traps to capture animals. Some animals, such as deer or rabbits, can be herded to holding pens, where they are then either destroyed or relocated.

8.2.2 General Benefits

- can effectively reduce predation on desirable species that are particularly vulnerable

8.2.3 General Drawbacks

- effects are often only short term
- direct measures usually require constant effort

9 MULTIPLE-USE TECHNIQUES

Wildlife habitat can be managed in cooperation with other land uses. This section describes how habitat improvement can be integrated into other land uses.

9.1 Integration of Wildlife Habitat and Crop Production

9.1.1 Overview of Technique

Farmland and rangeland can be co-managed for seasonal wildlife use. For example, retaining and flooding cropland stubble promotes winter waterfowl use, timing of crop harvest can improve (or harm) raptor nesting success, and planting uncultivated areas can improve habitats. Co-management of agricultural lands can be achieved through nonbinding cooperative agreements, easement acquisition, or land purchase/transfer and lease. Lands brought under co-management are typically already in agricultural use.

The methods and equipment for co-management include those typical of existing agricultural practices, including the use of tractors, combines, and trucks; application of fertilizers, herbicides, and/or pesticides; and irrigation.

Crop production on lands co-managed for wildlife use are more likely to employ conservation farming practices (e.g., no till or minimum tillage methods, establishment of buffer strips).

9.1.2 General Benefits

- can provide for multiple use and benefits, including revenue generation

9.1.3 General Drawbacks

- nonbinding agreements can be temporary

9.2 Provision of Educational and Recreational Opportunities

9.2.1 Overview of Technique

Recreational use of wildlife mitigation areas can be provided where such use does not interfere with overall program objectives. Wildlife-related activities are usually most compatible with wildlife enhancement areas.

Passive wildlife activities include outdoor education and interpretation, bird watching and other wildlife observation, nature photography, walking/hiking, and canoeing. Activities associated with such use can include development of interpretive trails and signs, wildlife viewing stations, and interpretive centers, including access and interpretive facilities for people with disabilities.

Consumptive wildlife-related activities, namely fishing, hunting, and trapping, are not as easily accommodated on wildlife enhancement areas but may be appropriate in certain circumstances. Consumptive use, when allowed, can be limited to certain seasons or to designated areas within a larger wildlife mitigation area.

Recreation that is not oriented toward wildlife can sometimes be provided at wildlife enhancement areas. Such activities may include camping, picnicking, swimming, boating, and sightseeing. Again, these activities may be prohibited where and when they would interfere with other management objectives or may be limited to designated areas.

9.2.2 General Benefits

- increases public awareness and appreciation for the mitigation area
- provides some economic benefits

9.2.3 General Drawbacks

- human activities may disturb some wildlife species
- recreational activities require staff to assist and monitor use

9.3 Facility Development

9.3.1 Overview of Technique

Some facilities may be developed for administrative, management, or recreational purposes in conjunction with the overall goal of providing wildlife habitat. Administrative facilities may include office space, parking, and housing. Management facilities may include garages, storage sheds, and fenced or open yards to store equipment and materials. Recreational facilities may include parking areas, interpretive centers, and observation stations. Facilities must be planned to comply with the Americans with Disabilities Act.

9.3.2 General Benefits

- onsite or near-site facilities provide efficient staff access to the mitigation area
- recreational facilities provide opportunities for public education and appreciation of nature

9.3.3 General Drawbacks

- development generally contradicts the overall objectives of habitat improvement and protection

9.4 Grazing

9.4.1 Overview of Technique

Grazing involves releasing livestock onto rangeland for the purpose of providing forage and shelter to the animals. Grazing can also be used as a management tool to manipulate vegetation and has been used to reduce shrub density, thus releasing trees from competition and reducing fire fuels. Grazing can also be used to create habitat diversity between grazed and ungrazed areas.

Cattle and sheep are the most typical livestock in the Interior Columbia Basin. Modern grazing management involves intensive grazing systems that utilize fencing, rotation of use, and control of movements.

Related management techniques that may be employed under a grazing management system include control of undesirable plants, seeding, fertilization, water improvements and pipelines, and construction of holding corrals, cattleguards, and fences.

Range management on public lands is usually carried out through range allotments. Range allotments are essentially lease arrangements for a specific number, kind, and timing of livestock use within a designated area. An allotment is typically implemented under an allotment management plan that specifies how and when the allotment area is to be grazed.

9.4.2 General Benefits

- can cause desired changes to vegetation while providing revenues and local economic benefits

9.4.3 General Drawbacks

- where range supply is limited, ranchers may come to rely on their allotments, which hampers the land manager's flexibility in management
- on rangeland in poor quality, a high initial investment may be required on behalf of the land manager and the permittee
- long-term costs are associated with monitoring

10 TRANSPORTATION/ACCESS TECHNIQUES

10.1 Land Use Restrictions

10.1.1 Overview of Technique

Access restriction is available to control the loss of habitat through human-caused disturbance. Restrictions can be applied to allow or disallow people, dogs (e.g., dog training and trials), or motor vehicles. Restrictions may also be specific to areas, seasons, or activities.

Public access can be restricted through the use of fencing and signs and can be discouraged by not providing trails or roads. Restrictions can be seasonal, such as in winter to protect wintering mule deer, or in spring and summer, to protect nesting great blue herons.

Fences and gates can effectively restrict unwanted human or animal access to protect wildlife habitat. Purposes can include public safety, habitat protection, and vandalism prevention. As with any facility design feature, fences and gates must be compatible with the Americans with Disabilities Act. Several types of fence and gate styles are available, but most consist of the same basic components, including the vertical structure of the fence itself and a foundation (fence posts anchored to the ground with concrete). Fences can be composed of wood, plastic, or metal. Barbed-wire fences with wood posts are commonly used to control livestock access or to protect riparian areas. Taller, wire fences are used to block elk or other larger animals (such as along roadways). Chainlink fences are used primarily to protect developed structures from vandalism and theft.

10.1.2 General Benefits

- provides secure habitat for wildlife
- minimizes the need to manage people in restricted areas
- can effectively control people or animals

10.1.3 General Drawbacks

- access can be difficult to control, especially where historic access is already established
- can be expensive to install and maintain
- can unintentionally restrict animal movements (such as mule deer migration routes)

10.2 Road Construction

10.2.1 Overview of Technique

Roads may be constructed to provide access for habitat management activities. Road construction can involve a wide range of techniques and levels of effort. Unimproved gravel roads are constructed by simple clearing and grading. Some roads may require cut and fill. Gravel substrate is sometimes added to improve stability. Paved roads involve clearing, grading, placement of a substrate (usually gravel), and finally application of asphalt or concrete.

Drainage structures are typically installed in conjunction with roads to allow streams to pass underneath the road, to direct runoff from road surfaces, and to direct surface water away from roads.

Typical techniques to facilitate drainage include roadside ditching, bridge construction, and culvert installation.

10.2.2 General Benefits

- roads allow direct access for management activities and public use
- roads focus vehicle travel and impacts, and reduce the tendency to form a braided network of informal roads where formal roads are lacking

10.2.3 General Drawbacks

- expensive construction and maintenance
- if provided for public access, can increase risks of vandalism, theft, and dumping
- potential liabilities for public safety

10.3 Road Maintenance

10.3.1 Overview of Technique

Roads present on wildlife mitigation areas may provide important access for management activities. These roads will need to be maintained.

The type of road maintenance performed depends on the road surface type. Gravel roads are maintained through grading and placement of additional gravel, soil, or other materials. Paved roads maintenance may involve repair of potholes, painting, or resurfacing. In general, road maintenance involves relatively minor construction efforts, typically involving a small work crew equipped with one or two vehicles.

10.3.2 General Benefits

- maintains safe travel
- can reduce future costs if problems are addressed early

10.3.3 General Drawbacks

- in certain circumstances, can involve more costs over the long run than road reconstruction

10.4 Road Decommissioning

10.4.1 Overview of Technique

Road decommissioning involves closing and eliminating roads from a transportation system to improve habitat values by restricting access and replanting vegetation. Attempts may be made to restore roadbeds by removing pavement, loosening underlying soils, or adding soils. Cutbanks may be planted or otherwise stabilized and culverts may be removed.

10.4.2 General Benefits

- can reduce road maintenance costs
- can increase habitat value through restoration efforts and through significantly reducing human access

10.4.3 General Drawbacks

- results in loss of access

11 CITATIONS

Gilbert, F. F., and D. G. Dodds. 1987. The philosophy and practice of wildlife management. Robert E. Krieger Publishing Company. Malabar, FL.

Payne, N. F., and F. Copes. 1986. Wildlife and fisheries habitat improvement handbook. (Wildlife and Fisheries Administrative Report [unnumbered].) U.S. Department of Agriculture, Forest Service. Washington, DC.

U.S. Forest Service. 1988. Management competing and unwanted vegetation. Final environmental impact statement. Pacific Northwest Region. Portland, OR.

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APPENDIX B

Contractor Disclosure Statement

ORGANIZATIONAL CONFLICT OF INTEREST REPRESENTATION STATEMENT

This representation is for Task Order 95AT61545, Contract No. 94AM10240, Wildlife Mitigation Program EIS. As a representative of Jones & Stokes Associates, Inc., I hereby certify that, to the best of my knowledge and belief, no facts exist relevant to any past, present, or currently planned interest or activity (financial, contractual, personal, organizational, or otherwise) which relate to the proposed work; and bear on whether I have (or the organization has) a possible conflict of interest with respect to (1) being able to render impartial, technically sound, and objective assistance or advice, or (2) being given an unfair competitive advantage.

Signature

Name: Mr. Grant T. Bailey

Title: Principal

Firm: Jones & Stokes Associates, Inc.

Date of Execution: 1/23/96

CONCUR:

Signature

Name: M. I. Goldman